

NUCLEAR WEAPONS: THE STATE OF PLAY

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PREFACE

By the end of 2009 hopes were higher than for many years that the world was at last seriously headed towards nuclear disarmament. Maybe, just maybe, we could not only stop further proliferation of the most indiscriminately inhumane weapons ever invented, but actually, over time, eliminate them from the face of the globe once and for all. President Barack Obama's Prague Speech of 2009 had set the tone, with its superbly articulated vision of a nuclear-weapon-free world. The report of the International Commission on Nuclear Non-proliferation and Disarmament (ICNND) in 2009, following others before it, had set an achievable global agenda, describing in detail all the building blocks that had to be constructed along the way.

In 2009 the United States and Russia were back negotiating nuclear arms control more seriously than they had been for a decade. A major Nuclear Security Summit was planned for 2010, with a sharply practical agenda designed to inhibit both proliferation and nuclear terrorism. And there was every sign, in the lead-up to the 2010 Non-Proliferation Treaty Review Conference, that – utterly unlike its failed predecessor five years earlier – there would be consensus for significant forward movement across the whole spectrum of inter-related disarmament, non-proliferation and peaceful-uses issues.

By the end of 2012, however, much of the sense of optimism of three years earlier had evaporated. Certainly some progress had been made, and on a few issues, on the face of it, quite substantial progress. The New START treaty, signed by the United States and Russia in 2010, will significantly reduce the number of deployed strategic weapons. The 2010 US Nuclear Posture Review did make some moves in the direction of reducing reliance on nuclear weapons. The 2010 NPT Review Conference succeeded in reaching agreement on 64 action points (a refreshing change from zero in 2005), adopted strong new language on the catastrophic humanitarian consequences of the use of nuclear weapons, and supported initial moves towards a weapons-of-mass-destruction-free zone in the Middle East. And at the Nuclear Security Summits (NSS) in both 2010 and 2012, states made strong commitments to ensure that weapon-useable materials, and weapons themselves, do not fall into the hands of rogue states or terrorists.

But New START left both US and Russian stockpiles intact, their high-alert status undisturbed, weapons-modernization programs in place, disagreements about missile defence and conventional arms imbalances unresolved – and talks on further draw-downs going nowhere. Nuclear weapons numbers have decreased overall, as a result of actions by the United States and Russia in particular; but there has been an actual acceleration of nuclear-weapons programs in India, Pakistan, and China. The cautious initial doctrinal move by Washington towards accepting that the “sole purpose” of nuclear weapons is to respond to nuclear threats, not those of any other kind, has gone nowhere, inhibited by resistance from its Northeast Asian and more nervous Central and Eastern European allies.

By the end of 2012, again, the push for talks on a nuclear-weapon-free zone in the Middle East had stalled, and the absence of any real bite in the 2010 NPT Review Conference outcomes on regime-strengthening measures was all too apparent. North Korea seemed no closer to being put back in its NPT box, and Iran perhaps closer than ever to jumping out of it. The US Senate was no closer to ratifying the Comprehensive Nuclear-Test-Ban Treaty, while China, India, and Pakistan, among others, took shelter behind that inaction, with a fragile voluntary moratorium the only obstacle to resumed testing. Negotiations in Geneva on a treaty to ban production of fissile material for nuclear weapons remained at a total impasse. And even on nuclear security, there is not much reason for optimism that the original target will be met, of achieving security of all nuclear materials by 2014.

So the unhappy reality is that while nuclear weapons continue to pose an existential threat to humanity, progress on their abolition, and on strengthening barriers to their proliferation, remains achingly slow. Road-maps do exist to walk us away from the edge of the nuclear cliff, authoritatively endorsed at inter-governmental conferences and summits and recommended by international commissions. But these commitments and recommendations, whatever their degree of ambition, are of little utility unless effectively implemented.

A key recommendation of the ICNND was that, to help build and sustain political will over time, a regular “report card” should be published and widely disseminated among policymakers and those who influence them. Such documents would evaluate, with rigorous objectivity, the performance of both nuclear-armed and non-nuclear-armed states against the benchmarks set not only by intergovernmental agreement but also, often more ambitiously, by independent commissions like the ICNND itself.

The present report is our effort to implement that recommendation. It describes in detail the progress – or lack of it – on the commitments and recommendations of the 2010 NPT Review Conference, the 2010 and 2012 NSS, and the rather more ambitious ICNND, as at December 2012. Its publication in early 2013 is timed to assist the deliberations of the NPT PrepCom process, and it will be followed by a further updated volume in 2015, prior to that year’s NPT Review Conference. While there are some other “report card” publications in existence, or in preparation, aimed at tracking particular sets of recommendations or the performance of particular groups of states, we believe that the present volume is the most comprehensive of its kind.

The layout of the report should be self-evident, but it should be noted that its two parts are closely inter-related. Part I is intended to be a systematic analytical discussion of all the key issues, grouped into four chapters addressing, respectively, disarmament, non-proliferation, nuclear security and peaceful uses of nuclear energy. Part II then tabulates all the relevant NPT, NSS and ICNND commitments and recommendations, cross-references them to the discussion in the main text, and ranks each on a scale ranging from “No Progress” (red) to “Fully Implemented” (green). It is, in effect, the index to the detailed Part I text. The synopsis which follows this preface is intended to give no more than a quick, broad-brush, overview of our evaluations, area by area – gathering together the general assessments that are made in the “Overview” section introducing each chapter. Necessarily highly condensed, these snapshots should be seen as a quick

introductory guide to the much more detailed text which follows, not a substitute for reading it!

This *State of Play* report is published by the Centre for Nuclear Non-Proliferation and Disarmament (CNND), part of the Crawford School of Public Policy at the Australian National University (ANU) in Canberra, which was established in 2011 with substantial funding support from both the Australian Government and the ANU, which we warmly acknowledge and appreciate. The Swiss Government has also provided support, for which we are grateful, for the dissemination and discussion of the report with the Geneva-based international policy community.

The Centre's Director is Ramesh Thakur and its Research Director Peter Hooton, and these two, together with part-time administrative officer Robert Luton and research assistant Srinjoy Bose – for whose help we are indebted – constitute its core staff, supplemented for the specific purposes of this report by John Carlson and John Page. The Centre has an International Advisory Board chaired by Gareth Evans, whose members are former ICNND co-chair Yoriko Kawaguchi (Japan), James Acton (United Kingdom), Alexei Arbatov (Russia), Jayantha Dhanapala (Sri Lanka), Mark Fitzpatrick (United States), Bates Gill (United States), Francois Heisbourg (France), Pervez Hoodbhoy (Pakistan), Patricia Lewis (Ireland), Pan Zhenqiang (China) and Jennifer Allen Simons (Canada). We are grateful to them for their support and advice in the design of this project, and in a number of cases for comment (although deadlines were impossibly tight) on the final draft.

The report was conceived and designed by the editors, and written by them and the Centre staff named with further very substantial input, as consultants, from the Stockholm International Peace Research Institute (SIPRI). We are indebted to SIPRI for the access this gave us to its superb and very up-to-date data base, and in particular to its staff members Ian Anthony, Andrea Viski and Vitaly Fedchenko who, with support from other Institute colleagues, responded quickly and professionally to our many requests for information and analysis on particular issues.

We hope that *Nuclear Weapons: The State of Play* as at December 2012, and its proposed successor reports, will advance helpfully the global nuclear policy debate by providing an informative and authoritative advocacy tool for governments, organizations and individuals committed to achieving a safer and saner nuclear-weapon-free world. We would appreciate any feedback that would help us in the design and writing of future reports.

Gareth Evans
Ramesh Thakur
Co-Editors

Canberra, 1 February 2013

SYNOPSIS

1. Disarmament

Disarmament Objectives and Strategy [Paras 1.18–31]: Nuclear-armed states pay at best lip-service to the ultimate elimination of nuclear weapons, and none has committed to any “minimization objective,” nor to any specific timetable for their major reduction – let alone abolition. On the evidence of the size of their weapons arsenals, fissile material stocks, force modernization plans, stated doctrine and known deployment practices, all nine nuclear-armed states foresee indefinite retention of nuclear weapons and a continuing role for them in their security policies.

No Progress

Disarmament Principles [Paras 1.32–53]: Some nuclear-weapon states (NWS) provide more information about their nuclear weapons than others, but none paints a full picture. The NWS are talking about improving transparency and have reaffirmed their commitment to report against 2010 Non-Proliferation Treaty Review Conference disarmament objectives to the 2014 NPT Preparatory Committee.

Some Progress

Nuclear Arms Reductions [Paras 1.54–103]: The global stockpile stands at nearly 18,000 nuclear weapons: while nearly half of these are earmarked for dismantlement, there is currently little prospect of major further reduction. Significant cuts in Russian and US stockpiles, mainly under previous treaty obligations, have continued, but no agreement on further cuts is likely while divisions over missile defence and conventional weapons remain. France has met the limited disarmament objective it set itself in 2008, and the United Kingdom could complete planned reductions in warhead numbers ahead of schedule. But elsewhere – in China, India, and Pakistan – nuclear arsenals are growing.

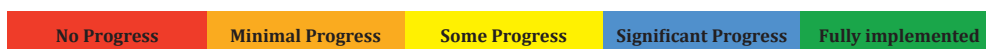
Some Progress

Nuclear Doctrine [Paras 1.104–46]: There have been no significant publicly declared shifts in nuclear doctrine in recent years, although US doctrine has given some acknowledgement to President Barack Obama’s 2009 undertaking to “reduce the role of nuclear weapons in national security strategy,” and an interagency review is examining revised constructs of deterrence and stability.

Minimal Progress

Nuclear Force Posture [Paras 1.147–74]: Apart from the reductions in deployed US and Russian strategic weapons under the New START treaty, the only significant changes in deployment practice elsewhere have been aimed at enhancing the survivability of nuclear weapons in case of attack. No progress has been made in reducing the dangerously high launch-alert status of large numbers of US and Russian weapons.

Minimal Progress



Parallel Security Issues [Paras 1.175–214]: Tensions between the United States and Russia and China are rising over ballistic missile defence, and an emerging new generation of advanced US conventional weapons, and prospects for progress in conventional arms control have receded. This complicates an already very difficult environment for nuclear disarmament talks.

No Progress

Mobilizing Political Will [Paras 1.215–36]: Work done to promote nuclear disarmament has had little impact outside specialist disarmament and non-proliferation circles. The UN Secretary-General’s welcome calls to prioritize nuclear arms control and disarmament have so far fallen largely on deaf ears. Civil society organizations, however dedicated and active, have achieved little of the traction needed to put relevant governments under serious political pressure. But the recent new emphasis on the catastrophic humanitarian consequences of nuclear weapons may show the way forward.

Minimal Progress

2. Non-Proliferation

Safeguards and Verification [Paras 2.36–66]: Additional Comprehensive Safeguards Agreements and Additional Protocols have entered into force but there is still strong resistance by some states to the idea of making APs obligatory. The IAEA’s evolving state-level approach to safeguards has been criticized – albeit not compellingly – as discriminatory by some states who want the emphasis to return from an information-driven and detection-focused approach to traditional nuclear material accounting.

Some Progress

Compliance and Enforcement [Paras 2.67–87]: The 2010 NPT Review Conference made no progress on non-compliance and withdrawal issues and none has been made since. Efforts by the five permanent members of the UN Security Council (P5) and Germany to negotiate a resolution of the stand-off with Iran have made no substantive progress.

No Progress

IAEA Resources [Paras 2.88–96]: The IAEA’s regular budget has seen some modest real growth in recent years but is still insufficient to allow the agency to fulfil its responsibilities and to meet the expectations of member states.

Some Progress

Export Controls [Paras 2.97–123]: A growing number of countries are making use of multilateral guidelines in developing national export controls. But the Nuclear Suppliers Group’s 2008 decision to exempt India from its comprehensive safeguards requirement, and China’s determination to supply more nuclear reactors to Pakistan, have damaged this key mechanism’s credibility, and no progress has been made towards adopting a criteria-based approach to cooperation agreements with states outside the NPT.

Some Progress

Nuclear-Weapon-Free Zones [Paras 2.124–53]: No new NWFZ has been established. There has been only modest movement on protocol ratifications. The Middle East NWFZ Conference mandated by the NPT Review Conference for 2012 has been postponed indefinitely.

Minimal Progress

Non-NPT Treaties and Mechanisms [Paras 2.154–67]: The Proliferation Security Initiative now has the support of around 100 countries and has helped make illicit weapons of mass destruction (WMD)-related transfers harder. But, despite many attempted constraints, ballistic missile technologies continue to proliferate.

Some Progress

Nuclear Testing [Paras 2.168–81]: Of nine Annex 2 states which had not ratified the Comprehensive Test Ban Treaty (CTBT) in May 2010, only one, Indonesia, has since done so. The United States and China are among those who have not. That said, voluntary moratoriums on nuclear tests remain in place, although North Korea continues to threaten more.

Minimal Progress

Fissile Material [Paras 2.182–231]: There has been no progress in beginning negotiations on a global ban on the production of fissile material for nuclear weapons purposes, a central non-proliferation policy objective. But NWS have not produced highly enriched uranium (HEU) or weapon-grade plutonium for years and the facilities used for these purposes have been either shut down or converted to other uses in at least four of them: the status of facilities in China is unknown. Russia and the United States are reducing excess HEU stocks and have a bilateral agreement in force for surplus plutonium disposition from 2018. The most significant growth in fissile material may be occurring in the non-NPT nuclear-armed states but, as with nuclear weapons stockpiles, their total stock is still hugely below that of the five NPT-recognized NWS.

Minimal Progress

3. Nuclear Security

Global Nuclear Security Architecture [Paras 3.32–72]: States have implemented many Nuclear Security Summit commitments, additional states have ratified the Convention on the Physical Protection of Nuclear Material and its Amendment, more are taking advantage of IAEA tools and services, and states have cooperated with one another. However, NPT 2010 and ICNND 2009-recommended support for universal application of the CPPNM and early ratification of the 2005 amendment is not in sight. Much of the architecture lacks any means to judge whether commitments are being met.

Some Progress

Role of the IAEA [Paras 3.73–95]: The IAEA is providing a wide range of advisory services and other assistance on nuclear security issues. The centrality of the IAEA's role makes a predictable and stable budget for nuclear security essential.

Some Progress

International Cooperation [Paras 3.96–111]: Significant international cooperation is taking place in detecting and thwarting illicit trafficking, but this needs to be expanded as gaps are identified. States need to commit more fully to cooperation in developing and sharing nuclear security best practices.

Some Progress

National Nuclear Security Regulations [Paras 3.112–15]: UN Security Council Resolution 1540 has played a significant role in this area, resulting in a substantial increase in the number of states with legislative measures to prohibit proliferation of nuclear weapons. But more needs to be done in national implementation.

Significant Progress

Sensitive Nuclear Materials [Paras 3.116–37]: While progress is being made on minimization of civil HEU use, states have been reluctant to ban outright HEU use in civilian applications. On non-civilian uses, the United States and Russia are on track to complete the conversion of 500 tonnes of HEU to low enriched uranium by the end of 2013 and have committed to the elimination of significant quantities of excess weapon-grade plutonium.

Some Progress

Nuclear Forensics [Paras 3.138–45]: In addition to significant work going on at the national level in some countries, the IAEA continues to provide assistance with building nuclear forensics capacity in member states, both through its own activities and by teaming with member states to hold workshops and other training.

Some Progress

Role of Nuclear Industry [Paras 3.146–50]: There is general understanding that effective nuclear security is strongly in the interests of the nuclear industry. More work is needed on identifying practical ways the nuclear industry and state authorities can work together to improve nuclear security.

Minimal Progress

Nuclear Security and Safety Interface [Paras 3.151–54]: The IAEA in cooperation with member states is providing training and other assistance in this area. A number of training centres have been established which emphasize an integrated approach to nuclear safeguards, safety and security.

Some Progress

Nuclear Security Culture [Paras 3.155–63]: Increasing organizational activity suggests some progress here, but the extent to which a genuine nuclear security culture exists is unclear because of the lack of monitoring and reporting on whether states are implementing best practice standards and recommendations.

Some Progress

4. Peaceful Uses

Nuclear Cooperation [Paras 4.22–46]: NPT 2010 commitments and ICNND 2009 recommendations are generally being met. There are grounds for criticism that technical cooperation assessed funding has not increased more – though it has increased substantially over the years – but the additional funding provided by a number of states is consistent with the increase called for in the NPT 2010 Action Plan.

Significant Progress

Mitigating Proliferation Risks [Paras 4.47–85]: Most states are meeting their NPT peaceful use commitments, but non-compliance cases – especially Iran and North Korea – are cause for concern. Issues of nuclear latency and hedging are not being addressed. The spread of sensitive nuclear technology and the prospective spread of fast reactors and plutonium fuels in the future will present serious challenges unless addressed. HEU minimization is proceeding, though large quantities of HEU remain in the civil cycle; but no effort has been made to minimize plutonium (as mixed oxide, or “MOX”). The establishment of two fuel banks and the work of the International Framework for Nuclear Energy Cooperation are positive developments, but further elaboration, and acceptance, of multilateral approaches have a long way to go.

Some Progress

Safety and Security Commitments [Paras 4.86–118]: Not all states with significant nuclear activities have joined the Convention on Nuclear Safety, and there is a lack of international standards, transparency and accountability. Many states with power reactors remain outside the liability regimes. On nuclear security, many states remain outside the CPPNM, and there are insufficient ratifications/accessions for the Amended CPPNM to enter into force. Again international standards, transparency and accountability are lacking.

Some Progress

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ABBREVIATIONS

ABM	Anti-Ballistic Missile
AERB	Atomic Energy Regulatory Board
AP	Additional Protocol
APLN	Asia Pacific Leadership Network for Nuclear Non-Proliferation and Disarmament
ANSN	Asian Nuclear Safety Network
APSN	Asia-Pacific Safeguards Network
ASEAN	Association of South East Asian Nations
AU	African Union
BASIC	British-American Security Information Council
BBC	British Broadcasting Corporation
BNFL	British Nuclear Fuels Limited
BWC	Biological Weapons Convention
CD	Conference on Disarmament
CFE	Conventional Armed Forces in Europe
CIRUS	Canadian-Indian Reactor
CNS	Convention on Nuclear Safety
CPPNM	Convention on the Physical Protection of Nuclear Material
CSA	Comprehensive Safeguards Agreement
CSC	Convention on Supplementary Compensation for Nuclear Damage
CTBTO	Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization
CTBT	Comprehensive Nuclear-Test-Ban Treaty
CTC	Counter-Terrorism Committee
CTED	Counter-Terrorism Executive Directorate
CTR	Cooperative Threat Reduction (Nunn-Lugar) Program
CW	chemical weapons
CWC	Chemical Weapons Convention
DDPR	Deterrence and Defence Posture Review
DOE	US Department of Energy
DPRK	Democratic People's Republic of Korea
EEZ	Exclusive Economic Zones
ELN	European Leadership Network for Multilateral Nuclear Disarmament and Non-Proliferation
EPAA	European Phased Adaptive Approach
EURATOM	European Atomic Energy Community
FAO	Food and Agriculture Organization

FMCT	Fissile Material Cut-off Treaty
FMWG	Fissile Materials Working Group
G8	Group of Eight countries (Canada, France, Germany, Italy, Japan, Russia, United Kingdom, United States)
GC	(IAEA) General Conference
GCSP	Geneva Centre for Security Policy
GICNT	Global Initiative to Combat Nuclear Terrorism
GIF	Generation IV International Forum
GFMR	Global Fissile Material Report
GNEII	Gulf Nuclear Energy Infrastructure Institute
GNPEP	Global Nuclear Energy Partnership
GOV	(IAEA) Board of Governors
GSN	Global Security Newswire
GTRI	Global Threat Reduction Initiative
HCOC	Hague Code of Conduct against Ballistic Missile Proliferation
HEU	highly enriched uranium
IAEA	International Atomic Energy Agency
ICAN	International Campaign to Abolish Nuclear Weapons
ICBM	intercontinental ballistic missile
ICJ	International Court of Justice
ICNND	International Commission on Nuclear Non-proliferation and Disarmament
ICSANT	International Convention for the Suppression of Acts of Nuclear Terrorism
IDSA	Institute for Defence Studies and Analyses (New Delhi)
IFNEC	International Framework for Nuclear Energy Cooperation
IISS	International Institute for Strategic Studies
IMS	International Monitoring System
INF Treaty	Intermediate-Range Nuclear Forces Treaty (1987)
INFCE	International Nuclear Fuel Cycle Evaluation
INFCIRC	Information Circular (from the International Atomic Energy Agency)
INPRO	International Project on Innovative Nuclear Reactors and Fuel Cycles
INSSP	Integrated Nuclear Security Support Plan
INSServ	International Nuclear Security Advisory Service
INTERPOL	International Criminal Police Organisation
IPCS	Institute of Peace and Conflict Studies (New Delhi)
IPFM	International Panel on Fissile Materials
IPPAS	International Physical Protection Advisory Service
IPPNW	International Physicians for the Prevention of Nuclear War
IRBM	intermediate-range ballistic missile
IRRS	Integrated Regulatory Review Service

ISIS	Institute for Science and International Security (Washington, D.C.)
ISI	Inter-Services Intelligence (Pakistan)
ISO	International Organization for Standardization
ISSAS	IAEA SSAC Advisory Service
ITDB	Illicit Trafficking Database Programme
ITE	International Team of Experts
IUEC	International Uranium Enrichment Centre
KCNA	Korean Central News Agency
LEU	low enriched uranium
MENWFZ	Middle East Nuclear-Weapon-Free Zone
MDGs	Millennium Development Goals
MIRV	multiple independent re-entry vehicle
MPI	Middle Powers Initiative
MOX	mixed oxide
MRBM	medium-range ballistic missiles
MTCR	Missile Technology Control Regime
MT	metric tons (tonnes)
NAM	Non-Aligned Movement
NATO	North Atlantic Treaty Organization
NCNK	National Committee on North Korea
NDA	National Decommissioning Authority (UK)
NGO	non-governmental organization
NNSA	National Nuclear Security Administration (US)
NPDI	Non-Proliferation and Disarmament Initiative
NPR	Nuclear Posture Review
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NPTREC	NPT Review and Extension Conference
NSA	Negative Security Assurance
NSG	Nuclear Suppliers Group
NSS	Nuclear Security Summit(s)
NTI	Nuclear Threat Initiative
NWC	nuclear weapons convention
NWFZ	nuclear-weapon-free zone
NWS	nuclear-weapon states
OECD	Organisation for Economic Co-operation and Development
OPCW	Organization for the Prohibition of Chemical Weapons
OSCE	Organization for Security Cooperation in Europe
P5	the five permanent members of the United Nations Security Council
PAROS	prevention of an arms race in outer space

PGS	prompt global strike
PMDA	US–Russia Plutonium Management and Disposition Agreement
PNNND	Parliamentarians for Nuclear Non-Proliferation and Disarmament
PPRA	US–Russia Plutonium Production Reactor Agreement
PPWT	Treaty on the Prevention of the Placement of Weapons in Outer Space, and the Threat or Use of Force against Outer Space Objects
PSI	Proliferation Security Initiative
RSAC	regional system of accounting for and control of nuclear material
SIPRI	Stockholm International Peace Research Institute
SLBM	submarine-launched ballistic missile
SLV	satellite launch vehicle
SRBM	short-range ballistic missile
SORT	Strategic Offensive Reductions Treaty
SSAC	state system of accounting for and control of nuclear material
SSP	Stockpile Stewardship Program
START	Strategic Arms Reduction Treaty
SQP	Small Quantities Protocol
TCF	Technical Cooperation Fund
TEPCO	Tokyo Electric Power Company
TTP	Tehreek-e-Taliban Pakistan
UAE	United Arab Emirates
UAV	unmanned aerial vehicle
UNEP	United Nations Environment Programme
UNFCC	UN Framework Convention on Climate Change
UK	United Kingdom
UNODC	UN Office on Drugs and Crime
UNSCR	United Nations Security Council Resolution
UN	United Nations
US	United States
VERTIC	Verification Research, Training and Information Centre
VOA	voluntary offer agreement
WANO	World Association of Nuclear Operators
WHO	World Health Organization
WILPF	Women’s International League for Peace and Freedom
WINS	World Institute for Nuclear Security
WMD	weapons of mass destruction
WMDFZ	weapons of mass destruction-free zone

PART I
THE STATE OF PLAY:
PROGRESS ON THE
ISSUES

1. NUCLEAR DISARMAMENT

- §1.1 Overview
- §1.2 Objectives and General Strategy
- §1.3 Disarmament Principles
- §1.4 Reducing Weapons Numbers
- §1.5 Nuclear Doctrine
- §1.6 Nuclear Force Posture
- §1.7 Parallel Security Issues
- §1.8 Mobilizing Political Will

§1.1 Overview

1.1 As the world in 2012 marked fifty years since the Cuban missile crisis, there were still almost 18,000 nuclear warheads distributed among nine nuclear-armed states. About 94 per cent of these are in Russian and US arsenals. There are many fewer nuclear weapons today than during the Cold War, and the risk of a deliberate nuclear war being started between the United States and Russia may well be negligible. Yet, paradoxically, the overall risks of nuclear war have grown – as more countries in more unstable regions have acquired these deadly weapons, terrorists continue to seek them, and as command and control systems in even the most sophisticated nuclear-armed states remain vulnerable not only to system and human error but, increasingly, to cyber attack. Even a “limited” regional nuclear war would have catastrophic global consequences.

1.2 While the need for total nuclear disarmament is more urgent than ever, its achievement remains little or no closer, both among the nuclear-weapon states (NWS) as defined in the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), viz. China, France, Russia, the United Kingdom and the United States, and the other four nuclear-armed states outside the NPT, viz. India, Israel, Pakistan and North Korea. There has been some small progress in reducing the overall US and Russian nuclear weapons stockpiles and the number of deployed strategic weapons, and in improving transparency among some NWS. But there has been only minimal progress in shifting nuclear doctrine, and no progress in either taking weapons off high-alert launch status, or in addressing the issues of ballistic missile defence and conventional arms imbalances, differences over which are presently seriously inhibiting further disarmament movement. And, despite the efforts of many dedicated non-governmental organizations and research centres, the cause of nuclear disarmament has achieved very little of the civil society traction needed to put governments under serious political pressure.



1.3 **Objectives and General Strategy.** Derived from the language of the NPT itself, NPT Review Conference outcomes, and the recommendations of blue-ribbon international panels like the International Commission on Nuclear Non-proliferation and Disarmament (ICNND), these might be described as:

- > Rapid movement towards a major overall reduction in the global stockpile of all types of nuclear weapons;
- > Such reduction to be accompanied, and assisted, by moves to further delegitimize nuclear weapons, reduce their role and significance in military doctrine and strategy, and dramatically curtail their operational deployment;
- > The major reduction of nuclear weapons stockpiles to be followed as soon as possible thereafter by their complete elimination; and
- > The disarmament process throughout to be irreversible, verifiable, and transparent.

1.4 Such progress as there has been on specific issues – on reducing weapons numbers, curtailing their operational deployment, reducing their doctrinal salience, and on achieving acceptance of the principles of irreversibility, verifiability and transparency – is summarized in the following paragraphs and discussed in detail in the remaining sections of this chapter. As to the overall picture, progress in winning acceptance in practice from the nuclear-armed states for a two-phase objective – rapid major reduction followed by complete elimination – can be described as non-existent.

1.5 While nuclear disarmament continues to be very strongly supported by the overwhelming majority of non-nuclear-armed states, it remains for every nuclear-armed state at best an open-ended, incremental process, with broad and indeterminate links to global and regional stability. There is no appetite for a multilateral nuclear disarmament process and no disposition on the part of the NWS to discuss nuclear disarmament timelines. All nine nuclear-armed states have long-term nuclear-weapons system modernization programs under development and in progress. Based on current arsenals, deployments and force postures, and on planned expansions, upgrades and modernization, every nuclear-armed state is committed to the indefinite retention of significant nuclear-weapon capability.

Overall Evaluation of Acceptance of Disarmament Objectives and Strategy:
No Progress. Nuclear-armed states pay at best lip-service to the ultimate elimination of nuclear weapons, and none has committed to any “minimization objective,” nor to any specific timetable for their major reduction – let alone abolition. On the evidence of the size of their weapons arsenals, fissile material stocks, force modernization plans, stated doctrine and known deployment practices, all nine nuclear-armed states foresee indefinite retention of nuclear weapons and a continuing role for them in their security policies.

1.6 **Disarmament Principles.** Of the five NWS, only the United States publishes official figures on aggregate warhead numbers (most recently in September 2009). Consistent with the new Strategic Arms Reduction Treaty (New START) provisions, both Russia and the United States declare the number of deployed strategic warheads and deployed and non-deployed launchers captured by the treaty; but Russia does not release data on the overall size of its arsenal or the number of non-strategic weapons. France and the United Kingdom have provided information on stockpile ceilings. China and the non-NPT nuclear-armed states provide no information on the size and composition of their nuclear weapons inventories. Only the United States has provided figures for warhead dismantlement (most recently in May 2010).

1.7 The NWS have established a semi-regular habit of meeting to discuss nuclear weapons issues, giving particular attention to issues of “transparency, mutual confidence and verification,” and have given at least initial consideration to a standard disarmament reporting form. While four of the five NWS (China is the exception) have taken steps in recent years to reduce the size of their nuclear arsenals, only the United States and Russia have international (in their case, bilateral) verification measures in place.

Overall Evaluation of Disarmament Principles: **Some Progress.** Some NWS provide more information about their nuclear weapons than others, but none paints a full picture. The NWS are talking about improving transparency and have reaffirmed their commitment to report against 2010 NPT Review Conference disarmament objectives to the 2014 NPT PrepCom.

1.8 **Reduced Numbers of Nuclear Weapons.** The overall global stockpile in 2012 is assessed in this report as just under 18,000. This compares very favourably with the figure for 2009 given in the ICNND report of over 23,000, but unfortunately it is not possible to conclude that stockpile numbers in fact declined by some 5,000 weapons during the period in question. While there has been a continuing reduction in US and Russian stockpiles under the older bilateral START and SORT (Strategic Offensive Reductions) treaties, and some additional unilateral reductions by both these powers, reductions by other nuclear-armed states have either been very modest (in the case of France and the United Kingdom), non-existent, or negative (in the sense that stocks have increased).

1.9 Most of the apparent overall downsizing can be explained by better information and research methodology with, in the 2009 ICNND report, the Russian figures in particular likely to have been significantly overstated. The better news, although it does not affect the size of the total stockpile of existing weapons, is that the New START Treaty will bring about a significant reduction in the number of strategic weapons actually deployed by the United States and Russia, and many weapons previously identified as held in reserve by both countries are now more accurately to be counted as “awaiting dismantlement.”

1.10 Russia and the United States will find it hard to reach agreement on further cuts while divisions, particularly over ballistic missile defence, remain. China, too, believes “global” missile defence to be detrimental to the strategic balance and to prospects for nuclear disarmament. It seems that the more confident the United States becomes of the superiority of its conventional weapons, and of the efficiency of its anti-missile systems, the more reluctant Russia and China are likely to be to negotiate serious nuclear arms reductions.

1.11 France has met the objective set in 2008 to reduce by one-third its nuclear deterrent’s airborne component, and the United Kingdom expects its planned reduction in nuclear warhead numbers to have been completed by 2015. But the nuclear arsenals of India, Pakistan and China meanwhile continue to grow, albeit modestly in terms of absolute numbers, and North Korea has also made clear its intention to expand, not dismantle, its small nuclear weapons stockpile.

*Overall Evaluation of Nuclear Arms Reductions: **Some Progress.*** The global stockpile stands at nearly 18,000 nuclear weapons: while nearly half of these are earmarked for dismantlement, there is currently little prospect of major further reduction. Significant cuts in Russian and US stockpiles, mainly under previous treaty obligations, have continued, but no agreement on further cuts is likely while divisions over missile defence and conventional weapons remain. France has met the limited disarmament objective it set itself in 2008 and the United Kingdom could complete planned reductions in warhead numbers ahead of schedule. But elsewhere – in China, India, and Pakistan – nuclear arsenals are growing.

1.12 **Nuclear Doctrine.** There have been no significant publicly declared shifts in nuclear doctrine since the 2010 NPT Review Conference. In its 2010 Nuclear Posture Review (NPR) the United States took some modest steps toward advancing the undertaking given by President Barack Obama in Prague in April 2009 to “reduce the role of nuclear weapons in [US] national security strategy”: while “not prepared at the present time to adopt a universal policy that deterring nuclear attack is the sole purpose of nuclear weapons...[the United States] will work to establish conditions under which such a policy could be safely adopted.” Obama subsequently asked the Pentagon to lead an interagency review to develop alternative constructs of deterrence and stability, with accompanying force sizes and postures. But in the opposite direction, India and Pakistan seem to be broadening their mix of nuclear weapon platforms and expanding the doctrinal role of nuclear weapons in their security strategies.

1.13 Of the five NWS, only China is publicly committed to no first use of nuclear weapons. Of the other nuclear-armed states, only India has made a similar commitment. NATO, at its Chicago Summit in May 2012, again affirmed its commitment to extended deterrence by declaring that “the strategic nuclear forces of the Alliance, particularly those of the United States” are the “supreme guarantee” of its security. Negative security assurances – not to use or threaten nuclear weapons against non-nuclear-armed states – remain unequivocal and unconditional again only in the case of China.

Overall Evaluation of Nuclear Doctrine: **Minimal Progress.** There have been no significant publicly declared shifts in nuclear doctrine in recent years, although US doctrine has given some acknowledgement to President Obama's 2009 undertaking to "reduce the role of nuclear weapons in national security strategy" and an interagency review is examining revised constructs of deterrence and stability. India and Pakistan are, if anything, expanding the role of nuclear weapons in their respective national security strategies.

1.14 **Nuclear Force Posture.** While the New START treaty will bring significant reductions in the number of strategic weapons deployed by Russia and the United States, no risk-reducing changes have occurred in the deployment by either of non-strategic weapons. Such changes as have occurred or been foreshadowed in the disposition of their warheads by other nuclear-armed states, including a gradual shift towards land-mobile and sea-based weapons, appear to have been aimed at enhancing their survivability in the face of attack. This raises issues of attenuated command and control and adds to the risks of accidental and unauthorized use. China is close to establishing a stable nuclear triad and India too is firmly on this path. The United States and Russia, alone among the nuclear-armed states, continue to keep most of their deployed intercontinental ballistic missiles (ICBMs), and in the case of the United States a majority of their submarine-launched ballistic missiles (SLBMs), on very high alert – meaning a dangerously short launch-decision time requirement of just a few minutes for about 1,000 warheads in each case.

Overall Evaluation of Nuclear Force Posture: **Minimal Progress.** Apart from the reductions in deployed US and Russian strategic weapons under New START, the only significant changes in deployment practice elsewhere have been aimed at enhancing the survivability of nuclear weapons in case of attack. No progress has been made in reducing the dangerously high launch-alert states of large numbers of US and Russian weapons.

1.15 **Parallel Security Issues.** Russia has taken strong exception to the planned deployment of US ballistic missile defence to Europe, interpreting it as a threat to its deterrent capability. Tensions are also rising in US relations with China over ballistic missile defence in Asia. The development of new US conventional systems, in particular long-range precision-strike weapons, has also been complicating the environment for nuclear disarmament talks. There is little sign of any movement on new conventional arms control measures or, despite some efforts for example by the European Union and the UN Group of Governmental Experts to try to break the deadlock, on regulating weapons in space to prevent its militarization.

Overall Evaluation of Parallel Security Issues: **No Progress.** Tensions between the United States and Russia and China are rising over ballistic missile defence, and an emerging new generation of advanced US conventional weapons, and prospects for progress in conventional arms control have receded. This complicates an already very difficult environment for nuclear disarmament talks.

1.16 **Mobilizing Political Will.** The global strategic environment has deteriorated since 2010; Russia has reacted strongly to planned US missile defence deployments in Europe; Russia and the United States have both stepped back from earlier signs of willingness to return to conventional arms control talks; US-China security relations have similarly cooled, with implications both for strategic nuclear disarmament and prospects for non-proliferation and disarmament in North Korea; nuclear weapons arsenals are growing in Asia; proliferation pressures are increasing; and the risk of accident or miscalculation leading to a nuclear exchange is undiminished. Nuclear-armed states are not ready to negotiate a nuclear weapons convention and believe that, without them, negotiations would be meaningless. An annual resolution calling for the negotiation of such a convention is nonetheless supported by some two-thirds of the UN membership.

1.17 This said, nuclear disarmament and the possibility of nuclear war are not currently prominent public issues anywhere. Governments are under no real pressure to respond to expressions of popular concern because truly popular concern barely exists. Despite the efforts of many dedicated non-governmental organizations and research centres, the cause of nuclear disarmament has achieved very little traction. But the recent new focus on the indescribably horrific consequences of a nuclear detonation, with strong advocacy from a number of states in the UN General Assembly First (Disarmament) Committee and elsewhere, may show the way forward.

Overall Evaluation of Mobilizing Political Will: **Minimal progress.** Work done to promote nuclear disarmament has had little impact outside specialist disarmament and non-proliferation circles. The UN Secretary-General's welcome calls to prioritize nuclear arms control and disarmament have so far fallen largely on deaf ears. Civil society organizations, however dedicated and active, have achieved little of the traction needed to put relevant governments under serious political pressure. But the recent new emphasis on the catastrophic humanitarian consequences of nuclear weapons may show the way forward.

§1.2 Objectives and General Strategy

1.18 The NPT, which was signed in 1968 and entered into force on 5 March 1970, contains the only global treaty-level commitment to nuclear disarmament. Article VI requires each of the parties to the treaty to undertake “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.” The formulation is weak and the link to “general and complete disarmament” unhelpful and unrealistic, but it would be a mistake to underestimate the contemporary normative force of Article VI and the expectations of the international community, which have been clarified and strengthened in subsequent reaffirmations.

1.19 The 1995 NPT Review and Extension Conference made clear, for example, that the five NPT NWS bore the primary responsibility for nuclear disarmament and that they were expected to take “systematic and progressive steps” to this end;¹ while the International Court of Justice (ICJ), in its July 1996 advisory opinion on the question concerning the legality of the threat or use of nuclear weapons concluded, *inter alia*, that there “exists an obligation to pursue in good faith *and to bring to a conclusion* negotiations leading to nuclear disarmament in all its aspects under strict and effective international control” (emphasis added).²

1.20 The eighth NPT Review Conference (May 2010), buoyed particularly by positive US re-engagement in multilateral disarmament diplomacy, reaffirmed the largely unrealized aspirations of previous years. The NWS promised to accelerate “concrete progress on the steps leading to nuclear disarmament” and, to this end, were called upon “to promptly engage” with a view to rapidly moving towards an overall reduction in the global stockpile of all types of nuclear weapons; further diminishing the role and significance of nuclear weapons in military doctrine and strategy; reducing the operational status of nuclear weapons in ways that promote international stability and security; and further enhancing transparency and mutual confidence.

1.21 The 2010 NPT Review Conference took place against the backdrop of a major speech in Prague in April 2009 in which newly-elected President Obama pledged the United States “to seek the peace and security of a world without nuclear weapons” and to “reduce the role of nuclear weapons in [its] national security strategy.” He promised, and delivered, a new Strategic Arms Reduction Treaty (New START) with the Russians; and foreshadowed further cuts in nuclear arsenals which, he hoped, would include all the NWS. He also undertook “immediately and aggressively” to pursue US ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and to support the negotiation of a fissile material cut-off treaty (FMCT).³ Later in the year, President Obama chaired a United Nations Security Council session which unanimously adopted US-sponsored

1. <http://disarmament.un.org/wmd/npt/1995dec2.htm> – NPT/CONF.1995/32 (Part I), Annex.

2. Summaries of Judgments, Advisory Opinions and Orders of the International Court of Justice, *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion of 8 July 1996. The added emphasis indicates how the ICJ opinion interpreted and strengthened the article VI obligation.

3. Remarks by President Barack Obama, Hradcany Square, Prague, 5 April 2009; www.whitehouse.gov.

Resolution 1887 “to create the conditions for a world without nuclear weapons” (S/RES/1887, 24 September 2009).

1.22 Over the years, a number of international commissions⁴ have drawn very similar conclusions about the all-encompassing nature of the threat posed by nuclear weapons, their dubious utility, and the steps needed to get rid of them. The ICNND report, published shortly before the 2010 NPT Review Conference, introduced a number of new, including time-bound, elements to the nuclear disarmament agenda. It argued for the delegitimization of the role of nuclear weapons and for a two-phase approach to their elimination, recommending that “minimization” be achieved between 2012 and 2025, and “elimination” as soon as possible thereafter. The ICNND took the view that, given the myriad of difficult political, security and technical verification and enforcement issues that remained to be resolved before any state would be prepared to give up its last nuclear weapons, it would not be credible, and might well be counterproductive, to identify now a specific target date for abolition.

1.23 The ICNND’s “minimization point,” to be achieved by 2025 at the latest, would be characterized by:

- > Low numbers: a global total of no more than 2,000 nuclear warheads, with the United States and Russia reducing to a total of 500 nuclear weapons each, and with at least no increase (and desirably significant reductions) in the arsenals of the other nuclear-armed states;
- > Agreed doctrine: every nuclear-armed state committed to no first use of nuclear weapons (on the basis that their sole remaining purpose is to deter the use of nuclear weapons by others); and
- > Credible force postures: verifiable deployments and alert status reflecting that doctrine.⁵

1.24 The ICNND Report emphasized the need to incorporate all the nuclear-armed states, not just the NPT nuclear-weapon states, in a fully inclusive nuclear disarmament process. It called on the NWS to reaffirm their unequivocal commitment to nuclear disarmament (which they did, at the 2010 NPT Review Conference), and for the non-NPT nuclear-armed states to accept similar undertakings towards the eventual total elimination of their nuclear arsenals, and the universal and binding nature of the norms against testing, acquisition and use or threat of use of nuclear weapons other than for defence against nuclear attack.⁶ It also encouraged all nuclear-armed states to accept and announce as soon as possible a diminishing role for nuclear weapons in their security policies and to make appropriate preparations for a multilateral disarmament process.

4. The Canberra Commission on the Elimination of Nuclear Weapons, 1996; the Tokyo Forum for Nuclear Non-proliferation and Disarmament, 1999; the UN Secretary-General’s High-level Panel on Threats, Challenges and Change, 2004; and the Weapons of Mass Destruction (Blix) Commission, 2006.

5. ICNND (Gareth Evans and Yoriko Kawaguchi co-chairs), *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers*. Report of the International Commission on Nuclear Non-proliferation and Disarmament (Canberra and Tokyo: ICNND, 2009), pp. 72–78.

6. ICNND, *Eliminating Nuclear Threats*, p. 153.

1.25 In 2009 the worldwide campaign organization, Global Zero, launched a four-phase Action Plan, much more ambitious than ICNND's, setting 2023 as the target date for negotiating a legally binding international agreement, signed by all nuclear-capable countries, that would lead to the phased, verified and proportionate reduction of all nuclear arsenals, with complete dismantlement of all the world's nuclear weapons to be achieved by 2030.⁷ Part of the plan is for the United States and Russia to negotiate bilaterally to achieve reductions of their stockpiles to 1,000 weapons each by 2018 and, in a wider multilateral context, to achieve further reductions to 500 each by 2021.

1.26 The credibility of the argument of both ICNND and Global Zero that a massive reduction in global arsenals can be achieved by the early 2020s (however long it might take thereafter to get to zero) has been reinforced recently by a study done for Global Zero by a panel under the leadership of retired US General James Cartwright, the former Vice Chairman of the Joint Chiefs of Staff, and including Senator Chuck Hagel.⁸ This recommends a dramatic drawdown over one decade of US and Russian nuclear forces to 900 total nuclear weapons (including both strategic and non-strategic) each, divided equally between deployed (450) and held in reserve on de-alerted status (450). For the United States, the total would consist of 360 strategic missile warheads deployed on ten ballistic missile submarines and 360 held in reserve; plus 18 B52 bombers armed with 90 deployed gravity bombs and 90 held in reserve. All US land-based ICBMs would be completely dismantled. Stocks in reserve could be regenerated to launch readiness within 24–72 hours for offensive strikes. The alternative deterrence construct would thus require a robust command, control, communications and early warning system that can withstand the shock of the initial strike and manage the transition to regenerated nuclear forces.

1.27 The Cartwright study argues that once the two major nuclear powers had reduced their arsenals to these levels, China could be drawn into the negotiations followed by the other nuclear-armed states. Dialogue with China could begin with information sharing on numbers, types and locations of nuclear stocks as laying the groundwork for drawing Beijing into the formal arms control talks.⁹ With each new entrant into the multilateral arms control negotiations, it would become progressively more difficult for the remainder to stay outside the process.

1.28 The study describes bilateral drawdown by the United States and Russia to 900 weapons each as being wholly consistent with the maintenance of a full deterrence – and extended deterrence – posture, and as being desirable and possible for five reasons:

- > Mutual nuclear deterrence is no longer a cornerstone of the bilateral US–Russia relationship;

7. Global Zero Action Plan, http://www.globalzero.org/files/pdf/gzap_3.0.pdf.

8. James Cartwright, et al., *Modernizing U.S. Nuclear Strategy, Force Structure and Posture*. Global Zero U.S. Nuclear Policy Commission Report (Washington DC: Global Zero, 2012), www.globalzero.org/en/us-nuclear-policy-commission-report.

9. Cartwright, et al., *Modernizing U.S. Nuclear Strategy*, p. 4.

- > Nuclear weapons are irrelevant to a broad range of contemporary threats – rogue and failed states, terrorism, organized crime and drug trafficking, conflict and environmental refugees, climate change and the like;
- > Only deep reductions in the nuclear arsenals to the levels of the other nuclear-armed states will remedy a basic deficiency in the framework of nuclear arms talks, namely the exclusion of the rest;
- > At a time of economic stagnation and in a fiscally constrained environment, it seems irrational to spend in excess of \$1 trillion per decade on producing and maintaining nuclear weapons (Table 1.1) and mitigating their health and environmental consequences; and
- > The launch-ready nuclear postures of Russia and the United States are very high-risk (see §1.6 below).¹⁰

**Table 1.1 Military and Nuclear Weapons Expenditures
(US \$ bn, 2010 exchange rates)**

	Total Military Spending (2010)	Nuclear Weapons (2011, estimated)	
		Core Cost	Full Cost
USA	687	34.0	61.3
Russia	53-86	9.8	14.8
China	129	6.4	7.6
France	61	4.7	6.0
UK	57	4.5	5.5
India	35	3.8	4.9
Israel	13	1.5	1.9
Pakistan	7.9	1.8	2.2
North Korea	8.8	0.5	0.7
Total	1052-1085	67.0	104.9

Core costs refer to researching, developing, testing, operating, maintaining and upgrading the nuclear arsenal (weapons and delivery vehicles) and the nuclear command-control-communications and early warning infrastructure. Full costs add unpaid/deferred health and environmental costs, missile defences assigned to defend against nuclear weapons, and nuclear threat reduction and incident management. Air defences, anti-submarine warfare and nuclear weapons-related intelligence and surveillance expenses are not included.

Source: Bruce Blair and Matthew A. Brown, "World Spending on Nuclear Weapons Surpasses \$1 Trillion Per Decade" (Washington DC: Global Zero, June 2011). Available at: <http://www.globalzero.org/en/page/cost-of-nukes>.

10. Cartwright, et al., *Modernizing U.S. Nuclear Strategy*, pp. 1-5.

1.29 Derived from these various sources, CNND suggests that the overall objectives and strategy that the international community should be pursuing in relation to nuclear disarmament might realistically be described as:

- > Rapid movement towards a major overall reduction in the global stockpile of all types of nuclear weapons;
- > Such reduction to be accompanied, and assisted, by moves to further delegitimize nuclear weapons, reduce their role and significance in military doctrine and strategy, and dramatically curtail their operational deployment;
- > The major reduction of nuclear weapons stockpiles to be followed as soon as possible thereafter by their complete elimination; and
- > The disarmament process throughout to be irreversible, verifiable, and transparent.

1.30 The unhappy reality is that by the end of 2012 very little progress has been made towards realizing any of these broad objectives. The optimism and energy that marked the year leading up to the 2010 NPT Review Conference have largely evaporated. Currently there is little appetite for further US–Russian nuclear arms reduction negotiations and none for a multilateral nuclear disarmament process; no inclination to embrace no first use or sole purpose doctrine on the part of nuclear-armed states that have not already done so; no willingness on the part of Russia and the United States to lower the launch alert status of their ballistic missiles; and no sign of any agreement on issues like ballistic missile defence and perceived conventional force imbalances which are seen as inhibiting further disarmament progress.

1.31 Specific questions relating to progress, or lack of it, on disarmament principles, reducing weapons numbers, nuclear doctrine, nuclear force posture and parallel security issues like ballistic missile defence are addressed in the following sections. For present purposes, the important point is that no visible progress has been made in extracting any kind of serious practical commitment to complete disarmament, or even to any kind of “minimization” target. There has been no disposition on the part of any NWS or other nuclear-armed states to discuss nuclear disarmament timelines of any kind – either modest, like the ICNND’s and Cartwright studies, or highly ambitious, like Global Zero’s 2030 abolition target. All nuclear-armed states have long-term nuclear weapons system modernization programs under development and in progress. Based on current arsenals, deployments and force postures, and on planned expansions, upgrades and modernization, every one of them is committed to the indefinite retention of significant nuclear-weapon capability.

§1.3 Disarmament Principles

1.3.1 Irreversibility

1.32 The 2010 NPT Review Conference committed all states “to apply the principles of irreversibility, verifiability and transparency in relation to the implementation of their treaty obligations” (Action 2). The concept of “irreversible nuclear disarmament” first seems to have been used in the framework of efforts to denuclearize the Korean peninsula. However, the term entered the multilateral disarmament lexicon after it was incorporated into the 13 practical steps towards nuclear disarmament elaborated at the 2000 NPT Review Conference. While the term was used in this context, it was not defined and there does not seem to be general agreement on what it means. The recollections of participants at the 2000 NPT Review Conference suggest that the expression should probably be interpreted in a broad manner and seen as a series of measures that, taken together, can reduce the likelihood of backsliding on agreed commitments.

1.33 Irreversible nuclear disarmament is here understood to encompass warhead dismantlement, the removal from nuclear weapons programs of fissile material no longer required for military purposes, and the decommissioning and dismantling of weapon-grade fissile material production plants. Fissile material production and disposition are covered in Chapter 2, although it may be noted here that four of the five NWS have declared an end to the production of fissile material for weapons purposes; and the exception, China, is thought not to have produced such material for more than two decades. Russia, the United Kingdom and the United States have each declared some weapon-grade fissile material excess to defence requirements. Non-NPT states parties India, Pakistan and North Korea all continue to produce fissile material for nuclear weapons; and Israel may do so. France, the United Kingdom and the United States have closed and are in the process of decommissioning their fissile material production facilities. In 2008, France invited international experts to observe the dismantlement of its facilities at Marcoule and Pierrelatte.

1.34 China, France and the United Kingdom provide no information on warhead dismantlement.¹¹ Russia is dismantling retired warheads but provides no details of this activity. It currently has two operating nuclear weapon assembly/dismantlement plants, at Lesnoy (formerly Sverdlovsk-45) and Trekhgorny (Zlatoust-36).¹²

1.35 The United States dismantled 8,748 nuclear warheads over fifteen years (1994–2009).¹³ No more recent figures are currently publicly available. The US National Nuclear Security Administration (NNSA) has, however, since announced (in October 2011) the completion of dismantlement programs for the W62 warhead (August 2010) and the B53 bomb, the oldest weapon in the US arsenal. It has also dismantled a number of B61 and B83-0/1 bombs and W76-0, W80-0, W84 and W78 warheads. On 3 December 2012

11. Gaukhar Mukhatzhanova, *Implementation of the Conclusions And Recommendations for Follow-On Actions Adopted at the 2010 NPT Review Conference Disarmament Actions 1–22: Monitoring Report* (Monterey, CA: James Martin Center for Nonproliferation Studies, Monterey Institute of International Studies, April 2012), p. 15.

12. International Panel on Fissile Materials (IPFM), *Global Fissile Material Report 2011*, p. 5 – www.fissilematerials.org.

13. NNSA, “Increasing Transparency in the U.S. Nuclear Weapons Stockpile,” *Fact Sheet*, 3 May 2010.

it announced that it had “accomplished 112 per cent of its goal for planned stockpile dismantlements in FY 2012.”¹⁴

1.3.2 Transparency

1.36 Transparency in this context refers to the willingness of a state to voluntarily expose credible information about its strategic aims, intentions, doctrines and current and prospective nuclear weapon capabilities and deployments. Transparency in relation to nuclear weapons doctrine, numbers and deployment can promote reciprocity and boost mutual confidence, and is a necessary condition for serious disarmament negotiations.

1.37 Public statements of the intent to pursue total elimination of nuclear weapons are hedged with so many caveats and qualifications as to render them meaningless in practice. Seven of the nine nuclear-armed states have at various times published statements of doctrine. None of them has said explicitly, however, when and how its nuclear weapons would be used. Of the exceptions (North Korea and Israel) little can be said. Israel shows no sign of relaxing its policy of nuclear opacity, while North Korea’s periodic warnings of nuclear annihilation would appear to signal a willingness to use nuclear weapons against its enemies.

1.38 China provides no details of the size, composition and deployment of its nuclear arsenal. It claims that, given the small size and limited capabilities of that arsenal, it needs to rely relatively far more than Russia and the United States on secrecy with respect to the survivability of its nuclear arsenal, infrastructure and national command authority. Chinese leaders and experts appear to believe that transparency is the enemy of confidence in survivability and retaliatory capability.

1.39 France has declared a stockpile ceiling of less than 300 operational nuclear warheads, with no warheads in reserve.¹⁵ The United Kingdom has gone further, announcing revised target ceilings for its stockpile and the number of operationally available warheads, including the number of warheads deployed on each submarine.

1.40 Consistent with New START Treaty provisions, Russia and the United States declare numbers of deployed strategic warheads and deployed and non-deployed launchers covered by the treaty. The United States has also published (most recently as of 30 September 2009) an aggregate figure for its nuclear weapons stockpile. Russia does not release data on the overall size of its arsenal, including warheads in reserve, or on the number of non-strategic weapons.¹⁶

1.41 Neither India nor Pakistan provides details of the size, composition and deployment of its nuclear arsenal. At a recent conference at the Institute of World Economy and International Relations in Moscow, Russian experts advised India and Pakistan to do more to enhance mutual transparency and set up verification mechanisms to build on confidence-building measures already agreed to, like the commitment not to attack each

14. “NNSA Exceeds 2012 Goal for Nuclear Weapons Dismantlements,” *Press Release*, 3 December 2012, <http://nnsa.energy.gov/mediaroom/pressreleases/dismantlements120312>.

15. <http://www.francetnp.fr/spip.php?article94>.

16. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p.18

other's civil nuclear installations. When the Indian participants responded that the Russians needed a reality check because of the prevailing levels of distrust between India and Pakistan, they were reminded that the trust divide was just as stark between Moscow and Washington when they began their nuclear arms talks in the 1970s.¹⁷

1.42 Israel does not admit to the possession of nuclear weapons. North Korea provides no details of the number, composition and deployment of its nuclear weapons.

1.43 The 2010 NPT Review Conference encouraged states parties to “submit regular reports” on implementation of the conference action plan and previous commitments (Action 20); and encouraged NWS “to agree as soon as possible on a standard reporting form and to determine appropriate reporting intervals for the purpose of voluntarily providing standard information without prejudice to national security” (Action 21). At the same time, the United Nations Secretary-General was “invited to establish a publicly-accessible repository” to include information provided by the NWS.

1.44 The ten-nation (Australia, Canada, Chile, Germany, Japan, Mexico, Netherlands, Poland, Turkey and the United Arab Emirates)¹⁸ Non-Proliferation and Disarmament Initiative (NPDI) conveyed a draft standard reporting form to the five permanent members of the UN Security Council (P5), who happen also to be the five NWS recognized as such by the NPT, prior to their meeting in Paris in July 2011. The P5 have not commented on the form (since made available to all states at the First Preparatory Committee of the 2015 NPT Review Conference in Vienna in May 2012) but have confirmed, at their most recent meeting in Washington in June 2012, that they had “considered proposals for a standard reporting form.” The P5 recognized “the importance of establishing a firm foundation for mutual confidence and further disarmament efforts, and [promised to] continue their discussions in multiple ways within the P5, with a view to reporting to the 2014 PrepCom, consistent with their commitments under Actions 5, 20, and 21 of the 2010 RevCon final document.”¹⁹

1.45 In May 2012, the International Panel on Fissile Materials (IPFM) presented a number of proposals on transparency to the First Preparatory Committee of the 2015 NPT Review Conference in Vienna. These included baseline declarations on nuclear weapons numbers and fissile material holdings by NWS to the 2014 NPT Preparatory Committee meeting and a commitment by NWS at the 2015 Review Conference “to develop information on the histories of their nuclear warhead and fissile material stockpiles, which could later provide the basis for public declarations.”²⁰ Meanwhile, an online repository established by the UN Office for Disarmament Affairs pursuant to Action 21 remains empty.

17. Vladimir Radyuhin, “Cold War lessons for India and Pakistan,” *The Hindu* (Chennai), 19 November 2012.

18. Seven of the ten shelter under the US nuclear umbrella, the exceptions being Chile, Mexico and the UAE.

19. US Department of State, “Third P5 Conference: Implementing the NPT,” *Media Note*, 29 June 2012, <http://www.state.gov/r/pa/prs/ps/2012/06/194292.htm>.

20. *Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step Toward Disarmament*, International Panel on Fissile Materials, Vienna, 3 May 2012, http://fissilematerials.org/blog/2012/05/ipfm_presents_proposals_o.html.

1.3.3 Verification

1.46 “Verification” refers to the process, established or approved in a bilateral agreement or multilateral arms control treaty, by which individual state parties or an appropriately empowered international body determine the degree to which the parties to the agreement have implemented its provisions. In the context of nuclear disarmament, it refers to the checks carried out by competent authorities using qualified personnel, technical means, or a combination of the two, to confirm that agreed commitments on numbers, stockpiles, force postures, deployments and the like have been implemented. The task can be undertaken outside the governmental or intergovernmental framework. For example, VERTIC (the Verification Research, Training and Information Centre), set up in London in 1986, is an independent non-governmental organization with the mission “to support the development, implementation and effectiveness of international agreements and related regional and national initiatives, with particular attention to issues of monitoring, review, implementation and verification.”²¹

1.47 As has been noted in introducing this section, the 2010 NPT Review Conference committed all states “to apply the principles of irreversibility, verifiability and transparency in relation to the implementation of their treaty obligations” (Action 2). In addition, all states agreed on “the importance of supporting [international] cooperation... aimed at increasing confidence, improving transparency and developing efficient verification capabilities related to nuclear disarmament” (Action 19).

1.48 China has taken no steps to reduce the size of its nuclear arsenal. It has made no claims to have shifted nuclear warheads from deployed to reserve status or to have dismantled any. The question of verification therefore is not relevant.

1.49 Neither France’s nor the United Kingdom’s unilateral nuclear arms reduction measures are subject to independent verification. UK Foreign Office Minister Alistair Burt told Parliament on 9 June 2010 that the United Kingdom had “no plans to establish procedures to allow the international community to verify the UK’s nuclear warhead stockpile.”²²

1.50 The United Kingdom and Norway have however, since 2007, been conducting joint research into possible methodologies for nuclear warhead dismantlement. The UK–Norway Initiative has “focused on the joint development of effective and mutually trusted solutions to technical and procedural disarmament hurdles which will not breach our respective non-proliferation obligations under the NPT.”²³ The two countries hosted a “managed access exercise” in the United Kingdom in 2010. In December 2011, they briefed technical experts from twelve interested non-NWS on the progress of their research. And in April 2012, the United Kingdom hosted an expert-level briefing for P5 partners on lessons learned from the UK–Norway Initiative and invited their views. The two countries made a presentation on the initiative at the first meeting of the Preparatory Committee of the 2015 NPT Review Conference in Vienna in May 2012. The United

21. <http://www.vertic.org/>.

22. Beatrice Fihn, ed., *The 2010 NPT Action Plan Monitoring Report* (Geneva: Geneva Centre for Security Policy, Swiss Federal Department of Foreign Affairs, and Reaching Critical Will, 2012), p. 41.

23. Statement by UK Head of Delegation (under Cluster 1 – Disarmament) at the 2012 Preparatory Committee of the 2015 NPT Review Conference, Vienna, 3 May 2012.

Kingdom is also cooperating with the United States on the development of disarmament verification technology, as discussed further below.

1.51 The New START Treaty between Russia and the United States incorporates a range of bilateral verification measures, including data exchanges, inspections and notifications. The United States is cooperating with the United Kingdom on the development of disarmament verification technology. Other members of the P5 were given an overview of this work at the third P5 conference in Washington in June 2012 and “agreed to consider attending a follow-up P5 briefing... to be hosted by the United States.”²⁴

1.52 In order to provide confidence that states do not retain undeclared nuclear weapons or fissile material and to facilitate future verification, the ICNND Report recommended that “nuclear archaeology” steps be taken now by the nuclear-armed states “to ensure that all relevant records are identified, secured and preserved, and relevant measurements and samples are taken” (Recommendation 48). All states have a shared interest “in ensuring that future verification is able to provide credible results.”²⁵

1.53 Since most states with nuclear weapons have stopped production of both highly enriched uranium (HEU) and plutonium, “nuclear archaeology” in this context would take the form of historical materials accountancy. Documenting the total production of HEU and/or plutonium over a few decades is a large and time-consuming effort, and the results are inevitably presented in aggregated form with significant associated uncertainties. The United States and the United Kingdom have made such efforts. The United States published the results of its historical accounting for both HEU and plutonium, while the United Kingdom has published a report on HEU.²⁶

§1.4 Reducing Weapons Numbers

1.4.1 Current Nuclear Arsenals

1.54 As the world marked fifty years since the Cuban missile crisis of October 1962, there were still almost 18,000 nuclear warheads distributed among nine nuclear-armed states. The size and distribution of the current global stockpile are shown in Table 1.2. On the one hand, as the table shows, 94 per cent of the world’s stocks of nuclear weapons are held in Russian and US arsenals. On the other hand, not shown, concerns about the *growth* in nuclear weapons stockpiles are focused on China, India, North Korea and Pakistan.

24. “Third P5 Conference: Implementing the NPT,” *Press Release*, Newsroom America Feeds, 29 June 2012.

25. ICNND, *Eliminating Nuclear Threats*, p. 171.

26. US Department of Energy (DOE), *Highly Enriched Uranium, Striking a Balance: A Historical Report on the United States Highly Enriched Uranium Production, Acquisition, and Utilization Activities from 1945 through September 30, 1996* (DOE: Washington, DC, 2001); DOE, *Highly Enriched Uranium Inventory: Amounts of Highly Enriched Uranium in the United States* (DOE: Washington, DC, 2012); DOE, *Plutonium: the First 50 Years* (DOE: Washington, DC, 1996); DOE, *The United States Plutonium Balance, 1944–2009* (DOE: Washington, DC, 2012); UK Ministry of Defence, “Historical accounting for UK defence highly enriched uranium,” March 2006, <http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/HealthandSafetyPublications/DepletedUranium/>.

Table 1.2: The World's Nuclear Arsenals (2012)

	Strategic		Other		To be Dismantled	Total by Country	Yield Range (kt)	Total Yield (Mt)
	Deployed	Reserve	Deployed	Reserve				
USA	1722 ^a	2450 ^b	200	300	3100	7772 ^c	Sub-kt-455	535
Russia	1799 ^d	700 ^e	0 ^f	~860 -1040 ^f	5500 ^g	8859 -9039	Sub-kt -1000	773
China	200 ^h	40	-	-	-	240	184-240	294
France	300	-	-	-	-	300	100-300	55
UK	160	65	-	-	-	225 ⁱ	100	21
Israel	80	-	-	-	-	80 ^j	-	1.6-12
India	80-100	-	-	-	-	80-100	15-200	1
Pakistan	90-110	-	-	-	-	90-110 ^k	Sub-kt-50	1.7
DPRK	-	-	-	-	-	- ^l	Sub-kt-8	0.05
Totals	4431	3255	200	1160	8600	17646		1682
	-4471			-1340		-17866		-1693

All figures are based on S. N. Kile, et al., "World Nuclear Forces," *SIPRI Yearbook 2012: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2012), pp. 307–44 unless otherwise noted below. All figures are estimates.

Notes to Table 1.2

- a. This number is based on the most recent information drawn from the exchange of data pursuant to the 2010 Russia–US Treaty on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START).²⁷ These warheads are fielded on 806 active ICBMs, submarine-based missiles and bombers. The number has decreased from 2,200 reported in the ICNND report of November 2009 due to the continued implementation of strategic arms reduction agreements. The United States will have to offload approximately 170 further warheads by 2018 in order to meet the New START limit.
- b. The United States has a total of 2,750 warheads held in reserve. Of these, 2,450 are strategic and 300 are non-strategic.²⁸ The United States possesses around 760 non-strategic nuclear warheads. This includes approximately 200 B61 gravity bombs deployed in Europe, 300 US-based bombs on reserve, and around 260 warheads for the Tomahawk Land-Attack Cruise Missile awaiting dismantlement.²⁹ The total number of non-strategic warheads has been decreasing partly due to steps delineated in the 2010 NPR including the planned retirement of nuclear-armed, sea-launched cruise missiles.
- c. Reductions in the US total stockpile can be attributed to obligations under bilateral arms control treaties with Russia, including the START and SORT treaties, as well as steps taken as a result of the 2010 NPR. Part of the total stockpile number includes the ongoing

27. US Department of State, Bureau of Arms Control, Verification and Compliance, "New Start Treaty Aggregate Numbers of Strategic Offensive Arms," *Fact Sheet*, 30 November 2012.

28. S.H. Kile, P. Schell and H.M. Kristensen, "World Nuclear Forces," *SIPRI Yearbook 2012: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2012), p. 309.

29. Kile, et al., "World Nuclear Forces," p. 313.

retirement of excess W76 warheads.³⁰ The US Navy is estimated to have downloaded each missile to an average of 4-5 warheads to meet a warhead ceiling mandated by SORT.

- d. This number is based on the most recent information drawn from the exchange of data pursuant to New START and further represents 300 bomber weapons thought to be present at bomber bases.³¹ These warheads are deployed on 491 extended-distance delivery systems. This number has decreased from 2,800 reported in the ICNND report of November 2009 due to continued implementation of strategic arms reduction agreements.
- e. There is substantial lack of data available regarding Russian strategic warheads in reserve, as well as unresolved definitional issues concerning the differentiation between warheads in reserve and warheads awaiting dismantlement. The 2009 ICNND table gave this number as 4,750 but qualified the figure as a rough approximation due to Russia's lack of transparency. The 2012 number for the strategic reserve comprises 700 strategic warheads thought to be in reserve for SSBNs and bombers.³² Based on SIPRI Yearbook information, many of the strategic warheads classified by the ICNND table as being in reserve are actually awaiting dismantlement, explaining the discrepancy between ICNND and SIPRI numbers in this category.
- f. Previous calculations regarding the size of Russia's non-strategic nuclear forces have been based on approximations that may have overestimated the real number owing to lack of a clear methodology. The difficulty in arriving at an accurate estimate is partly due to the fact that only the strategic forces of the United States and Russia have been subject to verification and transparency measures due to bilateral treaty obligations. The estimate used in this table is based on a report that uses a new and defined methodology for estimating the composition and size of Russia's operational non-strategic nuclear stockpile.³³ The methodology uses open-source information to establish "assignment rules" for nuclear-capable portions of Russia's military and the numbers attained come forth as reliable as they match reasonably accurately official and semi-official statements. The general trend has been a decrease since the end of the Cold War, with a 50 per cent decrease in the past seven years based on the study's methodology.
- g. This number includes approximately 3,500 strategic warheads and 2,000 non-strategic warheads.³⁴
- h. China is thought to be expanding its nuclear arsenal as part of a modernization program, explaining the slight increase from 2009 ICNND numbers.
- i. The 2010 UK Strategic Defence Review aims to decrease the size of the British nuclear arsenal from 225 warheads to "no more than 180 by the mid 2020s." Deployed strategic warheads will be reduced to no more than 120.³⁵
- j. Israel's policy of "nuclear opacity" makes any estimate of nuclear weapons numbers and capabilities essentially a matter of speculation.

30. Kile, et al., "World Nuclear Forces," p. 309.

31. US, "New Start Treaty Aggregate Numbers of Strategic Offensive Arms."

32. Kile, et al., "World Nuclear Forces," p. 317.

33. Igor Sutyagin, "Atomic Accounting: A New Estimate of Russia's Non-Strategic Nuclear Forces" (London: Royal United Services Institute, November 2012).

34. Kile, et al., "World Nuclear Forces," p. 315.

35. UK Ministry of Defence, *Securing Britain in an Age of Uncertainty: The Strategic Defence Security Review*, Cm 7948 (HM Stationary Office: London, October 2010), p. 38, paragraph 3.11.

- k. Pakistan has roughly doubled its nuclear arsenal since the ICNND report. Pakistan is now the world's fifth largest nuclear power. Several experts believe that Pakistan could double its nuclear stockpile within a decade based on increased military plutonium production capabilities.³⁶
- l. A currently inoperative reactor is estimated to have produced enough weapon-grade plutonium for perhaps 10 nuclear warheads.³⁷

1.55 The significant discrepancy in numbers between Table 1.2 (which shows a global total of just under 18,000 nuclear weapons in 2012) and its counterpart, Box 2.2 in the ICNND Report³⁸ (which shows a figure of over 23,000 in 2009) does not mean that we can conclude that stockpile numbers in fact declined by some 5,000 weapons during the period in question. While there has been a continuing reduction in US and Russian stockpiles under the older bilateral START and SORT treaties, and some additional unilateral reductions by both these powers, reductions by other nuclear-armed states have either been very modest (in the case of France and the United Kingdom), non-existent, or negative (in the sense that stocks have increased).

1.56 Most of the apparent overall downsizing can be explained by better information and research methodology with, in the 2009 ICNND report, the Russian figures in particular likely to have been significantly overstated. The better news, although it does not affect the size of the total stockpile of existing weapons, is that the New START Treaty will bring about a significant reduction in the number of strategic weapons actually deployed by the United States and Russia, and many weapons previously identified as held in reserve by both countries are now more accurately to be counted as "awaiting dismantlement."

1.57 The definitions used in this table are not universally agreed among the NWS. They are currently working on a glossary of terms intended to resolve definitional discrepancies. While Russian-US disarmament practice establishes some useful benchmarks, it should be noted that New START does not in fact define the terms "deployed" or "reserve" warhead. New START only regulates the number of warheads on deployed delivery vehicles, and warhead numbers reported by each state under the treaty reflect this practice. The term "reserve," while not defined in New START, is most often used to refer to warheads that have been placed in long-term storage (that is, they are not located on an operational base). The term "strategic" is typically based on the range of the delivery vehicle. Again, the term is not explicitly defined in New START, but given the treaty and its predecessors address the issue of "strategic offensive arms" reductions, any nuclear delivery vehicle not meeting the range requirements encompassed by New START is typically assumed to be non-strategic or tactical. However, outside of Russia-US agreements, other states with nuclear weapons generally consider all of their nuclear forces to be strategic, regardless of the ranges of their delivery vehicles.

36. D. Albright and P. Brannan, "Pakistan appears to be building a fourth military reactor at the Kushan site," Institute for Science and International Security (ISIS) Report, 9 February 2011.

37. *Nuclear Weapons: Who Has What at a Glance*, Arms Control Association, 2012, <http://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat>.

38. ICNND, *Eliminating Nuclear Threats*, p. 20.

1.58 Of the five NPT NWS, only *China's* nuclear arsenal is growing. China, however, does not publish or otherwise provide details of the size and composition of its nuclear arsenal, although it did claim in April 2004 to have the smallest arsenal among the NWS.³⁹ With the United Kingdom taking steps to reduce the size of its nuclear arsenal, this is no longer the case (Table 1.2). Taking into account estimates of China's fissile material production, the proportion of fissile material likely to have been used to make weapons, delivery vehicle numbers and other relevant factors, Hans M. Kristensen and Robert S. Norris estimate China's total stockpile to be approximately 240 warheads.⁴⁰ This figure appears to be the general consensus among non-government experts.⁴¹ General C. Robert Kehler, commander of the US Strategic Command, responding to recent studies suggesting that China could have between 1,600 and 3,000 warheads – for example, from the Russian Academy of Science's Institute of World Economy and International Relations (IMEMO RAN), arguing for a figure of 1,600-1,800⁴² – has rejected claims that the Chinese arsenal is much higher than commonly believed.⁴³

1.59 China is modernizing and expanding its nuclear weapons systems, as the Second Artillery Force continues progressively to improve its missile force structure in both nuclear and conventional configurations, and the navy to enhance its strategic deterrence and counter-attack capability.⁴⁴ China is reported to be working on a third generation ICBM equipped with multiple, independently targetable re-entry vehicles (MIRVs) and to be within two years of establishing a “near-continuous at-sea strategic deterrent” with the deployment of JL-2 SLBMs on JIN-class nuclear-powered ballistic missile submarines.⁴⁵

1.60 China's nuclear arsenal has evolved and grown rather more slowly than was the case historically with the United States and the former Soviet Union. There is nothing to suggest that China is engaged in a “sprint to parity” with Russia or the United States and plenty of evidence to conclude that it is not. China is believed to have made between 200 and 300 warheads in total, of which about 50 were used for the 45 nuclear tests it conducted before the CTBT-related moratorium in 1996. The number estimated to be prepared for deployment is approximately 155. It has about 150 land-based missiles capable of carrying nuclear payloads, of which some 50 have a long enough range (7,000–12,000 km) to reach the continental United States. Outside analysts do not

39. Ministry of Foreign Affairs of the People's Republic of China, *Fact Sheet*, 27 April 2004, www.fmprc.gov.cn.

40. Hans M. Kristensen and Robert S. Norris, “Chinese Nuclear Forces, 2011,” *Bulletin of the Atomic Scientists*, 67:6 (November/December 2011), pp 81–87, <http://bos.sagepub.com/content/67/6/81.full.pdf+html>.

41. See for example Federation of American Scientists *Status of World Nuclear Forces*, <http://www.fas.org/programs/ssp/nukes/nuclearweapons/nukestatus.html>, or Arms Control Association, *Nuclear Weapons: Who Has What at a Glance*, <http://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat>.

42. Victor Yesin, “China's Nuclear Capability” in Alexei Arbatov, Vladimir Dvorkin and Sergey Oznobishchev, eds., *Prospects of China's Participation in Nuclear Arms Limitations*, (Moscow: Institute of World Economy and International Relations, Russian Academy of Sciences, 2012), pp 26–33.

43. “STRATCOM Commander Rejects High Estimates for Chinese Nuclear Arsenal,” FAS Strategic Security Blog, 22 August 2012, <http://www.fas.org/blog/ssp/2012/08/china-nukes.php>.

44. *China Defence White Paper 2010*, http://www.china.org.cn/government/whitepaper/2011-03/31/content_22263885.htm.

45. “China ‘is two years from arming its submarines with nuclear weapons’, says U.S. report,” *MailOnline*, updated 9 November 2012.

believe that its missiles are armed with multiple warheads. Its small stock of air-deliverable nuclear weapons are not believed to have any “primary mission.”⁴⁶

Table 1.3: China’s Nuclear Forces (2012)

Type	NATO Designation	Year Deployed	Range (km)	Warhead x Yield (Kt)	No. of Warheads
Land-based missiles					
DF-3A	CSS-2	1971	3100	1 x 3300	16
DF-4	CSS-3	1980	5400(+)	1 x 3300	12
DF-5A	CSS-4 Mod 2	1981	13000(+)	1 x 4000-5000	20
DF-21A	CSS-5 Mod ½	1991	2150	1 x 200-300	60
DF-31	CSS-10 Mod 1	2006	7200	1 x 200-300(?)	10-20
DF-31A	CSS-10 Mod 2	2007	11200	1 x 200-300(?)	10-20
Submarine-launched ballistic missiles					
JL-1	CSS-NX-3	1986	1000(+)	1 x 200-300	12
JL-2	CSS-NX-14	-	ca. 7400	1 x 200-300(?)	36
Aircraft					
Hong-6	B-6	1965	3100	1 x bomb	20
Others	-	-	-	1 x bomb	(20)
Total					ca. 240

Source: SIPRI

1.61 *France* no longer has a ground-based missile force. Its nuclear weapons are deployed on its four submarines and aircraft. Despite recent cuts in the airborne component of France’s nuclear deterrent, its nuclear arsenal is being modernized and upgraded with the progressive introduction of longer-range missiles and new warheads.⁴⁷

46. Gregory Kulacki, “China’s Nuclear Arsenal: Status and Evolution,” Union of Concerned Scientists (October 2011), pp. 1–2.

47. Fihn, ed., *The 2010 NPT Action Plan Monitoring Report*, p. 28.

Table 1.4: France's Nuclear Forces (2012)

Type	No. Deployed	Year Deployed	Range (km)	Warhead x Yield (Kt)	Warheads in stockpile
Land-based aircraft					
Mirage 2000N	20	1988	2750	1 x 300	20
Rafale F3	20	2010-2011	2000	1 x 300	20
Carrier-based aircraft					
Rafale MK3	10	2010-2011	2000	1 x 300	10
Submarine-launched ballistic missiles					
M45	32	1996	6000	4-6 x 100	160
M51.1	16	2010-2011	6000	4-6 x 100	80
M51.2	0	-2015	6000	4-6 x TNO	0
Total					300

Note: TNO = Tête Nucléaire Océanique (Oceanic Nuclear Warhead)

Source: SIPRI

1.62 As noted above, while *Russia* declares the number of deployed strategic warheads and deployed and non-deployed launchers, it does not release data on the overall size of its arsenal or the number of non-strategic weapons.⁴⁸ It is currently thought to have some 9,000 nuclear warheads in total, including 5,500 retired strategic and non-strategic warheads awaiting dismantlement.

1.63 Russia is committed to reducing the size of its deployed strategic weapons arsenal in accordance with the provisions of the New START agreement, but is also modernizing its strategic nuclear forces. The National Security Strategy of the Russian Federation to 2020, adopted in May 2009, states that “Russia will undertake all necessary efforts, with minimum expenditure, to maintain parity with the United States of America in the area of strategic offensive arms.”⁴⁹ In an article published in August 2010, Foreign Minister Sergey Lavrov said that “as long as nuclear weapons exist, Russia’s national security must be strengthened by phasing in modern, more effective and reliable types of strategic offensive weapons in conditions of coordinated and planned reduction of their aggregate amount.” And in February 2011, First Deputy Minister of Defence Vladimir Popovkin told journalists that Russia would spend some US \$70 billion on its strategic nuclear forces over the next ten years.⁵⁰

48. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 18.

49. *National Security Strategy of the Russian Federation to 2020*, Approved by Decree of the President of the Russian Federation 12 May 2009 No. 537, paragraph 96.

50. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 8.

Table 1.5: Russia's Nuclear Forces (2012)

Type	NATO Designation	Year Deployed	Range (km)	Warhead x Yield (Kt)	Warheads
Strategic offensive weapons					
Bombers					
TU-95MS6	Bear-H6	1981	6500-10500	6 x AS-15A ALCMs, bombs	168
TU-95MS16	Bear-H16	1981	6500-10500	6 x AS-15A ALCMs, bombs	496
TU-160	Blackjack	1987	10500-13200	12 x AS-15B ALCMs or AS-16 SRAMS, bombs	156
ICBMs					
SS-18	Satan	1979	11000-15000	10 x 500-750	500
SS-19	Stiletto	1980	10000	6 x 500-750	288
SS-25	Sickle	1985	10500	1 x 550	135
SS-27	Topol-M	1997	10500	1 x 550	164
SS-N-18 M1	Stingray	1978	6500	3 x 200	144
SS-N-23	Skiff	1986	9000	4 x 100	384
SS-N-32	-	(2012)	-	6 x 100	(192)
Subtotal					ca. 2430
Non-strategic and defensive forces					
ABMs					
SH-11/SH-08	Gorgon/Gazelle	1989/86		1 x 1000/10	68
SA-10	Grumble	1980		1 x low	340
SSC-1B	Reduct	1973		1 x 500	17
Bombers and Attack aircraft					
Backfire/ Fencer/ Fullback				ASM, bombs	730
Ground-based					
SS-21 Scarab				1 x low	150
SS-26 Stone				1 x low	24
Naval					
Subs/ships/air					660
Subtotal					ca. 2000
Total					4430

Note: This table includes the latest available disaggregated specific data for Russian nuclear forces. The lower figure for Russian deployed strategic forces in Table 1:2 is based on more recent aggregate New START data, which does not include information on specific force elements. The significantly lower number attached to Russian non-strategic nuclear weapons in Table 1:2 is a product of new and more accurate methodologies used to calculate the figure.

Source: SIPRI

1.64 Russia is retiring some of its older land-based missiles and replacing them with SS-27s and its variants, including the road-mobile RS-24 Yars, which is equipped with MIRVs. It is reported to be developing a new ICBM with the capacity to overcome ballistic missile defences, though current projected deployment dates (2016/2018) may be unrealistic.⁵¹

1.65 Russia is also modernizing its nuclear submarine fleet and SLBMs. The first of eight fourth-generation Borei class nuclear submarines entered active service at the beginning of 2013.⁵² The submarines will carry up to sixteen new Bulava missiles which “can transport 10 independently targeted nuclear warheads over distances approaching 5,000 miles.”⁵³ Russia is reported to have plans to develop a fifth-generation nuclear submarine and to have started research and development work on a new strategic bomber.⁵⁴

1.66 *The United Kingdom’s* relatively small nuclear arsenal consists entirely of sea-launched Trident missiles deployed on Vanguard-class submarines. The existing fleet of four Vanguard-class submarines is due for replacement in the 2020s. The ruling Conservative Party favours a “like-for-like” nuclear modernization plan as the most viable way of maintaining what it sees as the required capability for continuous at-sea deterrence. Its Liberal Democratic coalition partner has, however, demanded a fresh assessment of the alternatives that could possibly include fewer new Vanguard-class submarines, or no new submarines and a switch from Trident ballistic missiles to nuclear-capable cruise missiles. In the meantime, senior military commanders are reported to have private doubts about the wisdom of investing in a replacement for the Trident submarines at the cost of cutbacks in other areas that would adversely affect the operational combat capability of British armed forces.⁵⁵ While a final decision on the shape of Britain’s future nuclear deterrent will now not be taken until after the next general election in 2016, the government has already placed some GBP 4 billion worth of orders for design and development of new submarines.⁵⁶

Table 1.6: UK Nuclear Forces (2012)

Type	Designation	No. Deployed	Year Deployed	Range (km)	Warhead x Yield (Kt)	Warheads in Stockpile
SLBMs						
D-5	Trident II	48	1994	>7400	1-3 x 100	225
Total						225

Source: SIPRI

51. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, pp. 8–9.

52. “Russian Nuke Sub Goes on Duty,” *Global Security Newswire*, 3 January 2013.

53. *Global Security Newswire*, 29 June 2012.

54. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 9.

55. Oliver Wright and Kim Sengupta, “Top military chiefs go cold on nuclear deterrent,” *The Independent* (London), 26 September 2012.

56. Rachel Oswald, “U.K. Defense Secretary Says Trident Renewal is Most Cost-Effective Way to Ensure Deterrent,” *Global Security Newswire*, 19 July 2012.

1.67 The United Kingdom is also modernizing its nuclear weapons complex. This includes a new facility for manufacturing uranium components for weapons at Aldermaston and a new warhead assembly/disassembly plant at Burghfield. Both plants are expected to enter into service between 2016 and 2020.⁵⁷

1.68 As of 30 September 2009 (the most recent publicly available figures), the *United States'* aggregate nuclear weapons stockpile (deployed and non-deployed, strategic and non-strategic nuclear weapons) comprised 5,113 warheads.⁵⁸ Under New START Treaty provisions, the United States declares deployed strategic warhead and deployed and non-deployed launcher numbers biannually (see Section 1.4.3).

1.69 The April 2010 NPR Report confirmed that the United States would maintain its nuclear triad of ICBMs, SLBMs and heavy bombers. The US long-term nuclear modernization program currently includes twelve new nuclear-powered ballistic missile submarines, a new air-launched stand-off nuclear missile, and eventual replacement of the Minuteman III ICBM and B-52H strategic bomber.⁵⁹ The F-35 Joint Strike Fighter will also be made nuclear-capable.⁶⁰

1.70 As the BASIC Trident Commission reminds us, it is important to remember that “planned reductions in deployed and Treaty-counted U.S. forces are... taking place in the context of an extensive Obama administration commitment to maintain and modernize the U.S. nuclear force and its supporting infrastructure for the long-term.”⁶¹ In 2010, senior US officials told hearings of the US Senate Foreign Relations Committee on the New START Treaty that “Over the next decade, the United States will invest well over \$100 billion in nuclear delivery systems to sustain existing capabilities and modernize some strategic systems. U.S. nuclear weapons will also undergo extensive life extension programs in the coming years to ensure their safety, security and effectiveness.”⁶²

1.71 The rapidly escalating costs of these programs are, however, sharply at odds with US efforts to rein in public spending. The life-extension program for the air-delivered B61 nuclear bomb is now expected to cost some US \$10.4 billion, more than two-and-a-half times the original estimate. Around 200 of these nuclear weapons in Europe are to be maintained and upgraded “despite the fact that no military commander can be found anywhere who would actually reach for them, in any scenario.”⁶³ Critics have attributed the massive cost overrun to “an overly ambitious refurbishment project” which involves redesigning most of the bomb’s major components and “for all practical purposes building new [bombs] from scratch.”⁶⁴ Cost estimates for a new plutonium laboratory,

57. IPFM, *Global Fissile Material Report 2011*, p. 6.

58. US Department of Defense, “Increasing Transparency in the U.S. Nuclear Weapons Stockpile,” *Fact Sheet*, 3 May 2010.

59. Ian Kearns, *Beyond the United Kingdom: Trends in the Other Nuclear Armed States*, Discussion Paper 1 of the British American Security Information Council (BASIC) Trident Commission (London: BASIC, November 2011), p. 4; available at: <http://www.basicint.org/publications/dr-ian-kearns-trident-commission-consultant/2011/beyond-uk-trends-other-nuclear-armed-s>.

60. US Department of Defense, *Nuclear Posture Review Report* (Washington: April 2010), p. 27; <http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf>.

61. Kearns, *Beyond the United Kingdom*, p. 11.

62. Kearns, *Beyond the United Kingdom*, p. 11.

63. Des Browne and Ian Kearns, “NATO, Russia, and the Nuclear Disarmament Agenda: Reflections Post-Chicago,” ELN *European Security Policy Brief 4* (London: European Leadership Network, August 2012), p. 10.

64. John Fleck, “Billions more needed to refurbish B61 nuclear bombs,” *Albuquerque Journal*, N.M., 4 November 2012. 64.

Table 1.7: US Nuclear Forces (2012)

Type	Designation	No. Deployed	Year Deployed	Range	Warhead x Yield (KT)	No. of Warheads
Strategic Forces						
Bombers						
B-52H	Stratofortress	9 3/44	1961	16000	ALCM/A CM 5-150	200
B-2	Spirit	2 0/16	1994	11000	Bombs	100
ICBMs						
LGM-30g	Minuteman III					
	Mk-12A	200	1979	13000	1-3 W78 x 335	250
	Mk-21/SERV	250	2006	-	1 W87 x 300	250
SSBNs/SLBMs						
UGM-133A	Trident II (D-5)					
	Mk-4	n.a.	1992	>7400	4W76 x 100	468
	Mk-4A		2008	-	4W76 x 100	300
	Mk-5	n.a.	1990	>7400	4 W88 x 455	384
Subtotal						1952
Non-Strategic Forces						
B61-3, -4, -10 bombs		n.a.	1979	n.a.	.3-170	200
Tomahawk SLCM		n.a.	1984	2500	1 x5-150	0
Subtotal						200
Reserve						2800
Total						ca. 5000

Note: This table includes the latest available disaggregated specific data for US nuclear forces. The lower figure for US deployed strategic forces in Table 1:2 is based on more recent aggregate New START data, which does not include information on specific force elements.

Source: SIPRI

the Chemistry and Metallurgy Research Replacement facility at Los Alamos, needed to meet an anticipated annual requirement for between 50 and 80 new plutonium pits for nuclear warheads, are reported to have increased tenfold, from US \$600 million to US \$6 billion.⁶⁵ The administration had intended to delay construction as a cost-cutting measure but has since approved defence authorization legislation which includes a requirement for the new facility to be fully operational by the end of 2026 – and caps expenditure on the project at US \$3.7 billion.⁶⁶ And a new multi-billion dollar Uranium Processing Facility at the Y-12 Nuclear Security Complex in Oak Ridge, Tennessee, has had to be redesigned after it was recognized that current plans could not have accommodated the equipment needed.⁶⁷

1.72 *India's nuclear arsenal is growing. It is currently estimated to possess some 80-100 warheads for delivery by missiles and aircraft.*⁶⁸

Table 1.8: India's Nuclear Forces (2012)

Type	Range (km)	Payload (kg)	Status
Ballistic Missiles (Land-based)			
Prithvi I/II	150/250	800/500	Weapons system entered service in 1994. Prithvi I has nuclear capability and Prithvi II is also believed to do so. Approx. fewer than 50 launchers deployed.
Agni I	700	1000	Entered service in 2004
Agni II	2000	1000	Entered service in 2004. Operational status uncertain.
Agni III	3000	1500	Operational since 2011.
Agni IV	>3000	1000	Under development.
Agni V	>5000	1000	Under development.
Ballistic Missiles (Sea-based)			
Dhanush	350	500	Under development.
K-15	700	500-600	Under development.
K-4	3500	1000	Under development.
Aircraft			
Mirage 2000H Vajra	1850	6300	Aircraft is capable of delivering nuclear gravity bombs.

Source: SIPRI

64. (cont) The life extension program, which the administration says is needed "to provide nuclear extended deterrence to NATO allies and to continue a gravity bomb capability on the B-2 stealth bomber," is expected to see the consolidation, in the B61-12, of four current versions of the weapon. Hans M. Kristensen, "B61 Nuclear Bomb Costs Escalating," <http://www.fas.org/blog/ssp/2012/05/b61cost.php>.

65. Kate Brannen, "Pentagon More Than Doubles Cost Estimate for B61 Nuclear Bomb," *Defense News*, 25 July 2012.

66. Diane Barnes, "Obama Inks Defense Spending Legislation," *Global Security Newswire*, 3 January 2013.

67. Brannen, "Pentagon More Than Doubles Cost Estimate for B61 Nuclear Bomb"; Fleck, "Billions more needed to refurbish B61 nuclear bombs."

68. S.H. Kile, P. Schell and H.M. Kristensen, "Indian Nuclear Forces," *SIPRI Yearbook 2012*, p. 332.

1.73 Pakistan's nuclear arsenal is growing. It is currently estimated to have some 90-110 warheads for delivery by missiles and aircraft.⁶⁹ Estimates of the number of weapons in Pakistan's nuclear arsenal are based on fissile material stock estimates and evidence of nuclear weapons design.

Table 1.9: Pakistan's Nuclear Forces (2012)

Type	Range (km)	Payload (kg)	Status
Ballistic Missiles (Land-based)			
Abdali (Hatf-2)	180	200-400	Under development
Ghaznavi (Hatf-3)	290	500	Entered service in 2004. Fewer than 50 launchers deployed.
Shaheen I (Hatf-4)	600-800	750-1000	Entered service in 2004. Fewer than 50 launchers deployed.
Shaheen II (Hatf-6)	2500	(approx. 1000)	Under development
Ghauri I (Hatf-5)	1200	700-100	Entered service in 2003. Fewer than 50 launchers deployed.
Nasr (Hatf-9)	60	-	Under development
Cruise missiles			
Babur (Hatf-7)	600	400-500	Under development
Ra'ad (Hatf-8)	350	-	Under development. Air-launched.
Aircraft			
F-16A/B	1600	4500	Currently being upgraded. Expected to be completed in 2013-2014
Mirage III/V	2100	4000	

Source: SIPRI

1.74 Israel's policy of "nuclear ambiguity" or "nuclear opacity" makes any estimate of nuclear weapons numbers and capabilities essentially a matter of speculation. It is, however, thought to have an arsenal of some 80 nuclear weapons (50 for delivery by ballistic missiles and 30 non-strategic nuclear weapons).⁷⁰

69. S.H. Kile, P. Schell and H.M. Kristensen, "Pakistani Nuclear Forces," *SIPRI Yearbook 2012*, p. 337.

70. S.H. Kile, P. Schell and H.M. Kristensen, "Israeli Nuclear Forces," *SIPRI Yearbook 2012*, pp. 341-42.

Table 1.10: Israel's Nuclear Forces (2012)

Type	Range (km)	Payload (kg)	Comments
Ballistic Missiles			
Jericho II	1500-1800	750-1000	Approx. 50 missiles. Introduced in 1990.
Jericho III	>4000	1000-1300	Status unknown.
Aircraft			
F-16 A/B/C/D/I	1600	5400	205 aircraft. It is believed that some have nuclear weapons delivery purposes.

Source: SIPRI

1.75 *North Korea* may have enough fissile material for between 4 and 12 nuclear warheads, depending on warhead yield and design.⁷¹ On such information as is available, it may also have some 50 KN-02 short-range ballistic missiles (SRBMs) with an approximate range of 100-120 km; developed an intermediate-range ballistic missile (IRBM), Musadan, with a range of 2,500-3,000 km; and have up to ten Taepodong-1 medium-range ballistic missiles (MRBMs), range 1,500-2,500 km, and some operational Taepodong-2 ICBMs.⁷²

1.4.2 Unilateral Measures

1.76 As noted above, such reductions as have occurred in US and Russian nuclear weapon stockpiles have resulted from a combination of bilateral commitments and unilateral decisions. The only other reductions known to have occurred have been in France and the United Kingdom, in each case as a result of unilateral decision rather than any treaty process. At the First Meeting of the Preparatory Committee of the 2015 NPT Review Conference (Vienna, April–May 2012), *France's* Head of Delegation confirmed that his country had met the objective set by the French President in 2008 to reduce its deterrent's airborne component (that is, missiles and nuclear warheads) by one-third. "All in all, in the last 15 years, we have cut the number of nuclear warheads by half and... announced the ceiling of nuclear warheads in our possession, which now number less than 300."⁷³

71. www.nti.org/analysis/articles/north-korea-nuclear-disarmament/.

72. National Committee on North Korea (NCNK) (2011), "An Overview of North Korea's Ballistic Missile Program," www.ncnk.org.

73. General Debate Statement by the Head of the French Delegation at the First Meeting of the Preparatory Committee of the 2015 NPT Review Conference (Vienna, 30 April–11 May 2012).

Table 1.11: French Increases/Decreases of Nuclear Arsenal

Date	Increases/Decreases	Number of Warheads
1995–2000	-9.38%	-48
2000–2005	-25.00%	-116
2005–2010	-13.79%	-48
2010–2012	0.00%	0

Source: SIPRI

1.77 *The United Kingdom* has announced reductions in the size of its arsenal since the 2010 NPT Review Conference. The 2010 Strategic Defence and Security Review concluded that the UK's minimum credible deterrence needs could be met with fewer nuclear weapons. As a consequence, the United Kingdom announced that by the mid-2020s, it would:

- > Reduce the number of warheads on each of its submarines from 48 to 40;
- > Reduce the requirement for operationally available warheads to no more than 120;
- > Reduce the number of launch tubes on each submarine, from 12 to 8; and
- > Reduce its overall nuclear weapons stockpile to no more than 180.

1.78 The United Kingdom has since confirmed that the projected changes have already been implemented with respect to at least one submarine, and that it expects the reduction in operationally available warhead numbers to have been completed by 2015.⁷⁴

Table 1.12: British Increases/Decreases of Nuclear Arsenal

Date	Increases/Decreases	Number of Warheads
1995–2000	9.95%	42
2000–2005	-25.00%	-116
2005–2010	-35.34%	-123
2010–2012	0.00%	0

Source: SIPRI

1.4.3 Bilateral Processes

1.79 The 2010 NPT Review Conference saw Russia and the United States “commit to seek the early entry into force and full implementation of New START.” They were also encouraged “to continue discussions on follow-on measures in order to achieve deeper reductions in their nuclear arsenals” (Action 4).

1.80 The New START Treaty entered into force on 6 February 2011, after ratification by the United States on 22 December 2010 and by Russia on 25 January 2011. The treaty

74. Statement by UK Head of Delegation (under Cluster 1 – Disarmament) at the 2012 Preparatory Committee of the 2015 NPT Review Conference, Vienna, 3 May 2012.

commits the two countries to establish new limits on deployed strategic offensive nuclear weapons by 2018. For warheads, these are 74 per cent lower than the limit of the 1991 START Treaty and 30 per cent lower than the deployed strategic warhead limit of the 2002 Moscow Treaty. For deployed ICBMs, SLBMs and nuclear-capable heavy bombers, the limits are less than half the corresponding strategic nuclear delivery vehicle limit of the 1991 START Treaty. The aggregate limits established by the treaty are 1,550 deployed strategic warheads (with each deployed nuclear-capable heavy bomber counting as just one warhead toward the limit) and a combined (deployed and non-deployed) limit of 800 strategic nuclear delivery vehicles (ICBMs, SLBMs, bombers), of which no more than 700 may be deployed.⁷⁵ Each party is permitted to determine its own strategic force structure within these limits.

1.81 The treaty's verification regime provides for up to 18 on-site inspections per year, data exchanges (through a common database) and notifications (numbers, locations and technical specifications of weapons systems and facilities subject to the treaty), non-interference with national technical means of verification, and an annual exchange of telemetric information (missile performance measurements) for up to five ICBM and SLBM launches per year.

1.82 The treaty also establishes a compliance and implementation body – the Bilateral Consultative Commission – that meets at least twice a year. The commission has so far met four times since the treaty's entry into force: in March–April 2011, October–November 2011, January–February 2012, and September 2012. The two countries conducted the maximum allowable number of inspections (18 each) for a twelve month period between April 2011 and February 2012. They each conducted a further 15 inspections in the period to December 2012, and have exchanged in excess of 3,400 notifications since entry into force.⁷⁶

1.83 By December 2012, Russia and the United States had exchanged data on aggregate numbers of strategic arms subject to the treaty on four occasions. Figures were made publicly available online. Between February 2011 and September 2012, Russia reduced its deployed warhead numbers by 38 (from 1537 to 1499); the United States by 78 (from 1800 to 1722). Over the same period, the number of Russian strategic nuclear delivery vehicles fell by 30 (from 521 to 491); and that of the United States by 76 (from 882 to 806).⁷⁷

1.84 The Senate, in its resolution consenting to US ratification of New START, said that the United States should seek, within a year (that is, by February 2012), to initiate new negotiations with Russia to address tactical nuclear weapons stockpile disparities “and to secure and reduce tactical nuclear weapons in a verifiable manner.” President Obama told the Senate in March 2011 that he would try to do this. Russia's Deputy Foreign Minister Sergei Ryabkov has said publicly that Russia is open to discussing further reductions in tactical nuclear weapons inventories, although Russia's “non-strategic nuclear potential” was now “no more than 25 per cent of that of the USSR in 1991.”⁷⁸ As

75. <http://www.whitehouse.gov/blog/2010/04/08/new-start-treaty-and-protocol>.

76. <http://www.state.gov/t/avc/newstart/index.htm>.

77. <http://www.state.gov/t/avc/newstart/index.htm>.

78. The United States similarly claims to have reduced the number of its non-strategic nuclear warheads by 90 per cent

a first step, others should follow Russia's example by returning tactical nuclear weapons to the territory of the possessor states, dismantling the infrastructure for their rapid deployment overseas and renouncing "nuclear sharing."⁷⁹ On 27 December 2011, acting US Under Secretary of State for Arms Control and International Security Rose Gottemoeller conceded, in remarks to RIA Novosti, that the two sides were not yet ready to embark on new negotiations.⁸⁰

Table 1.13: New START

Type	Russia	US
Maximum number of weapons after 7 years		
Deployed ICBMs, SLBMs, and bombers	700	700
Warheads on deployed ICBMs, deployed SLBMs, deployed and heavy bombers	1550	1550
Deployed and non-deployed ICBM launchers, SLBM launchers and heavy bombers	800	800
Reductions as of 2012		
Deployed warheads	38	78
Strategic delivery vehicles	30	76
Inspections and Notifications as of 2012		
Inspections	33	33
Notifications exchanged	3436	3436

Source: SIPRI

1.85 Differences over missile defence also stand firmly in the way of progress on further nuclear arms reductions for the moment. In a written address to a meeting of International Physicians for the Prevention of Nuclear War in Hiroshima, President Vladimir Putin said that, while Russia is open to the idea of additional cuts in Russian and US nuclear arsenals, this will only be possible "if all factors affecting international security and strategic stability are taken into account." Inhibiting factors include "the unilateral and totally unlimited deployment of a global U.S. missile defense system," the possible weaponization of space, and conventional arms imbalances in Europe.⁸¹ The issue of conventional arms imbalances, not just in Europe, and particularly of US global superiority in conventional weapons capability, will complicate and may significantly impede future bilateral, and multilateral, disarmament negotiations. (See further §1.7 below)

1.86 On 21 June 2012, US Assistant Secretary of Defense for Global Strategic Affairs Madelyn R. Creedon told the Senate Committee on Foreign Relations that the US

between 1967 and September 2009. US Statement (under Cluster 1 – Disarmament) at the 2012 Preparatory Committee of the 2015 NPT Review Conference, Vienna, 3 May 2012.

79. Russian Deputy Foreign Minister Sergei Ryabkov, *US-Russian Nuclear Disarmament: Current Record and Possible Further Steps*, 25 October 2011, <http://www.europeanleadershipnetwork.org>.

80. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, pp. 21–22.

81. Reuters, "Putin Links Nuclear Cuts to U.S. Shield," *Moscow Times*, 27 August 2012. See also 1.7.1 Parallel Security Issues: Ballistic Missile Defence.

“experience so far demonstrates that the New START’s verification regime works and will help push open the door to new and more complicated verification techniques in the future.”⁸² The only complaint so far has come from the United States which accused Russia of a treaty violation in the course of a Russian military exercise on 19 June 2012, when two Tu-95MS Bear H bombers armed with cruise missiles flew into the 200-mile air defence zone near Alaska, prompting US and Canadian jet fighters to intercept them.⁸³

1.4.4 Multilateral Processes

1.87 Conference on Disarmament. The world’s only standing multilateral disarmament negotiating forum is the Conference on Disarmament (CD) based in Geneva. It has been unable to agree and implement any program of work since the conclusion of nuclear-test-ban treaty negotiations in 1996. There has been protracted disagreement over the priority to be given to core issues: nuclear disarmament, a fissile material production ban, preventing an arms race in outer space, and assurances of immunity from nuclear attack for non-NWS. With Pakistan having in recent years taken the lead in blocking the adoption of a program of work because of its unshakeable opposition to fissile material cut-off treaty negotiations, the CD remains essentially moribund and in no position to “establish a subsidiary body to deal with nuclear disarmament.”⁸⁴ The impasse in the CD, its eroding credibility, and efforts to get it back to work are discussed in the next chapter (§2.10).

1.88 Permanent Five/NWS. While China advocates “the complete prohibition and thorough destruction of nuclear weapons,”⁸⁵ and has until now taken steps consistent with this position (for example, its unconditional no first use and negative security assurance declarations), it has taken no steps in support of any initiative in nuclear disarmament, believing this to be the particular responsibility of the two most heavily armed NWS. As such, China believes that Russia and the United States “should further drastically reduce their nuclear arsenals in a verifiable, irreversible and legally-binding manner, so as to create the necessary conditions for the complete elimination of nuclear weapons.”⁸⁶

1.89 Russia’s Deputy Foreign Minister Sergei Ryabkov assured a July 2011 meeting of the European Leadership Network (ELN) in Berlin that his country was fully committed to the goal of a nuclear-weapon-free world. Multilateralizing nuclear disarmament would require a supporting legal framework “closely reproducing the intricate system of rules, definitions, proceedings and mutual obligations that has been created bilaterally by Russia and the United States.” Progress towards the goal would require the involvement of all nuclear-armed states, non-deployment of “strategic offensive arms in non-nuclear configuration,” and the “cessation of conventional capabilities’ development coupled with efforts to resolve other international issues, including regional conflicts.” Russia also wanted to see agreement reached on a global treaty prohibiting intermediate and shorter range missiles.⁸⁷

82. <http://www.defense.gov/news/newsarticle.aspx?id=116849>.

83. <http://freebeacon.com/false-start/>.

84. 2010 NPT Review Conference Action 6.

85. *China Defence White Paper 2010*.

86. *China Defence White Paper 2010*.

87. Ryabkov, *US–Russian Nuclear Disarmament*.

1.90 The United Kingdom sees nuclear disarmament as an incremental, benchmarked and truly multilateral process based on nuclear non-proliferation, growing trust and confidence among states (including confidence in the efficacy of safeguards and verification techniques), and other “tangible steps towards a safer and more stable world where countries with nuclear weapons feel able to relinquish them”⁸⁸ – but, apart from its verification work with Norway, discussed above, has not been visible in operationalizing this approach.

1.91 In the case of the United States, the 2010 NPR report described as “very demanding” the conditions that would “ultimately permit the United States and others to give up their nuclear weapons without risking greater international instability and insecurity.” Among them were “success in halting the proliferation of nuclear weapons, much greater transparency into the programs and capabilities of key countries of concern, verification methods and technologies capable of detecting violations of disarmament obligations, enforcement measures strong enough to deter such violations, and ultimately the resolution of regional disputes that can motivate rival states to acquire and maintain nuclear weapons.”⁸⁹

1.92 In a carefully worded statement delivered by the United States to the First Meeting of the Preparatory Committee of the 2015 NPT Review Conference on 3 May 2012, the P5 jointly reaffirmed their “enduring commitment” to the fulfilment of their obligations under Article VI of the NPT and to the Action Plan adopted at the eighth review conference in 2010. They attributed the success of the 2010 Review Conference to “*the international community’s shared commitment to seeking a safer world for all and to creating the conditions for a world without nuclear weapons... in a way that promotes international stability, peace and security; based on the principle of undiminished security for all; and underlining the vital importance of non-proliferation for achieving this goal*” (emphases added). The statement notes, with a degree of satisfaction that would be hard for even some of the P5’s closest friends to share, “the unprecedented progress and efforts made by the nuclear-weapon states in nuclear arms reduction, disarmament, confidence-building and transparency.”⁹⁰

1.93 The statement describes the dialogue process begun in September 2009 at the London Conference on Confidence Building Measures towards Nuclear Disarmament. A second meeting was held in Paris in July 2011 to discuss implementation of the 2010 NPT Review Conference Action Plan. In Paris, the P5 agreed to establish a working group under the direction of China to compile a glossary of terms to facilitate future engagement on nuclear disarmament issues. After more than forty years of the NPT, and some twenty years after the end of the Cold War, this would seem at best to be a modest achievement.

1.94 The P5 met for the third time in Washington in June 2012 where they continued their discussions on “transparency, mutual confidence, and verification, and considered

88. *Securing Britain in an Age of Uncertainty*, p. 37.

89. *US, Nuclear Posture Review*, Executive Summary, p. xv.

90. “P5 Statement to the 2012 Preparatory Committee of the 2015 NPT Review Conference, Vienna, 3 May 2012.” The added emphasis draws attention to some persistent, and troubling, elements of P5 nuclear disarmament doctrine: getting rid of nuclear weapons is not just the responsibility of the nuclear weapons possessors; the world will have to change first; and any further increase in the number of nuclear-armed states will make an already distant objective recede even farther over the horizon.

proposals for a standard reporting form.” They also shared views on how best to “discourage abuse of the NPT withdrawal provision” (Article X) and discussed “concrete proposals for strengthening IAEA safeguards, including through promoting the universal adoption of the Additional Protocol.” They reiterated their commitment to “promote and ensure the swift entry into force of the CTBT and its universalization” (without mentioning the conspicuous absence of China and the United States from the ranks of Annex 2 States that have ratified the treaty). They discussed ways to advance FMCT negotiations and “exchanged perspectives on ways to break the current impasse in the CD, including by continuing their efforts with other relevant partners to promote such negotiations within the CD” (and, by implication, nowhere else). They agreed to hold a fourth conference “in the context of” the next NPT Preparatory Committee meeting (Geneva, April 2013).⁹¹

1.4.5 North Korea

1.95 The situation in North Korea requires separate discussion, because it has only very recently joined the ranks of the nuclear-armed states,⁹² possesses a much smaller nuclear arsenal than the other eight, and remains the subject of intense diplomatic efforts aimed at dismantling its nuclear weapons program. North Korea effectively confirmed its withdrawal from the NPT in January 2003⁹³ – the only country so far to have done so – after being accused of operating a clandestine uranium enrichment program. North Korea cited the “grave” threat to its security and sovereignty posed by the US “tyrannical nuclear crushing policy toward the DPRK” (Democratic People’s Republic of Korea).⁹⁴ This led also to the collapse of the 1994 US–DPRK Agreed Framework which had facilitated the suspension of an earlier notice of withdrawal and “froze Pyongyang’s plutonium-based nuclear program for nearly a decade.”⁹⁵

1.96 In September 2005, at the fourth round of Six Party Talks (between North Korea, South Korea, Japan, China, Russia and the United States) begun in 2003 with the aim of denuclearizing the Korean Peninsula, North Korea, in return for security assurances and the promise of economic cooperation, “committed to abandoning all nuclear weapons and existing nuclear programs” and to returning to the NPT and IAEA safeguards.⁹⁶ A year later, North Korea tested its first nuclear explosive device. This prompted UN Security Council resolution 1718 (14 October 2006) demanding North Korea “abandon all nuclear weapons and existing nuclear programs” and “return immediately to the Six

91. “Third P5 Conference: Implementing the NPT,” *Press Release*, Newsroom America Feeds, 29 June 2012.

92. While the ICNND in its 2009 report, paragraph 2.15, took the view that it was then premature to describe North Korea as having finally withdrawn from the NPT, it is now difficult to argue otherwise. Discussion of its status now belongs, accordingly, in a chapter on disarmament, not non-proliferation.

93. A state party has the right to withdraw from the NPT if it decides that “extraordinary events, related to the subject matter of [the] Treaty, have jeopardized the supreme interests of its country” (Article X). North Korea *announced* its withdrawal from the NPT on 12 March 1993 but then suspended it on 11 June 1993, the day before the decision would have taken effect. In January 2003, North Korea ended the suspension, which for all practical purposes meant withdrawal with immediate effect. Christer Ahlstrom, “Withdrawal from arms control treaties,” *SIPRI Yearbook 2004: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2004), pp. 763–77.

94. Korean Central News Agency (KCNA), 22 January 2003.

95. George Bunn and John B. Rhinelander, “NPT Withdrawal: Time for the Security Council to Step In,” http://www.armscontrol.org/act/2005_05/Bunn_Rhinelande.

96. Joint Statement of the Fourth Round of the Six-Party Talks, Beijing, 19 September 2005; <http://www.fmprc.gov.cn/eng/zxxx/t212707.htm>.

Party Talks without preconditions.”⁹⁷ The resolution imposed sanctions, including a weapons import-export ban, on North Korea.

1.97 In 2007, the six parties reached agreement on a plan to implement the 2005 Joint Statement,⁹⁸ but the agreement did not hold. In 2009, North Korea tested a second nuclear explosive device and announced its permanent withdrawal from the Six Party Talks.⁹⁹ UN Security Council resolution 1874 (12 June 2009) condemned the test “in the strongest terms” and demanded that “the DPRK not conduct any further nuclear test or any launch using ballistic missile technology.”¹⁰⁰ The resolution strengthened the compulsory international sanctions imposed three years earlier. The Panel of Experts established pursuant to resolution 1874 reported in 2012 that North Korea continued actively to violate Security Council resolutions 1718 and 1874. The Panel found that North Korea was using elaborate techniques to evade Security Council sanctions and the vigilance of UN member states.¹⁰¹

1.98 North Korea revealed the presence of a uranium enrichment facility at Yongbyon in 2010.¹⁰² It is developing a progressively more extensive range of ballistic missile capabilities. North Korea has close links with Iran and Syria and is a major proliferator of ballistic missile and other weapons of mass destruction (WMD)-related systems and technology. A February 2012 deal that would have had North Korea suspend uranium enrichment and nuclear weapon and long-range missile tests, and the United States send nutrition aid, collapsed in April 2012 in the face of Pyongyang’s determination to proceed with a long-range rocket launch.

1.99 The April launch was a failure. But there was no reason to believe that North Korea would abandon its quest for nuclear and ballistic missile capabilities that it sees as critical to the maintenance of its international standing and national security, and as contributing to the domestic credibility and cohesion of the regime. And so it proved. North Korea successfully launched a long-range rocket on 12 December 2012 that drew a condemnation from the UN Security Council president for constituting a clear violation of its resolutions. The United States which, along with South Korea, Japan and others regards the launch as a disguised ballistic missile test forbidden by previous Security Council resolutions, warned of unspecified consequences.¹⁰³ South Korean military officials said that the test would make them speed up plans for a comprehensive missile defence system.¹⁰⁴ A satellite aboard the rocket was also successfully put into orbit,

97. S/RES/1718 (14 October 2006).

98. Joint Statement of the Fourth Round of the Six-Party Talks, Beijing, 19 September 2005.

99. Korean Central News Agency (KCNA), “KCNA report on one more successful underground nuclear test,” 25 May 2009, <http://www.kcna.co.jp/item/2009/200905/news25/20090525-12ee.html>.

100. <http://www.un.org/News/Press/docs/2009/sc9679.doc.htm>.

101. http://www.un.org/ga/search/view_doc.asp?symbol=S/2012/422

102. In November 2010, North Korea showed a visiting delegation of US scientists a new uranium enrichment facility, located in a former fuel-rod fabrication building at Yongbyon. The scientists were told that the facility contained 2,000 centrifuges in six cascades; that it was built between April 2009 and November 2010; and that it was producing uranium with an average enrichment level of 3.5 per cent for a civilian light-water reactor program. S.S. Hecker, “What I found in North Korea,” *Foreign Affairs*, 9 December 2010, p. 4; <http://www.foreignaffairs.com/articles/67023/siegfried-s-hecker/what-i-found-in-north-korea>.

103. Some anti-nuclear activists asked why North Korea was singled out for worldwide condemnations while tests by India (Agni), Pakistan (Nodong-derived Ghauri) and the United States (Minuteman III) over the preceding weeks in November and December were hardly mentioned by anyone.

104. Kim Eun-jung, “Seoul says N. Korea’s satellite circling Earth ‘normally,’” Yonhap News Agency, 13 December 2012, <http://english.yonhapnews.co.kr/national/2012/12/13/63/0301000000AEN20121213005153315FHTML>.

despite some initial reports doubting this. Japanese experts were impressed by the precision of the rocket technology and by the fact that the test was planned for and executed during adverse winter conditions.¹⁰⁵

1.100 North Korea's nuclear and missile programs are a source of instability and tension in a region vital to global security and economic prosperity. Its nuclear weapons and ballistic missile programs weigh on nuclear disarmament efforts and will have to be dismantled as reductions elsewhere in nuclear weapon numbers proceed.

1.101 Its nuclear weapons are claimed by North Korea to be a hedge against attack particularly by the United States. In March 2010, a North Korean spokesman, commenting on joint military exercises between US and South Korean forces, promised that "those who seek to bring down the system in the DPRK... [would] fall victim to the unprecedented nuclear strikes of the invincible army."¹⁰⁶ North Korea also sees a nuclear weapons capability as a means of maximizing positive outcomes from negotiations with its adversaries.

1.102 A successful negotiated reversal of North Korea's nuclear program would reinforce the view that nuclear arms reductions can be made safely, "based on the principle of increased and undiminished security for all."¹⁰⁷ North Korea has repeatedly violated its international non-proliferation obligations, undermining confidence in the NPT and associated safeguards arrangements and thus also in the integrity of the nuclear disarmament-non-proliferation bargain. The international community must be confident that states cannot walk away from their non-proliferation commitments with impunity. In 2003, the Security Council failed to live up to its responsibilities in this regard when it took no action in response to North Korea's withdrawal from the NPT. Developments to that point, and certainly since, have provided ample evidence that North Korea's withdrawal from the NPT posed a threat to international peace and security. This was subsequently recognized in Security Council sanctions resolutions 1718 and 1874.

1.103 Resumption of the Six-Party Talks – or at least some further process leading to a multilaterally negotiated set of agreements, involving the key players in and around the Korean peninsula – still offers the best hope of pursuing a comprehensive, negotiated resolution of the North Korea nuclear issue. The situation should not be allowed to drift. However reluctantly, key players may need again to consider an initiative to bring North Korea back to the negotiating table. North Korea must realize that its nuclear weapons program has detracted from, rather than enhanced, its international standing and national security; and that isolation and eventual economic collapse pose a far more real threat to the regime than external attack. Recognizing that the international community is dealing with a disarmament problem created by a former, but not current, NPT state party, the objective must be either North Korea's return to the NPT as a non-nuclear-weapon state and resumption of, and full compliance with, its IAEA safeguards

105. Ayako Mie, "Significant leap for Pyongyang missile tech," *Japan Times*, 13 December 2012.

106. KCNA report, 26 March 2010.

107. A much-used phrase in this context. See, for example, 2010 NPT Review Conference, *Conclusions and recommendations for follow-on actions I* (Nuclear Disarmament) A (Principles and Objectives) iv.

obligations; or else, at the very least, getting North Korea to sign up to NPT-equivalent export, transfer and assistance disciplines through parallel agreements.

§1.5 Nuclear Doctrine

1.104 Reducing the role and salience of nuclear weapons in the national security strategies of the nuclear-armed states is a crucial step on any road to nuclear disarmament. This has been recognized in the prominence given to this subject in NPT Review Conference discussions, every major commission and panel report, and indeed in President Obama's pathbreaking 2009 Prague speech, when he said that "To put an end to Cold War thinking we will reduce the role of nuclear weapons in our national security strategy and urge others to do the same." Unhappily, however, this recognition has been matched by very few, if any, significant moves in this direction by the nuclear-armed states.

1.105 Taken at face value, *China's* stated nuclear doctrine goes further than the other nuclear-armed states in limiting the role of nuclear weapons. Its weapons, declared doctrine and force posture and deployment patterns are said to be designed neither to coerce others nor to fight a nuclear war with the expectation of winning, but to counter any attempt at nuclear blackmail. According to Li Bin, director of the Arms Control Program in Tsinghua University's Department of International Relations, China "chooses to keep a small, off-alert nuclear force" as a means of "countering nuclear coercion" but does not consider nuclear weapons to have any real military utility.¹⁰⁸ Its 2010 Defence White Paper says that China "has always exercised the utmost restraint in the development of nuclear weapons" and will continue to "limit its nuclear capabilities to the minimum level required for national security." China, at least as far as its declared doctrine is concerned, remains firmly committed to no-first-use of nuclear weapons "at any time and in any circumstances" and has made an "unequivocal commitment" not to use or threaten to use nuclear weapons against non-NWS and nuclear-weapon-free zones: that is, it would not use its nuclear weapons even in the extreme circumstances of its very survival being at stake under conventional attack. China wants the NWS to conclude treaties on mutual no-first-use of nuclear weapons and to provide unconditional treaty-based negative security assurances to non-NWS.¹⁰⁹ All that said, questions are being asked about the extent to which China's intense nuclear force modernization may be indicative of a likely future hardening of its nuclear doctrine. While debate within China on nuclear doctrine, including no first use, is not new,¹¹⁰ China's lack of transparency will continue to make it difficult to assess whether evolving force structures and postures do in fact accord with published statements of doctrine.

1.106 President Nicolas Sarkozy gave a clear exposition of *France's* nuclear doctrine in a speech in Cherbourg in March 2008. He emphasized France's strong attachment to its nuclear deterrent. While nuclear weapons would only be used "in extreme circumstances of legitimate defence," their role was not simply to protect France against nuclear attack

108. http://www.armscontrol.org/act/2011_03/LiBin.

109. *China Defence White Paper 2010*.

110. See for example, Phillip Saunders, "Chinese Nuclear Forces and Strategy," 26 March 2012, http://www.uscc.gov/hearings/2012hearings/written_testimonies/12_3_26/saunders.pdf

but from “any aggression against [its] vital interests emanating from a State – wherever it may come from and whatever form it may take.” France’s nuclear deterrent was “quite simply the nation’s life insurance policy.”¹¹¹ The 2008 French White Paper on defence and national security similarly describes nuclear deterrence as “the ultimate guarantee of the security and independence of France.”¹¹²

1.107 *Russia* reserves the right to use nuclear weapons in response to a WMD attack on it or its allies or if the country was under conventional attack and its very existence was under threat. According to the most recent version of military doctrine, published in February 2010, Russia’s nuclear weapons are intended to prevent military conflict and, as such, have a potential role to play in regional and large-scale conflicts involving not only nuclear or other WMD but also conventional weapons. Whereas, however, the previous (2000) version of the doctrine envisaged a resort to nuclear weapons “in situations critical for [the] national security” of Russia, the 2010 version foresees their use only in circumstances where “the very existence of Russia is under threat.”¹¹³

1.108 Then-Prime Minister Vladimir Putin published an article in February 2012 in which he described Russia’s “robust nuclear deterrent” as a counterweight to US strength and a contribution to international stability. He ruled out any concessions on tactical nuclear weapons. Russia’s armed forces were in fact “preparing additional stronger weapons.” Final nuclear disarmament would only be possible when Russia had “exceptionally accurate non-nuclear systems of similar effectiveness”¹¹⁴ (to those under development in the United States).

1.109 *The United Kingdom* states that it will only consider using nuclear weapons “in extreme circumstances of self-defence, including the defence of [its] NATO Allies” but remains “deliberately ambiguous about precisely when, how and at what scale [it] would contemplate their use.”¹¹⁵ The United Kingdom is committed to the long-term goal of a world without nuclear weapons, but not while large arsenals of nuclear weapons remain and there is any risk of nuclear proliferation. Until then, “only a credible nuclear capability can provide the necessary ultimate guarantee [of] national security. The UK Government is therefore committed to maintaining a minimum national nuclear deterrent, and to proceeding with the renewal of Trident and the submarine replacement program.”¹¹⁶

1.110 In the *United States*, the Obama administration has shown in multiple ways that it is acutely conscious of the significance of nuclear doctrine in setting the scene for serious movement towards disarmament, but so far its achievements in this respect have been

111. Speech by President Nicolas Sarkozy, Cherbourg, 21 March 2008, <http://www.acronym.org.uk/docs/0803/doc09.htm>.

112. *The French White Paper on Defence and National Security*, http://www.ambafrance-ca.org/IMG/pdf/Livre_blanc_Press_kit_english_version.pdf.

113. Nikolai Sokov, *The New 2010 Russian Military Doctrine: The Nuclear Angle*; <http://npsglobal.org/>.

114. “Strong Russian Nuclear Force Deters Conflict, Putin Says,” *Global Security Newswire*, 27 February 2012. This last statement is hard to reconcile with his deputy foreign minister’s proposed prohibition of “strategic offensive arms in non-nuclear configuration.” Putin’s comments are, however, broadly consistent with current Russian military doctrine which “assigns high-precision [apparently, conventional] weapons to the mission of strategic deterrence.” Sokov, *The New 2010 Russian Military Doctrine*.

115. *Securing Britain in an Age of Uncertainty*, p. 37.

116. General Statement by UK Head of Delegation at the 2012 Preparatory Committee of the 2015 NPT Review Conference, Vienna, 30 April 2012. A final decision on the shape of Britain’s future nuclear deterrent will not, however, be taken until after the next general election in 2016.

more rhetorical than real. The April 2010 NPR Report recognized that, with “the growth of unrivalled U.S. conventional military capabilities, major improvements in missile defenses, and the easing of Cold War rivalries,” there was now an opportunity and the need to better align US nuclear doctrine with contemporary national security priorities: preventing nuclear terrorism and nuclear proliferation.¹¹⁷ Furthermore, by “reducing the role and numbers of U.S. nuclear weapons – and thereby demonstrating that we are meeting our NPT Article VI obligation to make progress toward nuclear disarmament – we can put ourselves in a much stronger position to persuade our NPT partners to join with us in adopting the measures needed to reinvigorate the non-proliferation regime and secure nuclear materials worldwide against theft or seizure by terrorist groups.”¹¹⁸

1.111 The NPR affirmed that the primary function of US nuclear weapons was to deter nuclear attack on the United States, its allies and partners. Although nuclear weapons would continue to have a role in deterring non-nuclear attacks (conventional, biological and chemical), this role had diminished and would continue to do so. While the United States was “not prepared at the present time to adopt a universal policy that deterring nuclear attack is the sole purpose of nuclear weapons,... [it] will work to establish conditions under which such a policy could be safely adopted.”¹¹⁹ The United States would now only consider the use of nuclear weapons “in extreme circumstances to defend the vital interests of the United States or its allies and partners.”¹²⁰ Henceforth, non-nuclear systems could be expected to make an increasingly significant contribution to US deterrence and reassurance goals.

1.112 In February 2011, the Department of Defense published a new National Military Strategy which affirmed “the fundamental role” of US nuclear weapons in a nuclear-armed world. It promised nonetheless to support “the President’s vision” by reducing “the role and numbers of nuclear weapons, while maintaining a safe, secure, and effective strategic deterrent.” US nuclear forces would “continue to support strategic stability through maintenance of an assured second-strike capability,” and the United States would “retain sufficient nuclear force structure to hedge against unexpected geopolitical change, technological problems, and operational vulnerabilities.”¹²¹

1.113 New strategic guidance published by the White House and the Department of Defense in January 2012 under the heading “Sustaining U.S. Global Leadership: Priorities for 21st Century Defense” similarly commits the United States to “field nuclear forces that can under any circumstances confront an adversary with the prospect of unacceptable damage, both to deter potential adversaries and to assure U.S. allies and other security partners that they can count on America’s security commitments.” But, taking its cue from the NPR and the previous year’s National Military Strategy, it too suggests that the United States may be able to achieve its deterrence goals “with a

117. *Nuclear Posture Review*, April 2010, p. 6.

118. *Nuclear Posture Review*, April 2010, p. 7.

119. *Nuclear Posture Review*, April 2010, p. viii.

120. *Nuclear Posture Review*, April 2010, p. 16.

121. US Department of Defense, *The National Military Strategy of the United States of America 2011: Redefining America’s Military Leadership* (Washington DC: February 2011), pp. 7 and 19; <http://www.army.mil/info/references/docs/NMS%20FEB%202011.pdf>.

smaller nuclear force, which would reduce the number of nuclear weapons in our inventory as well as their role in U.S. national security strategy.”¹²²

1.114 President Obama reinforced this message at the second Nuclear Security Summit in Seoul in March 2012 when he said that, after New START, the United States would still have more nuclear weapons than it needs and that it was “now conducting the follow-on analysis called for in the NPR to set goals for future nuclear reductions in line with strategic requirements.” The NPR meanwhile had ruled out development of “new U.S. nuclear warheads and new missions and capabilities for existing warheads.”¹²³

1.115 *India* first conducted what it called a “peaceful nuclear explosion” on 18 May 1974. It confirmed its nuclear-armed status almost twenty-five years later with five tests over the period 11–13 May 1998. India’s declared aim is to “pursue a doctrine of credible minimum nuclear deterrence.” It will not be the first to use nuclear weapons but would “respond with punitive retaliation should deterrence fail.” India has pledged not to use nuclear weapons against non-aligned non-NWS.¹²⁴ It has, however, reserved the right to use nuclear weapons in response to biological or chemical weapons attack.¹²⁵

1.116 India’s National Security Advisory Board published its draft report on nuclear doctrine in 1999, and it was officially adopted by the cabinet on 4 January 2003. Kanti Bajpai divides India’s analysts into three camps: rejectionists; maximalists; and pragmatists, who accept that nuclear weapons have both a security (deterrence and prevention of nuclear coercion) and political (global prestige) role to play in India’s defence and foreign policy.¹²⁶ The stated doctrine of credible minimum deterrence reflects the triumph of the pragmatists. While “credibility” is defined by retaliatory capability, command-control-communications survivability, and political will on the part of the national command authority, “minimum” defines size, cost, posture, doctrine and use.¹²⁷

1.117 Former External Affairs Minister S. M. Krishna has described nuclear weapons as integral to India’s national security and said that they would “remain so, pending non-discriminatory and global nuclear disarmament.”¹²⁸ National Security Adviser Shivshankar Menon believes that India’s possession of nuclear weapons has, “empirically speaking, deterred others from attempting nuclear coercion or blackmail against India.” India’s nuclear weapons are not meant, however, to counter the superior armed strength of others or for use in theatre-level conflict.¹²⁹ India’s primary objective nonetheless is to strengthen its strategic deterrent against China. With respect to Pakistan, the Indian establishment continues to believe, as said openly by Defence Minister George Fernandes

122. US Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* (Washington DC: January 2012), p. 5.

123. US Statement (under Cluster 1 – Disarmament) at the 2012 Preparatory Committee of the 2015 NPT Review Conference, Vienna, 3 May 2012.

124. *Draft Report of the National Security Advisory Board on Indian Nuclear Doctrine*, 17 August 1999; <http://www.fas.org/nuke/guide/india/doctrine/990817-indnucltd.htm>.

125. <http://www.armscontrol.org/factsheets/indiaprofile>.

126. Kanti Bajpai, “India’s Nuclear Posture after Pokhran II,” *International Studies* 37:4 (October 2000), pp. 267–301.

127. Tanvi Kulkarni and Alankrita Sinha, “India’s Credible Minimum Deterrence: A Decade Later,” Institute of Peace and Conflict Studies (New Delhi), *IPCS Issue Brief 179* (December 2011), www.ipcs.org/pdf_file/issue/IB179-NSP-AlankritaTanvi.pdf.

128. “India Says Nuclear Weapons ‘Integral’ to Security,” *Global Security Newswire*, 22 August 2012.

129. “India Says Nuclear Weapons ‘Integral’ to Security.”

in 2002, that India can survive a nuclear attack but Pakistan cannot.¹³⁰ India explicitly rejects the distinction between nuclear and non-nuclear-weapon states established by the NPT and has made it very clear that it will not join the NPT as a non-NWS.

1.118 *Pakistan*, which has had a nuclear weapons program since the early 1970s, followed India's nuclear weapons tests with six of its own on 28 and 30 May 1998. Pakistan's nuclear doctrine is similarly based on the principle of "credible minimum deterrence," with resort to nuclear weapons envisaged only in response to an existential threat which need not be the result of an attack by any category of WMD (biological, chemical or nuclear weapons).¹³¹ Pakistan's nuclear doctrine is India-specific, although, particularly after the US raid on Abbotabad in May 2011 that killed Osama bin Laden and in light of continuing strong differences of opinion on regional security issues, the expansion and modernization of Pakistan's nuclear arsenal may also now be driven partly by fears of a US raid to capture or secure its nuclear forces.¹³²

1.119 The development of tactical nuclear weapons as a counter to India's superiority in conventional arms, and to compensate for its lack of strategic depth, would seem to leave open the possibility of first use of nuclear weapons against India, particularly in the case of invasion. While battlefield nuclear weapons may be thought to give Pakistan the chance of denying "victory" to India in a nuclear war by inflicting particularly severe damage, they would also expose Pakistan to a very high risk of nuclear retaliation and, if used against Indian forces inside Pakistan, to the certainty of partial irradiation of the homeland. Deployment of battlefield nuclear weapons requires the delegation of command and control to military units in the field. This increases the risks of miscalculation, accident, theft, and infiltration by militant groups.¹³³

1.120 Pakistan is the only one of the nine nuclear-armed states where nuclear weapons were developed by the military, are essentially under military control, and the decision to use them will be made by the military rather than civilian leadership. Pakistan for this purpose is not a unitary actor and this poses a "particular challenge for deterrence stability in the context of a disunity in the chain of command between top Pakistani authorities and actors who may commit violence against India... of a scale that could lead to inter-state war with potential to escalate to potential use of nuclear weapons."¹³⁴ For so long as Pakistan is unable or unwilling to take effective preventive action to stop extremists based on its territory from planning and launching attacks on India, the latter's presumption of state-jihadists collusion will remain powerfully operative.

1.121 *Israel* does not admit to the possession of nuclear weapons. It has maintained a policy of "nuclear ambiguity" or "nuclear opacity" since the 1960s when Prime Minister

130. Michael Richardson, "Q&A George Fernandes: India and Pakistan are not 'imprudent' on nuclear option," *International Herald Tribune*, 3 June 2002.

131. <http://www.globalsecurity.org/wmd/world/Pakistan/nuke-battlefield.htm>.

132. Shyam Saran, "Dealing with Pakistan's brinkmanship," *The Hindu*, 7 December 2012.

133. <http://www.globalsecurity.org/wmd/world/Pakistan/nuke-battlefield.htm>.

134. George Perkovich, "The Non-Unitary Model and Deterrence Stability in South Asia" (Washington: Carnegie Endowment for International Peace, 13 November 2012), p. 3, <http://www.carnegieendowment.org/2012/11/13/non-unitary-model-and-deterrence-stability-in-south-asia/eihm>. For example, the 1999 Kargil operation was planned by a small group of officers in the Pakistan Army without foreknowledge of the country's air and navy chiefs, with dangerously high escalation potential; see Peter R. Lavoy, *Asymmetric Warfare in South Asia: The Causes and Consequences of the Kargil Conflict* (Cambridge: Cambridge University Press, 2009).

Levi Eshkol declared that Israel would “not be the first to introduce nuclear weapons to the Middle East”¹³⁵ – nor the second, add some Israeli wags. The policy has served Israel well, providing “the benefits of existential deterrence at a very low political cost” without directly opposing US non-proliferation objectives.¹³⁶ In the absence of a declared nuclear-weapons capability, the circumstances in which Israel might be prepared to use such weapons have not been publicly documented, although prior to the first Gulf War, in response to Iraqi missile threats, Prime Minister Yitzhak Shamir warned of Israel’s “very strong deterrent capability” and Defence Minister Moshe Dayan referred, none too subtly, to Israeli weapons “which the world does not yet know about.”¹³⁷ It would thus seem reasonable to assume that Israel sees an undeclared but barely disguised nuclear-weapons capability as compensating for its small size and population, lack of strategic depth, and as an appropriate response to the multiplicity of existential threats confronting it in its region.

1.5.1 No First Use

1.122 The ICNND Report recommended that, pending the elimination of nuclear weapons, every nuclear-armed state “make an unequivocal ‘no first use’ declaration, committing itself to not using nuclear weapons either preventively or pre-emptively against any possible nuclear adversary” (Recommendation 49); and that, until this is done, they should “at least accept the principle that the sole purpose of possessing nuclear weapons... is to deter others from using such weapons” against them or their allies (Recommendation 50).

1.123 Of the five NWS, only China is publicly committed to no first use of nuclear weapons. Of the other nuclear-armed states, only India has made a similar commitment. China’s commitment to no first use dates back to the 1960s. China holds that all NWS “should abandon any nuclear deterrence policy based on first use of nuclear weapons” and “conclude a treaty on no first use of nuclear weapons against each other,” pending the prohibition and elimination of nuclear weapons.¹³⁸

1.124 The 2010 NPR was the first comprehensive reassessment of US nuclear weapons policy in a decade (the previous NPR was in 2001). This makes no reference to no first use but does take a very small step in the direction of “sole purpose” when it says that, as already noted above, while the United States is “not prepared at the present time to adopt a universal policy that deterring nuclear attack is the sole purpose of nuclear weapons,... [it] will work to establish conditions under which such a policy could be safely adopted.”¹³⁹ The NPR failed to reassess existing nuclear weapons deployment and targeting policies, and President Obama subsequently asked the Pentagon to lead an interagency review to develop alternative constructs of deterrence and stability with accompanying force sizes and postures. Decisions on any new nuclear policy guidance and force levels have not yet been announced.

135. Noam Sheizaf, “Clear and Present Danger,” *Haaretz*, 21 March 2012.

136. <http://www.nti.org/country-profiles/Israel/nuclear/>.

137. <http://www.nti.org/country-profiles/Israel/nuclear/>.

138. *China Defence White Paper 2010*.

139. *Nuclear Posture Review*, April 2010, p. viii.

1.5.2 Extended Nuclear Deterrence

1.125 “Extended nuclear deterrence” refers to the role of nuclear weapons of the NWS in protecting allies from external attack.¹⁴⁰ While it applies to the Russian nuclear umbrella extended to allies in the Commonwealth of Independent States (former Soviet republics), the concept has particular force with respect to the network of US alliances in Europe, the Middle East and the Asia–Pacific. In this context, Russia appears in practice to envisage a possible resort to nuclear weapons only in response to a WMD attack on its allies.¹⁴¹ For the United States, while the primary function of US nuclear weapons is seen as deterring nuclear attack,¹⁴² as already indicated it has not yet excluded the possibility of a nuclear response to non-nuclear threat contingencies.

1.126 **NATO.** Many believe that NATO has a responsibility to provide leadership on the alliance’s nuclear policy and on the NATO–Russia relationship. Instead, NATO is “pursuing an enhanced nuclear capability in Europe that can neither be afforded nor makes strategic sense in current or likely future circumstances.”¹⁴³ Under current NATO nuclear-sharing arrangements, there are understood to be a total of some 200 American B-61 tactical nuclear weapons on bases in five European countries (Belgium, Germany, Italy, Netherlands and Turkey), all of them non-NWS signatories to the NPT.

1.127 NATO’s Strategic Concept, adopted at the Lisbon Summit in November 2010, commits NATO to “the goal of creating the conditions for a world without nuclear weapons – but reconfirms that, as long as there are nuclear weapons in the world, NATO will remain a nuclear Alliance.” However, unlike its predecessors, which called for the indefinite preservation of nuclear deployments in Europe, the 2010 Strategic Concept does not exclude a possible end to nuclear-sharing arrangements. The new formulation – “Deterrence, based on an appropriate mix of nuclear and conventional capabilities, remains a core element of our overall strategy” – does not call for nuclear weapons to be in Europe indefinitely or indeed at all. It does, however, clearly identify “the strategic nuclear forces of the Alliance, particularly those of the United States,” as “the supreme guarantee” of NATO’s security.¹⁴⁴

1.128 The Lisbon Summit mandated a review of NATO’s “overall posture in deterring and defending against the full range of threats to the Alliance” which, in the shape of the Deterrence and Defence Posture Review (DDPR), was adopted by the NATO Summit in Chicago on 20 May 2012. The DDPR describes, in standard terms, the alliance’s resolve “to seek a safer world for all and to create the conditions for a world without nuclear weapons in accordance with the goals of the NPT.” Rather more significantly, though, it also describes nuclear weapons as “a core component of NATO’s overall capabilities for deterrence and defence” and affirms that the review has demonstrated “the Alliance’s nuclear force posture currently meets the criteria for an effective deterrence and defence

140. This is a subset of the wider concept of “extended deterrence,” which refers to the commitment by a state to defend its allies from external attack by any means, nuclear or non-nuclear.

141. Sokov, *The New 2010 Russian Military Doctrine*.

142. *Nuclear Posture Review*, p. 16.

143. Browne and Kearns, “NATO, Russia, and the Nuclear Disarmament Agenda,” p. 2.

144. *Active Engagement, Modern Defence: Strategic Concept for the Defence and Security of the Members of the North Atlantic Treaty Organization*, adopted by Heads of State and Government at the NATO Summit in Lisbon, 19–20 November 2010.

posture.” The DDPR simply repeats the Lisbon Strategic Concept document when it says that “the supreme guarantee of the security of the Allies is provided by the strategic nuclear forces of the Alliance, particularly those of the United States” and goes on to observe that “the independent strategic nuclear forces of the United Kingdom and France, which have a deterrent role of their own, contribute to the overall deterrence and security of the Allies.”¹⁴⁵

1.129 Because it includes three of the world’s five NWS (France, the United Kingdom and the United States) and eight of the fourteen states that have nuclear weapons on their territory (Belgium, France, Germany, Italy, Netherlands, Turkey, the United Kingdom and the United States), NATO “has a responsibility to be the change it wants to see in the world, not just to advocate for that change on the part of others.”¹⁴⁶ Instead, having committed to President Obama’s goal in Prague in April 2009 of creating the conditions for a world without nuclear weapons, at the Lisbon summit in 2010, NATO ignored the commitment in making its own nuclear policy. For example, it has chosen to modernize and enhance its tactical nuclear weapons in Europe, not just to maintain the current capability.¹⁴⁷ The DDPR disappointed those who had hoped that it might provide an opportunity to soften NATO’s nuclear deterrence posture, for example by declaring “that the central purpose of nuclear weapons was to discourage a similar attack” or by responding positively to calls “for the immediate reduction, withdrawal, or consolidation” of US tactical nuclear weapons in Europe.¹⁴⁸ Instead, Allies simply acknowledged “the importance of the independent and unilateral negative security assurances offered by the United States, the United Kingdom and France” and, “while seeking to create the conditions and considering options for further reductions of non-strategic nuclear weapons assigned to NATO,” promised to “ensure that all components of NATO’s nuclear deterrent remain safe, secure, and effective for as long as NATO remains a nuclear alliance.”¹⁴⁹

1.130 The DDPR emphasized that, since the end of the Cold War, NATO had “dramatically reduced the number, types, and readiness of nuclear weapons stationed in Europe and its reliance on nuclear weapons in NATO strategy.” Against this background, it was ready to consider “further reducing its requirement for non-strategic nuclear weapons assigned to the Alliance in the context of reciprocal steps by Russia, taking into account the greater Russian stockpiles of non-strategic nuclear weapons stationed in the Euro-Atlantic area.”¹⁵⁰

1.131 Nuclear-sharing is a Cold War relic originally intended to offset the Soviet Union’s conventional weapons superiority and a means of involving NATO non-NWS in the potential nuclear defence of Europe. At the peak in 1971, there were 7,300 US tactical nuclear weapons in Europe.¹⁵¹ Nuclear-sharing is of little relevance to today’s Europe

145. “Deterrence and Defence Posture Review,” *NATO Press Release* (2012) 063, 20 May 2012.

146. Browne and Kearns, “NATO, Russia, and the Nuclear Disarmament Agenda,” p. 5.

147. Edmond Seay, “Escalation by Default: The Future of NATO Nuclear Weapons in Europe,” (London: ELN, 10 May 2012), http://www.europeanleadershipnetwork.org/escalation-by-default-the-future-of-nato-nuclear-weapons-in-europe_380.html.

148. Rachel Oswald, “NATO Maintains Nuclear Weapons’ Role in Deterrence,” *Global Security Newswire*, 21 May 2012.

149. “Deterrence and Defence Posture Review,” 20 May 2012.

150. “Deterrence and Defence Posture Review,” 20 May 2012.

151. Robert N. Norris and Hans M. Kristensen, “US tactical weapons in Europe, 2011,” *Bulletin of the Atomic Scientists*, 67:1 (January/February 2011), p. 65.

and is not a prerequisite for US extended nuclear deterrence (cf. Japan and South Korea). To many, the DDPR was an opportunity missed “to make a comprehensive, coherent and balanced assessment of the mix of capabilities required by the Alliance in the years ahead” and “to spell out the potential contribution that arms control and disarmament could make to reducing nuclear risks in Europe and more widely.”¹⁵²

1.132 **Asia Pacific.** In the Asia Pacific, extended nuclear deterrence is understood in the context of the reliance by a number of US allies (especially Japan and South Korea) on US nuclear capability, not only to deter possible nuclear attack, but also to deter or respond to threats from biological and chemical weapons, and indeed overwhelming conventional forces, deployed against them. The particular significance of the US commitment here is seen as lying in its very strong incentive for Japan and South Korea not to acquire a deterrent nuclear capability of their own, although the strong anti-nuclear sentiment in Japan in particular acts as a very powerful disincentive for any government to go down that path.

1.133 Extended nuclear deterrence nonetheless appears in practice to have operated more as an expression of closeness between the United States and its allies rather than as a concrete security measure. To the extent that there is a diminished role for nuclear weapons, and emphasis on conventional military capabilities, envisaged in current US strategic guidance, this should have little impact on the substance of US security relationships with Japan and South Korea. As ever, these relationships will rest upon non-nuclear defence and security cooperation.

1.134 The limitations of extended nuclear deterrence are those of nuclear deterrence generally. As already noted, the United States has stated that it would only consider using nuclear weapons in extreme circumstances. Washington is also acutely conscious that the use of nuclear weapons to defend an ally against a nuclear-armed adversary would risk nuclear retaliation against the United States. It is thus hardly surprising that, while the United States has firm security commitments to countries in North Asia, these do not include specific commitments to use nuclear weapons in their defence.¹⁵³

1.135 Within Japan and South Korea there is a range of views on the value of extended nuclear deterrence. Leaving aside its dubious utility, there is no reason why stable deterrence cannot be maintained as nuclear weapon numbers are reduced. As Japan’s Foreign Minister Katsuya Okada said in a December 2009 letter to US Secretaries Hillary Clinton and Robert Gates, “While the Japanese Government places trust and importance on your government’s extended deterrence, this does not mean that the Japanese Government demands a policy of your government which conflicts with the goal of a world without nuclear weapons.”¹⁵⁴ It remains to be seen, however, whether Okada’s more conservative successors will maintain this perspective.

152. Browne and Kearns, “NATO, Russia, and the Nuclear Disarmament Agenda,” p. 12.

153. Jeffrey Lewis, *Extended Nuclear Deterrence in Northeast Asia*, 1 August 2012, <http://nautilus.org/napsnet/napsnet-special-reports/extended-nuclear-deterrence-in-northeast-asia>.

154. Quoted in Gregory Kulacki, “Japan and America’s Nuclear Posture,” Union of Concerned Scientists, March 2010, p. 7.

1.5.3 Negative Security Assurances (NSAs)

1.136 A negative security assurance in this context is one given by a nuclear-armed state that it will not threaten or use nuclear weapons against non-nuclear-armed states. At the 2010 NPT Review Conference, all states agreed that the CD should “immediately begin discussion of effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons” (Action 7). The ICNND Report called on all nuclear-armed states to provide “new and unequivocal negative security assurances... supported by binding Security Council resolution” to all non-NWS (Recommendation 53).

1.137 Understandably, and particularly since the NPT’s entry into force in March 1970, states which have pledged not to acquire nuclear weapons have been keen to secure from the treaty’s five recognized NWS firm assurances that nuclear weapons will not be used against them. Assurances were provided, individually by each of the five NWS, at the first special session of the UN General Assembly devoted to disarmament (May–June 1978) and reaffirmed in the lead-up to the NPT Review and Extension Conference in 1995 as part of efforts to win support for the treaty’s indefinite extension.¹⁵⁵

1.138 Of the NWS, only China has given an unconditional undertaking not to use or threaten to use nuclear weapons against non-nuclear-armed states. Of the non-NPT nuclear-armed states, only Pakistan has given a like undertaking. China and Pakistan are the only two nuclear-armed states to support the idea of transforming this undertaking into a legally binding international instrument. There has been no substantive discussion of this, or any other disarmament issue, in the CD since 2009 (ICNND report) and 2010 (NPT Review Conference).

1.139 Four of the five NWS (France, Russia, the United Kingdom and the United States) have undertaken not to use nuclear weapons against NPT non-NWS except in the case of an invasion or any other attack on the state concerned, its territory, its armed forces or other troops, its allies or on a state towards which it has a security commitment, carried out or sustained by such a non-NWS in association or alliance with a NWS.¹⁵⁶

1.140 Two NWS, the United Kingdom and the United States, have qualified their assurances by specifying that beneficiaries must be in compliance with their obligations under the NPT. Most recently, in its April 2010 NPR, the United States said that it would not “use or threaten to use nuclear weapons against non-nuclear-weapon States that are party to the NPT and in compliance with their nuclear non-proliferation obligations.” The United States nonetheless reserved “the right to make any adjustment in the assurance that may be warranted by the evolution and proliferation of the biological weapons threat and U.S. capacities to counter that threat.”¹⁵⁷

1.141 For countries not covered by this assurance (other nuclear-armed states, and states deemed by Washington not to be in compliance with their nuclear non-proliferation

155. See Jayantha Dhanapala (President of the 1995 NPT conference), “The Permanent Extension of the NPT, 1995,” in Andrew F. Cooper, Jorge Heine and Ramesh Thakur, eds., *The Oxford Handbook of Modern Diplomacy* (Oxford: Oxford University Press, forthcoming 2013).

156. UN Security Council documents S/1995/261, 262, 263 and 264 of 6 April 1995.

157. *Nuclear Posture Review Report*, p. viii.

obligations), there remains “a narrow range of contingencies in which US nuclear weapons may still play a role in deterring a conventional or CBW attack against the United States or its allies and partners.” The United States is thus, as already noted, not ready to make a “sole purpose” affirmation (that “detering nuclear attack is the sole purpose of nuclear weapons”), but “will work to establish conditions under which such a policy could be safely adopted.”¹⁵⁸

1.142 The UK’s 2010 Strategic Defence and Security Review similarly provides an assurance that “the UK will not use or threaten to use nuclear weapons against non-nuclear-weapon States parties to the NPT,” noting that the assurance “would not apply to any State in material breach of [its] non-proliferation obligations.” It also reserves the right to review this assurance if “the future threat, development and proliferation of [other weapons of mass destruction, for example chemical and biological] make it necessary.”¹⁵⁹

1.143 China has adopted a different approach. Its April 1995 declaration opened with an undertaking “not to be the first to use nuclear weapons at any time or under any circumstances” and went on to promise that China would not “use or threaten to use nuclear weapons against non-nuclear-weapon States or nuclear-weapon-free zones at *any time or under any circumstances*” (emphasis added). China urged all NWS to follow its lead by providing both no-first-use declarations and unqualified NSAs, incorporating nuclear-weapon-free zones (NWFZs); and concluded by calling for “the early conclusion of an international convention on no first use of nuclear weapons as well as an international legal instrument assuring the non-nuclear-weapon States and nuclear-weapon-free zones against the use or threat of use of nuclear weapons.”¹⁶⁰ China’s unequivocal NSA is reaffirmed in its most recent National Defence White Paper.

1.144 Of the five NWS, all but China oppose the idea of a legally binding international instrument on NSAs and routinely abstain on a UN General Assembly resolution promoting the “Conclusion of effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.”¹⁶¹

1.145 Pakistan has given an “unconditional pledge not to use or threaten to use nuclear weapons against states not possessing nuclear weapons” and is “ready to transform this pledge into a legally binding international instrument.”¹⁶²

1.146 India’s position is less clear. The Indian National Security Advisory Board’s 1999 Draft Report on Nuclear Doctrine says that India “will not resort to the use or threat of use of nuclear weapons against states which do not possess nuclear weapons, or are not aligned with nuclear weapon powers.”¹⁶³

158. *Nuclear Posture Review Report*, p. viii.

159. *Securing Britain in an Age of Uncertainty*, pp. 37–38.

160. UN Security Council document S/1995/265 of 6 April 1995.

161. In 2011, A/RES/66/26 was adopted 119-0-56.

162. http://www.reachingcriticalwill.org/images/documents/Disarmament-fora/cd/2012/statements/part2/12June_Pakistan.pdf.

163. Draft Report of National Security Advisory Board on Nuclear Doctrine, <http://www.fas.org/nuke/guide/india/doctrine/990817-indnucl.htm#disarm>.

§1.6 Nuclear Force Posture

1.147 “Trust, but verify,” US President Ronald Reagan famously said about arms control agreements with the Cold War enemy the Soviet Union. Whatever the declared policy, statements on nuclear doctrine reducing the role of nuclear weapons have credibility only if backed by appropriate nuclear force postures, that is, arrangements for the deployment of nuclear arsenals, and the launch alert status of those weapons, which are consistent with the stated doctrine.

1.6.1 Weapons Deployment

1.148 Only *Russia* and the *United States* currently maintain a nuclear triad of land, air and sea-based nuclear weapons. Their deployed strategic offensive weapons – to be significantly reduced in number under present New START obligations, as discussed above, but still constituting formidable arsenals – include ICBMs, SLBMs and gravity bombs. Russia appears to be making changes to the deployment patterns of land-based strategic forces to increase their survivability. The road-mobile single warhead Topol-M and a new road-mobile multiple warhead missile, the Yars, will be the backbone of the Russian strategic rocket forces in the coming decades. Both Russia and the United States also have inventories of “tactical” or “non-strategic” weapons. The United States currently deploys some 200 B-61 bombs at bases in five NATO countries. “Russia’s non-strategic nuclear warheads are normally kept in central storage.”¹⁶⁴ US and Russian nuclear missiles are de-targeted. Re-targeting can be accomplished quickly, but a missile launched accidentally will land in an area of open ocean and an additional decision from the command authority is required prior to an authorized launch.

1.149 *China* provides no details of its nuclear arsenal. China is believed to have a small stock of air-deliverable nuclear weapons but depends heavily on land-based missiles. It is actively modernizing its land-based ballistic missiles by replacing ageing liquid-fuelled, silo-based missiles with newer solid-fuelled, road-mobile models to increase the survivability and strengthen the retaliatory capabilities of its nuclear forces.¹⁶⁵ Beijing is also believed to be within two years of establishing a “credible sea-based nuclear capability.” According to the US Department of Defense, two of China’s newly developed Jin-class SSBNs appear to be in service. A third boat is believed to be under construction. The associated JL-2 SLBM, however, has faced technical delays and is expected to become operational within two years.¹⁶⁶ While the development of a sea-based component of China’s nuclear arsenal would significantly increase the survivability of its nuclear forces, it remains unclear how many Jin-class SSBNs China plans to build and what strategy it envisions for its future sea-based nuclear forces.¹⁶⁷ China’s nuclear doctrine stipulates that “in peacetime the nuclear missile weapons of the Second Artillery Force are not aimed at any country.”¹⁶⁸ Its stockpile is not thought to be fully deployed.

164. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 29.

165. Li Bin, “Tracking Chinese Strategic Mobile Missiles,” *Science & Global Security* (15:1 (2007)), pp. 4–5.

166. “Military and Security Developments Involving the People’s Republic of China 2012,” *Annual Report to Congress, Office of the Secretary of Defense*, May 2012, p. 23.

167. Wu Riqiang, “Survivability of China’s sea-based nuclear forces,” *Science and Global Security* 19:2 (2011), pp. 94–96.

168. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 28.

1.150 *France's* nuclear weapons are deployed on its four ballistic missile submarines and a mix of land- and carrier-based aircraft. At any given time, at least one submarine is at sea, providing continuous deterrence. In December 2012, France denied that it was contemplating a change to its nuclear force posture such that it would no longer have a sea-borne deterrent 365 days in the year. This would happen if its fleet of submarines was reduced from four to three as a cost-cutting measure. A Defence White Paper for 2014–2019 is to be released in January 2013. A related speculation is that air-deliverable nuclear weapons on Mirage 2000 and Rafale jets would also be jettisoned.¹⁶⁹

1.151 *The United Kingdom* has only sea-launched Trident missiles deployed on four Vanguard-class submarines, one of which is always at sea. Over the next several years, the number of warheads on each submarine is to be reduced from 48 to 40. Missiles are de-targeted. The Vanguard-class submarines are due for replacement in the 2020s. While both the ruling Conservative and opposition Labour parties support the maintenance of a nuclear deterrent, a final decision on the configuration of the United Kingdom's future nuclear forces will not be taken until after the next general election in 2016. In the meantime, as mentioned earlier in this chapter, the Conservatives' Liberal Democratic coalition partner has demanded a fresh assessment of possible alternatives to Trident.

1.152 Neither *India* nor *Pakistan* provides details of its nuclear arsenal. India and Pakistan are working to create survivable nuclear forces based on a mix of different launch platforms. Indian plans to deploy nuclear weapons at sea are based on the development of a ballistic missile launched from a nuclear-powered submarine. Both elements are in the development testing phase and the capability may be deployed in coming years. Pakistani plans are not thought to be as far advanced. Both India and Pakistan have developed road-mobile nuclear-capable ballistic missiles. Their stockpiles are not thought to be fully deployed.

1.6.2 Launch Alert Status

1.153 In the middle of a nuclear crisis, if strategic doctrine and operational plans require a very quick decision on strategic force employment, the possibility grows of miscalculation or a decision based on the wrong information by the national command authority. This is why the issue of launch alert status has been of great interest to successive NPT review conferences and international commissions alike. Both the 2010 NPT Review Conference (Action 5) and the ICNND Report emphasized the need for reducing the operational status of nuclear weapons systems as a confidence-building measure. ICNND urged changes to the deployment of nuclear weapons which, while allowing them to survive a potentially disarming first strike, nonetheless ensures that they are not "instantly useable" (Recommendation 55). Weapons should be taken off "launch-on-warning alert" as soon as possible (Recommendation 56).

169. Henry Samuel, "France denies claims it will ditch year-round seaborne nuclear deterrent," *The Telegraph* (London), 11 December 2012, <http://www.telegraph.co.uk/news/worldnews/europe/france/9727414/France-denies-claims-it-will-ditch-year-round-seaborne-nuclear-deterrent.html>.

1.154 Terms like “hair trigger” and “launch-on-warning” may be criticized as technically inaccurate in that they imply automaticity. There are rigorous technical and procedural safeguards that require human agency: the *decision* has to be made to launch the nuclear weapons. But this does not negate the fact that thousands of Russian and US nuclear weapons are maintained on a “ready alert” or “day-to-day alert” status. The problem and the solution thus concern issues of nuclear doctrine and deployment. Regrettably, there have been no declared or assumed reductions in operational status since the 2010 NPT Review Conference.

1.155 Historically, alert levels of nuclear weapons systems have varied with changes in the overall security environment, the deployment patterns of the adversary, fiscal elasticity, and political pressures. At present, Russia and the United States keep about 1,000 warheads each on high alert, with the posture dictated by the approximately 30-minute flight time of a putative enemy missile. According to the Cartwright study for Global Zero already referred to, US early warning teams will have up to three minutes to determine that indications of an incoming nuclear attack are real and report to the president; the president would have a maximum of twelve minutes to decide whether to retaliate in kind or risk decapitation of nuclear command and control capacity and decimation of US nuclear forces; missile launch crews in underground command posts and submarines would have two and twelve minutes respectively to take the missiles out of their silos and tubes and launch them on their 30 minutes (or less) flight path to enemy targets.¹⁷⁰

1.156 Some steps have been taken by the United States and Russia to address the potential risks arising in circumstances where there is only a short time available to reach a decision to launch nuclear weapons. The two countries operate Nuclear Risk Reduction Centres, initially designed and launched as a single government-to-government communications link, intended to provide a reliable channel of communication in times of crisis: this includes the direct communication line established in 1963 between Washington and Moscow to help reduce the risk of nuclear exchange precipitated by accident or mistake. (Similar lines exist between India and Pakistan and the United States and China.) But for all this, and despite the many calls that have been made by many commissions, experts and campaign groups for change – and see further the discussion of the case for de-alerting discussed below – there has been no movement on increasing launch decision times. As the ICNND report put it, “So long as the logic of mutual deterrence prevails in the minds and behaviour of U.S. and Russian decision-makers...it has to be acknowledged that, for all the evident need to do so urgently, stepping back quickly from this precipice is going to prove rather more difficult than would appear at first sight.”¹⁷¹

170. Cartwright, et al., *Modernizing U.S. Nuclear Strategy, Force Structure and Posture*, p. 5. See also ICNND Report, pp 178–79.

171. ICNND, *Eliminating Nuclear Threats*, pp. 178–79, paragraph 17.42.

1.157 *Russia's* deployed ICBMs are at launch-on-warning (“ready to launch if it appears that another state has initiated a nuclear strike against Russia”). Sea- and air-based nuclear weapons are at lower levels of readiness. “Gravity bombs are not continuously deployed on heavy bombers and Russian SSBNs are not on continuous at-sea patrol.”¹⁷² Increasing the mobility of ICBMs, and increasing the number of prepared and pre-surveyed places from which they can be launched, could help increase the time available for reaching a decision to launch. Russia is also said to be implementing measures to reduce the risk posed by advanced conventional weapons to missiles prior to launch, including electronic counter-measures and decoys. But it remains extremely nervous about its overall vulnerability to superior US conventional capability. As the ICNND Report points out, whatever the unlikelihood may now be of war between them, Moscow sees mutual de-alerting of ICBMs, the principal launch-on-warning force, as making US missiles essentially invulnerable.¹⁷³

1.158 *The United States* has combined a launch posture that safeguards against unauthorized launch of ICBMs with procedures that allow for rapid re-targeting and launch of strategic forces after a valid order is received from the national command authority. Little is known about the launch status of US submarine forces at sea, but it obviously would be impractical in the extreme for these to be without the ability to launch warheads without having to return to shore. Strategic submarines on combat patrol maintain a radio silence to help avoid detection, but could receive and carry out a launch order before enemy anti-submarine warfare assets could engage. In case of loss of communication with the national command authority, it is believed that the commanding officer performs a list of checks to indicate whether the command authority has been destroyed. If the indicators are positive, the commanding officer has sealed orders that explain the specific course of action to follow.

1.159 The April 2010 NPR included a statement that the United States would continue to seek ways to maximize the time available to the president to consider whether to authorize the use of nuclear weapons. But the NPR did not change the alert status of US nuclear forces, summarized as “heavy bombers off full-time alert, nearly all ICBMs on alert, and a significant number of SSBNs at sea at any given time.”¹⁷⁴ Most US deployed ICBMs are at launch-on-warning. Eight or nine SSBNs are at sea at any given time, with up to five SSBNs on “hard alert.”¹⁷⁵ In 2010 the United States revealed that all of its ICBMs are in so-called “open ocean target” mode, so that if there was an inadvertent launch the missile would land in the middle of one of the large oceans.¹⁷⁶

1.160 US officials contest the view that current launch status is “dangerously high,” arguing that a prudent balance has been struck between the survivability of nuclear forces and the capacity to implement a legal order from the proper command authority.

172. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 29.

173. ICNND, *Eliminating Nuclear Threats*, p. 179, paragraph 17.42.

174. Testimony of James Miller to the *Hearing on Implementation of the New Strategic Arms Reduction Treaty (START) and Plans for Future Reductions in Nuclear Warheads and Delivery Vehicles*, before the Subcommittee on Strategic Forces of the House of Representative Armed Services Committee, 4 May 2011.

175. S.H. Kile, P. Schell P. and H.M. Kristensen, “US Nuclear Forces,” *SIPRI Yearbook 2012*, p. 313.

176. Andrew Quinn, “U.S. reveals nuclear target: oceans,” *Reuters*, 6 April 2010.

Modifying launch status to prolong the time taken to implement a lawful order would, according to officials, carry the risk of creating a “window” of time that an adversary might exploit to try and neutralize US strategic forces. US military representatives have also argued that re-alerting weapons in a crisis could trigger escalation by causing an adversary to conclude that a first strike was imminent – although it should be noted that US nuclear strategy already includes scenarios for increasing alert levels in a crisis.

1.161 The US Department of Defense is completing a review of the current deterrence strategy, including a nuclear targeting review, which may result in new presidential guidance. However, unlike the nuclear posture review process, there are not expected to be any unclassified documents to inform public debate or the international community.

1.162 In *France*, one SSBN is always at sea on deterrent patrol. In the *United Kingdom*, at any given time, one SSBN is at sea on deterrent patrol and at several days’ “notice to fire.” *China’s* nuclear force posture would appear to be consistent with its stated view of the limited utility of nuclear weapons and the declared doctrine of using nuclear weapons solely to deter a nuclear attack and prevent any nuclear blackmail. China is believed to keep its nuclear weapons on low alert, with warheads separated from missiles and fuel. It is worth noting that under New START counting rules, this would reduce China’s nuclear weapons stockpile to zero.¹⁷⁷

1.163 *India* and *Pakistan* also keep warheads separate from delivery systems. Published sources agree that India has decided against a strategy that requires launch-on-warning and has structured its nuclear forces accordingly. India’s nuclear arsenal is said to be dispersed in different locations, with warheads separated from delivery systems. Different organizations have custody of weapons and delivery systems in peacetime.¹⁷⁸ Pakistan’s nuclear weapons are believed to be kept on low alert. Missiles may not be mated with warheads under normal conditions and the two may be stored at different locations, though this is unclear. The suggestion that warheads were kept in disassembled form was denied by a former official from the weapons establishment.¹⁷⁹ Information on *Israeli* practices is not available.

1.164 The differences between Russia, the United States, France and the United Kingdom on the one hand, and the remaining nuclear-armed states on the other, may be ascribed to differences in doctrine (China), absence of early warning systems (India, Pakistan) or considerations of control and safety (India, Pakistan). Keeping nuclear weapons on high alert is not required for any political roles – of coercion and bargaining – seen for them by some weapons possessors.

1.165 **The Case for De-alerting.** A nuclear-armed state acquires credible first-strike capability against a nuclear rival when it can launch a nuclear attack without fear of reprisal. Taking nuclear warheads and weapons systems off high alert can deepen the stability of nuclear deterrence so that nuclear-armed rivals will not attack each other

177. Kulacki, “China’s Nuclear Arsenal,” p. 2.

178. Manpreeth Sethi, *Nuclear Deterrence in Second Tier Nuclear Weapon States: A Case Study of India*, Centre de Science Humaine, CSH Occasional Paper no. 25, Dec. 2009, p. 54.

179. Bruno Tertrais, *Pakistan’s Nuclear and WMD Programmes: Status, evolution and risks*, EU Non-proliferation Consortium paper no. 19, July 2012, p. 5.

regardless of any rise in tension between them. The security environment of the 21st century is starkly different from the Cold War period, but the nuclear force posture is still trapped in the old paradigm with some 2000 nuclear warheads kept at high readiness to be launched en masse before the apprehended arrival of incoming enemy missiles.

1.166 Like nuclear terrorism, the launch of nuclear weapons on high alert by mistake, miscalculation or through a malfunction is low probability but high impact. In the tense environment of nuclear decision-making, high alert weapons carry a fourfold risk of unnecessary nuclear war:

- > Accidental launch (technical failure caused by malfunction);
- > Authority to launch being usurped by a subordinate official or by terrorists (custody failure leading to rogue launch). Unauthorized use is judged to be the least likely of these contingencies, although the risk increases in the middle of a crisis dispersion of nuclear weapons and in the case of countries like Pakistan whose organizational and technical safeguards may be brittle rather than robust;¹⁸⁰
- > Misinterpretation of incoming warning data (information failure leading to miscalculation);
- > Premature and ill-judged response to an actual attack (miscalculation caused by decision-making failure in a crisis).

1.167 Conversely, anything that lengthens the decision-making fuse – such that there is a significant extension of the timeline from the first report of an incoming threat to a decision to use a nuclear weapon and then the actual launch of the weapon – can only add to the existing tight margins of security from nuclear weapons.

1.168 Non-NWS have forcefully argued that lowering of the operational status of nuclear weapons would both reduce the risk of accidental or unintended nuclear war and provide a much-needed practical boost for disarmament and non-proliferation. A resolution on decreasing the operational readiness of nuclear weapon systems, first submitted in 2007 by Chile, New Zealand, Nigeria, Sweden and Switzerland (later joined by Malaysia), and adopted annually by the UN General Assembly by over two-thirds majority, typically has only France, Russia, the United Kingdom and the United States voting against it. The four have usually argued that the resolution seeks to address a problem that does not exist because of physical locks, technical safeguards, and procedures that require the US or Russian president to decide to launch missiles and transmit authorization codes to launch crews who confirm authenticity before taking action.

1.169 Opponents of de-alerting also argue that high alert levels have not been a bar to Russia and the United States building a good strategic relationship. Conversely, nuclear risk reduction narrowly conceived could potentially undermine the overarching objective of strategic stability and equal security. Crisis stability is reduced when a potential enemy, who has cheated by either failing to de-alert fully or by secretly re-alerting, has an incentive to launch an attack during a tense standoff before “re-alerting” has been completed. Therefore irreversible deep cuts are better than reducing

180. Cartwright, et al., *Modernizing U.S. Nuclear Strategy, Force Structure and Posture*, p. 5.

operational readiness of forces that do exist. Both crisis stability and deterrence are enhanced when nuclear rivals know that primary targets will not escape retaliatory strikes even if a surprise attack is launched first.

1.170 This is a questionable claim. A group of American and Russian experts has conducted simulations to show that strategic stability is enhanced by taking nuclear weapons off high alert.¹⁸¹ They point out that current nuclear postures call for massive re-alerting to mobilize two-thirds of nuclear arsenals rapidly during a Russia-US confrontation. Their model would *suppress* such re-alerting impulses by partitioning de-alerted weapons into a First and Second Echelon. The First Echelon consists of equal numbers of high-yield, single-warhead, silo-based ICBM launchers that can be quickly generated in hours to launch-ready status, which in themselves can survive in sufficient numbers to satisfy the requirements of deterrence. Their primary role is peacetime nuclear deterrence. The Second Echelon consists of deeply de-alerted but more diverse nuclear forces of road-mobile and sea-based systems with both single and multiple warheads that require weeks or months to become launch-ready. But they are invulnerable to enemy attack once re-alerted. The numbers are equal on each side in the Second Echelon, but the types of weapons are not symmetric.

1.171 The model shows that no advantage is gained by any re-alerting of either First or Second Echelon forces to launch a surprise attack. The conclusion holds even if Russia and the United States have cut their nuclear arsenals to 500-1,000 warheads each: 100 cities of the attacker would still be hit by the victim's retaliatory forces, causing unthinkable devastation.¹⁸²

1.172 "De-alerting has to be seen not only as a technical fix but also as a strategic step in deemphasizing the military role of nuclear weapons, in other words moving to retaliatory strike postures and doctrines instead of legacy preemptive or 'launch-on-warning' postures."¹⁸³ Current alert levels are full of inherent risks and are out of sync with improved political relations between Russia and the United States. De-alerting, by moving to retaliatory strike postures, is a strategic step in downgrading the military role of nuclear weapons. It is also a necessary step in transforming relations between nuclear adversaries from one of strategic confrontation to strategic collaboration. It confirms the now generally assumed status of nuclear weapons as weapons of last resort.

1.173 There is also a moral hazard argument. Nuclear weapons are believed to confer certain security benefits. This requires that nuclear rivals be convinced that states possessing nuclear weapons will use them as a last resort if under attack. The most effective way to instil such belief in nuclear rivals is by having a sufficient number of the

181. Bruce Blair, Victor Esin, Matthew Mckinzie, Valery Yarynich, and Pavel Zolotarev, "Smaller and Safer," *Foreign Affairs* 89:5 (September/October 2010), pp. 9-16 and "One Hundred Nuclear Wars: Stable Deterrence between the United States and Russia at Reduced Nuclear Force Levels Off Alert in the Presence of Limited Missile Defenses," *Science & Global Security Archive* 19:3 (2011), pp. 167-94. The technical details of the analysis is available at www.globalzero.org/files/FA_appendix.pdf. See also John Hallam, "Straight from the Planning Department of Hell: Maximising Decision-making Time, Lowering Operational Readiness," unpublished ms., May 2012.

182. However, these calculations can be upset by developments in strategic missile defence.

183. Department of Foreign Affairs, Switzerland, East-West Institute, and Ministry of Foreign Affairs, New Zealand, *Reframing Nuclear De-Alert: Decreasing the Operational Readiness of U.S. and Russian Arsenals* (New York: East-West Institute, 2009), p. 15.

weapons in a state of high operational readiness. But this means that Russia and the United States cannot convince others that nuclear weapons now, in the post-Cold War era, are in fact playing a reduced role in their national security strategies. In turn this makes it more difficult to convince non-NWS that national security goals can be fully met without nuclear weapons. On the contrary, indefinite reliance on nuclear weapons on short-notice alert can legitimize the nuclear ambitions of others. There is thus a non-proliferation as well as a disarmament and crisis stability argument for de-alerting. And reducing alert status is a confidence-building measure not just among NWS, but also between them and non-NWS, a point forcefully made by the latter at the 2010 NPT Review Conference.

1.174 The reality is that whether the alarm about an incoming nuclear attack turns out to be genuine or false matters not at all. For in the real world, the sole purpose of nuclear weapons can only be deterrence, neither defence nor retaliation. There is no conceivable circumstance in which either Russia or the United States could launch massive nuclear strikes against the other without committing nuclear suicide itself. Even if all fixed site weapons and missiles could be destroyed in a surprise attack – regardless of how many nuclear weapons the enemy has on high alert – Russia would have more than enough mobile ICBMs and the United States would have more than enough sea and air-launched weapons to destroy the other. To this extent the debate over alert status is esoteric and surreal rather than grounded in reality.

§1.7 Parallel Security Issues

1.7.1 Ballistic Missile Defence

1.175 While the US withdrawal in 2002 from the 1972 Anti-Ballistic Missile (ABM) Treaty did not derail either the 2002 Strategic Offensive Reductions Treaty or New START, the shadow of US abrogation will continue to hover over future nuclear disarmament efforts. The ABM Treaty helped to contain the nuclear weapons competition between the United States and Russia by limiting the deployment of systems capable of destroying incoming ballistic missiles, thereby preserving the perceived deterrent value of each side's strategic nuclear forces that rely on guaranteed second-strike retaliatory capability. Russia reacted strongly to planned US missile defence deployments in Europe which it believes could eventually undermine its own nuclear deterrent capability. The resulting distrust is inhibiting US–Russia and NATO–Russia cooperation on nuclear and wider international issues.

1.176 The ICNND believed that “severe limits” should be set on strategic ballistic missile defences which “now constitute a serious impediment to both bilateral and multilateral nuclear disarmament negotiations” (Recommendation 61). Missile defence has been revisited frequently, both bilaterally (US–Russia) and in the context of NATO–Russia relations, since the ICNND report (2009) and the eighth NPT review conference (2010).

1.177 The irony of the entire elaborate, protracted and intense debate on ballistic missile defence is that it proceeds on the assumption that the defence systems in question will

actually work in the real world, and be capable of destroying all, or the overwhelming majority, of hostile incoming missiles. As recent high-level US scientific assessments have shown – by the Defense Science Board Task Force on *Science and Technology Issues of Early Intercept Missile Defense Feasibility*, and the National Research Council of the National Academy of Sciences on Making Sense of Missile Defense – these programs may well be complete technological dead-ends.¹⁸⁴ But such is the confidence of most US policymakers in the country's own capability, and the extent to which that perception is shared by others, that the debate goes on.

1.178 Evolving US strategic doctrine assigns a progressively larger role to non-nuclear systems, including missile defence. Plans for extending missile defence to cover Europe, with geographical mission creep to the Middle East and Asia-Pacific, are criticized for promising a false sense of security to the United States and its allies while provoking a false sense of insecurity among Russia and China. False in both cases, because the deployment of the sophisticated sea and land based interceptors may not work. Cancelling the plan could save \$8 billion per year,¹⁸⁵ and make Moscow more open to cooperation on other international issues in Europe, the Middle East and Asia.

1.179 The US approach to missile defence cooperation with friends and allies has changed in important ways. Whereas the Clinton Administration focused on the defence of the continental United States, George W. Bush integrated elements of cooperation with states in Europe, outside the framework of multilateral institutions, including NATO. The Obama Administration kept the cooperative element of the Bush approach, but brought it into a multilateral framework. Missile defence was integrated into NATO at the Lisbon summit in 2010. NATO now has missile defence as a collective mission, based on indivisibility of protection. The terms of bilateral cooperation agreements with Poland and the Czech Republic were changed when the European Phased Adaptive Approach (EPAA) was announced in 2009 “based on an assessment of the Iranian missile threat, and a commitment to deploy technology that is proven, cost-effective, and adaptable to an evolving security environment.”¹⁸⁶

1.180 The main drivers for missile defence are the incremental improvements in range and accuracy of missiles close to Europe (and Asia), but there are also internal alliance dynamics to be considered, in particular relations between European allies and the United States. Cooperation with Russia on “strategic” missile defence has been an issue in bilateral relations with the United States since the 1960s, but could not really be an issue for NATO because the alliance was only active in theatre missile defence programs and had no strategic missile defence plans of its own prior to 2010. As soon as NATO had a program, it made the discussion of cooperation with Russia an important part of it.

184. Philip Coyle, “The Failures of Missile Defence”, *The National Interest*, 26 July 2012, <http://nationalinterest.org/commentary/the-failures-missile-defense-7248>

185. Yousaf Butt (a nuclear physicist), “Obama, Congress should push NATO missile defense program off ‘fiscal cliff’”, *Christian Science Monitor*, 15 November 2012, <http://www.csmonitor.com/Commentary/Opinion/2012/1115/Obama-Congress-should-push-NATO-missile-defense-program-off-fiscal-cliff>

186. http://www.whitehouse.gov/the_press_office/FACT-SHEET-US-Missile-Defense-Policy.

1.181 The issue of strategic missile defence has been addressed in the bilateral US–Russia context in many forums, unofficial as well as official. However, the positions of the two sides cannot currently be reconciled. Russia seeks “clear legal guarantees... verifiable under mutually approved technical criteria” that the system will not be directed against Russia’s nuclear forces, and has threatened military retaliation if differences remain unresolved.¹⁸⁷ Options under consideration include deployment of nuclear-capable short-range missiles in the Kaliningrad enclave and a ramping up of the Collective Security Treaty Organization created after the fall of the Soviet Union.¹⁸⁸ The United States maintains that Russian objections are valid neither on political nor military–technical grounds.

1.182 The possibility of cooperation on theatre missile defence has been a part of NATO–Russia documents since 1997, but has not led to any meaningful joint projects. NATO and Russia held a fifth theatre missile defence computer-assisted exercise in Germany from 26–30 March 2012.

1.183 Russia has suspended discussion of missile defence cooperation pending (i) provision by NATO of clear and verifiable assurances that its missile defence systems will be directed against the risks that are being generated outside the Euro–Atlantic region; (ii) clarification of President Obama’s comment to then-President Dmitry Medvedev that the United States could be more flexible on missile defence after his re-election; and (iii) clarity on the consequences of the US budget decision on sequestration and its implications for defence spending – missile defence programs may be cut or modified unilaterally by the United States as part of that package.

1.184 Current plans for implementing the EPAA are (relatively) low cost and straightforward, and they are scalable (it is possible to increase or decrease the force packages in a fairly flexible way depending on the threat). The EPAA is based mainly on the Aegis architecture developed for the Asian context in cooperation with Japan. US force deployments will not take place until systems are ready and will be tailored to the threat (of emerging missile forces, not the strategic forces of Russia).

1.185 US–Russia/NATO–Russia technical discussions are also at an impasse. Each side’s proposed approach to cooperation is currently unacceptable to the other. Russia proposes a sectoral approach, with NATO and Russia each taking responsibility for agreed airspace. This would mean that NATO is partly defended by Russian systems, which is not acceptable to the alliance. NATO suggests connecting sensor communication networks so that Russia and NATO can receive information from each other to supplement their respective national technical means. This would mean that information from Russian radars would supplement information gathered by the alliance but not replace it. There would be no mutual dependence. This is not acceptable to Russia because it places no restrictions on the scope or development of US/NATO missile defence systems.

187. Mansur Mirovalev, “Russia pessimistic about US missile defense talks,” AP, 3 May 2012, <http://news.yahoo.com/>; “Russia Warns West on Antimissile Effort,” *Global Security Newswire*, 21 August 2012.

188. “Putin slams US–Euro missile defence plans,” <http://www.abc.net.au/lateline/content/2012/s3452675.htm>; “Russia Eyes Regional Ties to Help Counter U.S. Antimissile Systems,” *Global Security Newswire*, 24 October 2012. The CSTO comprises Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia and Tajikistan.

1.186 The United States emphasizes that reducing the threat will lead to changes in the plans for deployment of missile defences. However, cooperation with Russia on missile proliferation has been limited. Browne and Kearns suggest that NATO and Russia could create joint cooperation centres for pooling and sharing data from satellites and radar in real time; NATO should specify the maximum number of interceptors to be deployed in Phase IV of the EPAA; and Russia and the United States should increase transparency and warning and decision times in order to reduce fears of a short-warning nuclear or conventional attack.¹⁸⁹

1.187 If the purpose of the missile defence scheme truly is threats from a third party like Iran, then a solution may be feasible. The two sides need to find a system that offers protection against third-party missile strikes, assuages Russia's concerns about undermining the credibility of its deterrent capability, and does not compromise the principle of sovereign control of national assets. Dmitri Trenin and James Collins propose a scheme for cooperative missile defence which could provide the platform to transform the semi-adversarial relationship that needs to be carefully managed into a collaborative strategic partnership. In turn, this could be the prelude to a genuine Euro-Atlantic security community in which war becomes unthinkable for the solution of political conflicts.¹⁹⁰ The two sides' information assets would be integrated, providing for real-time sharing and exchange of data on third-country missile activity. Operational protocols would permit and mandate each side to intercept and destroy missiles overflying its territory to hit targets in the other side. Subject to sensitive material being screened out first, both sides would create jointly staffed cooperation centres for pooling and sharing information, satellite data and radar operations.

1.188 Such arrangements would facilitate the integration of data, the painting of a comprehensive picture of potential dangers, and the coordination of responses to the missile threats. A positive externality would be that each side would acquire a deeper understanding of the other's national security strategy and nuclear doctrines. And the experience of joint missile defence could prove valuable in shaping both Russian and US relations with China and attenuating China's concerns about missile defence systems in the Asia-Pacific.

1.189 The arguments made by Russia also apply to the Chinese assessment of missile defence, its relationship to strategic stability and implications for arms reduction. China has long opposed the general concept of strategic missile defence systems and views US cooperation with Japan on Aegis-based theatre ballistic missile defence in the Asia-Pacific region with growing concern. In its latest biennial defence white paper, released in March 2011, Beijing reiterated that:

China maintains that the global missile defense program will be detrimental to international strategic balance and stability, will undermine international and regional security, and will have a negative impact on the process of nuclear disarmament. China holds that no state should deploy overseas missile defense systems that have strategic missile defense capabilities or potential, or engage in any such international collaboration.¹⁹¹

189. Browne and Kearns, "NATO, Russia, and the Nuclear Disarmament Agenda," pp. 5–6.

190. Dmitri Trenin and James Collins, "The Game Changer: Cooperative Missile Defense" (Washington: Carnegie Endowment for International Peace, 29 November 2012), <http://carnegieendowment.org/globalten/?fa=50173>.

191. *China Defence White Paper 2010*.

1.190 China has much smaller and less modern nuclear forces than Russia. Whereas Russia has nuclear forces that would survive under any scenario, China is still at a fairly early stage of creating a mobile missile force with intercontinental range and a submarine-launched ballistic missile capability. China is concerned that its current nuclear forces might be neutralized by a combination of preemption and missile defences. While Beijing conducted its own missile defence test in early 2010, there are no indications that China has decided to develop its own national missile defence system.

1.191 China responded firmly to March 2012 comments by US Assistant Secretary of Defense Creedon that the United States was discussing cooperative missile defence with Australia, Japan and South Korea. A senior foreign ministry official said that a missile defence system in the Asia-Pacific region would have “negative effects on global and regional strategic stability, and go against the security needs of the countries in the Asia-Pacific region.”¹⁹² A senior Chinese military official subsequently warned that US missile defence activities could force China to “modernize its nuclear arsenal.... Beijing will have to improve its capabilities of survival, penetration... otherwise it is very difficult for us to maintain the credibility of nuclear deterrence.”¹⁹³

1.192 If the United States proceeds to expand its missile defence system in the Asia-Pacific to include Australia and South Korea, China is very likely to accelerate the expansion of its own nuclear and ballistic missile programs and possibly adopt a somewhat more robust nuclear deterrence doctrine. Such a response would be inevitable, and more marked, if the US missile defence plans were ever to encompass Taiwan.

1.7.2 Weapons in Space

1.193 There are a number of dimensions to the issue of space weapons: ground-based weapons that attack targets in space; space-based weapons that attack targets in space; and space-based weapons that attack targets on the ground. Many of the issues involved are caught up in the missile defence debate. In addition, space-based assets have become an increasingly important component of military missions such as surveillance, early warning, target acquisition, guidance and communications. The ability to degrade or destroy such assets can have a significant impact on military capability; equally, the capacity to hold such assets at risk can have a significant deterrent effect.

1.194 The ICNND Report called for strong support to be given to attempts to prevent the weaponization of space at the CD in Geneva (Recommendation 63). However, differences among the P5 and the enduring stalemate in the CD over the adoption of a work program continue to prevent any progress on the development of an international legally-binding instrument for the prevention of an arms race in outer space (PAROS).

192. “China Lashes Talk of Asian Missile Shield,” *Global Security Newswire*, 12 April 2012.

193. “China Warns of Response to U.S. Missile Defense,” *Global Security Newswire*, 19 July 2012.

1.195 The discussions on PAROS have focused on a Chinese–Russian draft text of a Treaty on the Prevention of the Placement of Weapons in Outer Space, and the Threat or Use of Force against Outer Space Objects (PPWT). A number of countries, but principally the United States, find the text unacceptable because it does not define a space weapon or suggest how such a weapon might be defined; identifies a need for, but includes no detail on the approach to be taken to, verification and compliance; and does not address the destruction of space-based assets using ground-based systems. The United States and several of its allies are not willing to proceed on the basis of the current draft and are not inclined to produce their own, while China and Russia have not tabled any more detailed document.

1.196 Given the deadlock in the CD, other processes have been initiated to try and move the discussion of space security issues forward. The European Union (EU) developed a draft Code of Conduct for Outer Space Activities in 2008, which was published in revised form in 2010. In January 2012, Secretary of State Clinton announced that the United States would initiate consultations and negotiations with other spacefaring nations to develop an International Code of Conduct for Outer Space Activities. The United States did not endorse the draft Code of Conduct developed by the EU, but referred to it as a useful foundation and constructive starting point for developing a consensus on an international code.¹⁹⁴

1.197 A UN Group of Governmental Experts on Transparency and Confidence-building Measures in Outer Space Activities was established by the secretary-general in 2011 in response to General Assembly Resolution 63/68. The group's objectives are "to improve international cooperation and reduce the risks of misunderstanding and miscommunication in outer space activities," and to reach agreement on "conclusions and recommendations on transparency and confidence-building measures that can help ensure strategic stability in the space domain." Russia and China were strong supporters of General Assembly Resolution 63/68. The United States abstained on the resolution, objecting to its mention of the draft PPWT, but has since publicly declared its support for the process.¹⁹⁵ The Group of Governmental Experts is expected to complete its work and issue a final report with recommendations in July 2013.

1.198 Other international efforts, such as the UN Committee on the Peaceful Uses of Outer Space Long-term Sustainability of Space Activities Working Group, focus essentially on civil space issues.¹⁹⁶

194. Frank A. Rose, Deputy Assistant Secretary, Bureau of Arms Control, Verification and Compliance, Department of State, "Pursuing an International Code of Conduct for the Security and Sustainability of the Space Environment," National Space Symposium, Colorado Springs, Colorado, 18 April 2012.

195. Tiffany Chow, "Group of Governmental Experts on TCBMs in Outer Space Activities: Fact Sheet," Secure World Foundation (21 June 2012), <http://swfound.org/media/84703/SWF%20-%20GGE%20Fact%20Sheet%20-%20June%202012.pdf>.

196. Chow, "Group of Governmental Experts on TCBMs in Outer Space Activities." The issues – military vs. civilian – are not, however, always easy to compartmentalize. For example, one of the major issues on the civilian side is debris mitigation, but the shooting down of satellites with ballistic missiles has been a significant recent cause of debris.

1.7.3 Biological and Chemical Weapons

1.199 The ICNND Report, although focused on nuclear weapons, recognized that concerns about other weapons of mass destruction (WMD) impacted on the nuclear debate, and called for strong efforts to be made to promote universalization of the Biological (BWC) and Chemical (CWC) Weapons Conventions; and for the development of “more effective ways of defending against potential biological attacks, including – for all its difficulties – building a workable [Biological Weapons] Convention verification regime” (Recommendation 64). Progress on the biological weapons front, in particular, has been slow.

1.200 Parties to the BWC continue to lament the absence of a verification mechanism. Agreement on such a mechanism is no closer, however, with the United States remaining firmly of the view that effective BWC verification is impossible. Meanwhile, fear of a biological weapons strike exercises a conservative influence on nuclear doctrine, including, though not exclusively, in the case of the United States which has reserved “the right to make any adjustment [to its NSA] that may be warranted by the evolution and proliferation of the biological weapons threat and U.S. capacities to counter that threat.”¹⁹⁷

1.201 Chemical weapons do not pose a threat of the magnitude of other categories of WMD (nuclear and biological), although their possible use, as has been seen recently in situations of regime breakdown and civil war (Libya and Syria), still arouses strong international concern. The CWC has achieved near universality with 188 states parties representing about 98 per cent of the worldwide chemical industry. While Russian and US failure to meet the final extended deadline (29 April 2012) for destruction of chemical weapons stocks was unhelpful (though expected and finally accommodated by other states parties), the focus of activity for the CWC’s implementing agency, the Organization for the Prohibition of Chemical Weapons (OPCW), is nonetheless moving progressively from monitoring and verification of CW destruction schedules to non-proliferation. Vigorous implementation, particularly of the CWC’s inspection provisions, will be essential for the treaty’s future effectiveness, given the globalization of industrial chemical production, the emergence of new technologies and chemical compounds suitable for CW applications, and the relative ease with which some existing facilities could be converted or returned to the production of CW or CW precursors.¹⁹⁸

1.7.4 Conventional Weapons

1.202 The ICNND Report argued that “the issue of conventional arms imbalances... between the nuclear-armed states, and in particular the relative scale of U.S. capability, needs to be seriously addressed if it is not to become a significant impediment to future bilateral and multilateral nuclear disarmament negotiations.” It recommended revisiting matters covered in the Treaty on Conventional Armed Forces in Europe (CFE) “establishing comprehensive limits on key categories of conventional military equipment

197. *Nuclear Posture Review*, April 2010, p. viii.

198. See Ramesh Thakur and Ere Haru, eds., *The Chemical Weapons Convention: Implementation, Challenges and Opportunities* (Tokyo: United Nations University Press, 2006).

in Europe (from the Atlantic to the Urals) and mandating the destruction of excess weaponry,”¹⁹⁹ and believed that “the development of more cooperative approaches to conflict prevention and resolution may well prove more productive in this context than focusing entirely on arms limitation measures” (Recommendation 65).

1.203 At the time of the report’s release and in the period immediately afterwards (late 2009–2010), there were grounds for optimism about the prospects for renewed attention to conventional arms control in Europe. The Organization for Security Cooperation in Europe (OSCE)-led dialogue on the European security framework (the “Corfu Process”) emphasized the need for renewed attention to the issue. Russia appeared to be willing to return to discussions about the future of the CFE Treaty, albeit without reversing its 2007 decision to suspend participation in the treaty. The Obama Administration emphasized its willingness to revisit the future of conventional arms control and, in their bilateral summit in 2010, Presidents Obama and Medvedev committed to strengthen and modernize conventional arms control in Europe.

1.204 In 2011 and 2012 hopes for any progress in this area faded, to the point where it is highly unlikely that the adapted CFE Treaty will ever enter into force and prospects for any meaningful negotiations on an alternative look remote. In 2011 the United States suspended its cooperation with Russia within the framework of the CFE Treaty (while continuing to meet its obligations to the other parties to the treaty). NATO allies party to the CFE Treaty, as well as Georgia and Moldova, followed the US lead. The US focal point and negotiator on conventional arms control was withdrawn. Perhaps most significantly, the United States and Russia repeatedly stated that the basic problem that CFE was intended to address had been resolved and was no longer relevant to European security.

1.205 Russia, the United States and other countries have said that they are willing to look at alternative approaches to conventional arms control, beyond CFE. It is, however, not clear how such a process could be organized. Confining the talks to NATO–Russia or to Europe would be difficult as many capabilities (and in particular those of most concern to Russia) are to be employed globally. There cannot be any Europe-wide agreement based on equal balance because the forces of the potential parties are extremely asymmetrical and uneven. Russia’s aim is to incorporate into the discussion weapon types that the United States has always insisted on keeping outside arms control agreements (naval forces, missiles, unmanned aerial vehicles, space-based military assets).

1.206 Behind this is a fundamental disagreement on the problem that arms control should seek to address. While Russia’s objective is to contain the global power of the United States, NATO’s principal aim is to stabilize military security in specific “grey zones” around the periphery of the enlarged alliance.

1.207 The state of play on conventional arms control has important implications for nuclear arms control. Russia has argued that current US plans to develop a faster global conventional strike capability could have an impact on strategic nuclear arms control. Senior Russian officials generally refer to such weapons as “strategic offensive weapons with conventional warheads.” President Putin has said that Russia will only contemplate

199. ICNND, *Eliminating Nuclear Threats*, p. 197, paragraph 18.35.

additional nuclear weapons reductions “if all factors affecting international security and strategic stability are taken into account”,²⁰⁰ and has linked final nuclear disarmament to Russia’s acquisition of “exceptionally accurate non-nuclear systems of similar effectiveness” to those now under development in the United States.²⁰¹ The United States, meanwhile, can be expected to seek to preserve its global advantage in conventional military capability as a guarantee of continuing strategic preeminence and as a hedge against future nuclear arms reductions.

1.208 The purpose of developing a “prompt global strike” (PGS) capability is to attack difficult-to-reach but very high value targets making use of real-time intelligence. These capabilities lie far in the future and New START is unlikely to be the point of reference. However, Russia has raised the issue of whether such weapons could confuse implementation of the treaty. Existing ballistic missiles converted for this mission count against New START ceilings, but a hypersonic weapon with a conventional warhead (or a kinetic kill vehicle with no warhead at all) has no nuclear mission and would clearly fall outside New START.

1.209 Russia suggests that a conventionally armed ballistic missile could be confused with a nuclear first strike if it is launched over a polar flight path, or that it could be used in a disarming first strike. None of the weapons will be available in the near term, but there is a suggestion that the complications will be greater in conditions where Russia has reduced its nuclear weapons holdings to low numbers.

1.210 The impact of the increasingly complex and ambiguous relationship between conventional and strategic nuclear forces is also visible in other strategic dyad relationships. Ballistic missile defence, long-range conventional strike systems and space-based systems have already emerged as major complicating factors in achieving or maintaining stable deterrence relationships, and these are likely to intensify as relevant military capabilities improve over time.

1.211 China, which has relatively small nuclear forces, may feel vulnerabilities more acutely than Russia. Beijing’s concerns about maintaining a credible second-strike capability can be closely linked to advances in non-nuclear strategic weapon systems, in particular by the United States. China will continue to develop strategies and technologies to counter evolving conventional threats. Should it choose to award a nuclear role to its land-attack and air-launched cruise missiles, this would signal a shift towards a more flexible nuclear posture to deter a broader range of threats. At the same time, China is developing its own conventional medium-range ballistic missiles, which are believed to have an anti-ship capability.

1.212 In its 2010 NPR, the United States emphasized its intention to deepen the strategic dialogue with Russia and to initiate a strategic stability dialogue with China. Conventional PGS capabilities and their implications would logically be a part of such discussions. It would seem, though, that the more confident the United States becomes of the superiority of its conventional weapons and of the efficiency of its anti-missile systems, the more

200. Reuters, “Putin Links Nuclear Cuts to U.S. Shield,” *Moscow Times*, 27 August 2012.

201. “Strong Russian Nuclear Force Deters Conflict, Putin Says,” *Global Security Newswire*, 27 February 2012.

reluctant Russia and China are likely to be to negotiate serious nuclear arms reductions in the absence of broader arms limitation talks.

1.213 In South Asia, Pakistan makes no secret of the fact that it sees nuclear weapons, including tactical nuclear weapons, as its principal means of offsetting India's advantages in size, strategic depth and conventional military capability.

1.214 This creates a dilemma because, while it is obviously wrong to overlook or to undervalue the strength and persistence of these concerns, it is equally wrong to make nuclear disarmament contingent on their resolution, not least because to do so, while simultaneously maintaining the exclusive right of the NPT's recognized NWS to possess such weapons, is to ignore present realities and to invite further proliferation. It is important to see conventional and nuclear disarmament as overlapping, rather than interdependent, security issues. To hold them hostage to each other – as the strategically weaker states, particularly, will be inclined to do – is likely to render progress on both impossible.

§1.8 Mobilizing Political Will

1.8.1 Disarmament Education

1.215 The ICNND Report drew attention to the need for “sustained campaigning... to better inform policy-makers and those who influence them about nuclear disarmament and non-proliferation issues” (Recommendation 71) and called for a “major renewed emphasis on formal education and training about nuclear disarmament and related issues in schools and universities” (Recommendation 72).

1.216 The UN General Assembly, by Resolution 57/60 of 30 December 2002, which affirmed a pressing need for disarmament and non-proliferation education and recognized the important role of civil society in promoting such education, welcomed the presentation of a UN study on disarmament and non-proliferation education and conveyed its 34 short and long-term recommendations “for implementation... by Member States, the United Nations and other international organizations, civil society, non-governmental organizations and the media.” The Secretary-General was asked to prepare biennial reports on implementation of the recommendations. Five such reports have been published to date, the latest in July 2012.

1.217 The reporting record has been poor. Since the resolution's adoption in 2002, a total of just 37 reports have been submitted to the United Nations. Of these, Japan and Mexico have each submitted four, and New Zealand three. Six reports were submitted in 2010 (A/65/160), the lowest number to date. Nine were submitted in 2012 (A/67/138). Russia is the only NWS to have reported on its implementation of the UN study. Several countries that implement and finance projects to promote nuclear disarmament and non-proliferation education, including Norway, Sweden, and the United States, have not reported at all.²⁰²

202. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 63.

1.218 A robust, urgent, credible and sustained global commitment to public education with a view to building broad popular support for nuclear disarmament is badly needed and, in this context, Global Zero's efforts to build an international movement for nuclear disarmament among students in multiple countries is particularly to be welcomed.

1.8.2 Civil Society Action

1.219 While only governments and intergovernmental organizations can set authoritative standards, establish duly recognized international norms and negotiate treaties, civil society organizations have a crucial role to play in promoting global norms, monitoring state compliance with agreed commitments, and in reflecting community values and concerns that may not always find appropriate expression in governmental processes. Their critiques and policy prescriptions have demonstrable consequences in the governmental and intergovernmental allocation of resources and in the exercise of political, military and economic power.

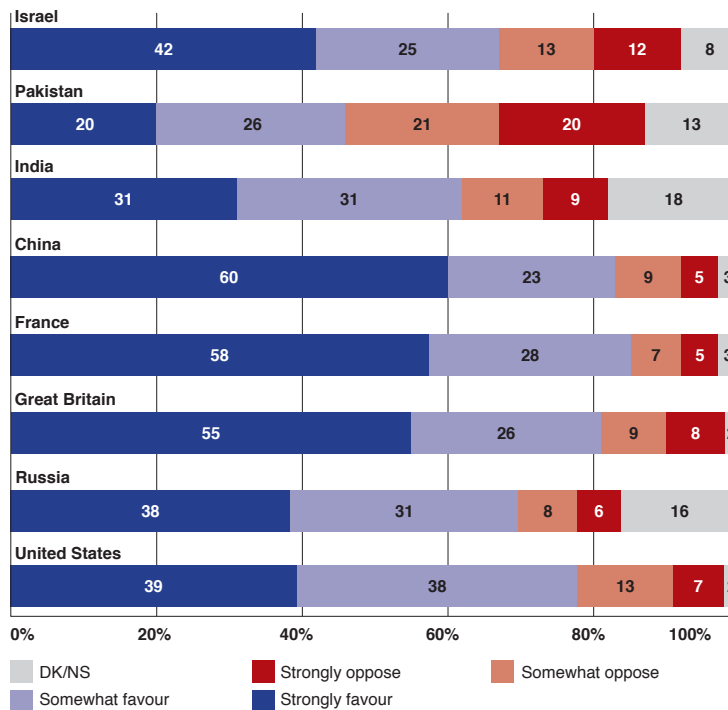
1.220 In the nuclear field, International Physicians for the Prevention of Nuclear War (IPPNW) and the Pugwash Conferences on Science and World Affairs have been awarded the Nobel Peace Prize. Several regional nuclear-weapon-free zones have their origins in NGO advocacy and grassroots campaigns; and NGOs have formed coalitions to draft a universal Nuclear Weapons Convention that would prohibit nuclear weapons and to promote a range of nuclear arms control and disarmament measures, including the de-alerting of "launch on warning" ICBMs. Global Zero is currently seeking support for its own step-by-step plan to completely eliminate nuclear weapons by 2030; highly regarded think tanks and study centres such as the Carnegie Endowment for International Peace, the Monterey Institute's James Martin Center for Nonproliferation Studies and the Nautilus Institute contribute significantly to our understanding of the challenges facing us in the nuclear non-proliferation and disarmament field; while the *Bulletin of the Atomic Scientists*, and the famous Doomsday Clock (whose hands remain set – in the group's latest alarming judgment in January 2013 – at five minutes to midnight), provide timely information and analysis of threats to our survival and development from nuclear weapons, climate change and emerging technologies in the life sciences.

1.221 In addition, coalitions such as Parliamentarians for Nuclear Non-Proliferation and Disarmament (PNND), the International Campaign to Abolish Nuclear Weapons (ICAN), the Middle Powers Initiative (MPI) and the Women's International League for Peace and Freedom (WILPF) use their extensive networks to support the elimination of nuclear weapons. Likewise, the Washington-based Nuclear Threat Initiative (NTI) works to reduce the global threat from WMD, including by supporting leadership networks of former senior political, diplomatic and military figures, in Europe (ELN), the Asia-Pacific (APLN) and Latin America. The Moscow-based International Luxembourg Forum on Preventing Nuclear Catastrophe is another organization focusing on senior decision-makers. All these groups are engaged in efforts to energize public opinion, and especially high-level policy makers, to take seriously the very real threat posed by nuclear weapons and to do everything possible to achieve a world in which they are contained, diminished and ultimately eliminated.

1.222 Sadly, though, it still has to be said that most of the very good work done to promote nuclear disarmament, by a wide range of highly credible and committed civil society actors, currently has little impact outside specialist disarmament and non-proliferation circles. In most countries, when asked whether they would prefer to live in a world without nuclear weapons, most people will say yes. But the very real possibility of nuclear war, whether by accident, miscalculation or design, is not presently an issue which brings large numbers of people together on a regular basis. Consequently, governments are under no real pressure to respond to expressions of popular concern because truly popular concern barely exists. Shaping and delivering the messages required to galvanize public opinion must be a priority and remains very much a work in progress.

1.223 World Public Opinion.org conducted a survey of public attitudes to nuclear weapons in 2008.²⁰³ The poll involved more than 19,000 respondents in 21 countries. Results in eight of the nine nuclear-armed states are shown below: no information was available from North Korea. Respondents were asked whether they supported the idea of an internationally negotiated ban on nuclear weapons under the terms of which countries with nuclear weapons would be required to dispose of them within a fixed timeframe and no other countries would be permitted to acquire them. The agreement would be subject to verification.

Table 1.14: Global Public Opinion on Nuclear Abolition



Source: World Public Opinion.org (December 2008)

203. World Public Opinion.org, http://www.worldpublicopinion.org/pipa/articles/international_security_bt/577.php?lb=btis&pnt=577&nid=&id=

1.224 According to the survey, the majority of populations favour the complete elimination of nuclear weapons. The elimination of nuclear arsenals is strongly supported in France (86%), China (83%), Great Britain (81%) and the United States (77%). Sixty-nine per cent of Russians, 67% of Israelis, and 62% of Indians would also support such an agreement. Only in Pakistan did less than half the respondents (46%) favour the elimination of nuclear weapons. All this indicates that the potential for strong community support is there: the problem continues to lie in effectively harnessing and mobilizing it.

1.8.3 Nuclear Weapons Convention

1.225 A model Nuclear Weapons Convention (NWC) was prepared in 1997 in response to the ICJ Advisory Opinion on the legality of nuclear weapons and updated in 2007. It brought together an impressive international consortium of lawyers, doctors and scientists and attracted the interest, involvement and support of many civil society arms control groups. It continues to enjoy the support of many NGOs, non-NWS and the United Nations General Assembly. The model NWC would prohibit the development, making, testing, transfer, use and threat of use of nuclear weapons. A fifteen-year timetable for the elimination of nuclear weapons by NWS (“nuclear-capable states” outside the NPT would be given only five years to reach the same objective) includes de-alerting, removal from deployment, dismantlement, and placement of all fissile material under international control. The model NWC’s UN sponsors have described the draft convention as “a useful tool in the exploration, development, negotiation and achievement of such an instrument or instruments.”²⁰⁴

1.226 Some such convention will undoubtedly be necessary in the long run to embed the complete elimination of nuclear weapons in a universal treaty. The ICNND Report, while sceptical that the model convention at its present stage of evolution could, in an area as complex as this, be an effective “campaign treaty” on the model of the Ottawa and Oslo Conventions discussed below, recommended further work on “refining and developing the concepts in the model Nuclear Weapons Convention now in circulation... with the objective of having a fully-worked through draft available to inform and guide multilateral disarmament negotiations as they gain momentum” (Recommendation 73). There are many technical, legal and political hurdles to be overcome and details to be clarified before any NWC can be finalized. But the very act of beginning a deliberate and sustained conversation on the topic would compel states to take the prospect of an NWC seriously and to begin to address particularly the “hard basket” issues of verification, compliance and enforcement.

1.227 While the ICNND report saw formal negotiations now as premature, and the NPT Review Conference simply noted the UN Secretary-General’s Five-Point Proposal for Nuclear Disarmament, an annual resolution (for example, A/RES/67/64 of 3 December 2012) calling for the negotiation of a convention prohibiting the use of nuclear weapons “as an important step in a phased programme towards the complete elimination of those weapons within a specified timeframe” is supported by some two-thirds of the UN membership.²⁰⁵

204. ICNND, *Eliminating Nuclear Threats*, p. 225, paragraph 20.40.

205. “General Assembly, in Wake of High-Stakes Debate in First Committee that Championed Common Positions but Fell

1.228 UN Secretary-General Ban Ki-moon, in a landmark speech in October 2008 that still serves as a rallying call for nuclear arms control and disarmament advocates, urged all NPT parties, in particular the NWS, to fulfil their treaty obligations through negotiations leading to nuclear disarmament. In the first step of his five point-plan, he suggested that they could do this either by negotiating a “nuclear-weapons convention, backed by a strong system of verification” or, only marginally less ambitiously, “by agreement on a framework of separate, mutually reinforcing instruments.”²⁰⁶ The elements of such a framework are clearly visible today. They include a CTBT in force; an FMCT negotiated, adopted and in force; legally binding NSAs; reciprocal no-first-use declarations; ratification by all nuclear-armed states of the NWFZ treaty protocols; and the commencement of transparent, progressive and irreversible multilateral nuclear disarmament negotiations.

1.229 The aspiration for a comprehensive nuclear weapons convention, embodying a workable verification and enforcement system, must not be abandoned: it is the indispensable international legal framework for achieving ultimate abolition. The question, however, remains whether it would be productive to seek the commencement of negotiations on it now, with those fundamental verification and enforcement issues unresolved and multiple geopolitical issues inhibiting any likely agreement to the process by the present nuclear-armed states.

1.230 The international community has so far banned two entire classes of weapons of mass destruction – biological and chemical weapons.²⁰⁷ It has also negotiated treaties prohibiting some categories of particularly indiscriminate and inhumane conventional weapons – mines and cluster munitions. By no means every country has signed these conventions: the biggest users and producers of cluster munitions, and those with the largest anti-personnel-mine stockpiles, are not parties to the Cluster Munitions (Oslo) or Mine Ban (Ottawa) Conventions. But the conventions nonetheless exercise strong normative force and quite directly influence the behaviour of non-states parties. The CTBT provides a very clear example of this for, although its peculiar requirement for universal ratification by Annex 2 states prior to entry-into-force could leave the treaty in perpetual limbo, the current voluntary moratorium on nuclear testing which stands as a place-holder for the treaty has enormous practical effect and makes any return to nuclear testing by states not party to the treaty a fraught and challenging calculation indeed.

1.231 A nuclear weapons convention negotiated in the absence of all the nuclear-armed states would, however, be in a class of its own. These states are firmly of the view that it is far too early to be thinking seriously about a NWC and that, without them, such a convention would be meaningless. This may not in fact be completely the case. Four

Short of Bridging Divides, Adopts 58 Texts”; <http://www.un.org/News/Press/docs//2012/ga11321.doc.htm>.

206. UN Secretary-General Ban Ki-moon’s Five-Point Proposal for Nuclear Disarmament is contained in the text of an address (“The United Nations and Security in a Nuclear-Weapon-Free World”) to the East-West Institute in New York on 24 October 2008, www.un.org/News/Press/docs/2008/sgsm11881.doc.htm. The other four points in the plan focused on P5 initiatives; renewed efforts at treaty ratification; greater transparency and accountability; and new measures against WMD terrorism.

207. Although a bilateral arrangement, it should also be recorded here that, in December 1987, the United States and the USSR signed the Treaty on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (the INF Treaty). Final inspections under the treaty were conducted in May 2001.

answers suggest themselves as to the purposes such an instrument could serve:

- > It would compel consideration of the full range of technical, legal and political obstacles to the negotiation and signing of the convention, including the physical infrastructure and the multilateral agreements and protocols required for verification and enforcement;
- > It would demonstrate that a continuing determination on the part of the NWS to interpret Article VI as no more than aspirational and tied to at best remote general disarmament objectives was not without serious reputational cost;
- > It would have a non-proliferation benefit by supporting that increasingly beleaguered leg of the NPT, although non-NWS with nuclear weapons ambitions would almost certainly not ratify it; and, perhaps most importantly
- > The negotiations themselves could provoke some new thinking among all the nuclear-armed states, and possibly help stimulate serious multilateral disarmament talks among them as a step up from the first tentative confidence-building exchanges of recent years. They should also help strengthen public engagement and support for nuclear disarmament.

1.232 To achieve even these modest goals, however, a nuclear weapons convention negotiation would have to attract a significant and broadly representative level of participation by non-nuclear-armed states. Negotiation outcomes would, likewise, have to express a very broad non-nuclear-armed states consensus. The road to nuclear disarmament will always be long and obstacle-strewn, but the survival of this planet demands that we keep on trying to find ways to travel it.

1.8.4 The Humanitarian Dimension

1.233 The most productive way forward for both committed state and civil society actors to generate political momentum for the nuclear disarmament cause may be to emphasize the catastrophic humanitarian consequences of any use of nuclear weapons. The almost indescribable horror associated with any such use informed the very first resolution of the UN General Assembly in 1946, and has been a recurring campaign theme ever since. It was the primary motivation for the challenge to the legality of nuclear weapons mounted in the International Court of Justice by the UN General Assembly on the initiative of the World Health Organization which resulted in the 1996 advisory opinion concluding that their use was indefensible except, possibly, in self-defence when a state's very survival was at stake. And this was in turn the major motivation for those who prepared the 1997 model nuclear weapons convention, as noted above. But it is only recently that the humanitarian dimension has resumed any prominence in high-level state discourse.

1.234 The ICNND in 2009 made the point that there was much to be said for focusing on nuclear disarmament not through the lens of traditional arms control, but rather international humanitarian law: "The argument is that nuclear disarmament is at heart a humanitarian imperative because of the grotesquely inhumane and enormous impact of nuclear weapons; that the single most important thing is to prevent their use and the

most certain way of achieving that objective is to eliminate them completely; and that the best way of achieving that in practice – motivating like-minded governments and civil society alike – would be negotiations conducted through a humanitarian and human-rights focused process.”²⁰⁸

1.235 This theme was picked up by the 2010 NPT Review Conference in its Final Document, which expressed “deep concern at the catastrophic humanitarian consequences of any use of nuclear weapons, and reaffirm[ed] the need for all states at all times to comply with applicable international law, including international humanitarian law.”²⁰⁹ In the 2012 NPT PrepCom, sixteen countries issued a “Joint Statement on the humanitarian dimension of nuclear disarmament,” read by Ambassador Benno Laggner of Switzerland, arguing that “it is essential that the humanitarian consequences of nuclear weapons are thoroughly addressed.”²¹⁰ The chairman of the PrepCom summarized the debates on this issue as:

States parties recalled their deep concern at the catastrophic humanitarian consequences of any use of nuclear weapons. Many States parties stressed their serious concern that in such an event, these humanitarian consequences would be unavoidable and emergency relief could not be provided to affected areas. They expressed their expectation that the humanitarian consequences of any use of nuclear weapons would be addressed during the current review cycle.²¹¹

1.236 The momentum was sustained in the First (Disarmament) Committee of the UN General Assembly when, on 22 October 2012, Ambassador Laggner read out the same joint statement, this time on behalf of 34 countries. It stated that “the unique destructive capacity and uncontrollable effects” of nuclear weapons mean that all the international humanitarian law rules of distinction between combatants and civilians, proportionality and precaution “apply fully” to nuclear weapons. So too do the prohibitions against causing unnecessary suffering or superfluous injury and severe and long-term damage to the environment. As long as nuclear weapons exist, they will pose a threat to the very survival of humanity. Their “catastrophic humanitarian consequences... concern the community of states as a whole.” Under no circumstances must they ever be used again. “The only way to guarantee this is the total, irreversible and verifiable elimination of nuclear weapons, under effective international control.”²¹²

208. ICNND, *Eliminating Nuclear Threats*, pp. 218–19, paragraph 20.18.

209. 2010 NPT Review Conference, *Conclusions and recommendations for follow-on actions I* (Nuclear Disarmament) A (Principles and Objectives) v.

210. “Joint Statement on the humanitarian dimension of nuclear disarmament” (New York: 22 October 2012), available at: <http://www.psr.org/resources/joint-statement-on-the.html>.

211. “Chairman’s factual summary,” (Working paper), paragraph 9; Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Vienna, 30 April–11 May 2012; NPT/CONF.2015/PC.I/WP.53; <http://www.un.org/disarmament/WMD/Nuclear/NPT2015/PrepCom2012/documents.html>.

212. “Joint Statement on the humanitarian dimension of nuclear disarmament.”

2. NUCLEAR NON-PROLIFERATION

- §2.1 Overview
- §2.2 Objectives and General Strategy
- §2.3 NPT Safeguards and Verification
- §2.4 NPT Compliance and Enforcement
- §2.5 IAEA Resources
- §2.6 Export Controls
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- §2.9 Nuclear Testing
- §2.10 Fissile Material

§2.1 Overview

2.1 The Nuclear Non-Proliferation Treaty (NPT) rests on a straightforward understanding: countries without nuclear weapons will not seek to acquire them, while those with nuclear weapons move progressively towards complete nuclear disarmament, and all parties are to cooperate in the development of peaceful applications of nuclear energy. A troubling imbalance of obligations has, however, become steadily more obvious over the years. While the non-proliferation obligation is legally binding, subject to compulsory International Atomic Energy Agency (IAEA) verification and enforceable by the United Nations Security Council, the commitment to disarm is – according to the nuclear-weapon states (NWS) – conditional, and not subject to international verification, enforcement or deadlines. While the non-proliferation regime has been strengthened over the life of the NPT (albeit not to the extent necessary), the disarmament effort has been patchy and episodic.

2.2 The NWS place greater emphasis and a higher value on the prevention of nuclear proliferation than they do on nuclear disarmament. Disarmament is their business and is conducted on their terms in their own time. Non-proliferation, on the other hand, is truly a shared global responsibility. This attitude is putting the nuclear non-proliferation regime under increasing strain, and reinforcing resistance to predominantly Western efforts to enforce new safeguards measures. While the NPT's record of containing proliferation has been very good thus far, UN Secretary-General Kofi Annan's High-level Panel on Threats, Challenges and Change rightly warned in December 2004 that "[w]e are approaching a point at which the erosion of the non-proliferation regime could become irreversible and result in a cascade of proliferation."



2.3 The 2010 NPT Review Conference reaffirmed calls by previous review conferences for universal adherence to the treaty; for the signing and bringing into force, by states which have yet to do so, of Comprehensive Safeguards Agreements (CSAs) and Additional Protocols (APs); for regular assessment and evaluation of IAEA safeguards; and for the application of comprehensive safeguards to all source or special fissionable material in peaceful nuclear activities. While some progress has been made in some of these areas, overall the record of achievement has been manifestly unsatisfactory.

2.4 **Safeguards.** Between 1 July 2010 and 30 June 2012, CSAs entered into force for four states and APs for fifteen but, as at 31 December 2012, thirteen non-NWS parties to the NPT had still to bring CSAs into force and eight states with significant nuclear activities had yet to begin AP negotiations with the IAEA. While many countries, particularly members of the Nuclear Suppliers Group (NSG), argue that the AP should be recognized and accepted universally as a condition of nuclear supply, others, particularly within the Non-Aligned Movement (NAM), have stressed the AP's voluntary nature and have resisted efforts to transform it into an obligation, not least because they see this as evidence of some states' determination further to entrench the imbalance between non-proliferation and disarmament obligations.

2.5 The IAEA is moving progressively to develop and implement a state-level approach to safeguards. This is an iterative process in which an evaluation of all information available to the agency serves as the basis for safeguards planning, implementation and evaluation, and continues the evolution of the safeguards regime from one based almost wholly on nuclear material accounting to one strongly focused on detection. By facilitating the adoption of "integrated safeguards" in countries which qualify – a sign of the agency's confidence in the absence of undeclared nuclear material and activities in those states – the state-level approach allows the agency to make the most efficient use of its finite resources by making "differentiated assessments about which states' nuclear programs pose more risk." Some states have labelled the approach discriminatory and have called for the focus of the system to return to traditional nuclear material accounting.

Overall Evaluation of Safeguards and Verification: **Some Progress.** Additional CSAs and APs have entered into force but there is still strong resistance by some states to the idea of making APs obligatory. The IAEA's evolving state-level approach to safeguards has been criticized as discriminatory by some states who want the emphasis to return from an information-driven and detection-focused approach to traditional nuclear material accounting.

2.6 Compliance and Enforcement. The 2010 NPT Review Conference failed, in the face particularly of Iranian and other hard-line NAM opposition, to make any progress on non-compliance and withdrawal issues. Notwithstanding the adoption of resolutions highly critical of North Korea's nuclear weapons tests in 2006 and 2009, the UN Security Council has yet to make clear, as the ICNND Report sensibly recommends, that any future withdrawal "will be regarded as prima facie a threat to international peace and security, with all the punitive consequences that may follow from that under Chapter VII of the UN Charter."

2.7 Since an initial IAEA Board of Governors finding of non-compliance in September 2005, Iran has been the subject of six UN Security Council resolutions demanding a halt to its enrichment and reprocessing activities. Regular IAEA reports to its Board of Governors show that Iran has not suspended its uranium enrichment activities; nor has it clarified to the satisfaction of the international community outstanding issues giving rise to concerns about possible military dimensions to its nuclear program. The IAEA has been able to verify the non-diversion of nuclear material declared by Iran under its CSA. It has not, however, been able to provide a credible assurance of the absence of undeclared nuclear material and activities in Iran, and thus to conclude that all nuclear material in Iran is in peaceful activities, and efforts by the five permanent members of the UN Security Council (P5) and Germany to negotiate a resolution of the stand-off with Iran have so far been unsuccessful.

Overall Evaluation of Compliance and Enforcement: **No Progress.** The 2010 NPT Review Conference made no progress on non-compliance and withdrawal issues and none has been made since. Efforts by the P5 and Germany to negotiate a resolution of the stand-off with Iran have made no substantive progress.

2.8 Export Controls. The 2010 NPT Review Conference urged all states to ensure that nuclear-related exports are not misused to assist in the development of nuclear weapons and encouraged them to draw on multilateral guidelines and understandings in developing national export controls. A growing number of countries, without themselves being members of an international export control regime, are making use of the guidelines for this purpose. In September 2011, the Security Council's Resolution 1540 committee noted that 90 states had reported having export licensing provisions in place for nuclear weapons-related materials (compared with 76 in 2008).

2.9 Controversy has surrounded the most important nuclear export control mechanism, the Nuclear Suppliers Group (NSG), since it decided in 2008 to exempt India from its requirement for application of comprehensive safeguards to trigger list items. This has raised questions of consistent treaty interpretation, of consistent application of NSG guidelines and finally, among states already critical of the NPT's bias towards the nuclear "haves," of the credibility of the whole nuclear non-proliferation enterprise.

2.10 The ICNND Report recommended that the NSG develop “a criteria-based approach to cooperation agreements with states outside the NPT,” thereby establishing conditions for further exceptions based on new rules, rather than on an exemption from old ones. It will be hard, though, to persuade Pakistan or Israel to accept terms more rigorous than India’s; or India to make additional commitments (for example, to ratify the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and to end unsafeguarded fissile material production) when it already has the deal it wants. The NSG’s credibility problems are compounded by China’s determination to supply more nuclear reactors to Pakistan. In November 2010, the United States declared its support for Indian membership of the NSG and other international export control regimes. While there is support for India’s membership bid within the NSG, there is no consensus.

Overall Evaluation of Export Controls: **Some Progress.** A growing number of countries are making use of multilateral guidelines in developing national export controls. But the Nuclear Suppliers Group’s 2008 decision to exempt India from its comprehensive safeguards requirement and China’s determination to supply more nuclear reactors to Pakistan have damaged this key mechanism’s credibility, and no progress has been made towards adopting a criteria-based approach to cooperation agreements with states outside the NPT.

2.11 **IAEA Resources.** The IAEA’s regular budget has seen some modest real growth in recent years but is still insufficient to allow the agency to fulfil its responsibilities and to meet the expectations of member states. Important programs continue to depend on extra-budgetary contributions. The resources debate is complex and political. The IAEA is under pressure to become more cost-efficient, without letting its attention to safeguards implementation slide. While some states want the agency to pay more attention to nuclear security, others see this as likely further to diminish the resources available for the development of peaceful uses of nuclear energy, particularly in developing countries. They want priority, and more money, to be directed to technical cooperation. The debate is further complicated by concerns expressed by some states that the IAEA’s evolving state-level approach to safeguards, which is driven at least partly by budget pressures, is discriminatory, subjective and unreliable.

Overall Evaluation of IAEA Resources: **Some Progress.** The IAEA’s regular budget has seen some modest real growth in recent years but is still insufficient to allow the agency to fulfil its responsibilities and to meet the expectations of member states.

2.12 Nuclear-Weapon-Free Zones (NWFZs). The 2010 NPT Review Conference encouraged the establishment of further NWFZs and the ratification by NWS of the relevant protocols to existing NWFZ treaties. NWFZs have been proposed for Northeast Asia and the Arctic. Russia ratified Protocols One and Two of the Treaty of Pelindaba in March 2011. There have been no other ratifications by NWS of existing NWFZ protocols since the 2010 NPT Review Conference. US President Barack Obama has submitted the protocols to the treaties of Rarotonga and Pelindaba to the US Senate for ratification, but there is no indication of when this might be accomplished.

2.13 The 2010 NPT Review Conference reaffirmed the central importance of the 1995 Resolution on the Middle East and called on the UN Secretary-General to convene a conference in 2012, to be attended by all Middle East states, on the establishment of a Middle East zone free of nuclear weapons and all other weapons of mass destruction. A conference tentatively scheduled for 17 December 2012 in Helsinki has been postponed indefinitely. While it is understood that there are formidable challenges to the creation of a NWFZ in the prevailing security and political environment in the Middle East, failure to convene a conference on the issue will have a negative impact on the NPT review process.

*Overall Evaluation of Nuclear-Weapon-Free Zones: **Minimal Progress.** No new NWFZs have been established. There has been only modest movement on protocol ratifications. The Middle East NWFZ Conference mandated by the NPT Review Conference for 2012 has been postponed indefinitely.*

2.14 Other Non-Proliferation Mechanisms. The Proliferation Security Initiative (PSI), established by the United States in 2003 to prevent the shipment of weapons of mass destruction (WMD), their delivery systems and associated materials to state and non-state actors of concern, has the support of around 100 countries. The ICNND recommended that it “be reconstituted within the UN system as a neutral organization,” but this has not so far been seriously considered.

2.15 The proliferation of nuclear-capable missiles continues to cause growing international concern. In parallel with the steady spread of these technologies and the absence of an international instrument specifically governing the development, production, acquisition, transfer, deployment or use of missiles, the international community has tried to elaborate measures that would increase transparency and constrain the pace of, or roll back, missile proliferation. These efforts have enjoyed some success. Over the past decade, however, many countries have acquired technologies for short- and medium-range ballistic missiles, while India, Iran, Israel, North Korea and Pakistan have been developing long-range ballistic missile capabilities.

Overall Evaluation of Other Non-Proliferation Mechanisms: **Some Progress.** The Proliferation Security Initiative now has the support of around 100 countries and has helped make illicit WMD-related transfers harder. But on missile proliferation, despite many attempted constraints, ballistic missile technologies continue to proliferate.

2.16 Nuclear Testing. At the 2010 NPT Review Conference, NWS undertook to ratify the CTBT “with all expediency” and not to conduct nuclear-weapon tests in the meantime. Of the five NPT-recognized NWS, China and the United States have yet to ratify the CTBT. Of nine Annex 2 states which had not ratified the CTBT in May 2010, only one, Indonesia, has since done so. A substantial number of US Senators remain firmly opposed to US ratification and rejection by the Senate, for a second time, would be a huge setback to prospects for the CTBT’s eventual entry into force. All five NWS maintain a voluntary moratorium on nuclear tests, but at least three (Russia, the United Kingdom and the United States) and possibly China, conduct “subcritical” tests on small amounts of nuclear material at high pressure using conventional explosives without generating a sustained nuclear chain reaction. Of the non-NPT nuclear-armed states all except North Korea have observed the moratorium.

Overall Evaluation of Nuclear Testing: **Minimal Progress.** Of nine Annex 2 states which had not ratified the CTBT in May 2010, only one, Indonesia, has since done so. Neither the United States nor China has ratified the treaty. That said, voluntary moratoriums on nuclear testing remain in place. Meanwhile, North Korea continues to threaten further tests.

2.17 Fissile Material. At the 2010 NPT Review Conference, all states agreed that the Conference on Disarmament (CD) should “immediately begin negotiation of a treaty banning the production of fissile material for use in nuclear weapons or other nuclear explosive devices” and invited the UN Secretary-General to convene a high-level meeting in September 2010 in support of the work of the CD (Action 15). The CD has not been able to implement a program of work since the conclusion of CTBT negotiations in 1996. In recent years, Pakistan has consistently blocked the adoption of any program of work in the CD because it will not agree to Fissile Material Cut-off Treaty (FMCT) negotiations in the absence of prior agreement to include existing stocks of weapon-grade fissile material, where it believes itself to be at a particular disadvantage to India. The recommended high-level meeting was convened but made no real progress. In 2012, the CD again failed to adopt a program of work and concluded its annual session on 14 September with nothing to show for it.

2.18 Of the five NWS, only China has not declared an end to the production of fissile

material for weapons purposes. The United States has declared 210 tonnes of highly enriched uranium (HEU) excess to military requirements. HEU taken from dismantled Russian nuclear weapons is converted to low enriched uranium (LEU) and sold to the United States for use in nuclear power plants under the 1993 US–Russia HEU Purchase Agreement. By the end of 2013, the program is on schedule to have eliminated a total of 500 tonnes of weapon-origin HEU, an amount equivalent to some 20,000 nuclear weapons.

2.19 Russia, the United Kingdom and the United States have each declared some plutonium excess to military requirements. A Plutonium Management and Disposition Agreement (PMDA), signed by the United States and Russia in September 2000, and tentatively scheduled to begin in 2018 under IAEA verification, commits each country to dispose of 34 tonnes of excess weapon-grade plutonium by converting it to mixed oxide (MOX) fuel and using it in nuclear power reactors. Neither China nor France has declared any stocks of weapon-grade fissile material in excess of its defence needs.

2.20 Although it has not said so, China is believed no longer to produce either HEU for weapons or weapon-grade plutonium. The current status of facilities previously used for these purposes is, however, unclear. France’s military fissile material production facilities at Marcoule and Pierrelatte are being dismantled. Russia’s uranium enrichment plants are all now designated civilian facilities and its last operating plutonium production reactor was shut down in 2010. The UK’s only indigenous source of HEU stopped producing HEU in 1962, closed in 1982, and is now being decommissioned. Its closed former plutonium production reactors are the subject of long-term decommissioning plans.

2.21 Most US HEU was produced at two gaseous diffusion plants, both of which stopped producing HEU for weapons in 1964. The demolition of one is progressing and a contract for the decontamination and decommissioning of the second was awarded in 2010. The last of 14 US plutonium production reactors was shut down in 1987. The United States has begun decommissioning five heavy-water plutonium production reactors at Savannah River. Five of the nine reactors at Hanford had been “cocooned” by 2005. Another is currently being cocooned, with two more to follow. The remaining reactor has been turned into a museum.

Overall Evaluation of Fissile Material: **Minimal progress.** There has been no progress in beginning negotiations on a global ban on the production of fissile material for nuclear weapons purposes, a central non-proliferation policy objective. But NWS have not produced HEU or weapon-grade plutonium for years and the facilities used for these purposes have been either shut down or converted to other uses in at least four of them: the status of facilities in China is unknown. Russia and the United States are reducing excess HEU stocks and have a bilateral plutonium surplus disposition agreement in force. The most significant growth in fissile material may be occurring in the non-NPT nuclear-armed states but, as with nuclear weapons stockpiles, their total stock is still hugely below that of the five NPT-recognized NWS.

§2.2 Objectives and General Strategy

2.22 The overall and overriding objective of all non-proliferation efforts is to ensure that no more states seek to acquire or succeed in acquiring nuclear weapons. As distilled from the language of the NPT Treaty and Review Conference outcomes, and reports of international commissions, the strategies in support of this objective may be described as:

- > To strengthen NPT and non-NPT mechanisms:
 - safeguards in all their manifestations;
 - compliance and enforcement;
 - the IAEA;
 - export controls; and
 - NWFZs;
- > To avoid breakout by existing non-NWS who are members of the NPT, for example Iran;
- > To identify creative and innovative mechanisms and formulas by means of which the non-NPT nuclear-armed states (India, Israel and Pakistan) can be signed up to NPT-equivalent global disciplines;
- > To ensure the entry into force of the CTBT; and
- > To conclude an FMCT.

2.23 **NPT Treaty and Review Conference Outcomes.** States' nuclear non-proliferation obligations are set out in Articles I–III of the NPT. Under Article I, NWS party to the treaty undertake not to transfer nuclear weapons or other nuclear explosive devices, and not to help or encourage any non-NWS to manufacture or otherwise acquire such weapons. Article II requires non-NWS not to receive, manufacture or otherwise seek to acquire nuclear weapons or other nuclear explosive devices.

2.24 Under Article III.1, non-NWS agree to accept IAEA safeguards as a means of verifying the fulfilment of their treaty obligations; while Article III.2 obliges each state party to the treaty not to provide source or special fissionable material, or “equipment or material especially designed or prepared for the processing, use or production of special fissionable material,” to any non-NWS unless the source or special fissionable material is “subject to the safeguards required by this Article.”

2.25 Like the disarmament undertaking in Article VI, these obligations have been shaped over the years by a succession of treaty review conferences. The Principles and Objectives for Nuclear Non-proliferation and Disarmament adopted at the 1995 NPT Review and Extension Conference have a special significance in this regard. They affirm the importance of:

- > Universal adherence to the treaty;
- > The IAEA's role as the competent authority responsible for verifying compliance with safeguards agreements reached in line with states' obligations under Article III.1, and for the investigation and reporting of apparent or possible non-compliance with those obligations;
- > States parties which have not yet done so signing and bringing into force the CSAs

required by Article III;

- > A regular review of IAEA safeguards, the steady strengthening of their effectiveness, and of the agency's ability to detect undeclared nuclear activities;
- > States not party to the NPT entering into CSAs with the IAEA;
- > As a condition of new nuclear supply arrangements, acceptance of IAEA comprehensive safeguards¹ and internationally legally binding commitments not to acquire nuclear weapons or other nuclear explosive devices;
- > Placing under agency safeguards fissile material transferred from military to peaceful use;
- > The maintenance of high standards of safety, accounting, physical protection and transport of nuclear materials; and
- > Ensuring that the IAEA has the financial and human resources it needs to discharge its responsibilities effectively.²

2.26 These principles and objectives have been largely reaffirmed at subsequent NPT review conferences. As discussed further below, they have since been augmented by the emergence of the IAEA Model Additional Protocol, and diminished by the erosion of the comprehensive safeguards provision as a condition of nuclear supply.

2.27 There has been a growing convergence of non-proliferation and nuclear security goals over the past decade, with nuclear security issues assuming progressively greater prominence in the post-9/11 environment. Consistent with this trend, close to a third of the actions included under the nuclear non-proliferation heading in the final document of the 2010 NPT Review Conference were nuclear security items (discussed separately in the next chapter). Among other things, the conference encouraged states "to maintain the highest possible standards of security and physical protection of nuclear materials and facilities" (Action 40); called on states parties to the Convention on the Physical Protection of Nuclear Material (CPPNM) to ratify the amendment to the Convention as soon as possible (Action 42);³ called on states parties "to improve their national capabilities to detect, deter and disrupt illicit trafficking in nuclear materials" (Action 44); and encouraged states parties that have not yet done so to become party to the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) (Action 45).

2.28 International Commissions. The report of the UN Secretary-General's 2004 High-level Panel on Threats, Challenges and Change identified two key threats to the nuclear non-proliferation regime. The first has states parties to the NPT taking advantage of the treaty to develop either full-scale or threshold nuclear weapons capabilities, with a view

1. The purpose of "comprehensive" (sometimes also referred to as "full scope") safeguards is to verify that fissionable material is not diverted from civilian uses to nuclear weapons or other nuclear explosive devices, the basic safeguards measure being nuclear material accountancy, carried out through on-site inspections, supported by containment and surveillance measures (e.g. seals and cameras). They are "comprehensive" in the sense of being required to be accepted on all a state's current and future nuclear activities.

2. NPT/CONF.1995/32 (Part I), Annex: Decision 2: Principles and Objectives for Nuclear Non-Proliferation and Disarmament.

3. The CPPNM applies to the international transport of nuclear material in peaceful uses. The amendment to the convention expands the scope of the CPPNM to cover, inter alia, the physical protection of nuclear material in domestic use, storage and transport, and the protection of nuclear materials and facilities against sabotage.

to withdrawing from the treaty when caught and censured, or at the point of weaponization.⁴ North Korea, which confirmed its withdrawal from the NPT in 2003 and tested nuclear weapons in 2006 and 2009, provides a ready example of this kind, and there is concern that Iran could provide another.

2.29 The second and closely related threat to the nuclear non-proliferation regime stems from concerns about its possible collapse in the face of an erosion of confidence in and respect for the NPT's legal and normative constraints, which could lead to the sort of proliferation cascade – made so much easier now by the ever growing diffusion of sophisticated nuclear and dual-use technology – that the United States and others were predicting in the 1960s prior to the negotiation and adoption of the NPT.⁵

2.30 The various international commissions on nuclear non-proliferation and disarmament (including the Canberra (1996) and Blix (2006) Commissions, the Tokyo Forum (1999), ICNND (2009), and the more broadly mandated High-level Panel on Threats, Challenges and Change(2004)) have largely agreed on the steps needed to promote effective nuclear disarmament, prevent the spread of nuclear weapons and strengthen global non-proliferation norms. Prominent among their common themes are calls for:

- > A strong IAEA, with the authority and resources necessary to carry out its mandate fully and effectively;
- > Stronger safeguards, including, and with progressively more vigour since the Model Additional Protocol's emergence in 1997, global endorsement both of CSAs and APs, signed and in force, as the new international safeguards standard;
- > Multilateralization of the nuclear fuel cycle (international fuel banks, enrichment, reprocessing and spent fuel storage facilities) as a means of diminishing the risk of proliferation by reducing incentives to establish national fuel cycle facilities;
- > The phasing out of HEU in civil research programs (and of separated plutonium in energy programs) as alternatives become available; and
- > A determination, underwritten by the UN Security Council, to hold states withdrawing from the NPT responsible for violations committed while party to the treaty.

2.31 The ICNND Report, published in the lead-up to the May 2010 NPT Review Conference, recommended that nuclear non-proliferation efforts focus on both demand and supply, by “persuading states that nuclear weapons will not advance their national security or other interests” and by making it “as difficult as possible for states to buy or build such weapons” (Recommendation 4). It proposed a group of four safeguards and enforcement priorities (Recommendation 41) for the conference to consider:

- > A recommendation that all states should accept the application of the AP and that, to encourage its universal take-up, acceptance should be made a condition of all states' nuclear exports;
- > A declaration that a state withdrawing from the NPT is not free to use for non-peaceful

4. *A more secure world: our shared responsibility*. Report of the High-level Panel on Threats, Challenges and Change (New York: United Nations, document A/59/565, 2 December 2004), p. 38, paragraph 108.

5. *A more secure world*, pp. 38–39, paragraphs 109–11.

- purposes nuclear materials, equipment and technology acquired while party to the NPT;
- > A recommendation that the Security Council make clear that withdrawal from the NPT will be regarded *prima facie* as a threat to international peace and security; and
 - > A recommendation to states that they make it a condition of nuclear exports that safeguards agreements continue to apply after any such withdrawal.⁶

2.32 With the partial exception of the first proposal (Action 28 “encourages all states parties... to conclude and to bring into force additional protocols,” while Action 30 endorses universal application of comprehensive safeguards and additional protocols in a nuclear-free world), none of these found its way into the conference outcomes document. The reasons for this entrenched resistance to the idea of transforming the AP from a matter of sovereign choice into one of international obligation, and opposition from members of the hard-line NAM group to progress of any kind on non-compliance and withdrawal issues, are discussed below.

2.33 Recognizing that the three nuclear-armed states now outside the NPT – India, Pakistan and Israel – were not likely to join it “any time soon,” the ICNND report recommended that they be encouraged to participate “in parallel instruments and arrangements which apply equivalent non-proliferation and disarmament obligations” (Recommendation 17) and that, “provided they satisfy strong objective criteria demonstrating commitment to disarmament and non-proliferation, and sign up to specific future commitments in this respect,” they should have NPT-equivalent access to nuclear materials and technology for peaceful purposes (Recommendation 18).

2.34 It has not proven easy to find some means of accommodating, in multilateral non-proliferation and disarmament processes, nuclear-armed IAEA member states excluded from joining the NPT as NWS by the treaty’s own definition,⁷ and unlikely to accede to the treaty as non-NWS. To the extent that effort is currently essentially India-driven (involving a coincidence of US commercial and strategic objectives with India’s desire for formal admission to the nuclear club), questions have been raised of consistent treaty interpretation, of consistent interpretation and application particularly of NSG guidelines, and finally, among states already critical of the NPT’s bias towards the nuclear “haves,” of credibility for the whole nuclear non-proliferation enterprise.

2.35 The ICNND Report, conscious of these concerns, recommended that the NSG adopt “a criteria-based approach to cooperation agreements with states outside the NPT” (Recommendation 15) that would establish conditions for further exceptions based on new rules, rather than on an exemption from old ones, but this approach has yet to be embraced. NSG related issues are discussed further later in this chapter.

6. International Commission on Nuclear Non-proliferation and Disarmament (ICNND) (Gareth Evans and Yoriko Kawaguchi co-chairs), *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers* (Canberra and Tokyo: ICNND, 2009), pp. 257–58.

7. For the purposes of the NPT, a nuclear weapon state is “one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967” (Article IX.3).

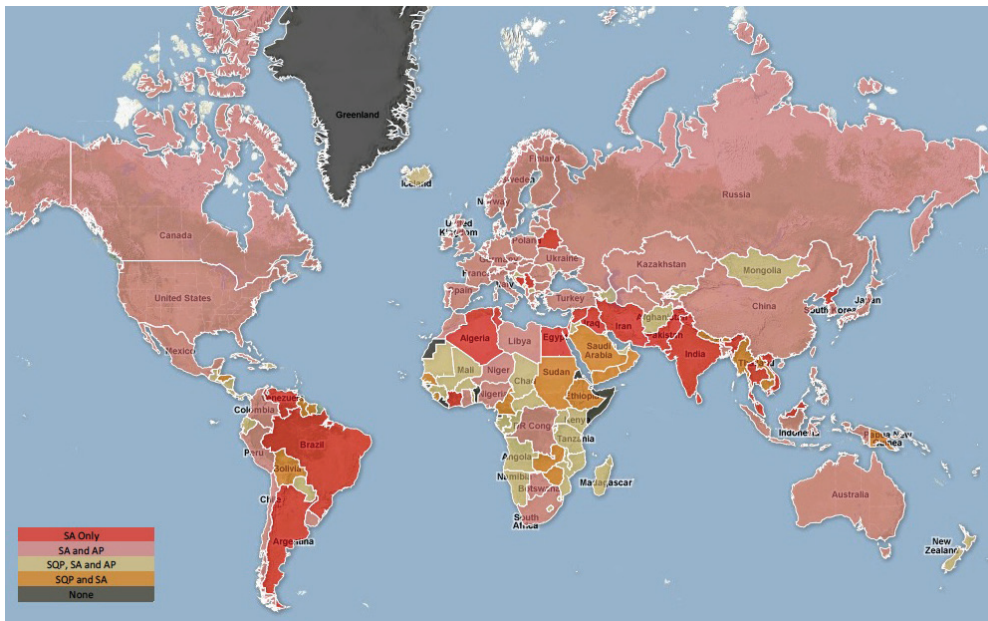
§2.3 NPT Safeguards and Verification

2.3.1 “Comprehensive” Safeguards: Traditional Materials Accounting

2.36 Under Article III.1 of the NPT, the IAEA assumed responsibility for negotiating, with non-NWS parties to the treaty, safeguards agreements that would allow the agency to verify the fulfilment of states’ obligations under the treaty “with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices.”

2.37 **Comprehensive Safeguards Agreements** (INFCIRC/153). Under a CSA, a state undertakes to accept safeguards “on all source or special fissionable material in all peaceful nuclear activities within its territory, under its jurisdiction or carried out under its control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices.”⁸ The objective of the CSA is to deter diversion “by the risk of early detection.”⁹

Map 2.1: Comprehensive Safeguards Agreements (2012)



Source: SIPRI

8. IAEA INFCIRC/153, Basic Undertaking.

9. IAEA INFCIRC/153, paragraph 28.

2.38 The 2010 NPT Review Conference reaffirmed the call by previous review conferences for the application of comprehensive safeguards to all source or special fissionable material in peaceful nuclear activities (Action 24). It called on those states which have yet to do so to bring into force CSAs (Action 25) with the assistance of the IAEA (Action 29).

2.39 Between 1 July 2010 and 30 June 2012, CSAs entered into force for four states (Andorra, Montenegro, Mozambique and Republic of Congo). As of 30 June 2012, 179 states (and Taiwan) had safeguards agreements in force with the agency. Fourteen non-NWS parties to the NPT had yet to bring CSAs into force (Map 2.1).¹⁰ At 31 December 2012, the number of states without a CSA in force had dropped by one, to thirteen.¹¹

2.40 **Small Quantities Protocols (SQPs).** Under a small quantities protocol (SQP), a state which claims that it carries on little or no nuclear activity is exempted from most of the safeguards procedures set out in its CSA. A revised standard text of the SQP was approved by the IAEA Board of Governors in 2005. The modified SQP reduced the scope of exemptions and is not available to a state with an existing or planned nuclear facility. "Of particular importance is the fact that, under the revised text of the SQP, the requirement that the State provide the Agency with an initial inventory report and the Agency's right to carry out ad hoc and special inspections are no longer held in abeyance."¹² In other words, the amended SQP gives the IAEA the authority to verify a claim by inspection.

2.41 The 2010 NPT Review Conference encouraged all states parties with SQPs which had not yet done so "to amend or rescind them." Between 1 July 2010 and 30 June 2012, SQPs were amended for nine states (Antigua and Barbuda, El Salvador, Gambia, Guatemala, Moldova, Panama, San Marino, Swaziland and Zimbabwe). Ghana rescinded its SQP. By the end of June 2012, of the 93 states with operative SQPs, 46 had brought modified SQPs into force.¹³ As of 21 September 2012, 54 states had accepted SQPs in accordance with the modified text endorsed by the Board of Governors.¹⁴

2.42 **Voluntary Offer Agreements.** Under a voluntary offer agreement (VOA), the IAEA applies safeguards to nuclear material in facilities selected by it from an NPT nuclear weapon state's list of eligible facilities. The purpose of such safeguards is "to verify that the material is not withdrawn from peaceful activities except as provided for in the agreement." Among the motives for choosing a particular facility may be its capacity to "satisfy legal obligations arising from other agreements concluded by the state."¹⁵

10. GC(56)/14, 25 July 2012, document of IAEA General Conference 56th regular session.

11. http://www.iaea.org/Publications/Factsheets/English/nptstatus_overview.html. Confirmed correct at 31 December 2012 in CNND email exchange with IAEA.

12. IAEA Safeguards and Verification: *Safeguards Statement for 2010*, p. 3, <http://iaea.org/OurWork/SV/Safeguards/es/es2010.html>.

13. GC(55)/16, 26 July 2011; GC(56)/14, 25 July 2012.

14. GC(56)/RES/13, September 2012.

15. IAEA, *Safeguards Statement for 2010*, p. 7.

2.43 All five NPT NWS have both voluntary offer agreements and APs in force.

Table 2.1: NWS Safeguards Agreements

State	Voluntary Offer Agreement	Additional Protocol
China	INFCIRC/369	28 March 2002
France	INFCIRC/290	30 April 2004
Russian Federation	INFCIRC/327	16 October 2007
United States	INFCIRC/288	30 April 2004
United Kingdom	INFCIRC/263	6 January 2009

Source: SIPRI

2.44 The 2010 NPT Review Conference called for the wider application of safeguards to peaceful nuclear facilities in the NWS (Action 30). But there has been no widening of the scope of application of safeguards to civilian nuclear facilities in states with a voluntary offer agreement since then.

2.45 **INFCIRC/66/Rev.2.** Under safeguards agreements based on INFCIRC/66/Rev.2 (1965) safeguards are applied to specific nuclear materials, facilities and other items in three non-NPT nuclear-armed states (India, Israel and Pakistan) with a view to ensuring their exclusively peaceful use. These agreements have no substantive impact on nuclear weapons programs.

2.3.2 Additional Protocol: Verifying the Absence of Undeclared Activity

2.46 The push for stronger safeguards was given greater urgency in the early 1990s as evidence emerged of a clandestine nuclear weapons program in Iraq and of discrepancies in North Korea's initial safeguards declarations.¹⁶ In response, the IAEA Board of Governors established a committee to draft a model protocol that granted the agency authority additional to that provided by its CSAs with states, by giving it greater access to information and sites, thereby permitting the agency to provide assurance about both declared nuclear activities and the absence of possible undeclared nuclear activities. The Model Additional Protocol was approved in May 1997 as INFCIRC/540.

2.47 An AP in force obliges a state to provide the agency with information about and access to all parts of the nuclear fuel cycle, including uranium mines, fuel fabrication and enrichment plants, and nuclear waste sites; as well as information on nuclear fuel cycle-related research and development, and the manufacture and export of sensitive nuclear-related technologies. It also provides for short-notice access to all buildings on a nuclear site and, in some circumstances, for environmental sampling beyond declared locations.¹⁷

16. Jack Boureston and Charles D. Ferguson, "Strengthening Nuclear Safeguards: Special Committee to the Rescue?" http://www.armscontrol.org/act/2005_12/DEC-Safeguards.

17. Wider area environmental sampling requires the approval of the Board of Governors and consultations with the state concerned. *IAEA Safeguards Overview: Comprehensive Safeguards Agreements and Additional Protocols*, http://www.iaea.org/Publications/Factsheets/English/sg_overview.html.

Together, a CSA and AP in force and fully implemented enable the IAEA both to verify the non-diversion of declared nuclear material from peaceful use and to determine whether there is evidence of undeclared nuclear material and activities.

2.48 The ICNND Report recommended that all states should accept the application of the AP and that acceptance should be made a condition of all states' nuclear exports (Recommendations 5 and 41). While many countries, particularly members of the Nuclear Suppliers Group (NSG), have argued that the AP should be recognized and accepted universally as a condition of nuclear supply, others, particularly within NAM, have stressed the AP's voluntary nature and have resisted efforts to transform it into an obligation, not least because they see this as evidence of some states' determination to further entrench the imbalance between non-proliferation and disarmament obligations.

2.49 As a consequence, the 2010 NPT Review Conference could only agree to "encourage" states parties which had not yet done so "to conclude and to bring into force additional protocols as soon as possible and to implement them provisionally pending their entry into force" (Action 28). The conference president's review of the operation of the treaty nevertheless noted that "numerous" states took the view that a CSA and AP in combination were now integral parts of the IAEA's safeguards system and that, together, the measures contained in both instruments represented "the enhanced verification standard."¹⁸ While it was for states to decide whether or not to conclude an additional protocol, a protocol in force became a legal obligation. And, in calling for the "wider application of safeguards to peaceful nuclear facilities in the nuclear-weapon states," the conference was able to agree that "comprehensive safeguards and additional protocols should be universally applied *once the complete elimination of nuclear weapons [had] been achieved*" (Action 30; emphasis added).

2.50 Between 1 July 2010 and 30 June 2012, APs, based on the Model Additional Protocol, entered into force for 15 states (Albania, Andorra, Bahrain, Costa Rica, Gambia, Kyrgyzstan, Mexico, Moldova, Montenegro, Morocco, Mozambique, Namibia, Republic of Congo, Swaziland and the United Arab Emirates). By 23 October 2012, the number of APs in force had risen, with Iraq's ratification, to 119.¹⁹ In November 2012, just ahead of a milestone visit by US President Barack Obama, the Government of Myanmar announced that it was now prepared to sign the AP.²⁰ Eight states with significant nuclear activities have yet to commence AP negotiations with the IAEA.²¹

18. NPT/CONF2010/L.2 (27 May 2010): Final Document: Part I: Review of the operation of the Treaty, paragraphs 18 and 19.

19. IAEA, "Iraq Ratifies Additional Protocol," 23 October 2012, <http://iaea.org/newscenter/news/2012/iraqap.html>.

20. AFP, "Myanmar to sign new nuclear safeguards: govt," *Times of Myanmar*, 19 November 2012, <http://www.timesofmyanmar.com/?p=2024>.

21. Argentina, Brazil, Egypt, Israel, North Korea, Pakistan, Syria and Venezuela. Brazil and Argentina argue, albeit not compellingly, that their membership of the Brazilian-Argentine Agency for Accounting and Control of Nuclear Material (ABACC) puts them in a special situation vis-à-vis the AP. "Significant nuclear activities" encompasses any amount of nuclear material in a facility, or nuclear material in excess of the exemption limits in INFCIRC/153 paragraph 37 in locations outside facilities. Neither Israel nor Pakistan is a party to the NPT. North Korea gave notice of withdrawal from the NPT in January 2003.

2.3.3 “State-Level” and “Integrated” Safeguards: Detection-Focused and Information-Driven

2.51 The 2010 NPT Review Conference called for regular assessment and evaluation of IAEA safeguards (Action 32). The IAEA inspections regime has become progressively more robust over the years, firstly by strengthening and continually upgrading its safeguards systems and procedures, and secondly by enlarging the scope of the agency’s policy authority independently of its Board of Governors. This has facilitated a shift in emphasis from nuclear material accountancy to a detection-based approach in IAEA safeguards procedures governing IAEA activities vis-à-vis states. A downside is an incipient backlash to the IAEA’s expanding remit and jurisdiction as some states see this as impacting on their sovereignty. Many of these larger issues have become entangled in the growing crisis over Iran’s suspected nuclear weapons program.

2.52 Until the first Gulf War (1990–91), IAEA safeguards were applied on the basis of accountancy procedures. States made their declarations to the IAEA on their facilities and activities and the agency conducted investigations to verify their peaceful purposes. The system failed to catch Saddam Hussein’s clandestine pursuit of nuclear weapons and others like North Korea and Syria also failed to declare all their nuclear activities.

2.53 To rescue its dented credibility, the IAEA began to develop alternative and more reliably effective inspection practices for detecting undeclared activities. The need for this became steadily more urgent as more reactors were built and commissioned and the number of facilities and the volume of nuclear material subject to safeguards grew. The IAEA response has been governed by four parameters: there are more commercial-scale nuclear fuel cycle installations being built; more facilities and materials are being brought under IAEA safeguards; there is not, and is not likely to be in the foreseeable future, any commensurate increase in the agency’s resources; and most states have a demonstrable record of responsible stewardship of nuclear operations for peaceful purposes. Putting the four propositions together, to perform effectively the IAEA had to become more targeted in its operations, focusing on states of possible concern rather than dividing its attention and fragmenting its scarce resources by mechanistically inspecting every state with nuclear facilities and activities.

2.54 This has led the IAEA to move progressively over the past fifteen years to develop and implement what is now described as a “state-level approach” to the planning, implementation and evaluation of safeguards. This is an iterative process in which an evaluation of all information available to the agency (that is, information provided not only by the state itself, but by other states, as well as information derived from inspections and visits, from commercial satellite imagery and from international databases on, for example, nuclear trade and illicit trafficking) serves as the basis for planning future safeguards objectives and activities. The IAEA believes that the state-level approach is flexible and responsive to change, thereby helping to ensure that peaceful use assurances provided to the international community remain credible and current.²²

22. GC(55)/16, 26 July 2011.

2.55 As an important step on this path, integrated safeguards – “the optimum combination of all safeguards measures available to the IAEA under comprehensive safeguards agreements and additional protocols”²³ – were implemented in 53 countries in 2012, an increase of six over 2010. The adoption of an integrated safeguards approach is a sign of the agency’s confidence in the absence of undeclared nuclear material and activities in a state and permits the application of reduced safeguards measures at some facilities. This allows the agency to pay ever-increasing attention to possible undeclared activities and to make the most efficient use of its finite resources by making “differentiated assessments about which states’ nuclear programs pose more risk.”²⁴

2.56 Some states – including Argentina, Brazil, Egypt, Russia, South Africa and Switzerland – have begun to argue that the state-level/integrated safeguards approaches are discriminatory rather than targeted. They have called for a return to a nuclear material accounting-based system of IAEA safeguards practices. There is concern in some quarters that the IAEA could be captured by the most powerful countries or by its strongest financial backers. The recent history of IAEA–Iran confrontations feeds into this narrative by some states that the agency’s proliferation judgments can be tainted by “subjective conclusions and insufficiently vetted third-party information.”²⁵

2.57 At the most recent meeting of the IAEA General Conference in September 2012, critics of the state-level approach were able to secure, in the annual safeguards resolution, the inclusion of a paragraph requesting the secretariat “to report to the Board of Governors on the conceptualization and development of the state-level concept for safeguards.”²⁶ The required report will be prepared in the first half of 2013.

2.58 **Strengthening the Technology Base.** The 2010 NPT Review Conference encouraged states to “further develop a robust, flexible, adaptive and cost-effective international technology base for advanced safeguards through cooperation among Member States and with the IAEA” (Action 34). The agency continues to use high-resolution imagery from commercial aerial and satellite-based sensors to enhance its ability to monitor nuclear sites and facilities worldwide, and contracts have been concluded with new imagery providers to diversify sources and ensure the integrity and authenticity of satellite imagery. Having a variety of national providers of imagery gives the IAEA greater confidence that imagery is accurate and has not been tampered with to reinforce one country’s assertions.

2.59 The IAEA has developed and improved its safeguards approaches to a range of existing facilities, and continues to prepare to safeguard new types of facilities, including geological repositories, pyro-processing plants and laser enrichment facilities. Through its International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) and in cooperation with the Generation IV International Forum (GIF), the IAEA is working to improve safeguards on future nuclear energy systems. Canada, Finland and Sweden have

23. International Nuclear Verification Series No.3, “Foreword,” in *IAEA Safeguards Glossary*, 2001 ed. (Vienna: IAEA, 2002).

24. Mark Hibbs, “The Plan for IAEA Safeguards,” 20 November 2012, <http://carnegiendowment.org/publications/index.cfm?fa=view&id=50075>.

25. Hibbs, “The Plan for IAEA Safeguards.”

26. GC(56)/RES/13, September 2012.

initiated “safeguards by design interactions” with the IAEA for future facilities.²⁷

2.60 The IAEA has tested an inspection concept using new combinations of existing techniques and technologies (including remote monitoring, unattended measurements, and unannounced or short-notice inspections) to enhance safeguards implementation.²⁸ However, practical implementation of the concept has its limitations. In some countries, a “short-notice inspection” can in fact take weeks to arrange, which gives the state concerned ample time to prepare for the arrival of IAEA inspectors.

2.61 Outreach and Facilitation. As the IAEA itself observes, “the effectiveness and efficiency of IAEA safeguards depend... on the effectiveness of state and regional systems of accounting for and control of nuclear material... and on the level of cooperation between state or regional authorities and the Agency.”²⁹ To this end, the agency provides training, at international, regional and national level, for personnel of state and regional authorities responsible for implementing safeguards obligations. In March 2012, the agency published comprehensive “Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols.”

2.62 In addition, an IAEA advisory service provides advice and recommendations to states on the establishment and strengthening of state systems of accounting for and control of nuclear material. By the end of June 2012 (the most recent information available publicly), a total of fifteen such missions had been conducted since the program began in 2004.

2.63 The IAEA continues to encourage and to facilitate wider adherence to the safeguards system, consistent with the plan of action outlined in resolution GC(44)/RES/19 and the agency’s updated Plan of Action to Promote the Conclusion of Safeguards Agreements and Additional Protocols (September 2010). GC(44)/RES/19 calls for:

- > Intensified efforts by the director general to conclude safeguards agreements and APs, especially with states which have significant nuclear activities;
- > Assistance by the agency and member states to other states on how to conclude and implement safeguards agreements and APs; and
- > Reinforced coordination between member states and the secretariat in their efforts to promote the conclusion of safeguards agreements and APs.³⁰

2.64 The IAEA’s June 2012 Status of Implementation report gives as evidence of ongoing implementation of the agency’s Plan of Action three outreach activities: briefings on safeguards for a number of permanent missions in New York (October 2011); similar briefings for states in the Pacific region in Fiji (June 2012); and a regional seminar in Mexico City for states in the greater Caribbean region with limited nuclear material and activities (June 2012). “Bilateral consultations on the conclusion of CSAs and APs and the amendment/rescission of SQPs were also held throughout the year with representatives from both Member and non-Member States in Berlin, Fiji, New York and Vienna.”³¹

27. GC(55)/16, 26 July 2011; GC(56)/14, 25 July 2012.

28. GC(55)/16, 26 July 2011.

29. GC(56)/14, 25 July 2012.

30. GC(55)/16, 26 July 2011.

31. IAEA, “Plan of Action to Promote the Conclusion of Safeguards Agreements and Additional Protocols” (no date), p. 1;

2.65 The report notes that, for the year ending 30 June 2012, “a CSA entered into force for one state and APs for seven states. During the same period, two additional states signed CSAs and APs. SQPs were amended for four states, and one state rescinded its SQP.” It rightly describes as “encouraging” the progress made in recent years with regard to the conclusion of safeguards agreements and additional protocols. “In May 2005... 38 NNWS [non-NWS] had not yet brought into force their NPT safeguards agreements; this number had decreased to 26 by the end of June 2009 and to 14 as of June 2012.... [W]hile in May 2005 only 66 States had APs in force, by the end of June 2010 this number had risen to 101; two years later, in June 2012, 116 states had such APs in force.”³²

2.66 At a regional level, the Asia–Pacific Safeguards Network (APSN) came into operation on 1 October 2009 and held its inaugural meeting in Bali in June 2010. The objective of the network is “to strengthen the quality, effectiveness and efficiency of safeguards implementation in the Asia–Pacific region, working closely with the IAEA, through activities such as training, professional development and sharing of experience.”³³

§2.4 NPT Compliance and Enforcement

2.4.1 Compliance Generally

2.67 The IAEA has the mandate, authority and expertise to determine whether or not a state is complying with its safeguards obligations. The UN Security Council is responsible for enforcement. Under Article XII.C of the Statute of the IAEA, the agency’s inspectors are required to report any non-compliance by a state with its safeguards obligations to the director general. The report is then transmitted to the Board of Governors and, by the board, to all members, the UN Security Council and the UN General Assembly. A non-compliance finding may also be reached via paragraph 19 of INFCIRC/153 which allows the board to make the reports provided for in Article XII.C of the Statute if “upon examination of relevant information reported to it by the Director General [it] finds that the Agency is not able to verify that there has been no diversion of nuclear material... to nuclear weapons or other nuclear explosive devices.”³⁴

2.68 Countries to have been found in non-compliance are Iraq (1991), Romania (1992), North Korea (1993), Libya (2004), Iran (2005) and Syria (2011). Of the six, Iran and Syria are currently judged by the international community to be in non-compliance with their safeguards obligations.³⁵ Both are parties to the NPT and members of the IAEA, with CSAs, but not APs, in force. In June 2011, the IAEA Board of Governors declared Syria to be in non-compliance with its obligations under its safeguards agreement with

http://www.iaea.org/OurWork/SV/Safeguards/documents/sg_actionplan.pdf.

32. “Plan of Action to Promote the Conclusion of Safeguards Agreements and Additional Protocols,” pp. 1–2.

33. John Carlson, “Strengthening safeguards through regional cooperation: establishment of the Asia-Pacific Safeguards Network”; <http://www.dfat.gov.au/asno/publications/strengthening-safeguards-through-regional-cooperation>.

34. See John Carlson, “Defining Noncompliance: NPT Safeguards Agreements,” *Arms Control Today* 39 (May 2009), pp. 22–27, www.armscontrol.org/act/2009_5/Carlson.

35. North Korea is in a different category at present, as resolution of the nuclear issue became the subject of a political process (that is, the Six-Party Talks). The IAEA’s role became one of monitoring the freeze at Yongbyon under the previous Agreed Framework, and now the IAEA is on standby to do what the parties request under the Six-Party Talks, but there is no agreement in sight.

the agency and reported the matter to the UN Security Council. The resolution was based on an IAEA finding that an installation destroyed by Israel at Dair Alzour in September 2007 was “very likely” to have been an undeclared nuclear reactor. Recent IAEA reports to the board reveal no progress in agency efforts to secure access to Dair Alzour and three possibly functionally-related sites. Iran is discussed below. North Korea’s withdrawal from the NPT and subsequent emergence as a nuclear-armed state was discussed previously in Chapter 1.

2.69 The 2010 NPT Review Conference failed, in the face particularly of Iranian and other hard-line NAM opposition, to make any progress on non-compliance and withdrawal issues. It simply underscored “the importance of resolving all cases of non-compliance with safeguards obligations in full conformity with the IAEA statute and Member States’ respective legal obligations” and called on states to cooperate with the agency (Action 27).

2.4.2 Iran

2.70 Iran has a growing and increasingly sophisticated nuclear program which currently includes facilities dedicated to uranium conversion and enrichment, heavy water production, research and development, power generation and the production of isotopes for nuclear medicine. The rise in tensions over Iran’s alleged and suspected nuclear weapons program has provoked a flurry of speculation and commentary about:³⁶

- > The benefits and limitations of sanctions as a means of containing its nuclear ambitions;³⁷
- > The costs and risks of pre-emptive and preventive war against the risks of not stopping Iran before the window of opportunity (or Iran’s “zone of vulnerability”) for military action closes;³⁸
- > Israeli and US red lines that might trigger such attacks and the impact of the Israel factor in shaping the US calculus on these decisions;³⁹

36. For a collection that canvasses all these issues in one volume, albeit from the US perspective, see Robert D. Blackwill, ed., *Iran: The Nuclear Challenge* (New York: Council on Foreign Relations, 2012).

37. Kenneth Katzman, *Iran Sanctions* (Washington DC: Congressional Research Service, RS 20871, 15 October 2012); Jeffrey J. Schott, “Economic Sanctions Against Iran: Is the Third Decade a Charm?” (Washington DC: Petersen Institute for International Economics, July 2012), <http://www.iie.com/publications/papers/paper.cfm?ResearchID=2173>; Ray Takeh and Suzanne Maloney, “The Self-limiting Success of Iran Sanctions,” *International Affairs* 87:6 (2011), pp. 1297–1312; and Daniel Wertz and Ali Vaez, “Sanctions and Nonproliferation in North Korea and Iran: A Comparative Analysis,” *FAS Issue Brief* (Washington DC: Federation of American Scientists, June 2012), www.fas.org/pubs/_docs/IssueBrief-Sanctions.pdf.

38. Morton Abramowitz, et al., *Weighing Benefits and Costs of Military Action against Iran* (New York: The Iran Project, 2012), <http://theiranproject.org>; David Albright, Paul Brannan, Andrea Stricker, Christine Walrond and Houston Wood, “Preventing Iran from Getting Nuclear Weapons: Constraining Its Future Nuclear Options” (Washington DC: Institute for Science and International Security, 5 March 2012), <http://isis-online.org/isis-reports/category/iran/#2012>; Anthony H. Cordesman, *Analyzing the Impact of Preventive Strikes Against Iran’s Nuclear Facilities* (Washington DC: Center for Strategic & International Studies, 4 September 2012), csis.org/files/publication/120906_Iran_US_Preventive_Strikes.pdf; James Kitfield, “The Path to War with Iran,” *National Journal*, 24 September 2012, <http://www.nationaljournal.com/nationalsecurity/the-path-to-war-with-iran-20120924>; Judith S. Yaphe and Charles D. Lutes, *Reassessing the Implications of a Nuclear-Armed Iran* (National Defense University, McNair Paper 69, 2005).

39. Andrew J. Bacevich, “How We Became Israel,” *The American Conservative*, 10 September 2012, <http://www.theamericanconservative.com/articles/how-we-became-israel/>; Colin H. Kahl, Melissa G. Dalton and Matthew Irvine, *Risk and Rivalry: Iran, Israel and the Bomb* (Washington DC: Center for New American Security, June 2012); Jim Zanotti, et al., *Israel: Possible Military Strike Against Iran’s Nuclear Facilities* (Washington DC: Congressional Research Service, R42443, 27 March 2012).

- > The driving US motive being non-proliferation or regime change,⁴⁰ and
- > The uneasy parallels with the Iraq War in 2003.⁴¹

2.71 For all the emotion generated, there remains as at the end of 2012 a broad international consensus that, while Iran may well be working on elements of a nuclear weapon, it has not taken the strategic decision to build one. The IAEA has been able to verify the non-diversion of nuclear material declared by Iran under its CSA. It has not, however, been able to provide a credible assurance of the absence of undeclared nuclear material and activities in Iran, and thus to conclude that all nuclear material in Iran is in peaceful activities. To this extent, even if Iran never does take the strategic decision to actually build a nuclear weapon, its activities pose a significant challenge to the credibility and effectiveness of the non-proliferation regime, and it remains crucial to bring the issue to satisfactory early resolution.

2.72 Since an initial IAEA Board of Governors finding of non-compliance in September 2005, Iran has been the subject of six UN Security Council resolutions demanding a halt to its enrichment and reprocessing activities.⁴² A steadily increasing range of commercial and financial sanctions have been imposed on Iran by the United Nations and, autonomously, by individual states and the European Union (EU).

2.73 The ICNND Report called for continuing efforts to be made by the five permanent members of the Security Council (P5) and Germany (+1), the Security Council and IAEA member states to achieve “a satisfactory negotiated resolution of the issue of Iran’s nuclear capability and intentions, whereby any retention of any element of its enrichment program would be accompanied by a very intrusive inspection and verification regime, giving the international community confidence that Iran neither has nor is seeking nuclear weapons” (Recommendation 60).

2.74 Regular IAEA reports to the board show that Iran has not suspended its uranium enrichment activities, nor clarified to the satisfaction of the international community outstanding issues giving rise to concerns about a possible nuclear weapons program. In an annex to a November 2011 IAEA safeguards report, the agency gave a detailed account of the possible military dimensions of Iran’s nuclear program.⁴³ This documented, for the first time in one place, a range of activities “relevant to the development of a nuclear explosive device,”⁴⁴ including warhead/missile payload design and experiments with high explosives.⁴⁵ The agency’s conclusions were based on information provided by “a number of Member States, from the Agency’s own efforts and from information provided

40. Paul Pillar, “The Temptation of Regime Change,” *The National Interest*, 3 October 2012, <http://nationalinterest.org/blog/paul-pillar/the-temptation-regime-change-7554>.

41. Rolf Ekeus and Málfrid Braut-Hegghammer, “Don’t Go Baghdad on Tehran,” *Foreign Affairs*, 18 October 2012, <http://www.foreignaffairs.com/articles/138201/rolf-ekeus-and-malfrid-braut-hegghammer/dont-go-baghdad-on-tehran>.

42. S/RES/1696 (31 July 2006), S/RES/1737 (23 December 2006), S/RES/1747 (24 March 2007), S/RES/1803 (3 March 2008), S/RES/1835 (27 September 2008), and S/RES/1929 (9 June 2010).

43. *Implementation of the NPT Safeguards Agreement and relevant provisions of the Security Council resolutions on the Islamic Republic of Iran – Report by the Director General* (Vienna: IAEA Board of Governors, GOV/2011/65, 8 November 2011).

44. Nuclear Threat Initiative, “Iran: Nuclear,” July 2012, <http://www.nti.org/country-profiles/iran/nuclear>.

45. S. Kile, “Iran and nuclear proliferation concerns,” *SIPRI Yearbook 2012: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2012), pp. 366–73.

by Iran itself.”⁴⁶ They indicated that, “prior to the end of 2003 the activities took place under a structured programme; that some continued after 2003; and that some may still be ongoing.” The IAEA claims to have obtained additional corroborative information since November 2011.⁴⁷

2.75 The documents on which the November 2011 account was based have not, however, been released publicly nor made available to Iran. Iran has dismissed the report as dishonest in its methodology and wrong in its conclusions.⁴⁸ One of the documents apparently cited by the IAEA, and subsequently leaked to the media, purports to be a graphic representation of a potential nuclear armament’s explosive force.⁴⁹ A commentary published in the *Bulletin of the Atomic Scientists* describes the graph as featuring “a quite massive error, which is unlikely to have been made by research scientists working at a national level.”⁵⁰ Similar (and presumably more reliable) graphs are to be found in nuclear science textbooks and on the Internet.⁵¹

2.76 In its latest (November 2012) report to the Board of Governors and to the Security Council on the implementation of the NPT safeguards agreement and Security Council resolutions in Iran, the IAEA notes that, notwithstanding several rounds of talks between the agency and Iran, no agreement has been reached on a “structured approach” to resolving outstanding issues related to possible military dimensions of Iran’s nuclear program and to the agency’s request for access to the Parchin military site where Iran is believed to have “constructed a large explosives containment vessel in which to conduct [possible nuclear weapons-related] hydrodynamic experiments.” In the meantime, the “extensive and significant” site modification activities which have taken place at Parchin since February 2012 “have seriously undermined the Agency’s ability to undertake effective verification.”⁵²

2.77 In violation of the resolutions of the Board of Governors and Security Council, Iran has not suspended uranium enrichment, nor construction of a heavy water moderated research reactor at Arak. Iran is not implementing its Additional Protocol, which it signed in 2003 but has not ratified.

2.78 Efforts by the P5 and Germany to negotiate a resolution of the stand-off with Iran have so far been unsuccessful. An agreement reached in Geneva in December 2010 that would have seen a (then) significant quantity of Iranian LEU exchanged for research (medical) reactor fuel collapsed early in 2011. Russia subsequently proposed a progressive easing of sanctions in return for improved cooperation and transparency by Iran, but the idea was not taken up by Russia’s P5 colleagues and received at best an ambivalent reception in Tehran. High-level talks resumed in Istanbul in April 2012, but

46. *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran*, GOV/2012/55, 16 November 2012.

47. *Implementation of the NPT Safeguards Agreement*, GOV/2012/55, 16 November 2012.

48. “Iranian envoy criticizes IAEA conduct,” *Press TV*, 22 November 2011, <http://www.presstv.ir/detail/211406.html>.

49. “Iran Modeled Nuclear Bomb Blast, Document Indicates,” *Global Security Newswire*, 27 November 2012.

50. Yousaf Butt and Ferenc Dalnoki-Veress, “DIY Graphic Design,” *Bulletin of the Atomic Scientists*, 28 November 2012, www.thebulletin.org/web-edition/op-eds/diy-graphic-design; Gareth Porter, “Fake AP Graph exposes Israeli fraud and IAEA credulity,” *Lobellog*, 1 December 2012, <http://www.lobellog.com/fake-ap-graph-exposes-israeli-fraud-and-iaea-credulity/>.

51. Butt and Dalnoki-Veress, “DIY Graphic Design.”

52. *Implementation of the NPT Safeguards Agreement*, GOV/2012/55, 16 November 2012.

made no substantive progress. Further inconclusive meetings were held in Baghdad (May 2012) and Moscow (June 2012). Since then, there have been further exploratory exchanges between EU foreign and security policy chief Baroness Catherine Ashton (acting on behalf of the P5+1) and lead Iranian nuclear negotiator Saeed Jalili. The United States meanwhile is reported to be considering a “more for more” deal with Iran and to be “looking for a solid bilateral channel that will augment multilateral talks.”⁵³

2.79 Iran has indicated that it is ready to suspend enrichment to just below 20 per cent U-235 in return for the lifting of sanctions.⁵⁴ It has not been willing, however, to accede to demands to suspend all enrichment, surrender its existing stock of uranium enriched to just under 20 per cent, and close the Fordow Fuel Enrichment Plant.⁵⁵ The parties remain deeply at odds and, while a negotiated resolution of the issue is still a priority, tension grows with every kilogram of enriched uranium produced, despite the temporary relief provided by Iran’s transformation some months ago of what was then more than a third of its existing stock of uranium enriched to just under 20 per cent into “a powdered form [uranium oxide] largely unsuitable for use in nuclear weapons.”⁵⁶

2.80 In December 2012, in an open letter, a group of 24 experts – including former generals, diplomats and officials – urged US President Barack Obama to table a new proposal whereby Iran would be offered relief from sanctions in return for some progress in meeting international concerns about its nuclear weapons program. As a first step, Tehran should be required to halt its accumulation of uranium enriched to just under 20 per cent in exchange for a relaxing of some “international and financial sanctions.” Beyond this, the P5+1 negotiators’ overall goals should include restricting Iran’s enrichment to “normal reactor-grade levels”; limiting its stockpiles to actual nuclear power and other peaceful needs; having Iran accept “more extensive and effective” IAEA inspections; and having Iran “account for previous weapons-related experiments to ensure that they have been halted.” In the longer term, a new framework agreement could be negotiated to cover nuclear cooperation, security and transparency.⁵⁷

2.81 If conflict is to be avoided, all parties to the dispute (not just, but especially, Iran and the United States) are going to have to modify their expectations and change their behaviour. Iran must understand that none of the P5 is prepared to accept its emergence as a nuclear-armed state, and that the world has a right to demand credible and comprehensive proof of its assurances that it has no intention of acquiring nuclear weapons. The United States must find some means of accommodating Iran’s demand for positive (rather than negative) recognition as a country of global significance and for unqualified admission to the society of advanced nuclear-capable states. While Iran might one day be persuaded to join actively in the multilateralization of the nuclear fuel cycle, for the time being at least its enrichment activities must be accommodated under appropriate international supervision.

53. Barbara Slavin and Laura Rozin, “US Considers ‘More for More’ with Iran,” *Al-Monitor*, 12 November 2012.

54. “Iran Reaffirms Uranium Restriction Proposal,” *Global Security Newswire*, 25 September 2012.

55. “Khamenei Has Final Say on Iran-U.S. Talks: FM,” *Global Security Newswire*, 13 November 2012.

56. “Iran Pulverizes Uranium Portion, Attempting to Calm Fears on Nuclear Program,” *Global Security Newswire*, 9 October 2012.

57. Julian Borger, “Former generals and diplomats urge Obama to put sanctions on table in Iran talks,” *Guardian*, 19 December 2012.

2.82 While there were signs as 2012 ended that Iran might be moving towards accepting a “structured approach” to the resolution of its disagreements with the IAEA, analysts remain cautious about the lengthy and fragile process needed to resolve the decade-long standoff between Iran and the agency before both sides agree on and implement a methodical work plan that gives the IAEA access to sites, facilities and activities of interest to it.⁵⁸

2.4.3 Response to Withdrawal

2.83 A state party has the right to withdraw from the NPT if it decides that “extraordinary events, related to the subject matter of [the] Treaty, have jeopardized the supreme interests of its country” (Article X). As discussed in Chapter 1, North Korea asserted its withdrawal from the NPT in January 2003 – the only country so far to have done so – after the United States said that Pyongyang had admitted to operating a clandestine uranium enrichment program. Several states remain unconvinced of the validity of the North Korean withdrawal from the NPT, questioning what “extraordinary events” justified it. Regardless, the IAEA has not implemented safeguards in North Korea since, and for all practical purposes that withdrawal should now be treated as a *fait accompli*.

2.84 The ICNND Report recommended that a state withdrawing from the NPT should not be free to use for non-peaceful purposes nuclear materials and technology acquired while a party to it (Recommendation 10). It added that states should make it a condition of their nuclear exports that safeguards agreements will continue to apply in the event of a recipient state’s withdrawal from the treaty (Recommendation 11).

2.85 The 2010 NPT Review Conference consensus outcomes document made no reference at all to withdrawal from the treaty, although the conference president’s summary review of the operation of the treaty (paragraph 120), while reaffirming the universally recognized right of withdrawal, recorded views expressed by “many” states that, under international law, a withdrawing party remained responsible for violations of the treaty committed prior to its withdrawal and, apparently though more elliptically, for its safeguards obligations to nuclear supplier countries. It also noted (paragraph 122) that “numerous” states acknowledged the prerogative of nuclear supplier countries to “consider incorporating dismantling and/or return clauses” in the event of withdrawal.

2.86 North Korea’s NPT withdrawal and subsequent nuclear weapons tests damaged all three pillars of the NPT – disarmament, non-proliferation and cooperation in the peaceful uses of nuclear energy. The security and stability benefits that all states receive from the nuclear non-proliferation regime depend on all states meeting their shared non-proliferation obligations. North Korea withdrew from the NPT in an attempt to avoid being held accountable for violating its treaty obligations, and then used plutonium produced while a party to the treaty for nuclear explosive purposes after withdrawal. North Korea’s withdrawal from the NPT and subsequent emergence as a nuclear-armed state has shown that a state can misuse NPT membership to acquire nuclear materials

58. Simon Sturdee, “Mooted IAEA–Iran ‘deal’ just the beginning: analysts,” AFP, <http://carnegieendowment.org/2012/12/18/mooted-iaea-iran-deal-just-beginning/ev0y>.

and sensitive nuclear technology before withdrawing from the treaty and quickly developing nuclear weapons.

2.87 Those advocating action on withdrawal are not seeking to remove the right to withdraw or to reinterpret Article X. Their intention is to ensure that any future withdrawal is fully consistent with the provisions of the treaty, including the requirement that advance notice of withdrawal be given not just to other NPT parties but also to the UN Security Council. Sadly, the Security Council failed to act following North Korea's withdrawal from the NPT in 2003, despite the fact that North Korea's nuclear history plainly signalled that its withdrawal from the treaty would pose a threat to international peace and security. By resolution 1887 (24 September 2009), however, the Security Council did undertake in future to address without delay any state's notice of withdrawal, including the events described in its statement of explanation, and affirmed that a state remains responsible under international law for violations of the NPT committed prior to its withdrawal. That said, notwithstanding the adoption of this resolution and others highly critical of North Korea's nuclear weapons tests in 2006 and 2009, the Security Council has yet to make clear, as the ICNND report recommended, that any future withdrawal "will be regarded as prima facie a threat to international peace and security, with all the punitive consequences that may follow from that under Chapter VII of the UN Charter" (Recommendation 9).

§2.5 IAEA Resources

2.88 The IAEA is the lead international organization for the safe, secure and peaceful uses of nuclear energy, science and technology. With a secretariat of 2,300 professional and support staff, the IAEA is the centrepiece of international efforts to combat proliferation from within the NPT regime. Although autonomous, the IAEA is a member of the UN system and reports annually to the General Assembly on its work. Several nuclear-weapon-free zones also link their regional verification systems to the global IAEA inspections regime. It pursues a three-pronged strategy to combat nuclear risks: prevention of illicit and non-peaceful use of nuclear material; the timely detection of any such efforts; and swift and decisive referral to the Security Council when nuclear risks are apparent. It has three main areas of work: confirming that nuclear material and activities (such as power generation) are not used for military purposes; protecting people and the environment from the harmful effects of radiation; and developing and promoting peaceful applications of nuclear energy.

2.89 The 2010 NPT Review Conference called on states parties "to ensure that IAEA continues to have all political, technical and financial support so that it is able to effectively meet its responsibility to apply safeguards as required by article III of the Treaty" (Action 33). The ICNND Report went further, picking up on a number of recommendations of the 2008 Zedillo Commission on the role of the IAEA to 2020 and beyond.⁵⁹ It recommended a one-off injection of funds to refurbish the Safeguards Analytical Laboratory; a significant increase in regular budget support, with no "zero

59. *Reinforcing the Global Nuclear Order for Peace and Prosperity: The Role of the IAEA to 2020 and Beyond* (Vienna: IAEA, 2008).

real growth” constraint; and security of future funding sufficient to enable medium to long-term planning (Recommendation 13).

2.90 The Zedillo Commission saw a need for a possible doubling of the regular budget by 2020 to permit the required “expansion of work on nuclear reactors and the fuel cycle, security and safety, and support for meeting basic human needs through nuclear applications and technical cooperation.” It believed that “the statutory functions of the Agency – including nuclear energy, nuclear applications, development, safety, security, and safeguards – should be fully funded from assessed contributions,” and that the Technical Cooperation Fund, while still based on negotiated targets, should be “predictable on a multi-year basis, and assured.” Recipient states, though, should be required to meet some of the costs of technical cooperation.⁶⁰

2.91 The IAEA’s regular budget has seen some modest real growth in recent years, although the core problem of dependence on extra-budgetary (voluntary) contributions remains unresolved. In 2009, the regular budget for 2010 was increased by €8.1 million, a real increase of 2.7 per cent over 2009 levels.⁶¹ This was followed by an increase of €6.9 million for 2012, a real increase of 2.1 per cent over 2011. The regular budget remains inadequate, however, to allow the IAEA to fulfil its responsibilities and to meet the expectations of member states.

2.92 Important programs continue to depend on extra-budgetary contributions. Such funding is unpredictable and its level uncertain, creating problems for program implementation, efficiency and forward planning. Extra-budgetary funding of €113.8 million and €107.4 million is predicted for 2012 and 2013 respectively, while annual regular budget resources for these years are expected to be €331 million. In some key areas, reliance on extra-budgetary funds is chronic – for example, about 80 per cent of Nuclear Security Fund expenditure for 2012 and 2013 is expected to come from extra-budgetary contributions.

2.93 The resources debate is complex and political. The IAEA is under pressure to become more cost-efficient, without letting its attention to safeguards implementation slide. While some states want the agency to pay more attention to nuclear security, others tend to see this as a preoccupation (as with non-proliferation) of the nuclear “haves” and as likely to further diminish the resources available for the development of peaceful uses of nuclear energy, particularly in developing countries. They want priority, and more money, to be directed to technical cooperation. The debate is further complicated by concerns expressed by some states that the IAEA’s evolving state-level approach to safeguards, which is driven at least partly by budget pressures, is discriminatory, subjective and unreliable (see discussion above).

60. *Reinforcing the Global Nuclear Order for Peace and Prosperity*: Recommendations 9(3), 9(5) and 9(6).

61. All the IAEA budget figures in this section are from: IAEA Programme and Budget, 2010–11, especially pp. iii, 1, 3 and 6; http://www.iaea.org/About/Policy/GC/GC53/GC53Documents/English/gc53-5_en.pdf.

2.94 Meanwhile, the new Clean Laboratory Extension to the Environmental Sample Laboratory at Seibersdorf was officially opened on 7 September 2011. This enhances the IAEA's nuclear analytical and forensic capabilities. Construction of a new Nuclear Material Laboratory has also begun at Seibersdorf and is scheduled for completion by 2014. While the former provides assurance that no undeclared activities have occurred, the latter provides assurance that member states are providing accurate information when they make declarations about the types and quantities of nuclear materials held on their territory. The new facility will also be used to train nuclear security professionals from member states.⁶²

2.95 Efforts have continued to expand the IAEA's Network of Analytical Laboratories in order to facilitate the analysis of both nuclear material and environmental swipe samples. The network currently consists of the agency's own facilities and 19 laboratories in eight member states and the European Commission. Since June 2010, laboratories in Australia, Brazil and France have been added to the network; and laboratories in Argentina, Belgium, China, Finland, France, Germany, Hungary, the Republic of Korea and the United States are either undergoing preliminary assessment or are at various stages of the qualification process.⁶³

2.96 The ICNND Report recommended that consideration be given to "an external review, by the Zedillo Commission or a successor panel, of the IAEA's organizational culture, in particular questions of transparency and information sharing" (Recommendation 14). There has been no move to embrace this recommendation.

§2.6 Export Controls

2.6.1 General

2.97 Export controls are intended to reduce the risk that nuclear trade and commerce undertaken for legitimate peaceful purposes will contribute to nuclear weapons programs. They have evolved in response to technological developments and to changes in the nature both of the proliferation threat and of business practices in the nuclear industry. There is now a very widespread acceptance in the international community of the need for national export controls.

2.98 Some export control obligations are anchored in the NPT, in particular the responsibility of NWS, under Article I of the treaty, not "in any way to assist, encourage, or induce any non-nuclear-weapon state to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices." Under Article III of the NPT, all parties undertake not to provide source or special fissionable material, or equipment or material for the processing, use or production of special fissionable material, to any non-NWS for peaceful purposes, unless it is subject to safeguards.

62. *Safeguards for the Next 40 Years*, <http://www.iaea.org/newscenter/news/2011/cleanlabext.html>.

63. GC(55)/16, 26 July 2011, p. 6; GC(56)/14, 25 July 2012.

2.99 Efforts to translate NPT obligations into governance mechanisms led in 1971 to the establishment of the informal *Zangger Committee* (named after its inaugural Swiss Chairman). The Committee's 38 members include the five NPT NWS.⁶⁴ Its decisions are taken by consensus and are not legally binding on members. It reached common understandings on the definition, absent from the NPT, of what constituted "equipment or material especially designed or prepared for the processing, use or production of special fissionable material," and on the conditions and procedures that would govern their export "on a basis of fair commercial competition."⁶⁵ This enabled the committee to create a "Trigger List," which it continues to publish, of nuclear-related materials and equipment, a guide to the identification of items to which safeguards should apply. Committee guidelines establish three conditions of supply: a non-explosive use assurance, an IAEA safeguards requirement, and a re-export provision which requires the receiving state to accept safeguards on the re-exported item.

2.100 The *Nuclear Suppliers Group* (NSG) – discussed in detail below – was established in 1975 after the "peaceful nuclear explosion" by India the previous year provided evidence of the misuse of nuclear technology transferred for peaceful purposes. While the Zangger Committee aimed to promote consistent implementation of states' obligations under Article III.2 of the NPT, and does this by focusing on practical means of defining and meeting those obligations, the NSG assumed a broader mandate and coverage of nuclear-related dual-use items, and is today a much more prominent mechanism. Like its predecessor, the NSG includes the five NPT NWS and works on a consensus basis. Its guidelines are implemented by participating governments in accordance with their national laws and licensing practices.⁶⁶

2.101 These are not the only two currently relevant export control arrangements (leaving aside for present purposes the Proliferation Security Initiative – discussed later in this chapter – which is about export interdiction rather than control in the sense being discussed here). Such arrangements are also implicit, for example, in *nuclear-weapon-free zone* (NWFZ) treaties, discussed later in this chapter, whose clauses variously complement and reinforce the NPT provisions on the export of proliferation sensitive material and equipment.

2.102 More specifically, concerns about nuclear terrorism have prompted significant further changes to the nuclear trade's international legal and regulatory framework. *Security Council Resolution 1540* (discussed in greater detail in Chapter 3) created a legal obligation, binding on all states, to implement "appropriate and effective" export controls.⁶⁷ In September 2011, the third report of the committee established pursuant to

64. Zangger Committee members: Argentina, Australia, Austria, Belarus, Belgium, Bulgaria, Canada, China, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Kazakhstan, South Korea, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States.

65. Zangger Committee, <http://www.zanggercommittee.org/Seiten/default.aspx>.

66. Nuclear Suppliers Group, <http://www.nuclearsuppliersgroup.org/Leng/default.htm>. NSG members: Argentina, Australia, Austria, Belarus, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Kazakhstan, South Korea, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States.

67. S/RES/1540 (28 April 2004).

that resolution noted that 124 states had reported legislative/enforcement measures in place for nuclear materials (compared with just 76 in 2008); while 90 states reported having export licensing provisions in place for nuclear weapons-related materials (compared with 76 in 2008).⁶⁸ The report also noted that many states had put in place laws and regulations governing the delivery of relevant ancillary services, such as brokering or financial services, and strengthened border controls as an aid to enforcement.

2.103 The 2010 NPT Review Conference, in Action 35 of the outcomes document, urged all states to ensure that nuclear-related exports are not misused to assist in the development of nuclear weapons and encouraged them to draw on multilateral guidelines and understandings in developing national export controls (Action 36). A growing number of countries, without themselves being members of the NSG or Zangger Committee, are indeed making use of the guidelines for this purpose. In addition, Action 44 called on all states “to improve their national capabilities to detect, deter and disrupt illicit trafficking in nuclear materials” and “to establish and enforce effective domestic controls to prevent the proliferation of nuclear weapons in accordance with their relevant international legal obligations.”

2.104 These mild exhortations were, however, more than balanced by calls “to observe the legitimate right of all states parties, in particular developing states, to full access to nuclear material, equipment and technological information for peaceful purposes” (Action 38), and to eliminate, with respect to nuclear transfers and international cooperation, “any undue constraints inconsistent with the Treaty” (Action 39).⁶⁹ Regime members insist that their guidelines are consistent with the obligations of all states under the NPT and do not hinder nuclear trade between NPT states parties in compliance with their treaty obligations. The conference president noted that “numerous” states believed “effective and transparent” export controls to be an important means of facilitating “the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy, which, in the view of those states, depends on the existence of a climate of confidence about non-proliferation.”

2.105 Since the 2010 NPT Review Conference, a number of NPT states parties have entered into civil nuclear cooperation agreements with India (Table 2.2), and other such agreements are under negotiation. The exceptionally loose wording of Action 37 (“consider whether a recipient state has brought into force IAEA safeguards obligations in making nuclear export decisions”) seems broad enough to cover this contingency. However, it is not possible to conclude unreservedly, with respect to nuclear-related exports to nuclear-armed states outside the NPT, that such exports have not “directly or indirectly” assisted the development of nuclear weapons in those states (Action 35).

68. *Report of the Committee established pursuant to Security Council Resolution 1540 (2004)*, UN Document S/2011/579, 12 September 2011.

69. NPT/CONF.2010/L.2 (27 May 2010): Draft Final Document: Part I: “Review of the operation of the Treaty,” paragraph 27.

Table 2.2: India's Civil Nuclear Cooperation

State	Date	Type of Cooperation
Argentina	23/09/2010	Agreement on cooperation in peaceful uses of nuclear energy ^a
Canada	29/06/2010	Civil nuclear cooperation deal signed in Toronto (still not ratified) ^b
France	20/02/2006	Joint declaration on the development of nuclear energy for peaceful purposes ^c
	26/01/2008	Joint statement on terms for India's acquisition of nuclear equipment and fuel from France ^d
	30/09/2008	Agreement on the development of peaceful uses of nuclear energy ^e
	19/12/2008	Agreement between the Nuclear Power Corporation of India Limited and French nuclear company AREVA for the supply of 300 tons of uranium to India ^f
	6/12/2010	Agreement on the Protection of Confidentiality of Technical Data and Information relating to cooperation in the peaceful uses of nuclear energy ^g
Kazakhstan	16/04/2011	Civil nuclear cooperation agreement ^h
Mongolia	14/09/2009	Agreement for peaceful uses of radioactive minerals and nuclear energy ⁱ
Namibia	14/08/2009	Agreement on cooperation in peaceful uses of radioactive materials and nuclear energy ^j
South Korea	25/07/2011	Agreement on cooperation in peaceful uses of nuclear energy ^k
Russia	6/12/2008	Agreement to construct four nuclear reactors at Kudankulam ^l
	8/12/2009	Civil nuclear cooperation agreement ^m
	12/3/2010	Agreement on cooperation in peaceful uses of nuclear energy ⁿ
United Kingdom	11/2/2010	Joint declaration on civil nuclear cooperation ^o
United States	10/10/2008	Civil Nuclear Agreement (123 Agreement) ^p

Notes

- a. India, Argentina ink agreement on peaceful uses of nuclear energy, *The Hindu*, September 24, 2010.
- b. Ending Freeze, India, Canada Sign Nuclear Deal, *The Times of India*, June 29, 2010.
- c. Government of India, Press Release, February 21, 2006. <http://pmindia.nic.in/press-details.php?nodeid=396>.
- d. French Embassy in New Delhi, <http://ambafrance-in.org/Presidential-visit-India-France>.
- e. Embassy of India in Paris, <http://www.ambinde.fr/indo-french-relations>.
- f. AREVA, www.aveva.com/EN/group-1476/india-demand-continues-to-grow.html.
- g. AREVA, www.aveva.com/EN/group-1476/india-demand-continues-to-grow.html.
- h. India, Kazakhstan welcome civil nuclear cooperation agreement, *Thaindian News*, 16 April 2011.
- i. Prasad, K.V. India -Mongolia pace for uranium supply, *The Hindu*, September 12, 2009.
- j. Press Information Bureau, Government of India, August 23, 2012.
- k. Indian Ministry of External Affairs, <http://www.mea.gov.in/mystart.php?id=510117869&flg=1>.
- l. Press Information Bureau, Government of India, August 23, 2012.
- m. Press Information Bureau, Government of India, December 8, 2009.
- n. Government of India, Department of Atomic Energy, <http://www.dae.nic.in/?q=node/75>.
- o. India, UK sign joint declaration of nuclear cooperation, *The Economic Times*, February 11, 2010.
- p. US Department of State, <http://2001-2009.state.gov/r/pa/prs/2008/oct/110920.htm>.

2.6.2 Nuclear Suppliers Group

2.106 Taking account of work done by the Zangger Committee, the NSG after its creation in 1975 adopted its own guidelines for nuclear transfers with the aim of ensuring their non-diversion to unsafeguarded nuclear fuel cycle or nuclear explosive activities. Recipient governments were required to provide formal assurances to this effect. The guidelines also required particular caution to be exercised in the transfer of sensitive nuclear facilities, materials and technology; the adoption by recipient governments of appropriate physical protection measures; and incorporation of stronger re-export provisions. The IAEA published the guidelines in 1978 as INFCIRC/254.

2.107 The work of a committee reviewing implementation of Article III at the 1990 NPT Review Conference had a significant impact on the NSG, especially its recommendation that “nuclear supplier states require, as a necessary condition for the transfer of relevant nuclear supplies to non-nuclear-weapon states, the acceptance of IAEA Safeguards on all their current and future nuclear activities” (that is, comprehensive or “full scope” safeguards).⁷⁰

2.108 This, and evidence of Iraq’s active pursuit of a clandestine nuclear weapons program facilitated by the acquisition from NSG participating governments of dual-use items not covered by existing NSG guidelines, prompted the NSG in 1992:

- > To establish and adopt guidelines for the transfer of nuclear-related dual-use equipment, materials, software and related technology that could make “a significant contribution to an unsafeguarded nuclear fuel cycle or nuclear explosive activity.” These were subsequently published as Part 2 of IAEA INFCIRC/254;⁷¹
- > To establish procedures for exchanging dual-use-related export denial notifications; and
- > To make a comprehensive safeguards agreement with the IAEA a condition of supply for future nuclear transfers to non-NWS.

2.109 The comprehensive safeguards provision was subsequently adopted at the 1995 NPT Review and Extension Conference. The requirement applies only to items that are exclusively for nuclear use, the so-called Trigger List items defined in Part I of the NSG control list: nuclear material, nuclear reactors and related equipment, non-nuclear material for reactors, plant and other equipment for the reprocessing, enrichment and conversion of nuclear material, and for fuel fabrication and heavy water production, and technology associated with each of the above items. Indeed, these items are often called trigger list items because they “trigger” full scope safeguards.

2.110 At its plenary meeting in Warsaw in 1992, the NSG agreed that the transfer of trigger list items “should not be authorized to a non-nuclear weapon State unless that State has brought into force an agreement with the IAEA requiring the application of safeguards on all source and special fissionable material in its current and future peaceful nuclear activities.”⁷² Transfers, though, are not prohibited in all cases. Paragraph IV(a) of Part I of the guidelines says that they may take place “in exceptional cases when

70. IAEA Information Circular, 16 September 1997.

71. Nuclear Suppliers Group, <http://www.nuclearsuppliersgroup.org/Leng/default.htm>.

72. Ian Anthony and Vitaly Fedchencko, *Reforming Nuclear Export Controls: The Future of the Nuclear Suppliers Group* (Stockholm: SIPRI, 2004).

they are deemed essential for the safe operation of existing facilities and if safeguards are applied to those facilities.” Different conditions, not including a comprehensive safeguards requirement, apply to transfers of nuclear-related dual-use equipment, material, software and related technology (Part II of the control list).

2.111 Issues of Consistency and Credibility: The Case of India. International export control regimes are sometimes portrayed by non-member states as supplier cartels whose aim is to intensify the existing imbalance between non-proliferation and disarmament obligations by denying states access to nuclear technology and the peaceful uses of nuclear energy in contravention of Article IV of the NPT. Outreach programs have been only modestly successful in changing this image and in encouraging non-member states to adopt the regimes’ export control lists and guidelines as a reasonably straightforward way of meeting their NPT non-proliferation obligations.

2.112 The NSG though has a particular credibility problem, a result of the decision taken in September 2008, under strong US pressure, to exempt India from the NSG’s requirement for application of comprehensive safeguards to trigger list items. It has been argued that, in doing so, the NSG missed an opportunity “to commit India to a responsible non-proliferation policy.” The United States had of course just negotiated a bilateral peaceful uses (“123”) agreement with India which exempted India from the undertaking given by all NPT non-NWS “to disavow nuclear weapons programs in order to access civil nuclear technologies.”⁷³ The agreement imposed no constraint either on India’s nuclear weapons program: “this Agreement shall be implemented in a manner so as not to hinder or otherwise interfere with... military nuclear facilities” (Article 4); or on its right to reprocess transferred nuclear material: “the Parties grant each other consent to reprocess or otherwise alter in form or content nuclear material transferred pursuant to this Agreement” (Article 6.iii).

2.113 The NSG decision to exempt India from its nuclear trade restrictions was nonetheless based on a negotiated series of commitments by India: to separate its civilian from its military nuclear facilities and to place some civilian facilities under IAEA safeguards; to sign and implement an AP with respect to civilian nuclear facilities under safeguards; to adhere to NSG guidelines and control lists; to refrain from transferring enrichment and reprocessing technologies to states that do not have them; to maintain a unilateral moratorium on nuclear tests; and to work collaboratively with other states on an FMCT.

2.114 While there are clearly some positives on this list, as the ICNND argued, “the main substantive problem with the deal was that it removed all non-proliferation barriers to nuclear trade with India in return for very few significant non-proliferation and disarmament commitments by it. The view was taken that partial controls – with civilian facilities safeguarded – were better than none. But New Delhi was not required, for example, to commit to sign the CTBT or to undertake a moratorium on production of fissile materials, either unilaterally or even upon reciprocation by Pakistan and China.”⁷⁴

73. Pierre Goldschmidt, “NSG Membership: A Criteria-based Approach for Non-NPT States,” 24 May 2011, <http://carnegieendowment.org/publications/index.cfm?fa=view&id=44147>.

74. ICNND, *Eliminating Nuclear Threats*, paragraph 10.7.

2.115 India's formal recognition by NPT nuclear supplier countries as a fully credentialed nuclear trading partner outside the established global non-proliferation and disarmament framework could not but damage the integrity of the NPT and the NSG's credibility as an instrument for reliable and consistent implementation of the treaty's Article III safeguards provisions. While India has an undeniably superior non-proliferation record to Pakistan's, and is more transparent than Israel, it is still only a special case because the NSG has chosen to make it one. In doing so, the NSG has stoked the fires of those who are all too ready to believe that the NPT and its supporting export control regimes are simply tools for the selective enforcement of non-proliferation norms by an elite group of countries which is ready to bend and change its own rules for commercial and strategic advantage.

2.116 During a visit to India in November 2010, President Obama declared his support for Indian membership of the NSG and three other export control regimes – related to missile proliferation (MTCR), chemical and biological weapons (Australia Group), and conventional weapons (Wassenaar Arrangement). While the NSG is India's priority, it considers itself well-qualified for membership of all four regimes given its firm commitment to non-proliferation, effective export controls and capacity to produce regime-regulated goods and technologies.

2.117 The NSG first considered this question at its meeting in Noordwijk in June 2011. No decision was expected and none was taken. The United States apparently suggested two possible ways forward for the group: "one would be to revise the admission criteria 'in a manner that would accurately describe India's situation.' The other would be to 'recognize' that the criteria, known as 'Factors to be Considered', are not 'mandatory criteria' and that a candidate for membership does not necessarily have to meet all of them."⁷⁵ One criterion for membership of the group is that a country should be a fully compliant party to the NPT or to a NWFZ treaty. Early signs are that most NSG members will find this criterion especially hard to overlook. While there is support for India's membership within the NSG, there is no consensus. No evidence of progress was visible at the NSG's most recent plenary meeting in Seattle on 21–22 June 2012. A public statement issued at the end of the meeting said only that the NSG "continued to consider all aspects of the implementation of the 2008 statement on Civil Nuclear Cooperation with India and discussed the NSG relationship with India."⁷⁶

2.118 The NSG's credibility problems are compounded by China's apparent determination to supply more nuclear reactors to Pakistan. When it joined the group in 2004, China formally advised the NSG of an existing commitment to supply two nuclear reactors (Chashma I and II) to Pakistan. As these were not new commitments, China argued that they were effectively "grandfathered" under the NSG's full scope safeguards guidelines.⁷⁷ No mention was made at the time of plans for further reactor sales but, in September

75. Daniel Horner, "NSG Revises Rules on Sensitive Exports," July/August 2011,

http://www.armscontrol.org/act/2011_%2007-08/Nuclear_Suppliers_Group_NSg_Revises_Rules_Sensitive_Exports.

76. National Nuclear Security Administration, Nuclear Suppliers group Plenary Meeting Public statement, Seattle, 22 June 2012. <http://nnsa.energy.gov/mediaroom/pressreleases/nsgstatement062212>.

77. The so-called grandfather clause refers to paragraph 4 (c) of Part I of the NSG guidelines which says that the full scope safeguards requirement on trigger list items does not apply to agreements or contracts drawn up on or before 3 April 1992.

2010, China announced its intention to supply two additional reactors (Chashma III and IV) to Pakistan.⁷⁸ Chashma III is nearing completion, while Chashma IV has progressed to advanced site engineering. All four reactors are subject to full IAEA safeguards.

2.119 While China may continue to insist that any number of nuclear reactors can be “grandfathered,” consistent with NSG guidelines, under its 1991 nuclear cooperation agreement with Pakistan, its NSG colleagues are unlikely to find this argument compelling. They are not, however, in a strong position to argue in the aftermath of their decision on India, and have no formal dispute resolution mechanism at their disposal.

2.120 Members can be expected to continue gently to press China for further information (as they did most recently in Seattle in June 2012⁷⁹) but, with the India exception now firmly in place, preceded by the US–India civil nuclear agreement and Russia’s own earlier recourse to the “grandfather” clause as a justification for its nuclear trade with India in the 1990s, it would be surprising if China felt under any particular pressure to change course. Meanwhile, the NSG’s adoption in 1992 of the comprehensive safeguards requirement, “hailed at the time as a significant accomplishment,” now has a decidedly hollow ring to it, giving NPT parties “good reason to complain because the actions of NSG members have made a mockery of Article IV of the NPT by giving non-NPT parties India and Pakistan the same benefits as NPT parties but without the accompanying obligations.”⁸⁰

2.121 The ICNND Report, while recognizing the flaws in the India exception, suggested that the NSG might salvage the situation by developing “a criteria-based approach to cooperation agreements with states outside the NPT, taking into account factors such as ratification of the Comprehensive Test Ban Treaty (CTBT), willingness to end unsafeguarded fissile material production, and states’ records in securing nuclear facilities and materials and controlling nuclear-related exports” (Recommendation 15). This would establish conditions for further exceptions based on new rules, rather than on an exemption from old ones.

2.122 Pierre Goldschmidt gives even more specific shape to this recommendation by suggesting that, to become a member of the NSG, a non-NPT state should, *inter alia*:⁸¹

- > Undertake to comply with the requirements of Articles I, III.2 and VI of the NPT;
- > Have in force a voluntary offer agreement with the IAEA whereby the non-NPT state undertakes to place all new nuclear facilities located outside existing military nuclear sites on the list of facilities eligible to be safeguarded by the IAEA under INFCIRC/66-type safeguards agreements;
- > Have ratified an AP to its safeguards agreement;
- > Not be in material breach of an IAEA safeguards agreement;
- > Commit not to export or transfer items specified in the NSG Guidelines to a non-NWS

78. “China says Pakistan nuclear deal ‘peaceful,’” *BBC News*, 17 June 2010, <http://www.bbc.co.uk/news/10340642>.

79. “China Brushes Off Fears Over Reactor Sales to Pakistan,” *Global Security Newswire*, 27 June 2012.

80. Fred McGoldrick, “The Road Ahead for Export Controls: Challenges for the Nuclear Suppliers Group,” January/February 2011, <http://www.armscontrol.org/print/4642>.

81. Goldschmidt, “NSG Membership.”

- unless such state has a CSA and AP in force with the IAEA;
- > Have in place legal measures to ensure the effective and uninterrupted implementation of the NSG Guidelines, including export licensing regulations, enforcement measures and penalties for violations;
 - > Commit to share information on “catch all” denials with the IAEA and the members of the NSG;
 - > Have signed and ratified the CTBT;
 - > Commit, pending the entry into force of the CTBT, to adhere to a unilateral moratorium on nuclear explosion tests;
 - > Fully implement all UN Security Council resolutions adopted under Chapter VII of the UN Charter that relate to nuclear proliferation or terrorism (in particular, Resolution 1540);
 - > Adhere to the MTCR and have in place the corresponding export control legislation;
 - > Have ratified the CPPNM, as amended in 2005;
 - > Be party to ICSANT;
 - > Agree to the immediate commencement of negotiations on a treaty banning the production of fissile material for nuclear weapons purposes with a view to its conclusion within five years.

2.123 The challenge will be to persuade Pakistan, and Israel should it show any interest in joining the NSG, to accept terms more rigorous than India’s. It will be just as challenging to persuade India to make additional commitments (for example, to ratify the CTBT and to end unsafeguarded fissile material production) when it already has the deal it wants.

§2.7 Nuclear-Weapon-Free Zones (NWFZ)

2.7.1 General

2.124 Nuclear-weapon-free zones deepen and extend the scope of the NPT and embed the non-nuclear-weapon status of NPT states parties in additional treaty-based arrangements.⁸² This is why several NPT review conferences have affirmed repeated support for existing NWFZs and encouraged the development of additional NWFZs. The first NWFZ was established in (uninhabited) Antarctica in 1959. Since then, five more have been established in Latin America and the Caribbean, the South Pacific, Southeast Asia, Africa, and Central Asia. Mongolia has also declared itself a national NWFZ in law. All NWFZs seek to do two minimum things. First, they prohibit the acquisition, testing, stationing and use of nuclear weapons within the designated territory of the zone. Second, they include protocols for binding the NWS to pledges not to use or threaten to use nuclear weapons against members of the NWFZ.⁸³

82. Ramesh Thakur, ed., *Nuclear Weapons-Free Zones* (London/New York: Macmillan and St. Martin’s Press, 1998).

83. In addition to the treaties mentioned in this paragraph, the Outer Space Treaty (1967) and the Seabed Arms Control Treaty (1972) prohibit the emplacement of nuclear weapons and other weapons of mass destruction in space and on the ocean floor respectively.

2.125 The 2010 NPT Review Conference encouraged the establishment of further NWFZs. It also encouraged “all concerned States... to ratify the nuclear-weapon-free zone treaties and their relevant protocols, and to constructively consult and cooperate to bring about the entry-into-force of the relevant legally binding protocols of all such nuclear-weapon-free zone treaties which include negative security assurances” (Action 9). New NWFZs have been proposed for the Middle East (discussed below) and Northeast Asia (also discussed below). The InterAction Council of Former Heads of State and Government has also recommended the exploration of a NWFZ in the Arctic.⁸⁴ Russia ratified Protocols One and Two of the Treaty of Pelindaba in March 2011. There has been no other ratification by any NWS of existing NWFZ protocols since the 2010 NPT Review Conference. On 2 May 2011, President Obama did submit the protocols to the treaties of Rarotonga and Pelindaba to the US Senate for ratification – fifteen years after signature – but there is no indication of when, if at all, Senate ratification might be expected.

2.126 Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean. The Treaty of Tlatelolco prohibits the testing, use, manufacture, production or acquisition by any means, as well as the receipt, storage, installation, deployment and any form of possession of any nuclear weapon, by Latin American and Caribbean countries. The parties are also required to conclude agreements individually with the IAEA for the application of safeguards to their nuclear activities. The IAEA has the exclusive power to carry out special inspections.

Table 2.3: NWS Ratification of the Treaty of Tlatelolco

Country	Protocol One	Protocol Two
China	Not Applicable	06/02/1974
France	24/08/1992	22/03/1974
Russia	Not Applicable	08/01/1979
United Kingdom	11/12/1969	11/12/1969
United States	23/11/1981	12/05/1971

Source: SIPRI. For the current status of the accession/ratification of the treaty by eligible states, see: <http://www.opanal.org/opanal/Tlatelolco/P-Tlatelolco-i.htm>.

2.127 The treaty includes two protocols. The first, by which parties agree to apply key provisions of the treaty to their territories within the zone, has been signed and ratified by France, the United Kingdom and the United States. All NWS have signed and ratified Protocol II, which promises respect for the treaty’s aims and provisions, and provides negative security assurances (NSAs: pledges not to attack non-NWS with nuclear weapons) to states parties. The United States, however, did so with two significant reservations. First, it sought to preserve its interpretation of “the relevant rules of international law” under which contracting parties retained “exclusive power and legal

84. Thomas Axworthy (Secretary-General of the InterAction Council), “A Nordic-Canadian nuclear-weapon-free zone,” *Embassy* (Ottawa), 28 November 2012, <http://www.embassynews.ca/opinion/2012/11/27/a-nordic-canadian-nuclear-weapon-free-zone/42901>.

competence... to grant or deny non-Contracting Parties transit and transport privileges.” Second, it qualified its NSA by making clear that an armed attack by a contracting party in which it was assisted by a NWS would be incompatible with the contracting party’s own obligations under the treaty.⁸⁵

2.128 There has been no recorded violation of the treaty by states parties. However, in February 2012, Argentina accused the United Kingdom of violating its commitment under Protocol I by sending a nuclear-capable submarine to the South Atlantic. UK Deputy Prime Minister Nick Clegg dismissed the allegation as baseless.⁸⁶

2.129 **The South Pacific Nuclear Free Zone Treaty.** The Treaty of Rarotonga prohibits the manufacture or acquisition of any nuclear explosive device, as well as possession or control of such device, by the parties anywhere inside or outside the zone, which is defined in an annex. The parties also undertake not to supply nuclear material or equipment, unless subject to IAEA safeguards, and to prevent in their territories the stationing as well as the testing of any nuclear explosive device. They undertake not to dump, and to prevent the dumping of, radioactive waste and other radioactive matter at sea anywhere within the zone. Each party remains free to allow visits, as well as transit, by foreign ships and aircraft regardless of whether they are conventionally or nuclear powered and whether they may or may not be carrying nuclear weapons. The treaty is open for signature by members of the Pacific Islands Forum. Three eligible states (Marshall Islands, Federated States of Micronesia, and Palau – which, as former members of a UN trusteeship administered by the United States, are now in “free association” with the United States) have not signed the treaty.

Table 2.4: NWS Ratification of the Treaty of Rarotonga

Country	Protocol One	Protocol Two	Protocol Three
China	Not Applicable	21/10/1988	21/10/1988
France	20/09/1996	20/09/1996	20/09/1996
Russia	Not Applicable	21/04/1988	21/04/1988
United Kingdom	19/09/1997	19/09/1997	19/09/1997
United States	Yet to ratify	Yet to ratify	Yet to ratify

Source: SIPRI. For the current status of the accession/ratification of the treaty by eligible states, see: <http://www.forumsec.org/resources/uploads/attachments/documents/SPNFZ%20Status%20Report.pdf>.

2.130 The treaty includes three additional protocols. Protocol II (which provides NSAs to states parties) and Protocol III (which bans nuclear testing anywhere in the zone) have been ratified by all NWS other than the United States. Protocol I, by which parties agree to apply key provisions of the treaty to their territories within the zone, has been ratified by France and the United Kingdom.

85. <http://www.armscontrol.org/documents/tlatelolco>.

86. “Argentina submarine claim baseless’, says Nick Clegg,” *BBC News*, 27 March 2012, <http://www.bbc.co.uk/news/uk-politics-17524714>.

2.131 US Secretary of State Hillary Clinton told the 2010 NPT Review Conference on 3 May 2010 that the administration was preparing to submit the treaty protocols to the US Senate for approval. President Obama submitted all three protocols to the Senate in May 2011 with a view to securing the Senate's consent to ratification. The Senate has so far taken no action on the matter.

2.132 Questions have been raised about possible or potential violations of the South Pacific (and African and Central Asian) NWFZ treaties with various decisions and agreements to sell uranium to India, which is not party to the NPT. The three zones prohibit the transfer of source or special fissile material and equipment to any non-NWS that is not subject to comprehensive IAEA safeguards under Article III.1 of the NPT. Australia (and – in the case of the Pelindaba and Semipalatinsk Treaties – South Africa, Namibia, and Kazakhstan) have either decided in principle or have signed agreements to sell uranium to India, or are reported as contemplating doing so.

2.133 Some critics argue that these possibly NWFZ-non-compliant agreements confirm that the India-US civil nuclear cooperation deal drove a cart and horse through the NPT regime's prohibitions on trade in nuclear material with non-NPT countries. But others argue that, legally speaking, India has no status under the NPT as either a NWS or a non-NWS, and therefore is not covered by such NWFZ prohibitions; moreover, it does apply facility-specific IAEA safeguards to some of its civilian nuclear activities. They further argue that the 2008 NSG "clean waiver" granted to India confirms this interpretation that trade in nuclear materials with India is not inconsistent with the NPT.⁸⁷

2.134 **Treaty on the Southeast Asia Nuclear-Weapon-Free Zone.** The Treaty of Bangkok prohibits the development, manufacture, acquisition or testing of nuclear weapons by the parties anywhere inside or outside the zone, as well as the stationing and transport of nuclear weapons in or through the zone. Each state party may decide for itself whether to allow visits and transit by foreign ships and aircraft. The parties undertake not to dump at sea, or discharge into the atmosphere anywhere within the zone, any radioactive material or waste, or to dispose of radioactive material on land. The parties are also required to conclude agreements individually with the IAEA for the application of full-scope safeguards to their peaceful nuclear activities. The zone includes not only the territories but also the continental shelves and exclusive economic zones (EEZs) of the states parties. The treaty is open for signature by all states of Southeast Asia.

2.135 The one protocol to the treaty is open for signature by the five NWS and commits the parties to "respect the Treaty... and not to contribute to any act which constitutes a violation of the Treaty or its Protocol." The protocol also commits the parties not to use or threaten to use nuclear weapons against any state party to the treaty or within the zone itself. None of the five NWS has ratified the protocol (although see reference to China below). Prominent among their concerns is the geographical scope of the treaty (which includes states parties' continental shelves and EEZs) and its implications for

87. For the contrasting legal analyses, see Donald R. Rothwell, *Australia's Obligations under the South Pacific Nuclear Free Zone Treaty and Uranium Sales to India* (Melbourne: ICAN, November 23, 2011), www.icanw.org/files/ICANW~Legal%20Opinion~FINAL.pdf; and Kalman A. Robertson, "The Legality of the Supply of Australian Uranium to India," *Security Challenges* 8:1 (Autumn 2012), pp. 25–34. Although the two analyses are specifically in the context of the South Pacific zone, because the other zones have generally equivalent clauses, they are broadly relevant to all three cases.

freedom of navigation in international waters.

2.136 Long-running negotiations were expected to conclude with a signing ceremony at the Foreign Ministers' Meeting of the Association of South East Asian Nations (ASEAN) in Phnom Penh on 12 July 2012, but late submission of reservations by France, Russia, the United Kingdom and the United States led to its postponement.⁸⁸ A rescheduled signing ceremony was again postponed on the eve of the ASEAN Summit in Phnom Penh in November 2012,⁸⁹ much to the ASEAN nations' disappointment.⁹⁰ China's concerns about the implications of the treaty's geographic area of application for its territorial claims in the South China Sea have been addressed separately via a Memorandum of Understanding which clarifies "the understanding among the States parties and China on the application of the treaty and the protocol."⁹¹

2.137 African Nuclear-Weapon-Free Zone Treaty. The Treaty of Pelindaba prohibits research, development, manufacture and acquisition of nuclear explosive devices and the testing or stationing of any nuclear explosive device. Each party remains free to allow visits and transit by foreign ships and aircraft. The treaty also prohibits any attack against nuclear installations. The parties undertake not to dump or permit the dumping of radioactive waste and other radioactive matter anywhere within the zone. Each party should individually conclude an agreement with the IAEA for the application of comprehensive safeguards to its peaceful nuclear activities. The zone includes the territory of the continent of Africa, island state members of the African Union (AU) and all islands considered by the AU to be part of Africa. The treaty is open for signature by all states of Africa.

2.138 Six states – Cameroon, Chad, Ghana, Guinea-Bissau, Namibia and Zambia – have acceded to the treaty since the 2010 NPT Review Conference. The treaty currently has 36 states parties, with 18 countries yet to ratify it. Morocco signed and ratified the treaty in April 1996, but is not a member of the African Union.

Table 2.5: NWS Ratification of the Treaty of Pelindaba

Country	Protocol One	Protocol Two	Protocol Three
China	06/09/1996	06/09/1996	Not Applicable
France	31/07/1997	31/07/1997	31/07/1997
Russia	11/03/2011	11/03/2011	Not Applicable
United Kingdom	27/02/2001	27/02/2001	Not Applicable
United States	Yet to ratify	Yet to ratify	Not Applicable

Source: SIPRI. For the current status of the accession/ratification of the treaty by eligible states, see: http://au.int/en/sites/default/files/pelindaba%20Treaty_0.pdf.

88. Xinhua, "4 nuke states postpone signing SEANWFZ protocol next week," 8 July 2012, http://news.xinhuanet.com/english/world/2012-07/08/c_131702340.htm.

89. "Powers Not Yet Expected to Sign SE Asia Nuke-Free Zone Protocol," *Global Security Newswire*, 15 November 2012.

90. Xinhua, "No signing of SE Asia nuke-free zone protocol at upcoming 21st ASEAN Summit," 15 November 2012, http://news.xinhuanet.com/english/world/2012-11/15/c_131976633.htm.

91. Xinhua, "4 nuke states postpone signing SEANWFZ protocol next week."

2.139 The treaty includes three additional protocols. Protocols I (which provides NSAs to states parties) and II (which bans nuclear testing anywhere in the zone) have been ratified by all NWS other than the United States. Protocol III, by which parties agree to apply key provisions of the treaty to their territories within the zone, has been ratified by all eligible states other than Spain. Secretary Clinton told the 2010 NPT Review Conference on 3 May 2010 that the administration was preparing to submit the treaty protocols to the US Senate for approval. President Obama submitted Protocols I and II to the US Senate in May 2011 with a view to securing the Senate's consent to ratification. The Senate has so far taken no action on the matter.

2.140 **Central Asian Nuclear-Weapon-Free Zone.** The Treaty of Semipalatinsk requires the parties not to research, develop, manufacture, stockpile or otherwise acquire, possess or have control over any nuclear weapon or other nuclear explosive device anywhere. There are five parties to the treaty: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

2.141 The treaty has a single protocol (NSAs) which is not yet open for signature. Three NWS (France, the United Kingdom and the United States) do not recognize the zone. They argue that Article XII, which says that the treaty "does not affect the rights and obligations of the Parties under other international treaties which they may have concluded prior to the date of the [treaty's] entry into force," would allow the stationing of Russian nuclear weapons in Central Asia if the Tashkent (Collective Security Organization) Treaty is invoked.⁹²

2.142 **Mongolia's Nuclear-Weapon-Free Status.** In September 2012, the five NWS and Mongolia signed "parallel political declarations regarding Mongolia's self-declared nuclear-weapon-free status."⁹³ The P5, who have not before recognized a single-country NWFZ, reaffirmed security assurances made in connection with Mongolia's nuclear-weapon-free status at the UN General Assembly in October 2000 and agreed "to respect the nuclear weapon-free status of Mongolia and not to contribute to any act that would violate it." Mongolia confirmed that it was fully compliant with its obligations as a non-NWS party to the NPT and that it had in place laws giving it "the domestic legal status of being free of nuclear weapons."⁹⁴

2.143 **Proposed Northeast Asia Nuclear-Weapon-Free Zone.** A NWFZ has been suggested for Northeast Asia as a means of finessing the dilemma over what to do with North Korea's nuclear weapons. Any formal acceptance of North Korea's possession of nuclear weapons would make it extremely difficult to avoid proliferation to South Korea and Japan, with commensurately enhanced risk of an armed conflict in the region in which nuclear weapons are used. But if international policy is to focus on

92. Gaukhar Mukhatzhanova, *Implementation of the Conclusions And Recommendations for Follow-On Actions Adopted at the 2010 NPT Review Conference Disarmament Actions 1-22: Monitoring Report* (Monterey, CA: James Martin Center for Nonproliferation Studies, Monterey Institute of International Studies, April 2012), p. 44.

93. US Department of State, "Five Permanent UN Representatives Support Mongolia's Nuclear-Weapon-Free Status," *Media Note*, 18 September 2012, <http://www.state.gov/r/pa/prs/ps/2012/09/197873.htm>.

94. US, "Five Permanent UN Representatives Support Mongolia's Nuclear-Weapon-Free Status"; AFP, "Major powers recognize Mongolia as nuclear weapons free," *Bangkok Post*, 18 September 2012, <http://www.bangkokpost.com/news/asia/312850/major-powers-recognize-mongolia-as-nuclear-weapons-free>.

verifiably and permanently reversing North Korea's nuclearization, then Pyongyang's security fears of an external attack must be addressed.

2.144 One way to do this could be to establish, as part of a comprehensive agreement on peace and security in Northeast Asia, a regional NWFZ that includes the two Koreas, Japan and, possibly, Mongolia. Consistent with the provisions of other NWFZ treaties, these states would undertake not to acquire, manufacture, test or deploy nuclear weapons or to allow them to be stored on their territory. NWS parties to the treaty (China, Russia and the United States) would agree not to store nuclear weapons in the zone and otherwise to support the objectives of the treaty. They would extend negative security assurances to non-NWS parties to the treaty who were observing its terms. France and the United Kingdom would be asked similarly to commit to treaty provisions that applied to NWS.

2.145 To accommodate the required dismantling of North Korea's nuclear weapons program, the treaty might include a transition period and be "structured so that it goes into effect when the three nuclear weapons states (the US, Russia and China) and the two non-nuclear states (Japan and South Korea) ratify it" but reserves for Japan and South Korea "the right to withdraw from the treaty after three or five years if the provisions were not being enforced effectively throughout the Korean Peninsula."⁹⁵

2.7.2 Middle East

2.146 The 2010 NPT Review Conference emphasized "the importance of a process leading to full implementation of the 1995 Resolution on the Middle East." It further agreed that the UN Secretary-General and the co-sponsors of the 1995 resolution (Russia, the United Kingdom and the United States), in consultation with the states of the region, would convene a conference in 2012, "to be attended by all States of the Middle East, on the establishment of a Middle East zone free of nuclear weapons and other weapons of mass destruction." The NPT Review Conference Action Plan provided, among other things, for the appointment of a facilitator "with a mandate to support implementation of the 1995 Resolution by conducting consultations with the States of the region... and undertaking preparations for the convening of the 2012 Conference."

2.147 A facilitator (Jaakko Laajava, Under-Secretary of State in Finland's Ministry of Foreign Affairs) has since been appointed and a venue (Helsinki) chosen, but efforts to convene a conference in 2012 ultimately stalled in the face of growing regional instability and the absence of agreement on what the conference might reasonably be expected to achieve. If, as now seems likely, no Middle East WMDFZ conference takes place before the next NPT Preparatory Committee meeting in Geneva in April 2013, the mood of that meeting will be much influenced by exchanges on the consequences of a possible unravelling of the deal which produced a consensus outcome at the NPT Review Conference in 2010, and agreement to the treaty's indefinite extension in 1995.

95. Morton H. Halperin, "A Proposal for a Nuclear Weapons-Free Zone in Northeast Asia," Nautilus Institute, 3 January 2012, <http://nautilus.org/napsnet/napsnet-special-reports/a-proposal-for-a-nuclear-weapons-free-zone-in-northeast-asia/>.

2.148 Meanwhile, as part of international efforts to create suitable conditions for an initial gathering of regional states, the EU sponsored Track II informal seminars (July 2011 and November 2012) in Brussels on a Middle East WMD/FZ conference; and the IAEA convened (November 2011) a long-delayed forum in Vienna on “Experience of Possible Relevance to the Creation of a Nuclear-Weapon-Free Zone in the Middle East.” Forum participants, which included “all States of the Middle East” apart from Iran, proposed “to continue working towards the establishment of a NWFZ in the Middle East; to consider declarations of good intentions as a first step to break the current stalemate; to make the best and most constructive use of every opportunity on the international agenda; and to identify specific and practical confidence-building measures.”⁹⁶

2.149 The Arab League elected not to run its traditional Israeli Nuclear Capabilities Resolution at the last two IAEA General Conferences (2011 and 2012). The resolution calls on Israel to join the NPT and to place all its nuclear facilities under IAEA safeguards. It was last adopted by a narrow margin in 2009 and defeated in 2010. The decision not to table the resolution in 2011 was presented as part of an effort to improve prospects for a Middle East WMD/FZ conference, although it is also likely to have been driven, on both occasions, by the assessment that it would be defeated.

2.150 The UN General Assembly, on 2 December 2011, adopted without vote a resolution on the establishment of a nuclear-weapon-free zone in the region of the Middle East (A/RES/66/25).⁹⁷ Israel, in an explanation of vote, said that it remained “committed to a vision of the Middle East developing eventually into a zone free of Chemical, Biological, and Nuclear weapons as well as ballistic missiles.” It suggested that the process begin with “modest” confidence-building measures and be followed by “the establishment of peaceful relations, reconciliation, mutual recognition and good neighborliness, and complemented by conventional and non-conventional arms control measures.” A “mutually verifiable” NWFZ could follow “in due course.”⁹⁸ In December 2012, Israel again joined consensus on the resolution, noting the fragility of regional security and the absence of a mechanism for regional dialogue, without which it “was not possible to build confidence and defuse tension.”⁹⁹

2.151 A three-day Middle East WMD/FZ Conference was tentatively scheduled to begin on 17 December 2012 in Helsinki. On 23 November, the United States announced that there would be no conference in 2012 “because of present conditions in the Middle East and the fact that states in the region have not reached agreement on acceptable conditions for a conference.”¹⁰⁰ State Department spokeswoman Victoria Nuland said that the United States “would not support a conference in which any regional state would be subject to pressure or isolation” (which generated speculation as to what would have

96. IAEA, “Forum on Nuclear-Weapons-Free-Zone in the Middle East Closes,” <http://www.iaea.org/newscenter/news/2011/nwzf-forum-closes.html>.

97. “General Assembly, gravely concerned about status of UN disarmament machinery, especially in Conference on Disarmament, invites States to explore options” <http://www.un.org/News/Press/docs//2011/ga11182.doc.htm>.

98. Beatrice Fihn, ed., *The 2010 NPT Action Plan Monitoring Report* (Geneva: Geneva Centre for Security Policy, Swiss Federal Department of Foreign Affairs, and Reaching Critical Will, 2012), p. 48.

99. “General Assembly, in wake of high-stakes debate in First Committee that championed common positions but fell short of bridging divides, adopts 58 texts,” <http://www.un.org/News/Press/docs//2012/ga11321.doc.htm>.

100. “No Middle East WMD Meeting This Year: U.S.,” *Global Security Newswire*, 26 November 2012, quoting US State Department spokeswoman Victoria Nuland.

been said if Iran rather than Israel had been likely to be the principal focus of attention). Iran confirmed its willingness to attend a conference in Helsinki in December, although cynics believe it did this only once it was confident no conference would take place. Of the other principal co-sponsors, Russia was critical of the decision to postpone and of the absence of an alternative date for the conference; UN Secretary-General Ban Ki-moon called for the conference to be held early in the new year; and the United Kingdom welcomed conference facilitator Laajava's commitment to conduct further consultations with a view to convening a conference in 2013.¹⁰¹

2.152 As with North Korea, it has been suggested that because "the logic of using force to secure a nuclear monopoly flies in the face of international norms," Israel could trade its nuclear weapons for a stop to Iran's developing nuclear weapons capability by agreeing to a Middle East NWFZ.¹⁰² But as in Northeast Asia, this begs the question of whether a NWFZ can create conditions of common security in a region, or whether it can only be negotiated in conditions free of tension in the region. The present bleak security and political environment in the Middle East is particularly inauspicious for the creation of a NWFZ.¹⁰³

- > No NWFZ has previously been established among countries at war, as is the formal state of relations between Israel and Syria;
- > No NWFZ has previously been established when a regionally significant state is convulsed in a civil war (Syria);
- > No NWFZ has been established among states that refuse to recognize one another and do not engage in diplomatic relations, as is the case with Israel and several of its neighbours;
- > No NWFZ has been established among states one of whom (Israel) faces the dedicated pursuit of the destruction of its very existence by some of the other political actors in the region. It is difficult to see how negotiations can begin until all states explicitly accept the existence of Israel;
- > No NWFZ has been established by states not in compliance with safeguard agreements (Iran, Syria);
- > No NWFZ has been established with a state pursuing a nuclear weapons breakout capability (Iran);
- > No NWFZ has been established with a state that is not party to the NPT (Israel);
- > No NWFZ has been established to include a state that already has nuclear weapons stationed on its territory within an alliance which explicitly practices burden-sharing on tactical nuclear weapons stewardship (Turkey);

101. "No Middle East WMD Meeting This Year: U.S.," Paul Meyer, "Mideast nuclear-free vision turns into a mirage," *Toronto Star*, 28 November 2012.

102. Uri Bar-Joseph, "Why Israel Should Trade Its Nukes," *Foreign Affairs*, 25 October 2012, <http://www.foreignaffairs.com/articles/138224/uri-bar-joseph/why-israel-should-trade-its-nukes>.

103. These are drawn from an amalgam of (1) Pierre Goldschmidt, "A Top-Down Approach to a Nuclear Weapons Free Zone in the Middle East," and (2) Ariel Levite, "Reflections on 'The Regional Security Environment and Basic Principles for the Relations of the Members of the Zone': papers presented at the EU Non-proliferation Consortium seminar, Brussels, 5-6 November 2012, <http://carnegieendowment.org/2012/11/05/top-down-approach-to-nuclear-weapons-free-zone-in-middle-east/ece2> and www.nonproliferation.eu/documents/backgroundpapers/levite.pdf; and (3) updated application of the analyses of NWFZ in Ramesh Thakur, "Stepping Stones to a Nuclear-Weapon-Free World," in Thakur, ed., *Nuclear Weapons-Free Zones*, pp. 3-32

- > The Binyamin Netanyahu government in Israel seems more interested in a military solution to its security challenges, including the threat of a preventive strike on Iran, than in exploring diplomatic options;
- > The Arab Awakening has produced more ferment, volatility, weakening of state governance and social upheaval in the entire region than has been seen for decades. Not surprisingly, the depth and speed of changes have produced much unrest and anxiety among both the leaders and the people of the region;
- > The role and salience of extra-regional powers – the United States, Russia, China – are changing, heightening the sense of flux in the region;
- > The Sunni–Shia divide has sharpened;
- > Finally, Egypt, a leading proponent of a Middle East NWFZ, has yet to sign the IAEA Additional Protocol and the Chemical Weapons Convention, or ratify the CTBT, the Biological and Toxin Weapons Convention and the African NWFZ. In addition, the Muslim Brotherhood, now influential in the current Egyptian government, has previously called for Egypt to develop its own deterrent, and a retired general called for the same and advocated that Egypt should emulate Iran to “deceive the international community.”¹⁰⁴

2.153 Against the backdrop of such a formidably difficult regional security environment, a conference, when and if it happens, will be significant in and of itself. Should it prove capable of providing a foundation for ongoing dialogue, so much the better. As an NPT non-state party, Israel is particularly wary of the proposal’s origins in a document to which it did not subscribe and which, with the reluctant agreement of the United States, singled Israel out for criticism. There was always a good chance that a meeting in Helsinki in December would simply have given Arab states, and Iran, another opportunity to condemn Israel’s nuclear opacity. But civil war in Syria and its expanding regional impact, as well as developments in Gaza, have further reduced the already poor prospects for a constructive exchange of ideas on Middle East WMD and related security issues.

§2.8 Non-NPT Treaties and Mechanisms

2.8.1 Proliferation Security Initiative (PSI)

2.154 The Proliferation Security Initiative (PSI) was established by the United States in 2003 with a view to preventing the shipment of WMD, their delivery systems and associated materials to state and non-state actors of concern. Its core objectives are contained in a Statement of Interdiction Principles to which all PSI-endorsing countries commit. These include support for interdiction efforts, the rapid exchange of relevant information and the strengthening of national legal authorities to facilitate interdiction. The PSI helps to build counter-proliferation capacity through workshops and exercises for participating states and observers. The number of countries participating in the initiative has grown from eleven at inception to 102, including four of the P5 (China is the exception).¹⁰⁵

104. Quoted in Goldschmidt, “A Top-Down Approach to a Nuclear Weapons Free Zone in the Middle East.”

105. On 19 November 2012, Thailand became the 102nd state to declare its support for the PSI. “Thailand Backs

2.155 A recent (29 June 2012) report by the UN Security Council's panel of experts on North Korea sanctions suggests that more and better surveillance of North Korea's shipping fleet has made it easier to interdict suspicious cargo and harder for North Korea to traffic successfully in arms and weapon components.¹⁰⁶ North Korea has responded to the challenge posed by closer international scrutiny of its ships by making greater use of alternative means of transport, including foreign-flagged vessels and aircraft – but these, too, have proven to be vulnerable to interdiction at least occasionally. Just how much of this activity can be attributed to the PSI is contestable, not least because of the character of the initiative itself, which is designed to accommodate a range of options, including unpublicized bilateral and plurilateral diplomatic and intelligence exchanges involving only directly affected PSI-endorsing states, and transit or destination countries.

2.156 The ICNND recommended that the PSI “be reconstituted within the UN system as a neutral organization to assess intelligence, coordinate and fund activities, and make both generic and specific recommendations or decisions concerning the interdiction of suspected materials being carried to or from countries of proliferation concern.”¹⁰⁷ This would go a long way towards addressing the concerns of states, including some PSI-endorsing countries, who do not like the fact that it operates outside the UN framework. It would also give this still largely US-driven initiative a potentially broader focus and greater international “legitimacy” – although it must be asked if, with more than 100 countries signed up to its guidelines, the PSI really lacks legitimacy. And greater legitimacy could come at a cost, reducing intelligence flows, lengthening decision times and making practical, timely and effective interdiction even harder than it is now. At any rate, nothing yet suggests that the PSI has seriously considered the recommendation.

2.8.2 Missile Proliferation

2.157 The growing sophistication and spread of ballistic and cruise missile technologies (see Map 2.2), and the missiles' capacity to deliver a conventional or WMD payload to targets quickly and accurately, are adding to international tensions by increasing the perceived threat posed by states with missiles, further undermining confidence in the integrity and long-term effectiveness of the nuclear non-proliferation regime and reducing incentives to wind back nuclear deterrence doctrine (see also the discussion of missile defence in Chapter 1). In parallel with the steady spread of these technologies, and the absence of any “universally accepted norm or instrument specifically governing the development, testing, production, acquisition, transfer, deployment or use of missiles,”¹⁰⁸ the international community has tried to elaborate measures that would increase transparency and constrain the pace of, or roll back, missile proliferation.

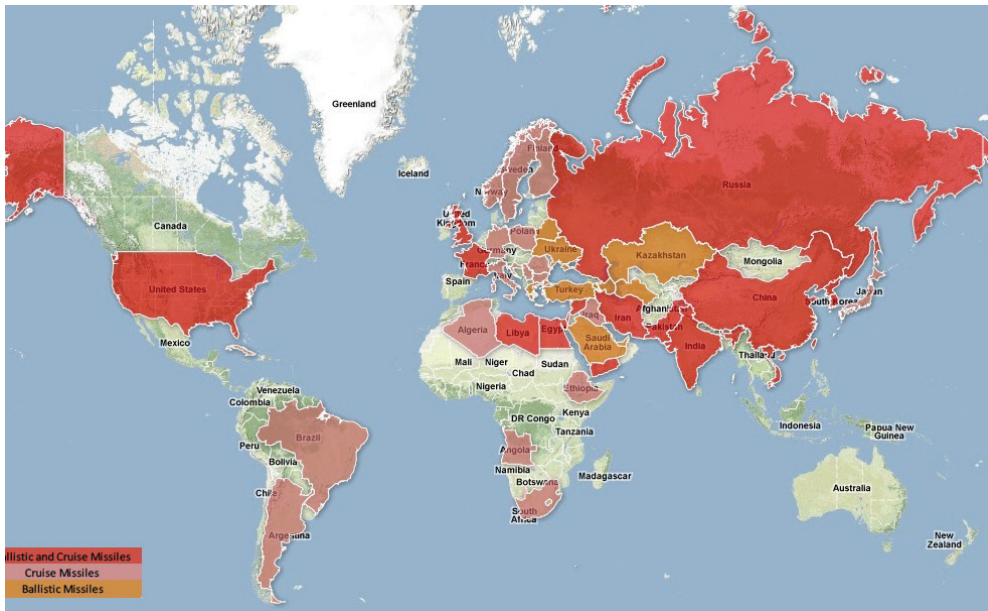
Proliferation Security Initiative,” *Global Security Newswire*, 20 November 2012.

106. Mark Hibbs, “Assessing UN Trade Sanction on North Korea,” 3 July 2012. <http://carnegieendowment.org/publications/index.cfm?fa=view&id=48742>.

107. ICNND, *Eliminating Nuclear Threats*, pp. 96–97.

108. Ban Ki-moon, *The issue of missiles in all its aspects*. Report of the Secretary-General (New York, UN Doc A/63/176, 28 July 2008), http://www.un.org/ga/search/view_doc.asp?symbol=A/63/176&referer=http://www.un.org/disarmament/WMD/Missiles/SG_Reports.shtml&Lang=E.

Map 2.2: Missile Possession Worldwide (2012)



Source: SIPRI

2.158 The Missile Technology Control Regime (MTCR). The MTCR was established in 1987 to address growing international concerns about the spread of nuclear-capable missiles.¹⁰⁹ As is the case with the other export control regimes, MTCR guidelines are not legally binding, and members are responsible for implementing and enforcing them within the context of their own legal systems. The MTCR relies for its effectiveness on the cooperation of all missile technology possessors and suppliers, but does not include all such countries.¹¹⁰ In its public statements the MTCR has drawn attention to the risks arising from horizontal cooperation among countries of proliferation concern outside the MTCR.¹¹¹

2.159 In 1992, the scope of the regime was broadened to include all missiles and unmanned aerial vehicles (UAVs) capable of delivering nuclear, chemical or biological weapons. Export restrictions are applied in two categories: the most stringent (Category I) includes complete rocket systems and UAVs capable of carrying payloads greater than 500 kg to distances of more than 300 km, their production facilities and major sub-systems; while a less restrictive Category II covers complete rocket systems and UAVs not included in Category I and a wide range of dual-use items.¹¹²

109. The Missile Technology Control Regime, <http://www.mtcr.info/english/index.html>.

110. C. Ahlström, "Non-proliferation of Ballistic Missiles: The 2002 Code of Conduct," *SIPRI Yearbook 2003: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2003), pp. 749–59. The MTCR members are: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, South Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Russia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States.

111. The MTCR Plenary statement, Noordwijk, 1999, <http://www.mtcr.info/french/press/noordwijk.html>.

112. The Missile Technology Control Regime, "Equipment, Software and Technology Annex," <http://www.mtcr.info/english/annex.html>.

2.160 The MTCR's successes include the cessation of ballistic missile programs by Argentina, Brazil, Egypt and South Africa, as well as the destruction of Soviet-era Scud missile inventories in former Eastern bloc countries. Although South Korea did not join the MTCR until 2000, its doing so was preceded by a long (5–6 year) bilateral discussion with the United States on range and payload caps for South Korean ballistic missiles using the MTCR 500 kg/300 km guidelines. Although South Korea decided in 2012 to abandon the range cap, the payload cap is still in place.

2.161 While Taiwan has not declared itself as adhering to MTCR guidelines, it has de facto adopted them in spite of developing a long-range missile in the 1980s. That said, Taiwan's ballistic missile research and development base has not been dismantled and its current status is opaque.

2.162 Over the past decade, many countries have acquired technologies for short- and medium-range ballistic missiles, while countries such as India, Iran, Israel, North Korea and Pakistan have been developing long-range ballistic missiles.¹¹³

2.163 **The Hague Code of Conduct against Ballistic Missile Proliferation (HCOC).** In September 2001, MTCR members published the text of a draft International Code of Conduct against Ballistic Missile Proliferation and recommended its universalization. The draft was considered at a series of well-attended international meetings before a launch and signing conference was held at The Hague in November 2002.¹¹⁴ The HCOC calls on subscribing states to provide information annually on ballistic missile systems (cruise missiles are not covered by the code), Satellite Launch Vehicles (SLVs) and land test-launch sites, as well as numbers and generic classes of ballistic missiles/SLVs launched, in accordance with the pre-launch notification mechanism established under the code. In the decade to November 2012, the number of HCOC state signatories grew from 96 to 134.¹¹⁵

2.164 The European Union has played a prominent role in promoting participation in the HCOC and has sought to expand its scope and effectiveness by broadening participation, including by bringing other existing initiatives (such as the India–Pakistan bilateral arrangements on notification) under the HCOC umbrella; extending the code to include cruise and short-range missiles; and developing a standard baseline template for reporting.¹¹⁶ However, none of these changes has yet been agreed.

2.165 **UN Panel of Governmental Experts.** Under the auspices of the United Nations, successive groups of government experts met at intervals from 2001 to 2008. Although they were able to agree that missile proliferation posed a threat to international peace and security, they could not agree on the scope and parameters of the threat, including which missiles should be the focus of their discussions.

113. A. Karp, *Ballistic Missile Proliferation: The Politics and Technics* (Oxford: Oxford University Press, 1996), pp. 204–06.

114. A. Harris, "International Code of Conduct Against Ballistic Missile Proliferation," *BASIC Notes*, 18 July 2002. http://www.basicint.org/pubs/Notes/2002international_code.htm. The text of the HCOC is available at: <http://www.hcoc.at/index.php#>.

115. "The Hague Code of Conduct against Ballistic Missile Proliferation," Austrian Foreign Ministry, <http://www.bmeia.gv.at/>.

116. "The European Union and the Hague Code of Conduct against Ballistic Missile Proliferation," European Consilium document, April 2009, http://www.consilium.europa.eu/uedocs/cmsUpload/EN-missiles_balistiques.pdf.

2.166 The third and last of the panels did, however, identify some issues for further consideration, “without necessarily agreeing on all of them.” These included the growing military significance of missiles, the fact that they can be armed with conventional or non-conventional warheads, their increasing manoeuvrability, the growing use of cruise missiles as a stand-off delivery system for conventional ordnance, the commonalities between missile and SLV technology, and the associated need “to address security concerns without impinging on the peaceful uses of space-related technologies.” The panel agreed on the need for a “step-by-step approach” which could include improved national export controls, voluntary transparency and confidence-building measures, the peaceful settlement of disputes and the promotion of peaceful uses of outer space.¹¹⁷

2.167 **Proposal to Expand the Scope of the INF Treaty.** The ICNND Report recommended that international efforts to curb missile proliferation should continue, but warned that failure to multilateralize the 1987 Treaty on the Elimination of Intermediate-Range Missiles (INF Treaty) between the United States and then-Soviet Union should not be used as an excuse for either of the two existing parties to withdraw from it (Recommendation 62). At the Conference on Disarmament in February 2008, Russia proposed that a treaty analogous to the INF Treaty be opened to global participation. In November 2008, France presented a similar proposal in a paper called “Basic Elements of a Treaty Banning Short and Intermediate Range Ground-to-Ground Missiles.”¹¹⁸ While, however, the INF Treaty encompasses ground-launched ballistic and cruise missiles with a range of between 500 and 5,500 km, the French proposal would lower the threshold for prohibition to 150 or 300 km. Although the idea of exploring the feasibility of a global INF treaty was endorsed by the European Union in 2008 during the French presidency, neither Russia nor the EU has pursued the issue.

§2.9 Nuclear Testing

2.168 The CTBT bans all nuclear explosions in all environments for civilian (“peaceful”) as well as military purposes. It was adopted by an overwhelming majority of members of the United Nations General Assembly on 10 September 1996. Since the treaty’s adoption, just a handful of nuclear-weapon test explosions have been conducted, by India and Pakistan in 1998 and by North Korea in the past decade. As of December 2012, 183 states had signed the CTBT, of whom 157 had also ratified it. The CTBT, however, has yet to enter into force, being hostage to the requirement that all 44 states with nuclear reactors listed in Annex 2 of the treaty must first sign and ratify it.¹¹⁹

2.169 At the 2010 NPT Review Conference, all NWS undertook to ratify the CTBT “with

117. Ban, *The issue of missiles in all its aspects*

118. Remarks by Russian Minister of Foreign Affairs Sergey Lavrov at the Plenary Session of the Conference on Disarmament, Geneva, February 12, 2008, http://www.mid.ru/brp_4.nsf/sps/111B7DD616FD1472C32573EE0024A63D; Letter from President Sarkozy to UN Secretary General Ban Ki-Moon, December 5 2008.

http://www.francetnp.fr/IMG/pdf/Letter_from_Nicolas_Sarkozy_to_Ban_Ki-Moon.pdf; “US Response to French Global INF Proposal,” WikiLeaks cable, 24 December 2008, <http://www.cablegatesearch.net/cable.php?id=08STATE134228>.

119. Annex 2 states are: Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Democratic People’s Republic of Korea, Egypt, Finland, France, Germany, Hungary, India, Indonesia, Iran (Islamic Republic of), Israel, Italy, Japan, Mexico, Netherlands, Norway, Pakistan, Peru, Poland, Romania, Republic of Korea, Russian Federation, Slovakia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America, Vietnam, Zaire.

all expediency” and acknowledged a “special responsibility to encourage Annex 2 countries, in particular those which have not acceded to the Treaty on the Non-Proliferation of Nuclear Weapons and continue to operate unsafeguarded nuclear facilities, to sign and ratify” (Action 10). Pending its entry into force, all NPT state parties promised “to refrain from nuclear-weapon test explosions or any other nuclear explosions, the use of new nuclear weapons technologies and from any action that would defeat the object and purpose of that Treaty.” They further agreed that existing moratoriums on nuclear-weapon test explosions should be maintained (Action 11).

2.170 Of nine Annex 2 states which had not ratified the CTBT when the eighth NPT Review Conference convened in May 2010, only one, Indonesia, has since done so (6 December 2011). Of the remaining eight, China, Egypt, Iran, Israel and the United States have signed the treaty while North Korea, India and Pakistan have not. The five NWS all maintain a voluntary moratorium on nuclear test explosions, although at least three (Russia, the United Kingdom and the United States), and possibly China, conduct “subcritical” tests of small amounts of nuclear material at high pressure using conventional explosives without generating a sustained nuclear chain reaction. As discussed in the previous chapter, all NPT and non-NPT nuclear-armed states have long-term nuclear weapons systems modernization programs under development and in progress.

2.171 NPT Nuclear Weapon States (NWS). *China* maintains a voluntary moratorium on nuclear test explosions, but possibly conducts “subcritical” tests of nuclear material.¹²⁰ China has not ratified the CTBT, but supports the treaty’s early entry into force, participates in the work of the Preparatory Commission for the CTBT Organization (CTBTO) and is preparing for national implementation of the treaty.¹²¹ Presidents Obama and Hu Jintao issued a joint statement in January 2011 reaffirming both countries’ support for early entry into force of the CTBT,¹²² and China repeated this at the first session of the Preparatory Committee of the 2015 NPT Review Conference in Vienna in May 2012.¹²³

2.172 The treaty has been presented to the National People’s Congress, which is said to be going through “the ratification formalities in accordance with the relevant constitutional procedure.”¹²⁴ Many experts believe that the formal conclusion of this procedure would quickly follow US ratification, but China never speaks of the status of the domestic ratification process, nor does it acknowledge or imply any link to ratification by another state.¹²⁵ It is unlikely that China would ratify the CTBT before the United

120. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 48.

121. Viyyanna Sastry, “The Poor Prospects of the CTBT Entering Into Force,” 9 January 2012, Institute for Defence Studies and Analyses, http://www.idsa.in/idsacomments/ThePoorProspectsoftheCTBTEnteringIntoForce_cvsastry_090112.

122. Office of the Press Secretary, The White House, “U.S.-China Joint Statement,” 19 January 2011, <http://www.whitehouse.gov/the-press-office/2011/01/19/us-china-joint-statement>.

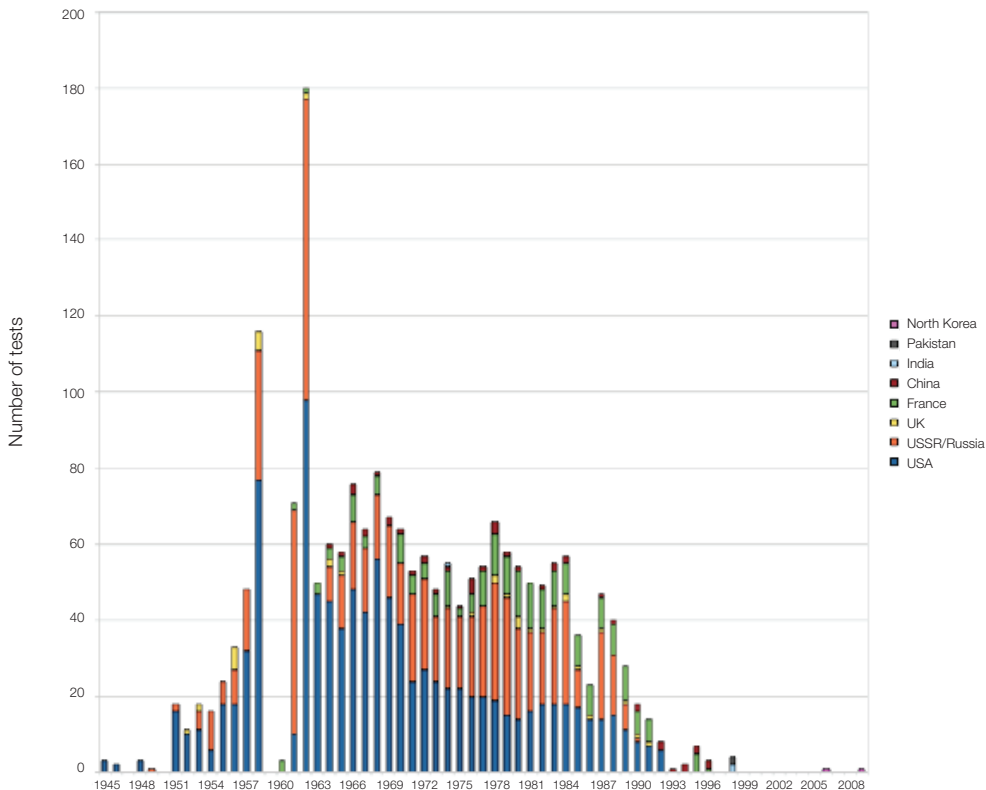
123. Statement by H.E. Mr. Cheng Jingye, Permanent Mission of the People’s Republic of China to the United Nations and Other International Organizations in Vienna, 30 April 2012, <http://www.un.org/disarmament/WMD/Nuclear/NPT2015/PrepCom2012/statements/20120430/China.pdf>; and “Nuclear disarmament and reduction of the danger of nuclear war,” working paper submitted by China, 27 April 2012, http://www.un.org/ga/search/view_doc.asp?symbol=NPT/CONF.2015/PC.I/WP.40.

124. Statement by H.E. Ambassador Zhang Yan, to the Article XIV Conference, 4 September 2003, http://ctbto.org/fileadmin/content/reference/article_xiv/2003/statements/0309_pm/0409_am/05_china_e.pdf.

125. For example, see “Joint Press Conference between Mr Gareth Evans and Ms. Yoriko Kawaguchi, Co-Chairs, International Commission for Nuclear Non-proliferation and Disarmament,” ICNND, 15 February 2009, http://icnnd.org/Pages/090215_jpc_evans_kawaguchi.aspx; Deepti Choubey, “Don’t wait for the United States,” *CTBTO Spectrum*, April 2009, http://www.ctbto.org/fileadmin/user_upload/pdf/Spectrum/2009/2009_April_Spectrum12_p10-11.pdf.

States has done so, not least because it would first want to be sure of what, if any, conditions had been inserted by the US Senate.

Figure 2.1: Estimated Number of Nuclear Explosions 1948–2012



Source: "Estimated number of nuclear explosions, 1945-2009," Table 8B.2, *SIPRI Yearbook 2010*, p. 375.

2.173 France and the United Kingdom have ratified the CTBT and maintain a voluntary moratorium on nuclear test explosions. The United Kingdom conducts "subcritical" tests of nuclear material.¹²⁶ In November 2010, France and the United Kingdom declared that they had decided to collaborate on nuclear stockpile stewardship in support of their "respective independent nuclear deterrent capabilities... through unprecedented co-operation at a new joint facility at Valduc in France that will model performance of... nuclear warheads and materials to ensure long-term viability, security and safety."¹²⁷ Russia has ratified the CTBT and maintains a voluntary moratorium on nuclear test explosions. It conducts "subcritical" tests of nuclear material.¹²⁸

126. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 48.

127. UK-France Summit 2010 Declaration on Defence and Security Co-operation, <http://www.number10.gov.uk/news>, 2 November 2010.

128. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 48.

2.174 *The United States* maintains a voluntary moratorium on nuclear test explosions. It conducts “subcritical” tests of nuclear material.¹²⁹ As part of the pledge made in Prague in April 2009 “to seek the peace and security of a world without nuclear weapons,” President Obama undertook “immediately and aggressively” to pursue US ratification of the CTBT.¹³⁰ He also promised, and delivered, a new START Treaty (New START) with Russia and expended significant political capital in the process of securing US Senate consent to ratification of that treaty in December 2010. While the administration clearly hopes to persuade Senators that the situation has changed, to the advantage of the United States and the CTBT, since the Senate rejected a request for consent to ratify the treaty in 1999, and has been working steadily to this end, it has not submitted the CTBT to the Senate for approval. President Obama may be keen to bring the CTBT back to the Senate during his second term but the numbers in the new Senate are little changed from its predecessor and a substantial number of Senators remain firmly opposed to US ratification (a two-thirds majority is required for treaty approval). Ratification by the United States is critical to the treaty’s eventual entry into force. Its rejection by the Senate, for a second time, would almost certainly ensure that this did not happen for many more years.

2.175 **Non-NPT Nuclear-Armed States.** *India* has not signed the CTBT but has maintained a voluntary moratorium on nuclear test explosions since 1998. In 2005 India committed to continuing its unilateral moratorium on nuclear testing as part of the joint US–India statement establishing the basis for renewed bilateral peaceful nuclear cooperation. It is not known whether India is able to conduct “subcritical” tests of nuclear material, but it is not generally believed to have such capability. *Pakistan* has not signed the CTBT but has, since 1998, maintained a voluntary moratorium on nuclear test explosions. Again, it is not known whether Pakistan has the capacity to conduct “subcritical” tests, but this is thought to be unlikely. *Israel* may have conducted at least one nuclear test but this has never been confirmed. Israel has signed but not ratified the CTBT. It is not known whether Israel conducts “subcritical” tests of nuclear material. *North Korea* has not signed the CTBT, and tested explosive devices in 2006 and 2009: in February 2012 Pyongyang gave an undertaking to suspend nuclear testing but this was subsequently withdrawn, and further tests continue to be threatened.

2.176 **Promoting Entry Into Force.** At the 2010 NPT Review Conference, all states that had ratified the CTBT recognized the importance of the biennial conferences on facilitating the entry into force of the treaty (Action 12) and undertook to promote the treaty’s entry into force and implementation at the national, regional and global levels (Action 13). Meanwhile, the CTBTO was encouraged to complete development of the treaty’s verification regime, “including early completion and provisional operationalization of the international monitoring system” (IMS) (Action 14).

2.177 Representatives of more than 160 countries, including the five NWS, attended the 7th biennial Conference on Facilitating the Entry into Force of the CTBT in New York on

129. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 48.

130. “Remarks by President Barack Obama, Hradcany Square, Prague, 5 April 2009” (Washington DC: White House, Office of the Press Secretary, 2009), <http://www.whitehouse.gov/video/The-President-in-Prague#transcript>.

23 September 2011. Participating states again adopted ten practical measures (a repeat of measures adopted by the previous Article XIV Conference in September 2009) “to accelerate the ratification process and bring the Treaty into force.”¹³¹ These included:

- > Encouraging further signatures and ratifications of the treaty;
- > Agreeing that ratifying states would “continue the practice of selecting coordinators to promote cooperation, through informal consultations with all interested countries, aimed at promoting further signatures and ratifications”;
- > Calling on the CTBTO Preparatory Commission to continue promoting understanding of the treaty, including “the benefits of the civil and scientific applications of the verification technologies”; and
- > Requesting the Provisional Technical Secretariat to continue to collect and publish information on outreach activities undertaken by ratifying states and states signatories.¹³²

2.178 The CTBTO conducts an extensive program of outreach and capacity building around the world, including training and other assistance on maintaining and improving the CTBT’s verification regime.

2.179 **Addressing Verification and Stockpile Reliability Concerns.** Even though the CTBT is not in force, construction and commissioning of the treaty’s supporting verification framework (the IMS) continues. The Final Declaration of the September 2011 Article XIV Conference stressed the importance of maintaining momentum “in building all elements of the verification regime.” States promised to continue to provide the “political and tangible support required to enable the Preparatory Commission to complete all its tasks in the most efficient and cost-effective way, including the building up of the on-site inspection pillar of the verification regime and the progressive development of the coverage of the International Monitoring System.”¹³³ In April 2010, 255 of a planned total of 337 IMS facilities employing a range of technologies (seismic, radionuclide, hydro-acoustic and infrasound) had been certified. That number has since increased to 273 (Table 2.6 and Map 2.3).

Table 2.6: IMS Facilities (November 2012)

Facilities	Number
Certified	273
Testing	14
Under Construction	22
Planned	28
Total	337

Source: SIPRI

131. “Urgent calls by international leaders to bring test ban treaty in force,” 23 September 2011, <http://www.ctbto.org/press-centre/press-releases/2011/urgent-calls-by-international-leaders-to-bring-test-ban-treaty-in-force/>.

132. *Final Declaration and Measures to Promote the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty*, Conference on Facilitating the Entry into Force of the CTBT, New York, 23 September 2011.

133. *Final Declaration*, Conference on Facilitating the Entry into Force of the CTBT, 23 September 2011.

Map 2.3: IMS Verification Regime-Stations Worldwide (2012)

Source: SIPRI

2.180 Of the five NPT NWS (three of which have ratified the CTBT), only the United States could still be prevented from signing up to the treaty by concerns about its implications for the efficacy of its Stockpile Stewardship Program. This, and the possibility of states either cheating or reneging on their CTBT commitments, is why some (and quite possibly a deciding minority) of Senators are reluctant to approve US ratification. A report commissioned by the White House from the National Research Council and released on 30 March 2012 has reviewed and updated a 2002 study that looked at technical concerns raised about the CTBT. The report concluded, inter alia, that:

- > Even for tests of well below 1 kt magnitude conducted anywhere in the world, confidence levels for IMS seismic detection are 90 per cent;
- > US national technical means provide monitoring capability superior to the IMS and can focus on monitoring countries of concern to the United States; and
- > The development of weapons with lower capabilities is possible with or without the CTBT for countries of different levels of nuclear sophistication, but this would not require the United States to return to testing in order to respond effectively.¹³⁴

2.181 According to the report committee's chair, "so long as the nation is fully committed to securing its weapons stockpile and provides sufficient resources for doing so, the U.S. has the technical capabilities to maintain safe, reliable nuclear weapons into the foreseeable future without the need for underground weapons testing."¹³⁵

134. "U.S. Stockpile Security and International Monitoring Capabilities Strengthened, Says New Report on Technical Issues Behind the Comprehensive Nuclear Test Ban Treaty," 30 March 2012

<http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12849>.

135. Ellen D. Williams, chief scientist at BP and chair of the committee that wrote the report: *The Comprehensive Nuclear*

§2.10 Fissile Material

2.182 **Fissile Material Cut-off Treaty: Conference on Disarmament.** More energy, probably, has been devoted by more policymakers to less practical effect on this issue than any other on the global nuclear non-proliferation and disarmament agenda. In December 1993, the UN General Assembly adopted a resolution recommending “the negotiation in the most appropriate international forum of a... treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices.”¹³⁶ The “most appropriate international forum” is the Conference on Disarmament in Geneva. In March 1995, the CD decided, on the recommendation of Special Coordinator Ambassador Gerald E. Shannon of Canada, to establish an ad hoc committee to negotiate a fissile material production ban. The “Shannon Mandate” was based on the General Assembly’s 1993 initiating resolution and allowed delegations to raise for consideration any concerns that they had about the appropriate scope of the convention, particularly whether it should encompass existing stocks as well as future production of fissile material.¹³⁷ The ad hoc committee process failed, but the Shannon Mandate survived.

2.183 The fifth NPT Review Conference in 1995, in addition to calls for a nuclear-test-ban treaty and progressive global efforts to reduce the size of nuclear arsenals, urged “the immediate commencement and early conclusion” of negotiations on a treaty banning the production of fissile material for nuclear weapons in accordance with the Shannon Mandate.¹³⁸ Five years later, the sixth NPT Review Conference urged the CD “to agree on a program of work which includes the immediate commencement of negotiations on such a treaty with a view to their conclusion within five years.”¹³⁹

2.184 The CD, however, has not been able to agree on and implement a program of work since the conclusion of nuclear-test-ban treaty negotiations in 1996. There have been protracted disagreements among the P5 over the priority to be given to the four main issues on the CD’s forward agenda: nuclear disarmament, an FMCT, the weaponization of space,¹⁴⁰ and negative security assurances. Of these, only fissile material provides for immediate treaty negotiations. Previous efforts to commence FMCT negotiations in the CD have foundered on the issues of the inclusion of existing fissile material stocks, appropriate safeguards measures, verification, and links to parallel negotiations on a nuclear disarmament treaty.¹⁴¹ In recent years, attention has focused almost exclusively on Pakistan, which has consistently blocked the adoption of a program of work in the CD

Test Ban Treaty: Technical Issues for the United States,

<http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=12849>.

136. A/RES/48/75L (16 December 1993).

137. *The Shannon Mandate*, <http://www.fas.org/programs/ssp/nukes/armscontrol/shannon.html>.

138. NPT/CONE.1995/32 (Part 1), Annex: Principles and Objectives for Nuclear Non-Proliferation and Disarmament, <http://disarmament.un.org/wmd/npt/1995dec2.htm>.

139. Part 1, Article VI.15, <http://www.acronym.org.uk/official-and-govt-documents/2000-npt-review-conference-final-document-13-steps>.

140. China, Russia and the United States particularly have been at odds over the need, which the United States does not see, for a new international instrument for the prevention of an arms race in outer space (PAROS).

141. S. Kile, “A ban on production of fissile material for nuclear explosives,” *SIPRI Yearbook 1997: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 1997), pp. 387–88; S. Kile, “The fissile material cut-off treaty,” *SIPRI Yearbook 2007: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2007), pp. 506–13; S. Kile, “The fissile material cut-off treaty,” *SIPRI Yearbook 2008: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2008), pp. 361–62.

because it will not agree to FMCT negotiations in the absence of prior agreement to include existing stocks of weapon-grade fissile material, where it believes itself to be at a particular disadvantage relative to India.

2.185 At the 2010 NPT Review Conference, all states again agreed that the CD should “immediately begin negotiation of a treaty banning the production of fissile material for use in nuclear weapons or other nuclear explosive devices” and invited the secretary-general of the United Nations to convene a high-level meeting in September 2010 in support of the work of the CD. The ICNND report similarly encouraged all states to negotiate “to an early conclusion” in the CD an FMCT (Recommendation 22). In the interim, all nuclear-armed states should declare or maintain a moratorium on the production of fissile material for weapons purposes (Recommendation 23). The report recommended a phased approach to the issue of pre-existing stocks (Recommendation 24).

2.186 The CD failed to reach agreement on a work program in 2010 and 2011. In March 2012, the Egyptian President of the CD proposed a draft program of work which called for the establishment of working groups under each of the conference agenda items. The fissile material working group was “to deal with elements of a multilateral treaty banning the production of fissile material” on the basis of the Shannon Mandate.¹⁴² It was clearly hoped that the introduction of slightly less outcome-specific language (that is, the reference to treaty elements) might be enough to bring Pakistan to the table; but it wasn’t. Pakistan rejected the Egyptian proposal as ambiguous. Pakistan did not want the CD “to become irrelevant but, if forced to choose between national security and the future of the CD, Pakistan’s national security would take priority.”¹⁴³ Having again failed to adopt a program of work, the CD occupied itself with yet more rounds of inconclusive discussion of “core issues” and concluded its 2012 session on 14 September with nothing to show for it.

2.187 **Fissile Material Cut-off Treaty: UN Consideration.** UN Secretary-General Ban Ki-moon convened a High-Level Meeting on Revitalizing the Work of the Conference on Disarmament and Taking Forward Multilateral Disarmament Negotiations on 24 September 2010. In his closing statement, the secretary-general acknowledged “broad concern” about the current state of the UN’s disarmament machinery, “in particular the impasse at the Conference on Disarmament, which is hurting its credibility and calling into question its relevance.” Failure to fix this “could result in states resorting to alternative arrangements outside the Conference on Disarmament.” Ban tasked his Advisory Board on Disarmament Matters to undertake a review of issues raised at the meeting. He said that he would consider further actions based on the board’s recommendations, including the establishment of a high-level panel of eminent persons.¹⁴⁴

142. CD/1933/Rev.1 of 14 March 2012.

143. “Conference on Disarmament Unable to Reach Consensus on Draft Programme of Work,” 15 March 2012, <http://www.unog.ch/80256EDD006B9C2E>.

144. “Secretary-General’s closing statement to High-Level Meeting on Revitalizing the Work of the Conference on Disarmament and Taking Forward Multilateral Disarmament Negotiations,” New York, 24 September 2010, <http://www.un.org/sg/statements/index.asp?nid=4808>.

2.188 The secretary-general addressed the CD itself in Geneva on 26 January 2011, warning that its record of achievement had been “overshadowed by inertia” and that continued inaction would “endanger its future as a multilateral negotiating forum.” He reminded the CD that, at the previous September’s high-level meeting in New York, participants had been “unanimous in stressing that limited membership of the Conference on Disarmament is a privilege. So is the consensus rule. Members of the Conference must accept that this privilege comes with responsibility.”¹⁴⁵

2.189 The UN General Assembly met over three days in New York in July 2011 to follow up the 2010 high-level multilateral disarmament meeting. The General Assembly had before it the report of the Secretary-General’s Advisory Board on Disarmament Matters which had clearly failed to reach agreement on any particular course of action. The board could recommend only that:

- > The secretary-general “persist in encouraging the Conference on Disarmament to seek all efforts to achieve a breakthrough to the continuing impasse,” possibly by “encouraging progress on a programme of work for the Conference that facilitates work on the four core issues based on the consensus reached in document CD/1864”,¹⁴⁶
- > Should a high-level panel of eminent persons be established, the secretary-general should ask it “to make recommendations on ways to revitalize the United Nations disarmament machinery as a whole, especially the Conference on Disarmament”; and
- > The secretary-general should “continue to raise public awareness and encourage civil society groups and non-governmental organizations to offer input on ways to overcome the prolonged stalemate.”¹⁴⁷

2.190 The secretary-general expressed his own views more clearly. He saw “no fundamental flaw in the United Nations disarmament machinery that may be blamed for this deadlock, certainly none that cannot be overcome by changes in state policies. The problem lies not with the vehicle, but with the driver. What is needed most of all is a closer alignment between policy priorities and multilateral disarmament goals.” He foresaw “no quick fixes” but believed that, if the CD remained deadlocked, the General Assembly had a “responsibility to step in... [T]he CD should not be held perpetually hostage by one or two members.”¹⁴⁸

2.191 These sentiments were subsequently echoed by others at the meeting, including Australia’s ambassador and permanent representative to the United Nations who, speaking on behalf of the Non-Proliferation and Disarmament Initiative (NPDI), urged the General Assembly’s First (Disarmament) Committee “to increase its practical relevance for disarmament and international security,” including by moving forward on

145. “Secretary-General warns Conference on Disarmament that decade-long deadlock puts its credibility at risk,” Geneva, 26 January 2011, <http://www.un.org/News/Press/docs/2011/sgsm13367.doc.htm>.

146. In 2009 the CD did manage to adopt a program of work (CD/1864) based on the establishment of issue-specific working groups. Pakistan, however, blocked implementation and the program’s mandate lapsed at the end of the year.

147. Ban Ki-moon, *Work of the Advisory Board on Disarmament Matters*. Report of the Secretary-General (New York: United Nations, document A/66/125, 11 July 2011).

148. “Secretary-General cites ‘growing crisis of confidence’ in remarks to General Assembly follow-up to 2010 high-level multilateral disarmament meeting,” New York, 27 July 2011, <http://www.un.org/News/Press/docs/2011/sgsm13723.doc.htm>.

the FMCT and other core disarmament issues.¹⁴⁹ The P5 for their part made clear that, its manifest shortcomings notwithstanding, “as the sole standing multilateral disarmament negotiating forum... the CD should maintain the primary role in substantive negotiations on priority questions of disarmament.” The P5 reiterated their support for “immediate commencement of negotiations *at the CD* on an FMCT” (emphasis added).¹⁵⁰

2.192 In December 2011, the UN General Assembly adopted a resolution on a “treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices.”¹⁵¹ The resolution, sponsored by Canada, with strong support from other members of the NPDI, was more ambitious in scope than its predecessors, which had routinely urged the CD to agree, early in each new year, on a program of work that included the immediate commencement of negotiations on a fissile material treaty. This time, the General Assembly itself resolved “to consider options” for the negotiation of such a treaty should the CD “fail to agree on and implement a comprehensive program of work by the end of its 2012 session.” Along the way, Canada was obliged to drop, at the insistence of the P5 and others, an NPDI-sponsored request to establish a group of governmental experts to identify FMCT negotiating options for consideration by the General Assembly at its next session if the CD failed to adopt a work program by the end of March 2012. The revised text was adopted by the General Assembly by a vote of 158 in favour, 2 (North Korea and Pakistan) against, and 21 abstentions.

2.193 At the 2012 UN General Assembly session, Canada was able to secure passage of a resolution which took that modest next step. As usual, the resolution urged the CD “to agree on and implement early in 2013 a balanced and comprehensive programme of work that includes the immediate commencement of negotiations on a treaty banning the production of fissile material for nuclear weapons.” In addition, however, it requested the secretary-general to seek the views of member states on such a treaty and “to establish a group of governmental experts with a membership of 25 states chosen on the basis of equitable geographical representation which, taking into account... the views of Member States, will make recommendations on possible elements which could contribute to a treaty.” The group of governmental experts would “operate on the basis of consensus, without prejudice to national positions in future negotiations” and meet in Geneva “for two sessions of two weeks” in 2014 and 2015. It would report back to the General Assembly in 2015, with the CD being invited to “take note” of the report and “consider further action as appropriate.”¹⁵²

2.194 The draft resolution was approved in First Committee by a recorded vote of 148 in favour to 1 against (Pakistan), with 20 abstentions. While it is certainly a step in the right direction, it is a very small one. The group of governmental experts will not meet until

149. “Statement on behalf of the Non-Proliferation and Disarmament Initiative (NPDI) at the Follow-up to the high-level meeting held on 24 September 2010: revitalizing the work of the Conference on Disarmament and taking forward multilateral negotiations,” statement by H.E. Mr. Gary Quinlan, Ambassador and Permanent Representative of Australia to the United Nations, New York, 27 July 2011. Current members of the NPDI are: Australia, Canada, Chile, Germany, Japan, Mexico, the Netherlands, Poland, Turkey, and the United Arab Emirates.

150. Statement by Mr. Gerard Araud, Permanent Representative of France to the United Nations, on behalf of the P5 and in a national capacity, New York, 27 July 2011, <http://www.franceonu.org/spip.php?article5694>.

151. UN General Assembly Resolution 66/44 (2 December 2011).

152. UNGA 67 First Committee draft resolution A/C.1/67/L.41, 19 October 2012.

2014 and is charged only with making recommendations, which the CD is free to ignore, on “possible elements” of a treaty. And even this modest objective may prove unattainable for a consensus-based group.

2.195 The First Committee also approved a draft resolution, sponsored by Norway, Austria and Mexico, on “Taking forward multilateral disarmament negotiations.” The resolution, approved by a recorded vote of 134 in favour to 4 against (France, Russia, United Kingdom, United States), with 34 abstentions, “decides to establish an open-ended working group to develop proposals to take forward multilateral nuclear disarmament negotiations for the achievement and maintenance of a world without nuclear weapons.”¹⁵³ The group would convene in Geneva in 2013 for up to three weeks.

2.196 Speaking also on behalf of France and the United States, the representative of the United Kingdom saw “little value in initiatives taking forward multilateral nuclear disarmament negotiations outside of the established forum, which only sought to circumvent the mechanism dealing with those issues.... [and]... could not support the establishment of such a group or any outcome it might produce.” China abstained but nonetheless made clear that it did not support the establishment of a working group which could “weaken the current multilateral disarmament mechanism and make it difficult to maintain the participation of major countries.”¹⁵⁴ Similar concerns were expressed by others, including Algeria, Cuba, India and Pakistan.

2.197 The chairman’s “factual summary” of proceedings at the first meeting of the Preparatory Committee for the 2015 NPT Review Conference (Vienna, 30 April–11 May 2012) draws carefully on language from 2010 NPT Review Conference Action 15 and resolutions adopted by the 2011 UN General Assembly to record states parties’ “deep concern at the continuing stalemate in the Conference on Disarmament, including the persistent failure to agree on and implement an agreed, comprehensive and balanced program of work,” and, in light of this, the need stressed by “a number of States parties... for the international community to consider options to ensure progress in multilateral disarmament negotiations.” Beyond this it manages only to have states parties “recall” that the CD “should immediately begin negotiation” of an FMCT.¹⁵⁵

2.198 **Fissile Material No Longer Required For Military Purposes.** The 2010 NPT Review Conference encouraged NWS to declare to the IAEA all fissile material “designated by each of them as no longer required for military purposes and to place such material as soon as practicable under IAEA or other relevant international verification” (Action 16). All states were encouraged to support the development of legally binding verification arrangements “to ensure the irreversible removal of fissile material designated by each nuclear-weapon state as no longer required for military purposes” (Action 17).

2.199 While *China*, alone among the five NWS, has not declared an end to the production of fissile material for weapons purposes, it is thought not to have produced such material

153. UNGA 67 First Committee draft resolution A/C.1/67/L.46, 19 October 2012.

154. UNGA 67 First Committee 21st Meeting (AM) GA/DIS/3470, 6 November 2012, p. 8.

155. “Chairman’s factual summary,” (Working paper), paragraph 25; Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Vienna, 30 April–11 May 2012; NPT/CONF.2015/PC.1/WP.53; <http://www.un.org/disarmament/WMD/Nuclear/NPT2015/PrepCom2012/documents.html>.

for more than two decades.¹⁵⁶ It is believed to have ceased production of HEU in 1987 and of plutonium some three years later.¹⁵⁷ Its International Panel on Fissile Materials (IPFM)-listed uranium enrichment facilities are all designated as civilian.¹⁵⁸ China provides no information on fissile material stocks. It is, however, estimated to have stockpiles of 16 (+/- 4) tonnes of HEU and 1.8 (+/- 0.5) tonnes of weapon-grade plutonium.¹⁵⁹ China has declared no stocks of weapon-grade fissile material in excess of its defence needs.

2.200 *France* stopped all fissile material production for weapons purposes in 1996. It provides no information on fissile material stocks. France is, however, estimated to have stockpiles of the order of 6 (+/- 1) tonnes of weapon-grade plutonium and 26 (+/- 6) tonnes of military HEU.¹⁶⁰ As of 31 December 2010, France had declared to the IAEA a civilian HEU inventory of 4.6 tonnes. France has not declared any fissile material in excess of defence needs but now almost certainly has more plutonium and HEU than it can use. France's nuclear arsenal has halved in size since its Cold War peak and HEU is no longer used for naval propulsion.¹⁶¹

Map 2.4: Enrichment (2012)



Source: SIPRI

156. International Panel on Fissile Materials (IPFM), "Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step toward Disarmament," 3 May 2012, p. 14.

157. IPFM, *Global Fissile Material Report 2010*, p. 97, <http://fissilematerials.org>.

158. Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 14.

159. IPFM, *Global Fissile Material Report 2011*, pp. 10, 18.

160. IPFM, *Global Fissile Material Report 2010*, pp. 84–85.

161. IPFM, *Global Fissile Material Report 2010*, p. 85; *Global Fissile Material Report 2011*, p. 10.

2.201 By the time the Soviet Union announced in 1989 that it was ceasing the production of HEU, it had already done so. *Russia* has the largest HEU stockpile – an estimated 737 (+/- 120) tonnes in late 2011 – of any nuclear-armed state.¹⁶² HEU taken from dismantled Russian nuclear weapons is converted to LEU and sold to the United States under the 1993 US–Russia HEU Purchase Agreement. In excess of 450 tonnes of HEU has so far been converted under the program, which is 90 per cent complete. By the end of 2013, the program will have eliminated a total of 500 tonnes of weapon-origin HEU, an amount equivalent to some 20,000 nuclear weapons. The down-blended HEU is delivered to the United States, fabricated into nuclear fuel and used in US nuclear power plants. “Nearly half of all commercial nuclear energy produced in the U.S. comes from nuclear fuel derived from Russian nuclear weapons.”¹⁶³ The program is not subject to verification by the IAEA. It is estimated that Russia’s total holdings of HEU will have been reduced to some 665 tonnes by the end of the blend-down program in 2013. “At 20 kg per warhead, this would be sufficient for more than 30,000 warheads.”¹⁶⁴

2.202 Russia formally stopped producing weapon-grade plutonium in September 1994, although three plutonium production reactors remained in operation as power providers to the cities of Tomsk and Zheleznogorsk in Siberia. Under the 1997 US–Russia Plutonium Production Reactor Agreement (PPRA), Russia undertook not to use plutonium produced in these reactors in its nuclear weapons program.¹⁶⁵ The agreement requires the cessation of weapon-grade plutonium production. The agreement’s monitoring provisions ensure that the reactors that are shut down in both countries are not restarted,¹⁶⁶ and that plutonium produced in reactors at Seversk and Zheleznogorsk after 1994 is not used for military purposes.¹⁶⁷

2.203 Russia’s weapon-grade plutonium stockpile is estimated to be of the order of 128 (+/- 8) tonnes.¹⁶⁸ While Russia does not include its excess military plutonium in its IAEA INFCIRC/549 declarations, it has declared a total of some 50 tonnes of plutonium (37.8 tonnes of which is unirradiated) as surplus to requirements.¹⁶⁹

2.204 The United States and Russia signed a Plutonium Management and Disposition Agreement (PMDA) in September 2000. The agreement was amended in April 2010 and entered into force in July 2011. Disposition of surplus plutonium is tentatively scheduled to begin in 2018 under IAEA verification. The agreement commits each country to dispose of 34 tonnes of excess weapon-grade plutonium by converting it to mixed oxide (MOX) fuel and using it in nuclear power reactors. Consistent with the assumption that the average Russian and US nuclear warhead contains about 4 kg of plutonium, the US

162. IPFM, *Global Fissile Material Report 2010*, p. 58; *Global Fissile Material Report 2011*, p. 8

163. “NNSA Announces Elimination of 450 Metric Tons of Russian Weapons Highly Enriched Uranium,” *Press Release*, 9 July 2012, <http://nnsa.energy.gov/mediaroom/pressreleases/450tons070912>.

164. IPFM, *Global Fissile Material Report 2010*, p. 58.

165. IPFM, *Global Fissile Material Report 2010*, p. 46.

166. NNSA Treaties and Agreements, <http://nnsa.energy.gov/aboutus/ourprograms/nonproliferation/treatiesagreements>.

167. <http://dtirp.dtra.mil/tic/synopses/ppra.aspx>.

168. IPFM, *Global Fissile Material Report 2011*, p. 18.

169. David Albright and Christina Walrond, “Civil Separated Plutonium in the INFCIRC/549 states – Taking Stock,” Institute for Science and International Security (ISIS) Report, 16 September 2010.

National Nuclear Security Administration (NNSA) estimates that the 68 tonnes of plutonium encompassed in the program would be enough to make 17,000 nuclear weapons.

2.205 The amended PMDA reduces the agreed rate of plutonium disposition from no less than two to no less than 1.3 tonnes per year. It also allows Russia to use the plutonium to fuel fast breeder reactors, which the IPFM considers to be “a controversial strategy as Russia plans to eventually separate the plutonium again to provide start-up fuel for a planned fleet of plutonium breeder reactors.”¹⁷⁰

2.206 *The United Kingdom* announced on 18 April 1995 that it “had ceased the production of fissile material for explosive purposes.” At 31 March 2002, the United Kingdom had a stockpile of some 21.9 tonnes of HEU, including HEU in spent naval-reactor fuel. The IPFM estimates that, by 2011, perhaps 0.7 tonnes of this HEU had been consumed by nuclear-powered submarines. The balance, 21.2 tonnes of HEU, was thought to include between 10 and 15 tonnes of unirradiated HEU, some of which was likely to have been set aside for naval propulsion. The United Kingdom does not provide details of its military HEU allocations.¹⁷¹

2.207 As of 2010, the United Kingdom had a stockpile of 3.2 tonnes of weapon-grade plutonium. The United Kingdom includes excess unirradiated separated military plutonium in its INFCIRC/549 declarations. The United Kingdom has declared 4.4 tonnes of plutonium (including 4.1 tonnes of non-weapon-grade plutonium under European Atomic Energy Community (EURATOM) safeguards) as excess to military requirements.¹⁷²

2.208 The United Kingdom has not yet begun to dispose of its excess plutonium. It is currently considering a number of options for the disposition of plutonium in civilian use: “continued long term storage (prior to disposal); reuse as fuel followed by disposal; and prompt immobilization and disposal as soon as practicable.”¹⁷³ The government’s current preferred approach is to reuse the plutonium as MOX fuel. A new facility for the disposition of surplus plutonium is, however, still a decade or so away.¹⁷⁴

2.209 *The United States* stopped producing HEU for nuclear weapons in 1964, although it continued to produce HEU, enriched to more than 96 per cent in uranium-235, for naval propulsion until 1992. In 2006, the United States declared a stockpile, at 30 September 2004, of some 690 tonnes of HEU. By mid-2011, this figure was estimated to have been reduced to around 610 tonnes, as a consequence of the progressive down-blending of 210 tonnes of HEU declared excess to military requirements for use in the nuclear power industry.¹⁷⁵

170. IPFM, *Global Fissile Material Report 2011*, p. 17.

171. IPFM, *Global Fissile Material Report 2010*, pp. 71–72; *Global Fissile Material Report 2011*, p. 10.

172. Albright and Walrond, “Civil Separated Plutonium in the INFCIRC/549 states – Taking Stock”; IPFM, *Global Fissile Material Report 2010*, p. 77.

173. Duncan Clark, “U.K. to Mull Case for Plutonium Power Reactor”, *Global Security Newswire*, 10 July 2012.

174. Clark, “U.K. to Mull Case for Plutonium Power Reactor”, *Global Security Newswire*, 10 July 2012.

175. IPFM, *Global Fissile Material Report 2010*, p. 28; *Global Fissile Material Report 2011*, p. 9.

2.210 The United States includes excess unirradiated military plutonium in its INFCIRC/549 declarations. It has declared a total of 61.5 tonnes of plutonium (including 47 tonnes of weapon-grade plutonium) as excess to military requirements, leaving an estimated 38 tonnes either in or available for nuclear weapons.¹⁷⁶ A small amount of the fissile material (HEU and weapon-grade plutonium) designated as excess to military requirements has apparently been placed under IAEA safeguards, but there are no publicly available statistics to confirm this.

2.211 The 1997 US–Russia PPRA requires the cessation of weapon-grade plutonium production. The agreement’s monitoring provisions ensure that reactors shut down in both countries are not restarted.¹⁷⁷

2.212 In implementation of the Russia–US PMDA, the United States is building a MOX production facility at the Savannah River Site in South Carolina. Plutonium oxide feedstock from the Los Alamos National Laboratory and the H-Canyon Complex at Savannah River will be combined with depleted uranium to produce the fuel. A first tranche of 442 kg of plutonium oxide feedstock derived from nuclear-weapon triggers was delivered by the Los Alamos National Laboratory to the plant’s future operators in November 2012.¹⁷⁸

2.213 Not all of the excess plutonium is suitable for fabrication into MOX fuel. At least some of this will be sent to a geological repository, the Waste Isolation Pilot Plant in New Mexico, for disposal. Plutonium sent to this plant will not be subject to IAEA monitoring. The IPFM believes this creates “a large uncertainty for any future international attempt to verify U.S. plutonium production and disposition.”¹⁷⁹

2.214 *India* is known to produce HEU and weapon-grade plutonium. Official information on India’s fissile material production and holdings is sparse. So far, HEU is thought to have been enriched only to levels of 30–45 per cent for use in India’s nuclear submarine propulsion program. As of 2011, India’s HEU stockpile was estimated at 2.0 (+/- 0.8) tonnes and its weapon-grade plutonium stockpile at 520 (+/- 170) kg.¹⁸⁰ India has not declared any stocks of weapon-grade fissile material surplus to military needs.

2.215 Like India, *Pakistan* continues to produce fissile material for military purposes. Uncertainties about Pakistan’s fissile material production histories and capacities make accurate estimates of its holdings difficult. HEU is produced for use in Pakistan’s nuclear weapons program. As of 2011, Pakistan’s stockpile of HEU was estimated at 2.75 (+/- 1) tonnes and its weapon-grade plutonium stockpile at 135 (+/- 45) kg.¹⁸¹ Pakistan has not declared any weapon-grade fissile material as surplus to military needs.

2.216 Little is known about *Israel’s* fissile material production capacities. Israel “may have produced enriched uranium for military purposes in the past” and is believed to

176. Albright and Walrond, “Civil Separated Plutonium in the INFCIRC/549 states – Taking Stock”; Communication Received from the United States of America Concerning Its Policies Regarding the Management of Plutonium, INFCIRC/549/Add.6/14, 20 September 2011; IPFM, *Global Fissile Material Report 2010*, p. 28. The 47 tonnes of excess weapon-grade plutonium includes some plutonium in spent fuel and some plutonium disposed of as waste (ref. US INFCIRC/ 549 declaration of 29 October 2012)

177. NNSA Treaties and Agreements, <http://nnsa.energy.gov/aboutus/ourprograms/nonproliferation/treatiesagreements>.

178. “Nuke Plutonium Turned Toward Fuel Production”, *Global Security Newswire*, 19 November 2012.

179. IPFM, *Global Fissile Material Report 2011*, p. 18.

180. IPFM, *Global Fissile Material Report 2011*, pp. 10, 18, 117.

181. IPFM, *Global Fissile Material Report 2011*, pp. 11, 19.

have been “extracting plutonium for nuclear weapons from spent fuel since the mid-1960s.” Israel continues to operate a production reactor but this may now be used mainly to produce tritium. While there is uncertainty about the reactor’s power level and operating history, as of 2011 it was estimated to have produced 820 (+/- 150) kg of weapon-grade plutonium.¹⁸²

2.217 *North Korea* has a uranium enrichment plant but its operational status and whether it has produced fissile material is unknown. It is not known whether North Korea has additional enrichment plants. A currently inoperative reactor is estimated to have produced enough weapon-grade plutonium for some 10 nuclear warheads.¹⁸³

2.218 **Fissile Material Production Facilities.** At the 2010 NPT Review Conference, all states that had not yet done so were encouraged to begin dismantling or converting for peaceful uses their weapon-grade fissile material production facilities (Action 18). *China* produced HEU for weapons at two sites: Lanzhou gaseous diffusion plant (from 1964 to 1980), and Heping gaseous diffusion plant (from 1975 to 1987). China also produced HEU for its research reactors and LEU for naval reactors at these sites. China now produces LEU for civilian purposes at two gas centrifuge enrichment plants at Hanzhong in Shaanxi province and at Lanzhou in Gansu province. A new plant using Chinese centrifuges may also be operating near Lanzhou.

2.219 China has produced weapon-grade plutonium at two sites: Jiuquan Atomic Energy Complex near Yumen in Gansu province (plutonium production reactor and reprocessing facility), and Guangyuan plutonium production complex in Sichuan province (plutonium production reactor and reprocessing facility). Production of weapon-grade plutonium is believed to have ended at both sites.¹⁸⁴

2.220 *France’s* weapon-grade fissile material production facilities at Pierrelatte (HEU) and Marcoule (plutonium production reactor) were decommissioned in 1996.¹⁸⁵ In March 2008, President Nicolas Sarkozy invited international experts to observe the dismantlement of those facilities. Several site visits have since taken place.¹⁸⁶ France’s Pacific nuclear testing facility was dismantled in 1998.

2.221 Between 1949 and 1963, the *Soviet Union* built four large gaseous diffusion plants for uranium-enrichment. By the early 1990s, all had transitioned to gas centrifuge technology, and all are now designated as civilian facilities. The last operating plutonium production reactor in *Russia* (at Zheleznogorsk) was shut down in April 2010. The Zheleznogorsk reprocessing plant was expected to complete reprocessing of the final spent fuel from that reactor in 2012.¹⁸⁷

182. IPFM, *Global Fissile Material Report 2011*, pp. 3, 18, 107.

183. *Nuclear Weapons: Who Has What at a Glance*, Arms Control Association, 2012, <http://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat>.

184. IPFM, *Global Fissile Material Report 2010*, pp. 98–103.

185. IPFM, *Reducing and Eliminating Nuclear Weapons: Country Perspectives on the Challenges to Nuclear Disarmament* (2010); *Global Fissile Material Report 2008: Scope and Verification of a Fissile Material (Cutoff) Treaty* (2008); www.fissilematerials.org.

186. IPFM, *Global Fissile Material Report 2010*, p. 85.

187. IPFM, *Global Fissile Material Report 2010*, p. 58; *Global Fissile Material Report 2011*, p. 18; Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 60.

Map 2.5: Reprocessing (2012)**Notes**

Pakistan's Chashma plant is under construction

North Korea's Yongbyon plant is reportedly on stand by

Source: SIPRI

2.222 *The United Kingdom's* HEU came from two sources: from indigenous production at Capenhurst gaseous diffusion plant; and from the United States, under the 1958 Mutual Defence Agreement. HEU production at Capenhurst ceased in 1962. Thereafter, the plant was used for unsafeguarded LEU production. It closed in 1982 and is now being decommissioned.

2.223 Most of the UK's weapon-grade plutonium was produced in six plutonium production reactors (the two Windscale Piles and the four Calder Hall reactors) at Sellafield. Four additional dual-use reactors at Chapelcross also produced plutonium for the UK's nuclear weapons program. All reprocessing was done at Sellafield. The Windscale Piles were shut down after a graphite fire in 1957. The Calder Hall reactors were shut down in March 2003 and the Chapelcross reactors in June 2004. Under current decommissioning plans, the reactor structures will be dismantled late in the site clearance process (2041–65 for Windscale, 2105–17 for Calder Hall, 2116–28 for Chapelcross).¹⁸⁸

2.224 In the *United States*, most HEU was produced at two gaseous diffusion plants, one at Oak Ridge, Tennessee, and the other at Portsmouth, Ohio. Oak Ridge produced HEU for weapons from 1945 to 1964, after which it produced LEU for nuclear fuel until 1985. Portsmouth produced HEU for weapons between 1956 and 1964. Thereafter, it too produced mainly LEU for nuclear power plants. Portsmouth also produced some HEU for naval reactors until 1992 "when huge quantities of excess weapon-grade HEU...

188. IPFM, *Global Fissile Material Report 2010*, pp. 72, 76, 83; *Global Fissile Material Report 2011*, p. 10.

became available due to the first post-Cold War downsizing of the U.S. weapons stockpile. Future U.S. naval reactors are being designed to be fueled with this uranium.” The demolition of Oak Ridge is in progress. The US Department of Energy awarded a contract for decontamination and decommissioning of Portsmouth in August 2010.

2.225 At its fissile-material-producing peak, the United States operated a total of fourteen plutonium production reactors: nine at the US Department of Energy’s Hanford site in Washington state, and five at its Savannah River site in South Carolina. Nine were shut down in the 1960s, while five continued into the 1980s, producing tritium for use in “boost” gas to increase the yield of fission triggers in nuclear weapons. The remaining reactors were finally shut down in 1987.

2.226 The United States has begun decommissioning the five heavy-water plutonium production reactors at Savannah River. Five of the nine reactors at Hanford had been “cocooned” – “partially taken apart with their cores encased to prevent the leakage of radiation” – by 2005. Another is currently being cocooned (scheduled for completion in 2013), with two more to follow. The remaining reactor has been turned into a museum.¹⁸⁹

2.227 *India* is significantly increasing its fissile material production capacities. The existing centrifuge enrichment plant in Rattenhalli, Mysore is understood to have been improved and expanded in recent years. A second enrichment complex is planned for the Chitradurga district which, like Rattenhalli, will be unsafeguarded, leaving open the possibility of its use to produce HEU for weapons.

2.228 India has produced weapon-grade plutonium in two reactors, CIRUS and Dhruva. The CIRUS reactor, which produced the plutonium used in India’s first nuclear test in 1974, was shut down in December 2010 after 50 years of operation. A new, higher powered reactor similar to the Dhruva reactor will replace CIRUS and is expected to be operational in 2017–18. A new reprocessing plant at Tarapur was inaugurated in January 2011, adding to India’s three existing reprocessing plants: Trombay at Mumbai, an existing plant at Tarapur and KARP at Kalpakkam. Further reprocessing plants are under construction or planned, including to provide fuel for planned fast breeder reactors. India’s prototype fast breeder reactors could produce more than 100 kg of weapon-grade plutonium per year if used for this purpose, significantly increasing India’s weapon-grade plutonium production capacity.¹⁹⁰

2.229 *Pakistan* is understood to have been using gas centrifuges to produce weapon-grade HEU since the early 1980s, and to have had a functioning plutonium production reactor since the late 1990s. Pakistan produces HEU for nuclear weapons at its Kahuta centrifuge enrichment plant. A possible additional enrichment plant may be operating at Gadwal. Pakistan is substantially expanding its capacity to produce weapon-grade plutonium. Two production reactors are operating at Khushab, the first since 1998 and the second since late 2009 or early 2010. A third reactor at Khushab is nearing completion and a fourth is under construction.¹⁹¹ Reprocessing is carried out at the New Laboratories

189. IPFM, *Global Fissile Material Report 2010*, pp. 28–30; Mukhatzhanova, *Implementation of the 2010 NPT Review Conference Disarmament Actions*, p. 60.

190. IPFM, *Global Fissile Material Report 2011*, pp. 10–11, 19, 23.

191. IPFM, *Global Fissile Material Report 2011*, pp. 11, 19; David Albright and Robert Avagyan, “Construction Progressing

Reprocessing Facility near Rawalpindi which has been operating since 2000. Construction of the larger capacity Chashma reprocessing facility at the Kundian nuclear complex is underway or may have been completed.¹⁹²

2.230 *Israel* is widely assumed to have produced plutonium for nuclear weapons at its Dimona reactor and to have reprocessed spent fuel from Dimona at a facility in the Negev Nuclear Research Center. The Dimona reactor has operated since 1963.¹⁹³

2.231 *North Korea* has produced weapon-grade plutonium at the Yongbyon 5MWe reactor and reprocessed spent fuel from the reactor at its Yongbyon reprocessing plant. The 5MWe reactor is currently inoperative and the reprocessing plant is understood to be on standby but not currently operating. North Korea is constructing a light water reactor at Yongbyon which could be completed by mid to late 2013. Light water reactors are not typically used for weapons plutonium production but can be used for this purpose, giving rise to concern that the light water reactor could substantially increase North Korea's capacity to produce weapon-grade plutonium. In 2010, North Korea revealed at Yongbyon its only known enrichment plant. North Korea claimed that the plant was intended to produce LEU fuel for the light water reactor under construction. The current operational status of the enrichment plant is unknown.¹⁹⁴

Rapidly on the Fourth Heavy Water Reactor at the Khushab Nuclear Site," ISIS, May 2012, <http://isis-online.org/isis-reports/detail/construction-progressing-rapidly-on-the-fourth-heavy-water-reactor-at-the-k/>.

192. NTI Country Profiles/Pakistan/Facilities/Nuclear, <http://www.nti.org/country-profiles/pakistan/facilities/>.

193. NTI Country Profiles/Israel/Facilities/Nuclear, <http://www.nti.org/country-profiles/israel/facilities/>.

194. IPFM, *Global Fissile Material Report 2011*, pp. 8, 11, 33; Kelsey Davenport, "North Korea Makes Progress on Reactor," Arms Control Association, October 2012, http://www.armscontrol.org/act/2012_10/North-Korea-Makes-Progress-on-Reacto.

3. NUCLEAR SECURITY

- §3.1 Overview
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§3.1 Overview

3.1 “Nuclear security” means measures designed to address the risks associated with theft and trafficking in nuclear and radiological materials (including for the benefit of would-be proliferators), sabotage of nuclear facilities, and the danger of terrorists acquiring and using a nuclear weapon. Despite recent advances global nuclear security is inadequate. Because a major nuclear security incident would have far-reaching consequences, effective nuclear security must be a global concern. But most countries regard nuclear security as primarily a national concern, devoting insufficient attention to the development, promotion and application of international standards.

3.2 The nuclear security regime consists of agreements, regulations, resolutions and guidelines that either existed or were close to being finalized before 2010. Further progress has been made in national implementation since leaders’ level Nuclear Security Summits (NSS) began in 2010. National ratifications of treaties and several projects were accelerated so that they could be announced at the summits. But nuclear security still lags well behind the other nuclear regimes for safety, safeguards and arms control. The current regime is reliant almost entirely on national protection and control systems in those countries that possess nuclear and radiological materials. It needs to be more comprehensive instead of incremental, covering all materials and all facilities at all times; integrated rather than disparate and piecemeal; and backed by global mechanisms in order to make the regime both robust and resilient. It also needs effective monitoring requirements, and authority, procedures and institutions for enforcing agreed commitments: without these, accountability is lacking and states cannot have confidence in the international nuclear security system.



3.3 Global Nuclear Security Architecture. Globally, nuclear security is less well developed than nuclear safeguards and nuclear safety. The three main elements of the nuclear security regime are national laws and regulations; international agreements, instruments and institutions; and ad hoc and voluntary cooperative measures. The main global components are: The Convention on the Physical Protection of Nuclear Material (CPPNM) (1980) which applies primarily to the protection of nuclear material in international transport; the CPPNM Amendment (2005) which extends the convention's application to protection of nuclear material in domestic use and of facilities against sabotage; the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) (2007); United Nations Security Council Resolution (UNSCR) 1540 (28 April 2004); IAEA guidance documents like INFCIRC/225/Rev.5, the Fundamental Principles of Physical Protection of Nuclear Material and Nuclear Facilities, and INFCIRC/153; and various multilateral, regional and bilateral agreements and initiatives.

3.4 The need for effective nuclear security has been widely recognized. The Final Document of the eighth NPT Review Conference (2010) noted "the paramount importance of effective physical protection of all nuclear material and the need for strengthened international cooperation in physical protection," and supported nuclear security improvements. Two NSS have been held so far, on 12–13 April 2010 in Washington, DC and 26–27 March 2012 in Seoul. A third is planned for 2014 in the Netherlands. Nuclear security was an important issue for the International Commission on Nuclear Non-proliferation and Disarmament (ICNND), with its 2009 report including a number of recommendations on strengthening the international regime (ICNND Recommendations 27–31).

3.5 The CPPNM has 148 States Parties, which means that about one-quarter of the world's states have still not acceded to it. By December 2012, only 61 of the 99 accessions needed for the 2005 amendment to enter into force had been received. The long delay with entry into force of the CPPNM amendment is starkly at odds with continued international concern about nuclear security standards.

3.6 The Nuclear Security Series are International Atomic Energy Agency (IAEA) publications "relating to the prevention and detection of, and response to, theft, sabotage, unauthorized access and illegal transfer or other malicious acts involving nuclear material and other radioactive substances and their associated facilities." They embrace such fields as nuclear security fundamentals, recommendations, implementing guides and technical guidance. In the series, INFCIRC/225/Rev.5, a set of non-legally-binding guidelines, is generally considered to be the cornerstone of the international physical protection regime for nuclear materials and facilities and has been incorporated into the domestic law of many states, and also in some suppliers' bilateral agreements as a condition of peaceful nuclear cooperation. Inclusion in bilateral nuclear supply agreements of a provision that recipient states apply INFCIRC/225 requirements is a means of making them legally binding in particular states. Effective nuclear security demands that all nuclear suppliers include the INFCIRC/225 condition (and a requirement that recipients be party to the CPPNM) in their agreements.

3.7 ICSANT is an important legally binding multilateral instrument establishing obligations to take domestic measures to prevent and punish nuclear terrorism and strengthening international cooperation in this area. The convention came into effect in 2007 but remains far from universal. A total of 115 nations have signed and 83 have ratified the convention to date.

3.8 UNSCR 1540, passed by the UN Security Council to counter the dangers of nuclear terrorism by, inter alia, improving and enhancing international cooperation on nuclear security, has resulted in some significant progress but has yet to be fully implemented.

3.9 The Code of Conduct on the Safety and Security of Radioactive Sources, approved by the IAEA Board of Governors in September 2003 with a supplement approved in September 2004, established detailed, non-legally binding guidance on international best-practice standards to prevent the misuse of radioactive sources including for “dirty bombs.” By December 2012, 115 states had expressed support for the Code of Conduct and 73 countries supported all aspects of the supplementary guidance as well. Continued regional and global assistance to states requiring it is vital to the effective control of radioactive sources.

3.10 Global cooperation mechanisms have made an important contribution to improving nuclear security, particularly those launched in the post-Cold War period to reduce the risk of leakage of nuclear and radioactive materials, technology and expertise from the former Soviet republics. Among the most successful and effective is the 21-year old Cooperative Threat Reduction (CTR or Nunn-Lugar) program. In October 2012, Russia announced that it would let the program expire in May 2013 because it no longer needs foreign assistance and has concerns about nuclear security information being leaked. Another initiative to have made a significant contribution to nuclear security is the \$20 billion Global Partnership of the Group of Eight (G8) countries. The G8 Global Partnership’s mandate was to expire in 2012 but has been extended indefinitely. The Global Initiative to Combat Nuclear Terrorism (GICNT), set up by Russia and the United States in 2006, had by December 2012 expanded its membership to include 85 countries plus four observers.

Overall Evaluation of Global Nuclear Architecture. **Some Progress** States have implemented many NSS commitments, additional states have ratified the CPPNM and its Amendment, more are taking advantage of IAEA tools and services, and states have cooperated with one another. However, NPT 2010 and ICNND 2009 support for universal application of the CPPNM and early ratification of the 2005 amendment is not in sight. Much of the architecture lacks any means to judge whether commitments are being met.

3.11 Role of the IAEA. The IAEA's lead role in strengthening international nuclear security – in particular through the services and assistance it provides under the Nuclear Security Plan for 2010–13, the third plan of its kind – is not reflected in the funding available for the agency's nuclear security work which, as well as being insufficient, is not guaranteed because it overwhelmingly comes from voluntary contributions. In addition to the funding issue, consideration is needed on whether the IAEA's authority and responsibilities in the nuclear security area should be expanded.

Overall Evaluation for the Role of the IAEA. **Some Progress.** The IAEA is providing a wide range of advisory services and other assistance on nuclear security issues. The centrality of the IAEA's role makes a predictable and stable budget for nuclear security essential.

3.12 International Cooperation. In 2011 the IAEA published a reference text on computer security at nuclear facilities and several countries and organizations have held workshops and other events on this subject. A total of 116 states have joined the Illicit Trafficking Database Programme (ITDB). International cooperation such as the US Megaports Initiative is providing training, technical assistance and equipment to strengthen detection and interdiction capabilities. But the historical bias towards national secrecy and sovereignty on nuclear security continues to result in inadequate transparency and accountability, notwithstanding the global consequences of vulnerability. This is reflected in insufficient international cooperation on developing and implementing nuclear security best practice, although it is demonstrably possible to develop and share such practices consistent with the confidentiality of commercially or militarily sensitive information.

Overall Evaluation for International Cooperation. **Some Progress.** Significant international cooperation is taking place on detecting and thwarting illicit trafficking, but this needs to be expanded as gaps are identified. States need to commit more fully to cooperation in developing and sharing nuclear security best practices.

3.13 National Nuclear Security Regulations. In 2011 the UNSCR 1540 Committee was able to report that: “at least 140 States have now adopted legislative measures to prohibit proliferation of nuclear, chemical and biological weapons, as compared to 65 States in 2006.” However, work remains to be done in the national implementation of nuclear security measures. Continued provision of assistance to states requiring it is essential.

Overall Evaluation for National Nuclear Security Regulations. **Significant Progress.** UNSCR 1540 has played a significant role in this area, resulting in a substantial increase in the number of states with legislative measures to prohibit proliferation of nuclear weapons. But more needs to be done in national implementation.

3.14 Sensitive Nuclear Materials. With civilian uses, progress continues to be made on global efforts to eliminate excess weapon-grade plutonium and to shift from highly enriched uranium (HEU) to low enriched uranium (LEU). The industrialized countries have assisted many others in HEU to LEU conversion efforts, but there has been a reluctance to ban outright HEU use in civilian applications. As to non-civilian uses, the United States and Russia have committed to the elimination of significant quantities of excess weapon-grade plutonium and are on track to complete the conversion of 500 tonnes of Russian HEU to LEU by the end of 2013, but no sensitive nuclear materials held anywhere for these purposes are subject to any international standards or assurance.

Overall Evaluation for Sensitive Nuclear Materials. **Some Progress.** While progress is being made on minimization of civil HEU use, states have been reluctant to ban HEU use in civilian applications. On non-civilian uses, the United States and Russia are on track to complete the conversion of 500 tonnes of HEU to LEU by the end of 2013 and have also agreed to eliminate significant quantities of excess weapon-grade plutonium.

3.15 Nuclear Forensics. Nuclear forensics needs to continue to develop and expand with the aim of increasing its capacity to provide information on the source, production and history of nuclear material outside regulatory control. The IAEA in particular has published descriptions of nuclear forensics tools and procedures and provided training to states on this.

Overall Evaluation for Nuclear Forensics. **Some Progress.** In addition to significant work going on at the national level in some countries, the IAEA continues to provide assistance with building nuclear forensics capacity in member states, both through its own activities and by teaming with member states to hold workshops and other training.

3.16 Role of Nuclear Industry. The shared responsibility for nuclear security between state authorities and the nuclear industry has been recognized, including at the two NSS. But implementation of public–private sector cooperation to strengthen nuclear security is not significant.

Overall Evaluation for Role of Nuclear Industry. **Minimal Progress.** There is general understanding that effective nuclear security is strongly in the interests of the nuclear industry. More work is needed on identifying practical ways the nuclear industry and state authorities can work together to improve nuclear security.

3.17 Nuclear Security and Safety Interface. The interface between nuclear safety and security has been recognized, including at the 2012 Seoul NSS. The overlaps between nuclear safety and security need to be fully reflected in the regulation, design and operation of nuclear facilities, including in risk assessments and training.

Overall Evaluation for Nuclear Security and Safety Interface. **Some Progress.** The IAEA in cooperation with member states is providing training and other assistance in this area. A number of training centres have been established which emphasize an integrated approach to nuclear safeguards, safety and security.

3.18 Nuclear Security Culture. In the absence of universal, binding nuclear security standards and adequate transparency and accountability mechanisms, a robust nuclear security culture is critical. The IAEA organizes training activities and workshops based on findings from the work of advisory missions. Its International Physical Protection Advisory Service (IPPAS) is particularly noteworthy in helping states to develop and improve national nuclear security on request.

Overall Evaluation for Nuclear Security Culture. **Some Progress.** Increasing organizational activity suggests some progress here. However, the extent to which a genuine nuclear security culture exists is unclear because of the lack of monitoring and reporting on whether states are implementing best practice standards and recommendations.

§3.2 Objectives and General Strategy

3.19 Nuclear disarmament, nuclear non-proliferation and peaceful uses of nuclear energy are the three main pillars of the NPT regime. Particularly since the terrorist attacks of 11 September 2001, nuclear security concerns have been heightened owing to several developments: fears that terrorist groups with cadres of suicide bombers not deterred by the thought of their own deaths are interested in acquiring radioactive and fissile material or in attacking nuclear facilities; revelations of illicit trafficking in nuclear materials, components and technology; unresolved security vulnerabilities at nuclear facilities in Russia and some other former Soviet republics; and several nuclear security incidents in recent times (see Box 3.1).

3.20 It is possible to interpret these in either of two contradictory ways. The first is to argue that the catalogue is unnecessarily alarmist and exaggerates and magnifies the importance of the incidents. After all, what is important is that none of them has actually led to anything consequential. Recalling them, therefore, is equivalent to crying wolf, alerting the international community to a non-existent danger. The alternative conclusion is that significant risks are inherent in this sphere and that the authorities have to be vigilant and succeed in preventing theft and attacks every single time.

3.21 Like the list of incidents involving temporary loss of secure control over nuclear weapons in storage or during transport, accidental or false reports of incoming attacks, and the like, the truth is that so far, no such alarms have resulted in a major incident, let alone a catastrophe. Unfortunately, however, this is no guarantee of the good luck holding always and forever. After all, the boy who cried wolf did indeed get killed and eaten by a wolf.

3.22 The working definition of nuclear security used by the IAEA since 2003 is: “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.”¹ A comprehensive definition of nuclear security would include regimes and protection, control and enforcement measures:

- > To prevent, detect and respond to acts of nuclear terrorism using fissile material and radiological sources, illicit transfers or thefts of fissile material and radiological sources, and sabotage of nuclear and radiological facilities;
- > To promote a nuclear security culture; and
- > To strengthen a comprehensive, integrated and global regime as well as a suite of national laws, agreements, instruments and systems to this end.

3.23 In his speech in Prague on 5 April 2009 in which he outlined his dream of a world free of nuclear weapons, US President Barack Obama also announced the start of “a new international effort to secure all vulnerable nuclear material around the world within four years.”² The justification was to reduce the risk of nuclear terrorism which the president described as both the most immediate and the most extreme threat to global security.

1. IAEA, *Nuclear Security Plan 2010-2013*, document GOV/2009/54-GC(53)/18 (17 August 2009), p. 1 n2.

2. “Remarks by President Barack Obama, Hradcany Square, Prague, 5 April 2009” (Washington DC: White House, Office of the Press Secretary, 2009), <http://www.whitehouse.gov/video/The-President-in-Prague#transcript>.

Box 3.1: Nuclear Security Incidents (1998–2012)

According to the IAEA, between 1993 and 2011, there were more than 2,000 cases of illegal trafficking, theft, or loss of nuclear and radiological materials around the world, of which only 40 per cent has been recovered.³ Some recent worrying incidents include:⁴

- > In 1998, insiders at a Russian nuclear weapons facility were discovered trying to steal 18 kg of highly enriched uranium (HEU);
- > In 2006, Russian citizen Oleg Khinsagov was arrested in Georgia with 100 grams of HEU, attempting to find a buyer for several kilograms of HEU;
- > On 8 November 2007, two groups of armed men broke into South Africa's Pelindaba nuclear research facility outside Pretoria from two different directions, deactivated several layers of security, penetrated into the control room for 45 minutes and escaped but without taking any nuclear material. The site is believed to store enough weapon-grade HEU for up to 25 nuclear bombs held in "locked-down" secure conditions;
- > In April 2012, another violation of protective measures at the Pelindaba facility was described as an act of "common" criminality. The national nuclear regulator spokesperson Gino Moonsamy was quoted as saying that thanks to "adequate physical protection, no nuclear or radioactive material was accessed, lost or stolen";
- > In May 2008, nuclear bombs were despatched from a North Dakota base without proper controls; three US Defense Threat Reduction Agency staff were dismissed;
- > In 2009, about 100 grams of HEU, lodged inside a nuclear fission chamber that likely came from a decommissioned Soviet nuclear facility, was recovered from a scrap metal yard in Rotterdam;
- > In November 2010, Belgian activists evaded NATO guards to expose security weaknesses at a base in Kleine Brogel where nuclear weapons are kept;
- > In 2011, Moldavian authorities arrested six people for smuggling 4.4 grams of weapon-grade uranium. They had plotted to sell up to 9 kg for \$31 million. The Russian ringleader is still at large;
- > Serial attacks have done little to dispel international fears over "the risk of terrorists breaching Pakistan's defences."⁵ Just before dawn on 16 August 2012, several gunmen wearing military uniforms and suicide vests attacked the Minhas base of the Pakistan Air Force in Kamra, about 60 km northwest of Islamabad.⁶ In September 2012, the Inter-Services Intelligence (ISI) reportedly intercepted plans by the Tehreek-e-Taliban Pakistan (TTP) to attack one of the country's largest nuclear facilities in Dera Ghazi Khan in what a military officer described as "the first-ever serious security threat" from the TTP.⁷

These incidents show the urgent need to raise international nuclear security standards. Terrorists need only to identify and exploit the weakest link in the chain of international nuclear security to acquire enough fissile material to make and detonate a bomb in a major city. And because the amount of fissile material required is as small as 5 kg of plutonium or 15 kg of HEU, the margin of accounting error for nuclear materials is dangerously small.⁸

3. Kim Joong Keun (South Korea's ambassador to India, writing on the eve of the Seoul NSS), "Beyond security, towards peace," *Times of India*, 26 March 2012.

4. Peter Goodspeed, "Ongoing nuclear threat looms over Seoul summit," *National Post* (Toronto), 24 March 2012; Jonathan Tirone, "Missing nukes fuel terror concern as Obama drawn to Seoul," *Bloomberg News*, <http://www.bloomberg.com/news/2012-03-22/missing-nukes-fuel-terror-concern-as-seoul-meeting-draws-obama.html>, 23 March 2012; "Another infiltration reported at South African atomic site," *Global Security Newswire*, 13 July 2012; <http://www.nti.org/gsn/article/new-infiltration-reported-south-african-atomic-plant>.

5. Banyan, "Nuclear profusion," *The Economist*, 25 August 2012.

6. "Gunmen storm military air base in Pakistan," *BBC News*, 16 August 2012, <http://www.bbc.co.uk/news/world-asia-19278302>.

7. Abdul Manan, "Taliban threat: Nuclear site in DG Khan cordoned off," *The Express Tribune*, 6 September 2012, <http://tribune.com.pk/story/432295/taliban-threat-nuclear-site-in-dg-khan-cordoned-off/>.

8. That said, the risks are further reduced, because an essential part of safeguards at processing plants (for example, enrichment, reprocessing, fabrication) is containment and surveillance (for example, cameras, radiation monitors) to ensure material cannot be removed.

3.24 Nuclear terrorism is defined in Article 2 of ICSANT⁹ as the making, demanding, possession, use, or threat of use of radioactive material or device by any person with the intent to cause death or serious bodily injury; cause substantial damage to property or the environment; or to compel a person, legal entity or international organization to do or refrain from doing an act.

3.25 While “defense against terrorism must succeed every time... terrorists must succeed only once. This is true from plot to plot, but within each plot, the logic is reversed. Terrorists must succeed at every stage, but the defense needs to succeed only once.”¹⁰ According to Harvard University’s Belfer Center in 2010, five terrorist groups “may be capable of acquiring and using nuclear weapons”; four are known to have “demonstrated an interest” in getting a nuclear weapon; and two are known to have tried to buy nuclear material on the international black market. In addition, al Qaeda is known to have been pursuing a nuclear weapon since the early to mid 1990s.¹¹ Although a successful act of nuclear terrorism remains difficult for terrorists, the potential consequences are such that it must be treated as a serious threat.

3.26 Several regimes have been refined and additional ones promulgated to treat nuclear terrorism as a matter subject both to domestic and to international law, to outlaw it, to require states to use and, if necessary, strengthen domestic legal systems to fight nuclear terrorism, to use international law as a basis and the United Nations as a key forum for international collaboration and action to meet the threat of nuclear terrorism, and in other ways to encourage and facilitate interstate cooperation in meeting the challenge. However, the development and widespread adoption of international best practice in nuclear security culture is inhibited by concerns over national sovereignty if multilateral standards are made more stringent and international institutions are given an expanded remit to monitor compliance.

3.27 As distilled from the sources described below, the objective of nuclear security is to ensure that nuclear weapons and materials are secure from unauthorized access and theft, the facilities in which nuclear weapons and radioactive material are manufactured and stored are secure from sabotage, and terrorists and criminals are prevented from acquiring, making and using nuclear explosive devices.

3.28 The strategies for ensuring nuclear security may be described as:

- To protect nuclear facilities, weapons and material against theft and sabotage by:
 - minimizing the number of locations at which nuclear weapons and fissile materials are stored;
 - strengthening security at all locations;
 - encouraging the switch from highly enriched uranium (HEU) to low enriched uranium (LEU);
 - reducing the size of global nuclear weapons and fissile materials inventories; and

9. <http://untreaty.un.org/cod/avl/ha/icsant/icsant.html>.

10. Michael Levi, quoted in International Commission on Nuclear Non-proliferation and Disarmament (ICNND) (Gareth Evans and Yoriko Kawaguchi co-chairs), *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers* (Canberra and Tokyo: ICNND, 2009), p. 47, paragraph 4.26.

11. Belfer Center for Science and International Affairs, *Nuclear Terrorism Fact Sheet* (Cambridge MA: Harvard University, 2010), <http://belfercenter.ksg.harvard.edu/files/Nuclear-Security-Fact-Sheet.pdf>.

- bringing all remaining excess military and civilian stockpiles of fissile materials under international monitoring;
- > To prevent, detect and respond to the theft and sabotage of nuclear material during international transport;
- > To prevent, detect and respond to any illicit trafficking in nuclear material;
- > To prevent, detect and respond to acts of terrorism using nuclear material and radiological sources;
- > To promote the adoption of rigorous and reliable nuclear and radiological material and inventory control systems;
- > To strengthen the nuclear security regime of national laws and regulations, bilateral and multilateral agreements, UN resolutions and international guidelines in order to fully and effectively implement the above strategies.

3.29 These descriptions are derived from the outcomes of the two Nuclear Security Summits (NSS) held in Washington (2010) and Seoul (2012); the outcomes document of the eighth NPT Review Conference (2010); and the ICNND report (2009). The NSS, a third and probably last of which is planned for 2014 in the Netherlands, have been convened to strengthen, consolidate, elevate and energize the many existing national, multilateral and cooperative institutions and structures to ensure nuclear security and prevent nuclear smuggling. They are important for having affirmed US presidential leadership on this critical area of the nuclear challenge and for elevating the issue to the level of a global leaders' summit.

3.30 In January 2012 the Nuclear Threat Initiative (NTI) published a benchmark study, *The Nuclear Materials Security Index*.¹² Based on five categories (quantities and sites, security and control measures, global norms, domestic commitments and capability, and societal factors like political stability and corruption), subdivided further into 18 indicators that went beyond "guns, guards and gates" and also beyond nuclear materials control and accountancy practices, the study concluded that although governments have become more aware of the threat:

- > There is still no global consensus on the most important steps to achieve nuclear security;
- > State accountability is problematical because of a deliberate lack of transparency;
- > Stocks of weapon-useable materials continue to rise in some countries;
- > Almost a quarter of the states scored poorly on societal factors; and
- > Many lag on joining international agreements.

3.31 The NTI Index was complemented by an assessment of national commitments carried out by a team for the Arms Control Association and Partnership for Global Security.¹³ Tracking the implementation of pledges made in Washington in April 2010 by 30 countries, the study concluded that of the more than 60 national commitments made

12. *NTI Nuclear Materials Security Index: Building a Framework for Assurance, Accountability, and Action* (Washington DC: Nuclear Threat Initiative, January 2012).

13. Michelle Cann, Kelsey Davenport and Margaret Balza, *The Nuclear Security Summit: Assessment of National Commitments* (Washington DC: Arms Control Association, March 2012).

by the 2010 summit participants, 80 per cent had been completed by February 2012 (the most recent publicly available data).

§3.3 Global Nuclear Security Architecture

3.32 The three main elements of the nuclear security regime, addressed in sequence below, are international agreements, instruments and institutions; ad hoc and voluntary cooperative measures; and national laws and regulations. The two NSS to date have reaffirmed the international treaties, instruments and institutions (clustered into the “global nuclear security architecture” in Seoul) that backstop national efforts to strengthen nuclear security and prevent nuclear terrorism. But both summits took care to reaffirm the rights of states to develop and utilize nuclear energy for peaceful purposes and that measures to strengthen nuclear security must not hamper these rights.

3.33 At the 2010 and 2012 NSS the leaders accepted that all states are responsible for ensuring the security of nuclear materials and facilities under their control, to seek assistance from others if necessary and to provide assistance to others if asked. The leaders have used the summits to renew their commitment to ensure that nuclear materials under their national control are not lost through theft or diversion, evaluate the threat and improve security as required on a continuing basis, and to share information and exchange best practices to these ends.

3.34 The main global components of the nuclear security regime, discussed in detail in following sections, are:

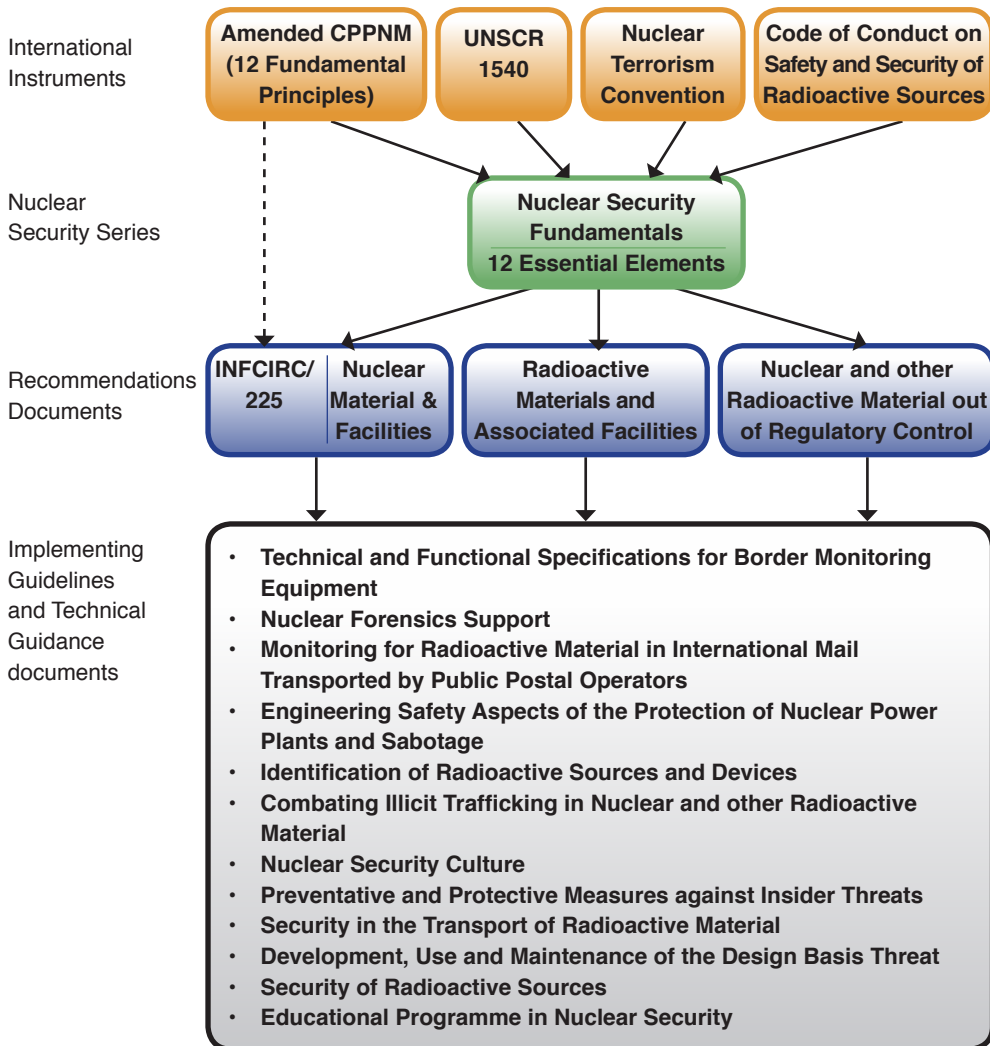
- > The Convention on the Physical Protection of Nuclear Material (CPPNM) which applies primarily to the protection of nuclear material in international transport, together with the CPPNM Amendment which extends the convention’s application to protection of nuclear material in domestic use and of facilities against sabotage;
- > International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT);
- > United Nations Security Council Resolution (UNSCR) 1540;
- > IAEA guidance documents like INFCIRC/225/Rev.5; the Fundamental Principles of Physical Protection of Nuclear Material and Nuclear Facilities; and INFCIRC/153; and
- > Various multilateral, regional and bilateral agreements and initiatives,¹⁴ in particular the Cooperative Threat Reduction (CTR or Nunn-Lugar) program, the Global Partnership of the Group of Eight (G8) countries, and the Global Initiative to Combat Nuclear Terrorism (GICNT).

3.35 All these various elements were the subject of close attention by the 2010 NPT Review Conference. Noting “the paramount importance of effective physical protection of all nuclear material and the need for strengthened international cooperation in physical protection,” the 2010 Final Document welcomed the 2005 CPPNM Amendment, affirmed the important role of the IAEA in promoting international cooperation by establishing “a comprehensive set of nuclear security guidelines” and in helping member

14. “Strengthening the Global Nuclear Security System,” Global Dialogue on Nuclear Security Priorities (Washington DC: Nuclear Threat Initiative, 10 July 2012), p. 2.

Figure 3.1: The Global Nuclear Security Regime

NSS 2012



Source: SIPRI

states, on request, enhance national security (paragraphs 27–28). It also acknowledged the need for international cooperation and coordination, with IAEA support, “in preventing, detecting and responding to illicit trafficking in nuclear and other radioactive material” (paragraph 29). Importantly, the conference noted that “While nuclear safety and nuclear security are national responsibilities, the IAEA should play the key role in the development of safety standards, nuclear security guidance and relevant conventions based on best practice” (paragraph 58). As well as endorsing the non-legally binding Code of Conduct on the Safety and Security of Radioactive Sources, the conference

encouraged all non-parties to the CPPNM to accede to it and to ratify the 2005 amendment “so that it may enter into force at an early date” (paragraphs 62–63). Finally, the conference took note of the first NSS held in Washington in April 2010, welcomed the voluntary efforts by states to minimize the use of HEU in the civilian sector, and encouraged states to promote the sharing of best practice in nuclear safety and security, including through dialogue with the nuclear industry and the private sector (paragraphs 65–69). These were translated into action points 40–46.

3.3.1. Convention on the Physical Protection of Nuclear Material (CPPNM) 1980

3.36 The basic knowledge and skill to make a crude nuclear explosive device is readily available and acquired. But it is far more challenging to produce fissile material – weapon-grade HEU (90 per cent U-235) or separated plutonium – on any substantial scale. Only states are likely to have the necessary level of infrastructure. But if their material, facilities and personnel have security vulnerabilities, then terrorists, criminals or other unauthorized actors could steal the nuclear material or even a nuclear bomb (see Box 3.1). They will raid not the facility or the country with the most nuclear material, but that which is the most vulnerable. Any country could be a target; all could feel the effects.

3.37 This is why measures for the physical protection of all nuclear materials, facilities and activities are an essential and critical component of nuclear security. As well as guards, gates and fences at nuclear plants and facilities, this requires thorough background checks on personnel employed there and rigorous training after recruitment in order to inculcate a culture of nuclear security. In a ‘whole-of-nuclear-security-chain’, the amount of nuclear material could be reduced; the physical protection of materials and facilities could be reinforced; security measures could be strengthened for materials during transportation and transit; and export and border controls could be made more stringent. In sum, both HEU and separated plutonium, even for peaceful purposes, should be subject to security controls no less stringent than those prescribed for nuclear weapons, or what the US National Academy of Sciences describes as “the stored-weapon standard.”¹⁵

3.38 The CPPNM, adopted in Vienna on 26 October 1979 and signed in Vienna and New York on 3 March 1980, entered into force on 8 February 1987. It establishes measures related to the physical protection of nuclear material during international transport and a general framework for cooperation among states in the protection, recovery and return of stolen nuclear material. At the end of 2012, the CPPNM had 148 states parties.¹⁶ That is, about one-quarter of the world’s states have still not acceded to it. Countries which attended one or both of the NSS and have not ratified or acceded to the CPPNM are Egypt, Malaysia, Singapore and Thailand.

3.39 A diplomatic conference was convened in 2005 to strengthen the convention in light of the terrorist attacks of 11 September 2001 and an amendment was adopted by

15. Weapons of Mass Destruction Commission, *Weapons of Terror: Freeing the World of Nuclear, Biological and Chemical Arms* (Stockholm: Weapons of Mass Destruction Secretariat, 2006), p. 84. However, while the “stored-weapon standard” would apply to plutonium metal, it would not necessarily apply to everything, for example plutonium in mixed oxide (MOX) powder or fuel assemblies.

16. http://www.iaea.org/Publications/Documents/Conventions/cppnm_status.pdf.

consensus on 8 July. The name was amended to the Convention on the Physical Protection of Nuclear Material and Nuclear Facilities. The amendment was promoted and justified as a key measure of nuclear security. The obligations for physical protection under the original CPPNM covered nuclear material during international transport. The amendment requires states parties to protect nuclear facilities and material in peaceful domestic use, storage and transport. In addition, it also provides for expanded cooperation among states on measures to locate and recover stolen or smuggled nuclear material, and mitigate any radiological consequences of sabotage. It will enter into force upon ratification by two-thirds of the states party to the convention. Countries which attended one or both of the NSS and which are party to the CPPNM but have not yet become party to the 2005 Amendment are Armenia, Azerbaijan, Belgium, Brazil, Canada, France, Italy, Japan, Morocco, New Zealand, Pakistan, Philippines, ROK, South Africa, Turkey, and the United States. By the end of 2012, it had only 61 of the 99 required number of accessions.¹⁷

3.40 On 11 September 2001 (the day of the terrorist attacks in New York and Washington), the IAEA Board of Governors approved twelve “Fundamental Principles of Physical Protection of Nuclear Materials and Facilities.” These were incorporated into the CPPNM Amendment (Article 3) and thus would apply to the 61 states that are party to the amendment.

3.41 Table 3.1 summarizes the current status of the CPPNM, CPPNM Amendment, and ICSANT. As can be seen, although the CPPNM was already adhered to quite widely (but not universally) before the first NSS in Washington in April 2010, the summit does seem to have injected fresh momentum into states becoming parties to the other two instruments. In the last two years, the number of states parties to the CPPNM Amendment has almost doubled, with 24 states becoming parties to it since the Washington NSS, and those acceding to ICSANT have increased by about one-quarter (14 additional states parties since April 2010).

Table 3.1: Status of CPPNM, CPPNM Amendment, and ICSANT (December 2012)

	Date adopted	Entry into Force	Parties	Signed but not Parties	Acceded since 1.1.2010
CPPNM	26.10.1979	8.2.1987	148	1 ^a	2 ^b
CPPNM Amendment	8.7.2005	–	61	0	24 ^c
ICSANT	13.4.2005	7.7.2007	83	32	15 ^d

A. Haiti; B. Laos (29.7.2010), Lesotho (18.8.2010); C. Argentina (15.11.2011), Bahrain (9.6.2010), Bosnia & Herzegovina (21.6.2010), Czech Republic (30.12.2010), Denmark (29.5.2010), Finland (17.6.2011), Georgia (5.4.2012), Germany (21.10.2010), Greece (13.12.2011), Indonesia (27.5.2010), Israel (16.3.2012), Kazakhstan (26.4.2011), Latvia (23.11.2010), Luxembourg (24.2.2012), Former Yugoslav Republic of Macedonia (25.11.2011), Mali (27.1.2010), Mexico (1.8.2010), Nauru (14.6.2010), Netherlands (17.4.2011), Portugal (26.11.2010), Saudi Arabia (21.1.2011), Sweden (23.3.2012), Tunisia (7.6.2010), UK (8.4.2010); D. Algeria (3.3.2011), Armenia (22.9.2010), Australia (16.3.2012), Bahrain (4.5.2010), China (8.11.2010), Côte d’Ivoire (12.3.2012), Democratic Republic of Congo (23.9.2010), Georgia (23.4.2010), Lesotho (22.9.2010), Morocco (31.3.2010), Nauru (24.8.2010), Netherlands (30.6.2010), Poland (8.4.2010), St. Vincent & the Grenadines (8.7.2010), Tunisia (28.9.2010)

Source: SIPRI

17. http://www.iaea.org/Publications/Documents/Conventions/cppnm_amend_status.pdf.

3.42 While the number of states that have signed the amendment is increasing, several significant states have still not signed. France, for example, hesitated to sign, signalling several reservations: disagreement with the scope of Annex II of the convention; lack of international control to ensure compliance with the convention; and that France already frames its bilateral cooperation through agreements for the peaceful development of nuclear energy, stating in particular that the parties agree to implement measures consistent with the convention.¹⁸ Notwithstanding these reservations, France now plans to sign the amendment.

3.43 Armenia, Canada, Belgium, France, Georgia, Italy, Mexico, New Zealand, Philippines, Republic of Korea, Singapore, South Africa, and Turkey, though they have not yet signed, made a commitment during the Seoul NSS to ratify the amendment.¹⁹ Canada, for one, has stated that the amendment overlaps with existing laws and that ratification can take place only once the necessary domestic implementing legislation is in force.²⁰ In other words, in some cases not signing the amendment is not necessarily indicative of a weak nuclear security framework.

3.3.2. International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) 2005²¹

3.44 How can states prevent, investigate and punish acts of nuclear terrorism, and promote law enforcement and judicial cooperation with one another to do so? Drafted during seven years of negotiations by the ad hoc group based on a text presented by Russia, and its importance and interest in it increasing dramatically owing to the terrorist attacks of 11 September 2001, ICSANT was adopted unanimously at the UN General Assembly on 13 April 2005. It makes it a crime to possess or demand a radioactive device or material with the aim of causing death or serious injury or substantial damage to property. The convention came into effect in July 2007, 30 days after Bangladesh became the 22nd state to deposit its instrument of ratification with the United Nations secretary-general. As of December 2012, a total of 115 nations had signed, of whom 83 had also ratified the convention.²²

3.45 The background to the heightened concern was the so-called problem of “loose nukes” in Russia after the end of the Cold War. There were many reports awash in the international media of substantial amounts of enriched fissile material that remained unaccounted for from the days of the former Soviet Union, leading to fears that some or much of the material might be being smuggled across international borders into and out

18. Guy-Michel Chauveu, “La Convention pour la protection physique des matieres nucleaires,” Assemblée Nationale, 24 July 2012, http://www.assembleenationale.fr/14/rapports/r0125.asp#P286_58156.

19. “The Seoul Nuclear Security Summit Preparatory Secretariat: Highlights of Achievements and Commitments by Participating States as stated in National Progress Reports and National Statements,” March 2012, <http://thenuclearsecuritysummit.org/userfiles/Highlights%20of%20the%20Seoul%20Nuclear%20Security%20Summit%28120403%29.pdf>.

20. “Nuclear Terror Legislation: Delivering on International Nuclear Terrorism Commitments,” Canadian Department of Justice, March 2012; http://www.justice.gc.ca/eng/news-nouv/nr-cp/2012/doc_32718.html.

21. <http://untreaty.un.org/cod/avl/ha/icsant/icsant.html>.

22. http://treaties.un.org/Pages/ViewDetailsIII.aspx?&src=TREATY&mtdsg_no=XVIII~15&chapter=18&Temp=mtdsg3&lang=en,

of Central Asia.²³ The CPPNM was limited to nuclear material used for peaceful purposes, not covering nuclear material of a military nature.

3.46 ICSANT is closely linked to UN Security Council Resolution 1540 (discussed below). The convention seeks to do three things: to protect against attacks on a broad range of nuclear targets, punish the perpetrators through domestic criminalization of acts of nuclear terrorism, and promote international cooperation in the prevention and investigation of acts of nuclear terrorism and the prosecution or extradition of the alleged terrorists. To this end, states parties are required to make the offences specified in the convention criminal offences under national law, and to provide stiff penalties appropriate to the gravity of the crimes.

3.47 The convention's scope extends to a range of acts and potential targets, including nuclear power plants and reactors, and attempts or threats to commit terrorist acts or participate in them as accomplices. To facilitate the "prosecute or extradite" regime, these offences are explicitly described as "non-political" so that the defence of any of these acts being a political offence is not available to anyone seeking to block extradition.

3.48 In taking all necessary measures to ensure the protection of radioactive material, states are enjoined to take into account the relevant recommendations and functions of the IAEA. Should states detect and find unauthorized radioactive material, device or facility, they must take steps to render it harmless, ensure that it is held in accordance with applicable IAEA safeguards, exercise due diligence with regard to IAEA physical protection and health and safety standards, and ensure its return to specified parties.

3.49 ICSANT was deliberately designed to have the broadest possible coverage in order to fill perceived CPPNM gaps in scope and enforcement.²⁴ However, ICSANT is limited to international offences involving more than one state, and does not apply where the offence is committed within a single state and the alleged offender and victims are nationals of that state.²⁵ The convention is not subject to any particular monitoring mechanism and responsibility for its implementation lies with state parties.

3.50 Nor does the convention take a position on the legality or otherwise of the use and threat of use of nuclear weapons. Its focus is on individual criminal responsibility of persons for specific acts of a terrorist nature. Agreement on the text was delayed for several years because of the demand by some states that the use or threat of use of nuclear weapons must also be addressed and, therefore, acts of state actors too should be brought within the scope of the proposed convention. Others countered that the legal regime underlying the existing sectoral conventions is of a law-enforcement nature and exclusively focused on the individual criminal responsibility of persons for specific acts of a terrorist nature; questions of state responsibility are regulated by other principles of international law. The issue was resolved on the basis of a package, whereby the use

23. Rohan Perera, "Historical context for the International Convention for the Suppression of Acts of Nuclear Terrorism," <http://untreaty.un.org/cod/avl/ha/icsant/icsant.html>.

24. "UN officials call for stronger global measures to counter nuclear terrorism," 28 September 2012, <http://www.un.org/apps/news/story.asp?NewsID=43106&Cr=nuclear&Cr1=#.UG6uMVG2WZR>.

25. O. Jankowitsch-Prevor, "International Convention for the Suppression of Acts of Nuclear Terrorism," OECD/NEA, *Nuclear Law Bulletin* 76 (2005).

of a nuclear device by a state during an armed conflict is explicitly excluded from the scope of the convention but without conferring or implying impunity.

3.3.3. UN Security Council Resolutions

3.51 **Resolution 1540 (2004).** On 28 April 2004, the Security Council adopted Resolution 1540, establishing for the first time binding obligations on all UN member states under Chapter VII of the United Nations Charter to take and enforce effective measures against the proliferation of weapons of mass destruction (WMD), their means of delivery and related materials to non-state actors. Controversy arose over the authority of the Security Council to impose general obligations of a “legislative” kind for UN member states under Chapter VII of the UN Charter, but after seven months of negotiations, the resolution was adopted by consensus.²⁶ Since 2004, Resolution 1540 has gained legitimacy as the legal basis for a range of national and international counter-terrorism activities.

3.52 The goal of Resolution 1540 is to ensure that no state or non-state actor is a source or beneficiary of WMD proliferation. Affirming WMD proliferation as a threat to international peace and security and expressing concern over the threat of WMD terrorism and of illicit trafficking in WMD material, weapons and delivery systems, UNSCR 1540 requires all states:

- > To enact and enforce laws to prohibit non-state actors to develop, acquire, transfer or use WMD;
- > To take and enforce effective domestic control, physical protection, accounting and border control measures to prevent proliferation to non-state actors and to prohibit assisting or financing such proliferation;
- > To control the provision of funds and services that contribute to non-state proliferation; and
- > To set up a committee of the whole to oversee implementation of the resolution.

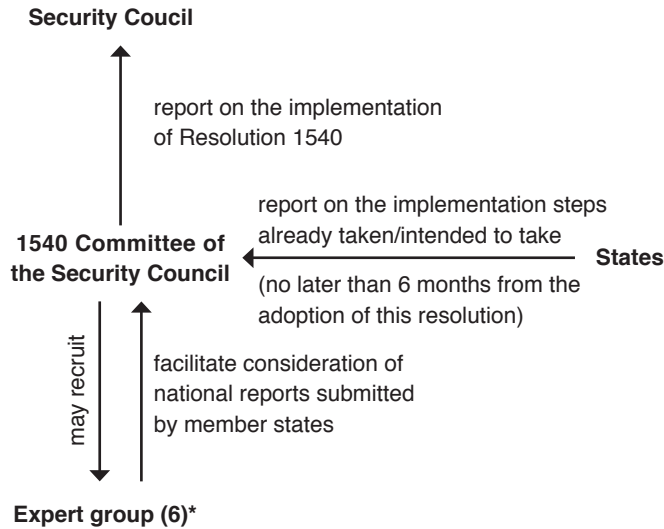
3.53 UNSCR 1977, adopted unanimously on 20 April 2011, extended the mandate of the 1540 Committee by ten years. To facilitate the work of the committee, an expert group consisting of eight members was set up to deal with technical issues. UNSCR 2055 (29 June 2012) increased the size of the group of experts to nine.

3.54 The implementation of UNSCR 1540 will mean that each state’s actions will significantly strengthen the international standards relating to the export of sensitive items and support for proliferators (including financing) and ensure that non-state actors, including terrorist and black-market networks, do not gain access to chemical, nuclear or biological weapons, their means of delivery, or related materials.²⁷

26. C. Ahlström, “Appendix 11A. United Nations Security Council Resolution 1540: non-proliferation by means of international legislation,” *SIPRI Yearbook 2007* (New York: Oxford University Press, 2007), p. 461.

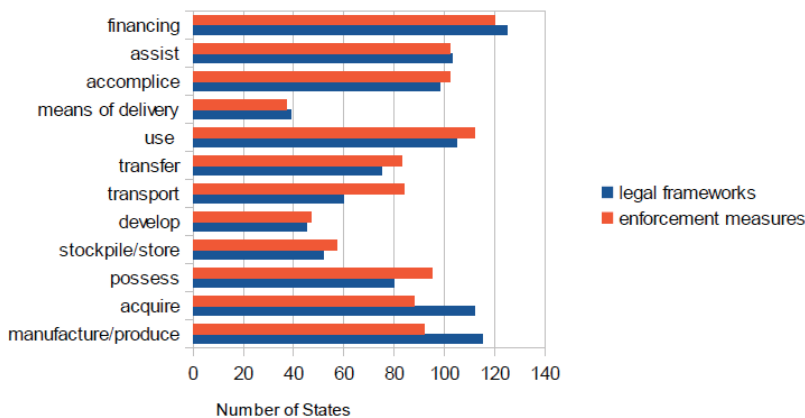
27. See also the section on UNSCR 1540 in the previous chapter 2 on non-proliferation.

Figure 3.2: UNSCR 1540 Reporting Mechanism



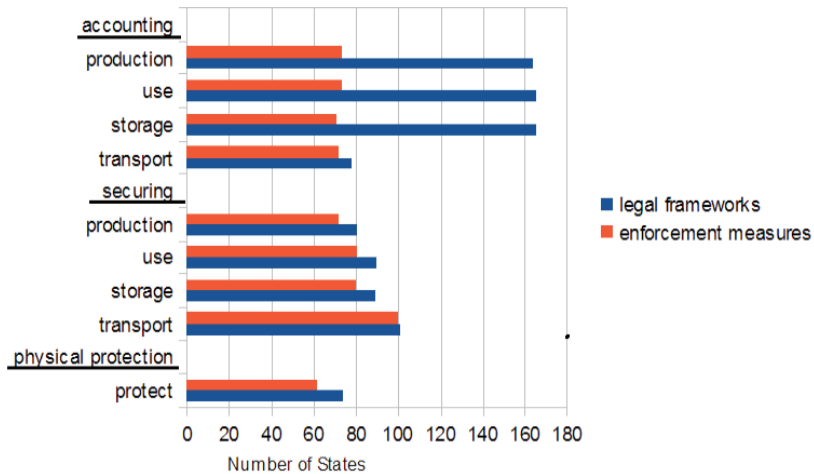
*Resolution 1977 (2011) changed expert group membership to 8 experts, and Resolution 2055 (2012) increased it to 9 experts.
Source: SIPRI

Figure 3.3: Status of Implementation of Resolution 1540, paragraph 2



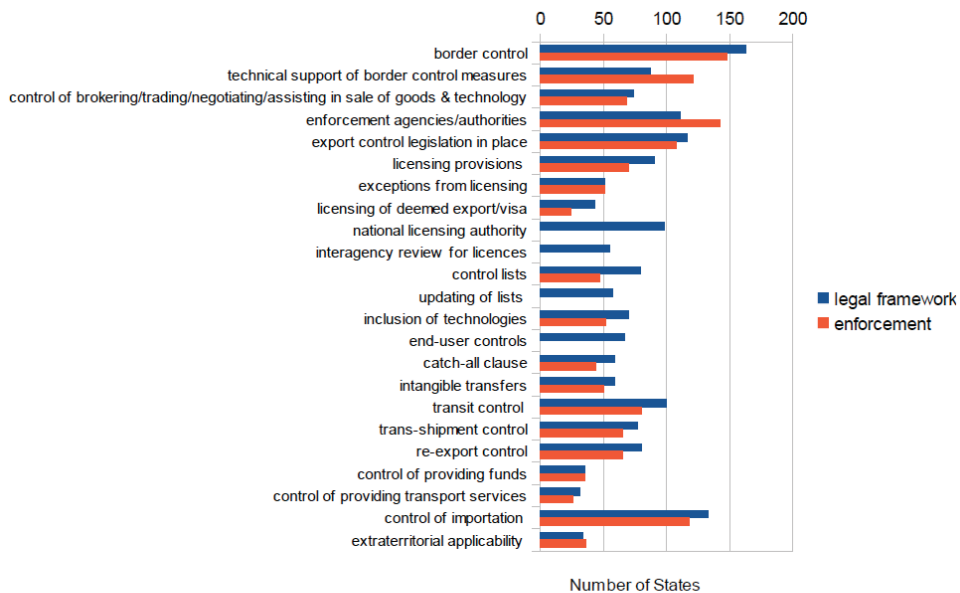
Source: Report of the Committee established pursuant to Security Council resolution 1540 (2004), 14 September 2011, http://www.un.org/ga/search/view_doc.asp?symbol=S/2011/579.

Figure 3.4: Status of Implementation of Resolution 1540, paragraph 3 (a) and (b)



Source: Report of the Committee established pursuant to Security Council resolution 1540 (2004), 14 September 2011, http://www.un.org/ga/search/view_doc.asp?symbol=S/2011/579.

Figure 3.5: Status of Implementation of Resolution 1540, paragraph 3 (c) and (d)



Source: Report of the Committee established pursuant to Security Council resolution 1540 (2004), 14 September 2011, http://www.un.org/ga/search/view_doc.asp?symbol=S/2011/579.

3.55 All member states were requested to report on the progress of their implementation to the 1540 Committee six months after the adoption of the resolution, and by 28 October 2004, 59 member states (and the European Union) had submitted their first reports.²⁸ UNSCR 1673 (27 April 2006) noted that not all member states had yet submitted their first national report, and that full implementation of the resolution is a long-term task. According to the UN 1540 Committee website, 176 states had submitted reports by December 2012.

3.56 Other Security Council Resolutions. UNSCR 1373 (28 September 2001) called on all states to prevent and suppress the financing of terrorism and to criminalize the wilful provision or collection of funds for such acts. The funds, financial assets and economic resources of those who commit or attempt to commit terrorist acts, participate in or facilitate the commission of terrorist acts, and of persons and entities acting on behalf of terrorists, were to be frozen without delay. To this end, the resolution imposed uniform legislative and reporting requirements and established the Counter-Terrorism Committee (CTC), made up of all fifteen members of the Security Council, to monitor implementation and increase state capacity.²⁹

3.57 The scope of Resolution 1373 is quite broad, encompassing domestic legislation, national executive machinery and international cooperation. Operative paragraph IV links the resolution to nuclear security, noting the close connection between international terrorism and, among other things, the illegal movement of nuclear and other potentially deadly materials, and emphasizes the need for coordination from national to international level to strengthen the global response to this serious threat to international security.

3.58 Under Resolution 1535 (26 March 2004), the Security Council also established the Counter-Terrorism Executive Directorate (CTED) to assist the work of the CTC and coordinate the monitoring of the resolution's implementation.³⁰ UNSCR 1624 (14 September 2005) pertains to the incitement to commit acts of terrorism. It targets terrorism in general, and refers to nuclear terrorism only when it calls on states to give priority consideration to the signing of ICSANT in one preamble paragraph. This resolution also guides the work of the CTC and requires states to report to the committee on their implementation of the resolution. The CTC is further directed to include Resolution 1624 in its dialogue with states to help build capacity through spreading best legal practices and promoting the exchange of information. In addition, the CTC helps with the capacity building of member states through dissemination of best practices; provision of technical, financial, regulatory and legislative expertise; and facilitating cooperation between national, regional and international organizations. But the CTC has neither the resources nor the capacity to monitor state compliance with UNSC-imposed obligations.

3.59 In accordance with Resolution 1624, the CTED prepared two reports summarizing the responses submitted by UN member states, acknowledging that fewer than half of

28. Ahlström, "Appendix 11A. United Nations Security Council Resolution 1540," p. 468.

29. Information on the CTC is available at www.un.org/Docs/sc/committees/1373.

30. United Nations, "About the Counter-terrorism Committee," <http://www.un.org/en/sc/ctc/aboutus.html>.

them have reported to it on their steps to implement Resolution 1624.³¹ The mandate of the CTED was extended to the end of 2013 by UNSCR 1963 (20 December 2010).

3.3.4. Radioactive Sources

3.60 The Code of Conduct on the Safety and Security of Radioactive Sources, approved by the IAEA Board of Governors in September 2003 with a supplement endorsed a year later, is meant to apply to the development and harmonization of policies, laws and regulations on the safety and security of radioactive sources from initial production to final disposal.³² Thus it applies also to radioactive wastes not covered by the CPPNM.³³ More detailed and prescriptive than an international convention, the Code of Conduct includes provisions on national registers of high-activity sources, the international trade in radioactive sources, security requirements and prompt notification to potentially affected states of loss of control of sources, or incidents with potential cross-border effects. It prescribes the principles for states to ensure the security of radioactive sources within their territory, the training of personnel and the establishment of channels of information and communication. The 2004 supplement recommends that every state designate a point of contact. But it notably does not apply to radioactive sources within military or defence programs.

3.61 By December 2012, 115 states had expressed support for the 2003 Code of Conduct, 73 countries supported all aspects of the supplementary guidance as well, and only 13 (Colombia, Georgia, Ireland, Macedonia, Madagascar, Mauritania, Nigeria, Oman, Paraguay, Serbia, Turkmenistan, Uzbekistan, and Zimbabwe) had not designated a national point of contact. But several have failed to respond to the IAEA's self-assessment questionnaire.³⁴

3.3.5. Global Cooperation Mechanisms

3.62 **US-Managed Threat Reduction Programs.** Since the early 1990s and the end of the Cold War, the United States has implemented a series of programs and projects, mainly on the territory of the former Soviet Union, to reduce the risk that nuclear and radioactive materials would escape from safe custody.³⁵ The Department of Defense managed implementation of the Cooperative Threat Reduction (CTR or Nunn–Lugar) Program, begun in 1991, and named after the two US Senators who initiated it, Sam Nunn and Richard Lugar.

31. Letter dated 18 January 2008 from the Chairman of the Security Council Committee established pursuant to resolution 1373 (2001) concerning counter-terrorism addressed to the President of the Security Council, S/2008/29.

32. <http://www-ns.iaea.org/tech-areas/radiation-safety/code-of-conduct.asp>.

33. Radioactive waste is covered, however, by a 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

34. http://www.iaea.org/Publications/Documents/Treaties/codeconduct_status.pdf. The list of national points of contact is published by the IAEA at <http://www-ns.iaea.org/downloads/rw/imp-export/import-export-contact-points.pdf>; and the directory of national regulatory bodies is published at <http://www-ns.iaea.org/downloads/rw/code-conduct/reg-auth-directory.pdf>.

35. See Amy F. Woolf, *Nonproliferation and Threat Reduction Assistance: U.S. Programs in the Former Soviet Union* (Washington DC: Congressional Research Service 7-5700, 6 March 2012).

3.63 The CTR set of programs has been among the most successful and effective. It has helped the countries of the former Soviet Union to destroy nuclear, chemical and biological weapons and associated infrastructure under agreed procedures; to transport bomb-making materials to central and more secure storage sites; to upgrade security perimeters around sensitive sites and screening of personnel working there; and to install monitoring devices at border crossings. The programs have facilitated the elimination of significant quantities of nuclear materials, promoted habits of international cooperation and reinforced nuclear disarmament and non-proliferation norms. Since 2003 the CTR program has incorporated several new initiatives that are relevant to nuclear security. The WMD Proliferation Prevention Initiative, a biosecurity effort, is intended to assist partners strengthen their border controls, including the installation of monitoring and detection equipment at border crossings and in other appropriate locations on the border.

3.64 In 2004 a number of projects (not including the CTR program) were consolidated into the Global Threat Reduction Initiative (GTRI) under the management of the Department of Energy (DOE). These were intended to reduce and protect vulnerable nuclear and radiological material worldwide by a combination of reactor conversion, removal of material and physical protection. In 2011 the Global Nuclear Lockdown program was initiated to support efforts to secure weapon-useable materials in Russia, among other things. In 2012 a number of the efforts noted above have been combined under the Global Nuclear Security program.

3.65 By the end of 2012, the 21-year old CTR program had deactivated more than 7,600 warheads, dismantled and destroyed more than 900 intercontinental ballistic missiles (ICBMs) and 33 submarines (almost certainly a more substantial level of destruction of Russian nuclear assets than Washington could have achieved through war), secured 24 nuclear weapons storage sites, and overseen the shipment of nuclear weapons out of Belarus, Kazakhstan and Ukraine.³⁶

3.66 The \$500 million per annum program had been extended twice since inception in 1992. But in October 2012, Moscow announced that it would let the program expire in May 2013 because it no longer needs foreign assistance and has concerns about nuclear security information being leaked. While Russia has become visibly uncomfortable in recent years about receiving foreign aid, some conservative US politicians and commentators have expressed concerns about the money from the program permitting Moscow to divert other sources of money to spend on new armaments. But Moscow was careful to stress that it is not abandoning efforts to secure nuclear weapons; it wants to explore alternative frameworks to that end.³⁷

3.67 In the meantime, other parts of the US government have also had important and active programs relevant to nuclear security. The International Nuclear Materials Protection and Cooperation program is particularly noteworthy in this context. This is a DOE umbrella program whose First Line of Defense projects cover nuclear materials

36. The Nunn-Lugar program also targeted chemical weapons, for example in Albania, and established monitoring facilities for the detection of biological weapons.

37. Will Englund, "Russia no longer wants U.S. aid on nuclear arms security," *Washington Post*, 10 October 2012.

protection and cooperation. The program is intended to prevent “the spread of materials, technology, and expertise relating to weapons of mass destruction; detect the proliferation of weapons of mass destruction worldwide; provide for international nuclear safety; and eliminate inventories of surplus fissile materials useable for nuclear weapons.” The program thus addresses the danger of hostile nations or terrorist groups acquiring WMD weapons, material, expertise or technology.³⁸ To achieve these ends the program has supported security upgrades at a large number of civilian and military sites of different kinds, predominantly in Russia. The program also supports projects to reduce the quantities of weapon-useable materials or make it less attractive to would-be nuclear terrorists.

3.68 The DOE has also implemented the Second Line of Defense and Megaports Initiatives, under National Nuclear Security Administration (NNSA) management,³⁹ that is intended to reduce the risk of smuggling of nuclear and radioactive materials, and in particular to reduce the risk that such materials will enter the United States. The DOE programs have also included projects focused on radiological dispersal devices. In all, 35 nuclear waste sites on the territory of the former Soviet Union were identified, including agricultural research institutes, research reactors and medical facilities. In 2006 this program was merged with others into an International Radiological Threat Reduction initiative that is no longer limited to working in the former Soviet space.

3.69 **G8 Global Partnership (G8-GP) 2002.** The Global Partnership is an initiative of the Group of Eight (G8) countries (Canada, France, Germany, Italy, Japan, Russia, United Kingdom, and United States) committed to preventing terrorists, or those who harbour them, from acquiring or developing nuclear, chemical, radiological or biological weapons, missiles, or related equipment and technology. Launched at the 2002 G8 Summit in Kananaskis, Canada, the \$20 billion G8 Global Partnership initially implemented projects in Russia and Ukraine but has expanded to deal with the spread of WMD weapons and materials worldwide. Non-G8 countries participating in the Global Partnership include Australia, Belgium, the Czech Republic, Denmark, Finland, Ireland, New Zealand, Netherlands, Norway, Poland, South Korea, Sweden, Switzerland, and Ukraine, and also the European Union. The G8 Global Partnership’s mandate was to expire in 2012 but has been extended indefinitely. Leaders have said that they would like to broaden the scope to include nuclear and radiological security, biosecurity, engagement of scientists and implementation of UNSCR 1540. Funding arrangements will be decided on a national, joint or multilateral basis. Unlike the first decade of the G8-GP, partners have not pledged any specific contributions going forward other than the United States which has planned to continue contributing up to \$10 billion again.

38. Department of Energy, FY 2004 Congressional Budget Request, *Budget Highlights*, DOE/ME-0023, February 2003, p. 25.

39. NNSA was established by Congress in 2000 as a semi-autonomous agency within DOE, responsible for the management and security of US nuclear weapons, nuclear nonproliferation, and naval reactor programs.

3.70 Achievements of the Global Partnership include:⁴⁰

- > Strengthened accounting, control, and physical protection of nuclear and radiological materials in Russia and Ukraine;
- > Destruction of over 20,000 tons of chemical weapons;
- > Dismantling of nuclear submarines and safe storage of removed spent fuel – out of the 198 decommissioned nuclear submarines by the Russian navy, only 6 remain to be dismantled, and the dismantling work was scheduled to be completed in 2012;
- > Improved detection of nuclear and radiological materials and prevention of illicit trafficking by strengthening border security capabilities – the United States and Russia are partnering to place equipment for radiation detection at border crossings; and
- > Engagement of scientists, technicians and engineers with WMD and missile expertise to redirect their efforts towards peaceful purposes. The International Science and Technology Center in Moscow and the Science Technology Centre of Ukraine, funded by the Global Partnership's partners, provide economic support for scientists during a transition period. The future of the centre in Moscow is however under review, as Russia has decided to withdraw from it.

3.71 **The Global Initiative to Combat Nuclear Terrorism.** GICNT is an international partnership working towards the individual and collective implementation of a set of shared nuclear security principles. It was set up by Presidents George W. Bush and Vladimir Putin in St. Petersburg on 15 July 2006. Its mission is to strengthen global capacity to prevent, detect and respond to nuclear terrorism by conducting multilateral activities that strengthen the plans, policies, procedures and interoperability of partner nations. Its eight guiding principles are:⁴¹

- > Improve accounting, control and protection of nuclear and radiological material;
- > Enhance security of civilian nuclear facilities;
- > Detect and suppress illicit trafficking of nuclear and radiological material;
- > Improve ability to search for, confiscate and establish safe control of nuclear and radiological material;
- > Assure denial of safe haven and resources to terrorists seeking to acquire or use nuclear and radiological material;
- > Ensure adequate legal frameworks to combat activity related to nuclear terrorism;
- > Respond to and mitigate the consequences of nuclear terrorism; and
- > Promote information sharing to prevent and respond to acts of nuclear terrorism.

3.72 The United States and Russia serve as co-chairs of the GICNT and Spain serves as Coordinator of the Implementation and Assessment Group. The Global Initiative has made some effort to improve the global nuclear and radiological detection architecture, including the installation of radiation detection equipment at major sea and air ports. By December 2012 its membership included 85 countries plus four observers (IAEA,

40. US Department of State, "G8 Global Partnership," <http://www.state.gov/t/isn/184759.htm>.

41. <http://www.state.gov/documents/organization/145499.pdf>.

European Union, UN Office on Drugs and Crime (UNODC), and INTERPOL).⁴² Argentina, Mexico, Philippines, Thailand and Vietnam joined GICNT in 2010; Singapore in 2011; and Algeria, Azerbaijan and Malaysia in 2012. The plenary meeting in 2010 noted nuclear detection (working group chaired by the Netherlands) and nuclear forensics (working group chaired by Australia) as the two priority functions; the 2011 plenary added response and mitigation (working group chaired by Morocco) as a third priority function. GICNT facilitates information sharing among partners and official observers through expert-level workshops, seminars, exercises and other activities. As of December 2012, it had held more than 50 multilateral activities and exercises to share best practices and lessons learned in order to strengthen individual and collective capabilities for preventing, detecting, deterring, and responding to nuclear terrorist incidents. The three working groups will present their findings and documents to the plenary meeting of GICNT scheduled to be held in Mexico in 2013.

§3.4 Role of the IAEA

3.73 As discussed fully in Chapter 2, the IAEA carries the chief international institutional responsibility for marrying the NPT's promise of assistance with peaceful uses of nuclear energy to non-nuclear weapon states to assurances of safety and non-diversion to weapons purposes. Because nuclear security is a much more recent concern, this has not been a priority item in the distribution of funding and agenda for the agency. Yet even here the IAEA has now taken on a lead role, if by default, because of its technical expertise, institutional credibility and legitimacy, and the lack of practical alternatives. This distinctive status quo – combining lack of mandated IAEA authority in nuclear security comparable to nuclear safeguards; technical capabilities to strengthen the global nuclear security regime through advisory services to member states on request; and the need to provide added resources to the IAEA in this field – is reflected in the decisions made at the 2010 NPT Review Conference and the 2010 and 2012 NSS.

3.74 The 2010 NPT conference encouraged all states parties to “broaden their support for the relevant IAEA programmes” and apply IAEA recommendations on the physical protection of nuclear materials and facilities; and encouraged the agency to assist states to strengthen their national regulatory controls of nuclear material (Actions 41 and 46). The 2010 NSS in Washington welcomed IAEA activities in support of national efforts to enhance nuclear security worldwide, commended the IAEA for the programs of assistance and advisory services and guidance to states on request, and acknowledged the importance of nuclear material accountancy. States participating in the NSS pledged “to work actively with the IAEA towards the completion and implementation” of the guidance series of documents and to incorporate the IAEA formulated principles into the planning, construction and operation of their nuclear facilities. The 2012 Seoul NSS reaffirmed “the essential responsibility and role of the IAEA in strengthening the international nuclear security framework” and participating states promised to “work to ensure that the IAEA continues to have the appropriate structure, resources and expertise needed.”

42. US Department of State, “Partner Nations List” for the GICNT, <http://www.state.gov/t/isn/c37083.htm>.

3.75 For all the IAEA's role, the primary responsibility for nuclear security rests with individual states. In the near term, therefore, the main focus will be on universalization of the existing framework and its full implementation, plus identification and filling of any gaps in existing arrangements. The extent of voluntary reporting by states at the Seoul NSS in 2012, of the compliance of their nuclear security systems with commitments made at the first NSS in 2010, was encouraging. That is, the threshold of compliance of legally binding international commitments was raised significantly higher with voluntary promises of a heads of state/government involvement in summit diplomacy.⁴³

3.4.1 Setting Guidelines

3.76 The IAEA publishes a Nuclear Security Series, providing detailed guidance “relating to the prevention and detection of, and response to, theft, sabotage, unauthorized access and illegal transfer or other malicious acts involving nuclear material and other radioactive substances and their associated facilities.”⁴⁴ They embrace such fields as nuclear security fundamentals, recommendations, implementing guides and technical guidance. From 2012, the Nuclear Security Guidance Committee, established by the IAEA director general, is in charge of making recommendations to the agency on the development and review of the series. The committee is composed of representatives from all IAEA member states. Its objective is to improve the quality, increase transparency and encourage consensus and coherence among the member states while working on international publications in the field of nuclear security. Representatives of international organizations and non-governmental bodies can attend the committee meetings. New publications in the series provide guidance for states on new or developing issues in nuclear security, such as the latest 2012 publication, *Nuclear Security Systems and Measures for Major Public Events*.

3.77 In the Nuclear Security Series, Information Circular 225 (INFCIRC/225) is generally considered to be the cornerstone of the international physical protection regime for nuclear materials and facilities. First published in 1975 and revised five times since, INFCIRC/225 is a set of guidelines, not a treaty or binding resolution, and not requiring legal commitments, signature or ratification. This makes assessment of state compliance problematical.

3.78 The 2011 revision (INFCIRC/225/Rev. 5) reflects the threat of nuclear terrorism and the need to align the document with the changed security standards set forth in the 2005 amendment to the CPPNM. It introduced the concept of a physical protection “regime” and a graded approach to physical protection to take into account the nature, severity and likelihood of the threat, the relative attractiveness of the material, and the possible consequences of theft or sabotage. It included guidance for the rapid recovery of nuclear material found to be missing and for the mitigation of sabotage. And it included recommendations on physical protection for states embarking on the development of peaceful nuclear energy for the first time.

43. Nuclear Security Governance Experts Group (NSGEG), *Improving Nuclear Security Regime Cohesion: Summary Report and Initial Policy Recommendations* (Muscatine, Iowa: Stanley Foundation, September 2012), p. 6.

44. IAEA website, <http://www.iaea.org>.

3.79 The IAEA guidelines serve as the international standard that has been incorporated into the domestic law of many states. But because the nuclear security series are guides for countries to use voluntarily, it is impossible to know how widely they are actually read or used by states. States have obligations written in their comprehensive safeguards agreements (CSAs) with the IAEA and in some cases, Additional Protocols, and some of those obligations overlap with what is written in the Nuclear Security Series. States, for example, can rely on the IAEA Nuclear Security Series for guidance in developing their own required nuclear material accounting systems, although it is not known how much they actually use that guidance.

3.80 The IAEA guidelines have been incorporated also in some suppliers' bilateral agreements as a condition of peaceful nuclear cooperation. The US "section 123"⁴⁵ civil nuclear cooperation agreement with the United Arab Emirates (UAE) is a good example of this. Inclusion of this requirement in bilateral agreements provides a means for making the application of INFCIRC/225 legally binding in particular states. The United States has 27 nuclear cooperation agreements that require partner countries to guarantee the physical protection of US-origin nuclear material. The US Nuclear Regulatory Commission and State and Energy departments visit partner countries to check on the physical protection measures.⁴⁶ Australia, Canada and the EURATOM (European Atomic Energy Community) countries also have similar bilateral agreements. In addition, the Pelindaba and Semipalatinsk treaties establishing nuclear-weapon-free zones in Africa and Central Asia respectively (see chapter 2) also require member states to apply security measures comparable to IAEA recommendations.

3.4.2 Advisory and Peer Review Services

3.81 The IAEA also offers advisory and peer review services in the realm of nuclear security to member states on request, specifically, by providing them with professional assistance such as Nuclear Security Advisory Assistance Service and nuclear security publications. The IAEA has helped states to develop integrated plans for nuclear security improvements and assistance. In consultation with the hosting state, the IAEA drafts an Integrated Nuclear Security Support Plan (INSSP) which is tailored to the state's specific needs on the basis of findings and recommendations from various technical services. A typical INSSP presents five components of work related to nuclear security: legislative and regulatory framework, prevention, detection, response, and sustainability. The INSSP identifies the needs of the state, responsible entities and organizations within the state, and the timeframe for the implementation of agreed activities.

45. The reference is to agreements pursuant to s.123 of the Atomic Energy Act that are commonly referred to as "123 agreements."

46. "Options for Strengthening the Global Nuclear Security System," Global Dialogue on Nuclear Security Priorities (Washington DC: Nuclear Threat Initiative, 2 October 2012), p. 8; https://www.nti.org/media/pdfs/Options_for_Strengthening_the_Global_Nuclear_Security_System_4.pdf?_=1353437739.

Table 3.2: IAEA Nuclear Security Advisory Services

Nuclear Security Advisory Services		Objective
International Nuclear Security Advisory Service	INSServ	Facilitate the identification of a state's broad nuclear security requirements and measures
International Physical Protection Advisory Service	IPPAS	Evaluate existing physical protection arrangements in member states
SSAC Advisory Service	ISSAS	Provide recommendations and suggestions for the requesting states for improvements to their state systems for accountancy and control
International Team of Experts	ITE	Monitor states' adherence to or implementation of international instruments for protection against nuclear terrorism
Integrated Regulatory Review Service	IRRS	Support states to improve the effectiveness of national regulatory bodies and to implement national safety legislation and regulations
Integrated Nuclear Security Support Plan	INSSP	Provide a general approach for nuclear security capacity- building

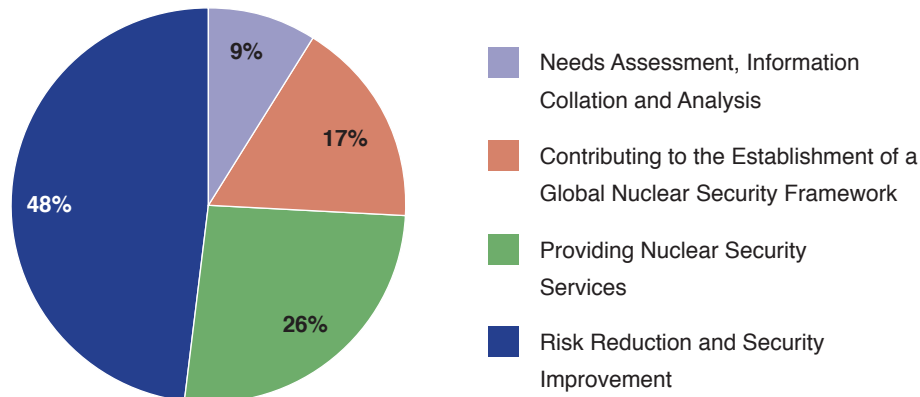
Source: SIPRI

Table 3.3: IAEA Nuclear Security Publications

IAEA Publications	Contents
INFCIRCs	Texts of Safeguards Agreements and Additional Protocols
Nuclear Security Series	
Nuclear Security Fundamentals	Objectives, concepts and principles of nuclear security
Recommendations	Best practices that should be adopted by Member States in the application of the Nuclear Security Fundamentals
Implementing Guides	Measures for the implementation of the Recommendations
Technical Guidance	
Reference Manuals	Measures on how to apply the Implementing Guides in specific areas
Training Guides	Syllabus/manuals for IAEA training courses in the domain of nuclear security
Service Guides	Guidance on the conduct and scope of IAEA nuclear security advisory missions
Nuclear Security Plan	
2002–2005	Nuclear Security Plan of Activities
2006–2009	Nuclear Security - Measures to Protect Against Nuclear Terrorism
2010–2013	Program Implementation to achieve worldwide effective nuclear security

Source: SIPRI

Figure 3.6: Resources required for implementing the Nuclear Security Plan 2010–2013 (Regular Budget and NSF)



Source: “Options for Strengthening the Global Nuclear Security System,” Global Dialogue on Nuclear Security Priorities (Washington DC: Nuclear Threat Initiative, 2 October 2012).

3.82 The establishment of the INSSP has enabled the IAEA, the states concerned and any donors financing the work to plan and coordinate activities from both a technical and a financial point of view. It also permits some states to prepare and implement the necessary nuclear security improvements internally and without external assistance. As of December 2012, 66 INSSPs were in varying stages of development and completion.⁴⁷

3.83 In 2002, the IAEA established the Nuclear Security Fund (a voluntary funding mechanism) and for the first time elaborated the Nuclear Security Plan whose objective is to combat nuclear security risk and support member states in the implementation of nuclear security instruments. The second Nuclear Security Plan for 2006–09 was approved by the Board of Governors in 2005. It concerned three main areas: needs assessment, analysis and coordination; prevention; and detection and response. The goal of the third Nuclear Security Plan for 2010–13 is to “contribute to global efforts to achieve worldwide, effective security wherever nuclear or other radioactive material is in use, storage and/or transport, and of associated facilities, by supporting States, upon request... through assistance in capacity building, guidance, human resource development, sustainability and risk reduction.”⁴⁸

3.84 At and since the Washington NSS, Belgium, Canada, Denmark, France, Japan, Norway, Netherlands, South Korea, and the United Kingdom have pledged contributions to the IAEA Nuclear Security Fund. Belgium agreed to provide \$300,000, Norway \$3.3

47. <http://www-ns.iaea.org/security/inssp.asp?s=4&l=26>.

48. Nuclear Security Plan 2010–2013, IAEA Board of Governors, GOV/2009/54-GC(53)/18, 17 August 2009. http://www.iaea.org/About/Policy/GC/GC53/GC53Documents/English/gc53-18_en.pdf.

million over four years, and the United Kingdom \$6 million; Japan, New Zealand and Russia did not specify the amounts of their contributions. The IAEA's €23 million 2010–13 nuclear security plan identifies four core areas of work: needs assessment, information collation and analysis; contributing to the enhancement of a global nuclear security framework; providing nuclear security services; and risk reduction and security improvement.⁴⁹ Nuclear safety and security accounts for approximately ten per cent of the IAEA's annual €333 million budget.⁵⁰ Funding is also provided by Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Netherlands, South Korea, Spain and Sweden.

3.4.3 Filling the Gaps

3.85 Because nuclear security is a new “fourth” leg of the global nuclear regime (along with disarmament, non-proliferation and peaceful uses), it suffers by comparison from lack of clear authority, resources and governance architecture. The advantage of a leaders' summit is that it can help to break down political barriers and overcome bureaucratic inertia, and the NSS have generally been given good reviews. According to the study conducted by the Arms Control Association, significant progress had been made in ratifying international conventions, securing and removing HEU and plutonium stocks, developing new nuclear security centres of excellence, conferences, and training activities, providing new funding support for HEU conversion and material removals and the like.⁵¹

3.86 But the force of the 2010 and 2012 NSS communiqués was weakened by the fact that they were vague, non-binding and full of escape clauses like “as appropriate,” “where technically and economically feasible,” “taking into account the need for assured supplies of medical isotopes,” and “consistent with national security considerations and development objectives.” The NTI study concluded that although governments have become more aware of the threat, there is still no global consensus on the most important steps to achieve nuclear security; state accountability is problematical because of a deliberate lack of transparency; stocks of weapon-useable materials continue to rise in some countries; almost a quarter of the states scored poorly on societal factors; and many lag on joining international agreements.⁵²

3.87 It is appropriate, accordingly, to include a brief discussion here of gaps in the nuclear security regime that need to be plugged. At present there are a plethora of initiatives. The IAEA adopts a nuclear security plan and the Board of Governors expects an annual report on nuclear security from the director general. However, nuclear security is still a peripheral part of the IAEA institutionally. Should initiatives be combined under the IAEA umbrella or is it better to keep the current arrangements but try to make them more efficient in coordination and cooperation?

3.88 The IAEA's work on nuclear security has been given much greater prominence, visibility and importance since the 2010 NSS. Its dedicated office on strengthening

49. IAEA, *Nuclear Security Plan 2010–2013* (Vienna: Report by the Director-General, GOV/2009/54-GC(53)/18, 17 August 2009), <http://www-ns.iaea.org/security/nsf.asp?s=4>.

50. “IAEA Regular Budget for 2012,” <http://www.iaea.org/About/budget.html>.

51. Cann, Davenport and Balza, *The Nuclear Security Summit: Assessment of National Commitments*.

52. *NTI Nuclear Materials Security Index*.

nuclear security provides global leadership as well as invaluable technical information, guidance, training and assistance. But it lacks authority to establish mandatory baseline standards for nuclear security and to monitor and enforce compliance with the standards. Regular, independent international review of safety, security and safeguards measures should be the international norm. As the UN's – that is, the world's – premier nuclear regulator, the IAEA must be mandated to negotiate binding agreements that establish global nuclear security standards. The IAEA must also be given the authority and the responsibility to certify compliance with these standards by monitoring national implementation. The IAEA should have the lead role in setting international standards, promoting cooperation, and providing on-request peer reviews. To be able to discharge the additional responsibility, the IAEA nuclear security funding should be set at an appropriate level. All nuclear suppliers should include the INFCIRC/225 condition (and a requirement that recipients be party to the CPPNM) in their nuclear supply agreements.

3.89 The IAEA also lacks predictable and stable funding for its regular budget. An annual budget of 333 million euros (2012) is modest for such an ambitious enterprise. Consistent with trends in most areas of the UN system, the vast bulk of the IAEA Nuclear Security Fund is funded through extra-budgetary support; that is, on a voluntary instead of an assessed basis. The net result is that the funding base is neither secure nor sufficient. It is highly desirable that nuclear security should be funded from an increased regular budget. As with most international organizations, the IAEA also faces the problem of tardy payments, and non-payments, by member states. In September 2010 (the year of the first NSS), around 60 member states owed outstanding contributions totalling almost €90 million to the agency;⁵³ almost 50 states still had outstanding dues of €15.6 million from previous years.⁵⁴ In September 2012 (the year of the second NSS), about 70 states owed outstanding dues of over €100 million.⁵⁵ There is no doubt that budgets are going to be cut in what have been the main donor states in the coming years, and this area is not going to be exempt unless there is a major incident that compels a response. There are going to be strong arguments for avoiding duplication in programs, and for looking for synergies, particularly on the technical side.

3.90 Should the IAEA become the main focal point for nuclear security cooperation? That will be one of the important issues at the 2014 NSS, possibly even the main one. The NSS was always envisaged as an ad hoc and temporary mechanism, not a permanent institution. There is a serious issue of how to sustain the commitment needed. The summits produce diminishing returns. The existing documents already make the political commitment and it is neither practical nor desirable to keep bringing large numbers of world leaders together to announce minor incremental steps towards the already agreed goal. One option would be for the IAEA to take over the NSS agenda after the third and final summit in 2014.

53. That said, even if everyone paid all their dues, none of that money would go to nuclear security projects as of today because nuclear security is not part of the IAEA core budget. This again reinforces the importance of shifting the nuclear security fund into the IAEA core budget.

54. Report by the Director General, *Statement of Financial Contributions to the Agency* (Vienna: IAEA General Conference, GC(54)/INF/9, 17 September 2010), http://www.iaea.org/About/Policy/GC/GC54/GC54InfDocuments/English/gc54inf-9_en.pdf.

55. Report by the Director General, *Statement of Financial Contributions to the Agency* (Vienna: IAEA General Conference, GC(56)/INF/7, 14 September 2012), http://www.iaea.org/About/Policy/GC/GC56/GC56InfDocuments/English/gc56inf-7_en.pdf.

3.91 To institutionalize the response under the IAEA will call for a major task of persuasion, requiring as it would the IAEA mandate, authority and powers to be greatly strengthened. Many IAEA members are concerned that incorporating a nuclear security budget into the regular budget while simultaneously freezing the regular budget will displace activities they see as more important (with technical assistance probably being the first casualty). At present states seek voluntary help and assistance from the IAEA to help improve their domestic regulatory, protection, control and accounting systems through services, guidance and recommendations, without needing to provide mandatory reports on implementation back to the IAEA.

3.92 Taken in conjunction with the effort to develop the so-called “state level approach” to safeguards (discussed in Chapter 2), this feeds into the wider complaint of some states that the IAEA is being re-configured as an instrument to implement Western priorities (non-proliferation, counter-terrorism) at the expense of global concerns (disarmament and development).

3.93 CNND believes that such complaints are not justified in this context and that the concerns that the IAEA is seeking to redress are genuinely global, and should be shared by all members of the international community. However, it is difficult within the foreseeable future to visualize enough states agreeing to give the IAEA mandatory and intrusive authority and powers, and the status quo – of IAEA services on request and non-binding recommendations as a de facto international nuclear security standard – is set to continue. One price of this is lack of uniformity in the interpretation and unevenness in the implementation of IAEA guidelines from one country to another.

3.94 Another possibility is the negotiation of a framework convention on nuclear security,⁵⁶ similar to the UN Framework Convention on Climate Change (UNFCCC), that would bring together the existing disparate and loosely-defined nuclear security conventions, rules and standards. Such a convention would establish an agreed overarching framework, set out common principles, express political commitments, and create a periodic review mechanism (for example, meetings at regular intervals like two or five years). The Fissile Materials Working Group (FMWG) believes that a framework convention would solve the present problem of a “patchwork of voluntary, nonbinding, non-transparent national commitments, ad hoc bilateral and multilateral initiatives, and vague legally binding measures” without specific standards. The IAEA, the group further argues, should be made the convention’s executive agent to monitor and assess national implementation of the international standards and requirements.⁵⁷ However, given the continuing sensitivity of issues surrounding the UNFCCC, an explicit parallel with that here may not be especially helpful.

3.95 A more mainstream view is that steps can only be taken nationally (since that is where the legal authority and resources are) and that it is not necessary to pursue either new legal instruments (we need to implement what we have) or a new coordination mechanism (if anything we already have too many). The IAEA is and will continue to be

56. As argued by Kenneth C. Brill and Kenneth N. Luongo, “A security system commensurate with the risk of nuclear terrorism,” *Bulletin of the Atomic Scientists*, 16 April 2012.

57. FMWG, *Preventing Nuclear Terror in the 21st Century: Policy Recommendations* (Washington DC: January 2012), p. 8.

an outstanding technical resource, but it may not help either the agency or the cause of nuclear security to introduce the question of a leading role in governance. An NTI-sponsored global dialogue on nuclear security has concluded that while legally binding mechanisms may be desirable in the future, the search for it now, when no consensus for it exists, is likely to delay urgently needed security upgrades that are feasible within voluntary mechanisms.⁵⁸ Any lowering of ambition to pursue a legally binding IAEA mechanism should not, however, be seen as reducing the need for intense further international cooperation in a number of other nuclear security areas.

§3.5 International Cooperation

3.5.1. General

3.96 Major nuclear reactor accidents – Three Mile Island, Chernobyl and, most recently, Fukushima – have triggered substantial reviews and produced major advances in nuclear safety governance. Because of the added gravity of the risks in the case of nuclear terrorism, advances in nuclear security governance to identify and plug vulnerabilities, both domestic and international, must precede and prevent major security crises, not follow one. Nuclear security is a sovereign responsibility. But because the economic and security consequences of a nuclear security breach or failure could be catastrophic for some or all others, “other governments and the global public have an equity in having some insight into how well the global nuclear security system is functioning.”⁵⁹ A major nuclear security vulnerability or crisis anywhere would pose an unacceptable risk and threat everywhere. Individual state determination of adequate nuclear security standards and national implementation of the standards will not be enough by themselves. In addition, strengthened international standards and accountability are required on early detection, prevention of attacks, thefts and sabotage, as well as recovery of missing nuclear materials. Securing the world’s most dangerous materials is the universal responsibility of all states and a common responsibility to all humankind.

3.97 Yet security lags well behind the other two nuclear “Ss” of safety and safeguards. The historical bias towards national secrecy and sovereignty must give way to international needs and standards of transparency and accountability. With safety, security and safeguards alike, states operating peaceful and/or weaponized nuclear programs must both manage the programs to international standards and be seen by the international community to be doing so.

3.5.2. Information Exchange

3.98 States parties are not required to report on how they are observing the terms of the CPPNM, the CPPNM Amendment, or the IAEA nuclear security recommendations. In addition to the lack of any reporting mechanism, there is no review mechanism. Nuclear

58. “Options for Strengthening the Global Nuclear Security System,” pp. 1–2.

59. “Options for Strengthening the Global Nuclear Security System,” p. 7.

safety has a mandatory peer review mechanism: the members of the World Association of Nuclear Operators (WANO) have accepted mandatory peer reviews. The CPPNM has no such peer review mechanism, nor an external review of any other type, nor any form of international inspection system or provision. Sharing and exchange of information,⁶⁰ and external reviews of national performance and reporting establish international confidence, may act as a check against vulnerabilities that may have escaped detection by national authorities, enable states to provide support and assistance to one another, and facilitate the development of international best practices. But for all the heightened concerns and awareness of the risks and dangers of nuclear terrorism, nuclear security is lacking in minimum transparency, reporting and accountability mechanisms.⁶¹

3.99 In 2005 INTERPOL started project GEIGER with a goal of collecting and analyzing information on illicit nuclear trafficking and other unauthorized activities involving nuclear and radiological materials.⁶² In 2010 the IAEA launched the Nuclear Security Information Portal available for all member states in order to provide an “interactive knowledge-based environment to enhance nuclear security cooperation, facilitate implementation of joint activities and share relevant information.”⁶³

3.100 The Seoul NSS communiqué encouraged states to share best practices. Nuclear security standards and best practices play complementary and parallel roles in ensuring security. A “standard” is established by authority, custom or general practice. It defines objectives: performance requirements, specifications, guidelines or characteristics.⁶⁴ It is static. It represents a consensus judgment – that is, a minimum level of agreement – on goals. It is politically or institutionally authoritative but can be slow to develop. The IAEA INFCIRC/225/Rev.5 is the primary nuclear security standards document.

3.101 A “best practice,” by contrast, is a method or technique that produces results consistently superior to those obtained with other means. It describes a process, not a goal, and aims to reach an optimum level of performance. Best practices can help to implement standards and also to inform their creation. They develop from the experience of many individuals and groups in government and industry in many countries and are constantly evolving.

3.102 The only existing schemes are voluntary and operated by the IAEA (the recommendations) and the World Institute for Nuclear Security (WINS). Modelled on WANO that was created after the Chernobyl nuclear accident as a forum for nuclear power plant operators to share best practices and exchange lessons learnt on reactor safety, WINS was founded in Vienna in September 2008. It facilitates the sharing of information and experience among security professionals in the nuclear industry,

60. Some information will have to remain confidential for national security or commercial proprietary reasons. But some other information can be shared with other governments, the IAEA, or trusted friendly or allied states, on a confidential basis.

61. It should be noted that some of the reporting on these issues is done via the UNSCR 1540 national reports. Using the reports it is possible to discern to some extent how states are living up to certain commitments.

62. CBRNE Terrorism Prevention Unit, Interpol. <http://www.interpol.int/Crime-areas/Terrorism/CBRNE-Terrorism-Prevention-Programme/Radiological-and-Nuclear-Terrorism-Prevention-Unit>.

63. IAEA, *Nuclear Security Report 2011*, GC(55)/21, 5 September 2011.

64. The descriptions of standards and best practices is summarized from “Options for Strengthening the Global Nuclear Security System,” pp. 2–3.

promotes training and best practices, and develops peer review systems. Much of its effort so far has concentrated on the preparation of a portfolio of best practice guides. In consultation with both industry and government stakeholders, WINS has developed more than 30 best practice guides.⁶⁵

3.103 Both the IAEA and WINS have demonstrated that it is possible to develop and share best practices consistent with the confidentiality of commercially or militarily sensitive information. The best practice guides offered by WINS cover topics from nuclear security culture to threat assessment and effective security regulation and implementation. It offers a peer review mechanism for security management on a voluntary basis on request. It is creating training programs for professional managers and operators of nuclear security and is thus creating “a community of practice” in nuclear security.⁶⁶

3.104 Canada and Japan have helped to host and fund nuclear security best practice workshops with WINS. Canada pledged \$100 million for new bilateral security cooperation with Russia. Japan set up a new Integrated Comprehensive Regional Support Centre for Non-proliferation and Nuclear Security in December 2010, and helped to fund R&D on nuclear detection and forensics techniques. Japan and the United States also set up a bilateral Nuclear Security Working Group to promote cooperation and collaboration. Nuclear security centres of excellence, training centres, workshops and conferences have been established or promised in China, India, Kazakhstan, France, Italy, Saudi Arabia and South Korea, often with US assistance.⁶⁷ The meetings of the Institute of Nuclear Material Management and the International Technical Working Group on Nuclear Smuggling have also become important information exchange and standard setting forums.

3.5.3. Information Security

3.105 Information security is defined as the preservation of the confidentiality, integrity and availability of information.⁶⁸ The past few years have witnessed new forms of nuclear security threats mirroring rapid changes in technology. In 2011, Iran experienced a high failure rate of its IR-1 centrifuges installed at a fuel enrichment facility in Natanz.⁶⁹ A computer code named Stuxnet is believed to have been responsible, and while Iranian officials denied that it had caused significant damage, the incident marked the first international incident of this nature.⁷⁰ The incident increased international awareness of threats to nuclear security due to gaps in information security. In light of the increased attention to the issue, in 2011 the IAEA published a reference text on computer security

65. NSGEG, *Improving Nuclear Security Regime Cohesion*, p. 6.

66. “Options for Strengthening the Global Nuclear Security System,” p. 4.

67. See Cann, Davenport and Balza, *Nuclear Security Summit*, pp. 8–11.

68. “Computer Security at Nuclear Facilities.” IAEA Nuclear Security Series No. 17 (2011), http://www-pub.iaea.org/MTCDD/Publications/PDF/Pub1527_web.pdf.

69. D. Albright, P. Brannan, and C. Walrond, “Did Stuxnet take out 1,000 centrifuges at the Natanz enrichment plant? Preliminary assessment,” Institute for Science and International Security (ISIS), *ISIS Reports*, 22 December 2010, <http://isis-online.org/isis-reports/category/iran/>.

70. “Iran says nuclear programme was hit by sabotage,” *BBC News*, 29 November 2010, <http://www.bbc.co.uk/news/world-middle-east-11868596>.

at nuclear facilities as part of its Nuclear Security Series. The publication highlights the specific situations where information security can be compromised to perpetrate an attack against a nuclear facility, viz:

- > Information gathering attacks aimed at planning and executing further malicious attacks on nuclear facilities;
- > Attacks disabling or compromising the attributes of one or several computers crucial to nuclear facility security;
- > Compromise of one or several computers combined with simultaneous methods of attack, such as physical intrusion.

3.106 Owing to the highly sensitive nature of the information to be protected, little is known publicly about specific country measures taken in this context. Nevertheless, several countries and organizations have conducted workshops or other events to train employees of nuclear power plant facilities, and there are now more published resources to which states can refer for the implementation of information security measures, for example the IAEA Nuclear Security Series publication on information security.

3.5.4. Transportation Security

3.107 In 2011, the IAEA released the “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities” as part of its Nuclear Security Series.⁷¹ The 2011 text is the fifth revision of INFCIRC/225 (discussed above). The manual contains a set of guidelines concerning the transportation of nuclear material. At the same time, it reaffirms that “the responsibility for the establishment, implementation and maintenance of a physical protection regime within a State rests entirely with that State.”

3.5.5. Combating Illicit Trafficking

3.108 The IAEA has operated the Illicit Trafficking Database Program (ITDB) since 1995 as an information system on incidents of illicit trafficking and other unauthorized activities and events involving nuclear and other radioactive material. Additional activities include performing analyses of confiscated samples, assisting states with border controls, testing detection and monitoring equipment, and conducting training courses.⁷² The IAEA encourages all its member states to participate and a total of 116 states have joined the ITDB as of 2012. From January 1993 to December 2011, a total of 2,164 incidents were reported to the ITDB by participating states and some non-participating states. Of these, 588 incidents involved the theft or loss of nuclear or other radioactive material, and 1,124 cases involved unauthorized activities like disposal of radioactive materials or discovery of uncontrolled sources. Another 399 incidents involved unauthorized possession, movement or attempts to illegally trade in or use nuclear material or radioactive sources. In turn, of these 399, there were 16 serious incidents involving HEU or plutonium.⁷³

71. “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities.” IAEA Nuclear Security Series No. 13, 2011. http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1481_web.pdf.

72. N. Zarimpas, “Appendix 6C: The Illicit Traffic in Nuclear and Radioactive Materials,” *SIPRI Yearbook 2001* (New York: Oxford University Press, 2001), p. 510.

73. *ITDB Fact Sheet*, <http://www-ns.iaea.org/security/itdb.asp>.

3.109 The UN Secretary-General's High-level Panel on Threats, Challenges and Change noted that 20 cases of nuclear material having been diverted had been publicly confirmed by various states,⁷⁴ and the IAEA's ITDB Program cites 421 incidents of illicit trafficking in nuclear materials between 1993 and 2008.⁷⁵ The most notorious example (albeit for non-proliferation rather than nuclear security) is the underground nuclear arms bazaar run by Pakistan-based Abdul Qadeer Khan, which showed the urgent and compelling need to detect, interdict and criminalize the clandestine trade in nuclear and dual-use components, materials, technology and skills. The other side of that enterprise is to secure them against unauthorized and illicit acquisition and use.

3.110 For obvious reasons, law enforcement and intelligence agencies are shy of publicizing their efforts to detect and thwart illicit trafficking in nuclear materials and components. But we know that significant cooperation is taking place. For example, the NNSA manages the Megaports Initiative within the US Second Line of Defense program to prevent and respond to incidents of nuclear and radioactive smuggling. It provides training, technical assistance and equipment to strengthen detection and interdiction capabilities in the maritime ports of partner countries. Italy, New Zealand, Norway and the United Arab Emirates have also contributed to the Nuclear Smuggling Outreach Initiative launched by the United States. Other donor partners include Canada, the Czech Republic, Finland, France, Germany, Japan, Netherlands, South Korea, Sweden and the United Kingdom; and the IAEA, European Union and UNODC.

3.111 In December 2011 Russia hosted a meeting with American experts to cooperate in improving national capacities to combat trafficking in nuclear materials.⁷⁶ Similar cooperation between the United States and China was established in January 2011.⁷⁷ On 1 November 2012, British scientists at the Atomic Weapons Establishment announced the creation of a new machine that can detect attempts to smuggle nuclear material through airports and seaports, even if it has been shielded from giving off radiation.⁷⁸

§3.6. National Nuclear Security Regulations

3.112 Several countries have strengthened their national regulatory framework and capacity as part of the global efforts to improve nuclear security, from stringent export control laws that incorporate international best practices (for example Armenia in 2009 and Malaysia in 2010), to regulating nuclear and radiological activities in conformity with regional and global norms and treaties (for example Egypt in 2010). Of course, there is a difference between creating the legal framework and implementation in actual practice.

74. *A more secure world: Our shared responsibility*. Report of the Secretary-General's High-level Panel on Threats, Challenges and Change (New York: United Nations, 2004), paragraph 112.

75. *ITDB*, <http://www-ns.iaea.org/security/itdb.asp>.

76. "Russian-US Expert Meeting on Combating Smuggling of Nuclear Material," 2 December 2011, http://www.mid.ru/brp_4.nsf/0/51790ADC3D6384F94425795D003B2002.

77. "USA and China Cooperate on Nuclear Security," *World Nuclear News*, 20 January 2011.

78. Oliver Wright, "Dirty bomb terror threat breakthrough: British scientists build machine to detect smuggling of nuclear materials," *The Independent*, 2 November 2012.

3.113 For example in 2012, on the eve of the Seoul NSS, China released a report listing several points that were implemented between the two nuclear security summits in order to enhance nuclear security in the country.⁷⁹ The report said that authorities had already finished assessing security systems at operational nuclear power plants all over the country. Since September 2010, China and the United States had worked together to convert Chinese miniature research reactors, allowing them to substitute HEU with LEU fuel. The two countries were about to establish a radiation detection training centre for Chinese and other Asia-Pacific customs officers in accordance with the January 2011 agreement. They had also jointly implemented a pilot program in Shanghai under the Megaports Initiative. Beijing claimed that it had created several laws and regulations to enhance security for radioactive storage facilities; upgraded security facilities for regional radioactive storage centres and centralized the storage of several dozen hazardous radioactive sources; and developed new high-tech devices to detect explosives and radioactive substances inside vehicles that had already been deployed at major international events, including the Shanghai World Expo and the Guangzhou Asian Games in 2010.

3.114 A number of similar initiatives are occurring elsewhere. For instance, Indonesia has announced plans to install, with IAEA help, new mobile radiation portal monitors that will greatly increase nuclear and radioactive material detection capabilities at the country's major seaports. It had already been successfully tested at one port, an official said.⁸⁰

3.115 In this context, UNSCR 1540 has played a significant role in terms of creating a legal obligation for states to implement measures related to nuclear security and to report on the measures they have taken to the 1540 Committee. "[A]t least 140 States have now adopted legislative measures to prohibit proliferation of nuclear, chemical and biological weapons, as compared to 65 States in 2006. The number of countries reporting national legal frameworks regarding the manufacture and production of nuclear materials has risen from 32 in 2006 to 71 in 2009 and to more than 120 in 2011."⁸¹ However, as noted in the 2011 report of the committee, significant work remains to be done in the national implementation of nuclear security measures and many states continue to ask for its assistance.

§3.7. Sensitive Nuclear Materials

3.116 "Sensitive nuclear materials" are HEU and separated plutonium. The bulk of HEU in the world is used for military purposes, but significant amounts are also used in civilian programs and the same is true for separated plutonium. HEU has a threefold attraction for terrorists: it can be used in the simple "gun-type" fission weapon with no need for sophisticated detonation equipment; it is smuggler-friendly because it emits

79. Xinhua, "China makes progress on nuclear security: report," *China Daily*, 27 March 2012, http://www.chinadaily.com.cn/china/2012-03/27/content_14922661.htm.

80. Bagus B.T. Saragih, "Govt expands nuclear monitoring at major ports," *Jakarta Post*, 3 April 2012, <http://www2.thejakartapost.com/news/2012/04/03/govt-expands-nuclear-monitoring-major-ports.html>.

81. United Nations, *Report of the Committee established pursuant to Security Council resolution 1540 (2004)*, S/2011/579, 14 September 2011, p. 2, http://www.un.org/ga/search/view_doc.asp?symbol=S/2011/579. The list of the 168 states that had provided national reports or additional information by 24 April 2011 is given in Annex III.A, while Annex III.B gives the list of those 24 states who had not done so by 30 April 2011.

only faint radiation signals that make it hard to detect; and, being less radiotoxic than plutonium, it is safer to handle. HEU remains “the most accessible fissile material for a terrorist nuclear device.”⁸² Making a successful explosive device from plutonium would present greater challenges for terrorists, compared with using HEU, but the risk is real, especially given the possibility that terrorists might succeed in recruiting one or more experts from a national nuclear weapon program.

Table 3.4: Fissile Material Stocks, Military and Civil Material (tonnes, January 2012)

	Highly-enriched	Separated Plutonium		Total
	Uranium	Weapon-grade	Reactor-grade ^a	
Russia	737	128	48.4	913.4
USA	610	80.7	7.1	697.8
France	30.6	6	56.0	92.6
China	16	1.8	0.01	17.8
UK	21.2	3.2	92.1	116.5
Pakistan	2.75	0.14	0	2.9
India	2.0	0.52	4.44 ^b	7.0
Israel	0.3	0.82	-	1.1
North Korea		0.03	-	
Germany		-	7.6	7.6
Japan		-	44.9	44.9
Others	20.0	-	10.7	30.7
TOTAL (rounded)	1440	221	271	1932

a. Includes “fuel-grade,” an intermediate category between weapon-grade and reactor-grade.

b. Includes 4.2 tonnes of plutonium in India’s strategic reserve, not under IAEA safeguards.

A number of the figures are IPFM estimates, with varying degrees of uncertainty.

Nineteen countries, plus Taiwan, had eliminated nuclear weapon-useable materials as of January 2012.

Source: International Panel on Fissile Materials (IPFM), <http://www.fissilematerials.org>. Also “The United States Plutonium Balance 1944-2009”, DOE, June 2012.

3.117 Almost 1,700 tonnes of weapon-grade nuclear materials in the world – enough for around 100,000 bombs additional to present stockpiles of just under 18,000 (see Table 1.2)⁸³ – are stored in hundreds of sites in 32 countries. This is in addition to an estimated 111 sites spread across 14 countries in which nuclear weapons are stored.⁸⁴ While some of the sites are well-secured, many are not.⁸⁵ Hence the risk of sabotage and theft by or

82. FMWG, *Preventing Nuclear Terror in the 21st Century*, p. 6.

83. As an additional complication, not all the HEU will be weapon-grade. A break-down does not seem to be publicly available.

84. Belfer Center, *Nuclear Terrorism Fact Sheet*.

85. Sometimes even a well-secured facility is vulnerable; for an account of what may have been “the biggest security breach in the history of the nation’s atomic complex,” see William J. Broad, “The nun who broke into the nuclear sanctum,” *New York Times*, 10 August 2012, <http://www.nytimes.com/2012/08/11/science/behind-nuclear-breach-a-nuns-bold-fervor.html?pagewanted=all&r=0>.

illicit sales to terrorists, criminals and others.⁸⁶ Materials used in the nuclear fuel cycle can be lost, abandoned or removed from decommissioned and inactivated facilities without proper authorization. The risks are multiplied in conditions of fragile and failing states, of fragmented authority structures, of a pervasive culture of corruption among public officials, or when widespread unemployment, underemployment and poverty can weaken resistance to inducements offered by various groups. There are no precise and reliable figures on how much HEU or separated plutonium is missing.

3.118 The elements of a perfect nuclear security storm are the abundant supply of weapon-useable nuclear materials, all of which must be secured to ensure non-availability to unauthorized individuals or groups; the explosion of knowledge and technical expertise, much of it relatively easily accessed through the Internet; the determination of terrorists to get it; and the known ruthlessness of terrorists to use it. For all these reasons, effective nuclear security demands that weapon-useable HEU and plutonium stocks should be eliminated where feasible, and where this is not feasible, they should be minimized and consolidated into fewer sites.

3.119 In order to limit opportunities for theft and sabotage, states must limit access to nuclear material and facilities only to authorized personnel, and to the minimum number of personnel consistent with safe operational requirements; keep material that is not in use in secure vaults; and monitor all storage and access of materials. Physical protection systems should be subject to periodic inspection and testing. Accountability mechanisms include an appropriate legislative and regulatory framework, a competent and independent oversight authority or nuclear regulator, and a clear assignment of responsibilities for nuclear security as well as nuclear safety.

3.120 **Sensitive Nuclear Materials for Civil Use.** Progress has been made in the global efforts to eliminate excess weapon-grade plutonium and to shift from HEU to LEU. Under the Reduced Enrichment for Research and Test Reactors program initiated by the DOE in 1978, 62 HEU-fuelled research reactors have been converted to LEU fuel, another 17 have been shut down, and 11 Russian reactors have downshifted to a lower level of 36 per cent enrichment (which is still HEU).⁸⁷ The Plutonium Management and Disposition Agreement (PMDA) between Russia and the United States entered into force in July 2011, setting the stage for the United States and Russia to each eliminate 34 tonnes of excess weapon-grade plutonium, enough for 17,000 nuclear weapons (see Chapter 2.10).⁸⁸ In addition, Russia shut down its last plutonium production reactor, in Zheleznogorsk, in 2010, with Kazakhstan, Mexico, the United States and Vietnam also committing either to shut down or to convert reactors that use or produce weapon-grade nuclear materials.

86. For an indication of the scale of damage that can be caused by such an eventuality, see http://www-pub.iaea.org/MTCD/publications/PDF/Pub815_web.pdf, regarding what happened in Goiania, Brazil.

87. Corey Hinderstein, Andrew Newman and Ole Reistad, "From HEU minimization to elimination: time to change the vocabulary," *Bulletin of the Atomic Scientists* 68:4 (2012), p. 85.

88. US Department of State, "Nuclear Security Summit National Progress Report," 16 November 2012, <http://www.state.gov/t/isn/rls/other/200633.htm>.

3.121 The United States, the first country to enrich uranium, ended all HEU production in 1992. But it continues to use HEU for military and civilian purposes and to engage in HEU commerce.⁸⁹ Noting that it had completed the conversion of 20 HEU reactors that can use existing LEU fuels, Washington has pledged to convert its six remaining HEU-fuelled reactors to LEU as soon as suitable fuel can be developed. It is also assisting – sometimes in cooperation with the IAEA – several other countries, among them Kazakhstan, Mexico and Vietnam, to fulfil their NSS pledges and meet their targets.

Map 3.1: Nuclear Research Reactors (2012)



Note

The shutting down or conversion of the reactors shown has been pursuant to the NNSA Global Threat Reduction Initiative
Source: SIPRI

3.122 The most significant theatre of operations in this area of work is Russia and the former Soviet republics and Eastern Bloc countries. In July 2012, the NNSA announced that it had monitored the elimination of more than 450 tonnes of Russian HEU under the 1993 US–Russia HEU Purchase Agreement, otherwise known as the “Megatons-to-Megawatts” program. This program, which is a government–industry program additional to the CTR and GTRI programs, is now 90 per cent complete and on track for the conversion of the total of 500 tonnes of Russian nuclear weapons HEU to LEU by the end of 2013 (see Chapter 2).⁹⁰ As part of monitoring the Megatons-to-Megawatts program, since 1995 NNSA has conducted 335 monitoring visits to Russian HEU processing facilities, and since 2000 the elimination of 30 tonnes of Russian HEU has been monitored each year. By the end of 2013, the NNSA will have monitored the elimination of HEU

89. Unattributed, “Civilian HEU: United States,” NTI, 2 August 2012, <http://www.nti.org/analysis/articles/civilian-heu-united-states/>.

90. “NNSA announces elimination of 450 metric tons of Russian weapons highly enriched uranium,” 9 July 2012, <http://www.nnsa.energy.gov/print/mediaroom/pressreleases/450tons070912>.

equivalent to about 20,000 nuclear weapons. In addition to the Megatons-to-Megawatts program, from the Washington NSS in April 2010 to mid-November 2012, the United States down-blended 10.5 tonnes of its own HEU, supported Russian down-blending of about 2 tonnes of HEU, and supported the removal and elimination of over 400 kg of HEU from ten countries – in aggregate enough for about 500 nuclear weapons.⁹¹

3.123 In 2010, Ukraine removed 56 kg of spent HEU fuel to Russia and another 50 kg of fresh HEU fuel to the United States. It completed the elimination of its HEU stock on 25 March 2012, when the final shipment of 19 kg of HEU was sent to Russia.⁹² Ukraine signed an MOU with the United States on 26 September 2011 for \$60 million in assistance for LEU reactor conversion and a new neutron source medical isotope production facility to be operational by 2014. On 22 March 2012, Ukraine announced that it had fulfilled its pledge to remove all HEU material from its territory that was made in advance of the 2010 NSS.⁹³

3.124 Kazakhstan returned more than 70 kg of spent HEU fuel to Russia in 2009 and down-blended 33 kg of fresh HEU fuel in 2011. It also signed an agreement with the United States in November 2010 for a fuel security project to secure three tonnes of weapon-grade plutonium and ten tonnes of HEU. Belarus pledged to return all of its HEU to Russia and had removed approximately 85 kg of HEU.⁹⁴ However, the project was suspended by Belarus in 2011 in protest at sanctions placed on it by the European Union. Poland worked with the NNSA to remove 450 kg of spent Russian-origin HEU fuel in 2010. In 2012 a further 90 kg of HEU fuel was returned to Russia from Poland's only operational research reactor.⁹⁵ The Maria reactor in Poland was converted to LEU as of September 2012.⁹⁶

3.125 Canada agreed to remove its spent HEU fuel to the United States by 2018 and to provide funding for HEU removals from Mexico and Vietnam. The United States and Canada have been active also in the Americas. The Colombian research reactor IAN-R1 was converted to run on LEU instead of HEU in 1996.⁹⁷ This was the start of the project to remove US-origin nuclear material from sites and countries where it was considered surplus, an effort that later became part of the Global Threat Reduction Initiative. Since then, 19 countries have removed HEU fuel from research reactors and critical assemblies, and more than 400 kg of HEU has been removed from civilian sites for safe storage in Russia and the United States since the first NSS in 2010.⁹⁸

91. US Department of State, "Nuclear Security Summit National Progress Report," 16 November 2012, <http://www.state.gov/t/isn/rls/other/200633.htm>.

92. Richard Balmforth, "Last enriched uranium rumbles out of Ukraine," Reuters, 25 March 2012, <http://www.reuters.com/article/2012/03/25/us-nuclear-ukraine-idUSBRE82006G20120325>.

93. Pavel Podvig, "Ukraine removed all HEU from its territory," *IPFM Blog*, 22 March 2012, http://fissilematerials.org/blog/2012/03/ukraine_removed_all_heu_f.html.

94. Pavel Podvig, "Belarus suspends HEU removal talks with the United States," *IPFM Blog*, 19 August 2011, http://fissilematerials.org/blog/2011/08/belarus_suspends_heu_remo.html.

95. Rosatom, "Non-proliferation milestone for Polish reactor," *World Nuclear News*, 28 September 2012, http://www.rosatom.ru/en/presscentre/nuclear_industry/4386c7804ce1faa086feefb60f1aecb4.

96. Pavel Podvig, "Maria reactor in Poland converted to LEU," *IPFM Blog*, 25 September 2012, http://fissilematerials.org/blog/2012/09/heu_fuel_removed_from_pol.html.

97. <http://www.nrc.gov/reading-rm/doc-collections/commission/secys/1996/secy1996-114/1996-114scy.pdf>.

98. Hinderstein, Newman and Reistad, "From HEU minimization to elimination," p. 84.

3.126 Working with the NNSA, Chile completed the elimination of its stock of 18 kg of HEU and its removal to the United States ahead of the first NSS in 2010. At the 2012 Seoul NSS, Canada, the United States and Mexico announced the successful removal of HEU from Mexico and conversion of the Triga II Research Reactor to LEU. The HEU removal and reactor conversion were completed with IAEA support. The first shipment of LEU took place in December 2011 and the shipment of fuel exchanges was completed in February–March 2012. The HEU removal and upgrades to the Triga II Research Reactor were made possible with more than \$5 million in funding from Canada. These upgrades, along with the LEU shipments, will allow Mexico to expand its capability to produce a variety of medical isotopes for domestic use.⁹⁹

3.127 Between 2004 and 2012, 39 research reactors were converted from HEU to LEU fuel, 9 in the United States and 30 in other countries, with NNSA collaboration.¹⁰⁰ Overall, the NNSA's Global Threat Reduction Initiative has eliminated all HEU from eight countries: Chile, Libya, Mexico, Romania, Serbia, Taiwan, Turkey and Ukraine. As of February 2012, the United States had removed 400 kg of HEU and plutonium and down-blended 700 kg from civil nuclear programs around the world since the Washington NSS.¹⁰¹

3.128 The reactors yet to be converted may pose the biggest technical challenges. Russia has devoted more effort and resources to converting and shutting down the facilities of others than its own, on the argument that its stockpiles are well secured. Indeed Russia was slated to open a new HEU-fuelled reactor in 2012 near St. Petersburg (now expected to begin operations after 2014),¹⁰² and is also scaling up the production of HEU-based medical isotopes.¹⁰³

3.129 New technologies have enabled the production of reactor fuel and medical isotopes using LEU fuel. More than 700 kg of HEU – or about half the world's consumption – is used in civilian research reactors annually, of which 40-50 kg is used for civilian isotope production. Just five countries – Belgium, Canada, France, the Netherlands, and South Africa – produce most of the world's radioactive isotope molybdenum 99 that is the source for more than 20 million diagnostic imaging procedures globally. The Canadian producer has announced the intention to close its business entirely; in December 2010 South Africa switched to LEU-sourced molybdenum 99; and the other producers have promised to follow suit by 2016.¹⁰⁴ At the Seoul NSS in 2012, Belgium, France and the Netherlands pledged to convert existing HEU-fuelled facilities by 2014 and to recycle or dispose of accumulated HEU.

99. NNSA, "Mexico HEU Removal: Fact Sheet," 26 March 2012, <http://www.nnsa.energy.gov/mediaroom/factsheets/mexico>.

100. Jeff Chamberlin, NNSA, "Overview of the Global Threat Reduction's Reactor Conversion and Mo-99 Programs," presentation at the National Academy of Sciences, May 2012, www.nas.edu.

101. All the information in this paragraph is from Cann, Davenport and Balza, *Nuclear Security Summit*, pp. 4–8.

102. Pavel Podvig, "Russia is set to produce new highly-enriched uranium," *IPFM Blog*, 1 June 2012, http://fissilematerials.org/blog/2012/06/russia_to_resume_product.html.

103. Matthew Bunn, "HEU Consolidation: The U.S. and Russian Pictures," unpublished conference paper, 24 January 2012, https://www.nti.org/media/pdfs/Bunn_-_HEU_Symposium_-_Vienna_24_jan_2012.pdf?_id=1328045409.

104. Hinderstein, Newman and Reistad, "From HEU minimization to elimination," pp. 85–87.

3.130 Although significant progress has been made on reducing the number of and securing fissile materials storage sites, and in conversion of HEU to LEU, states have been reluctant to ban HEU use in civilian applications. Hinderstein, Newman and Reistad have argued that the time has come to move from HEU minimization to elimination.¹⁰⁵ As part of this, they call for a new global norm that requires LEU to be used in any new facility, process or vessel under development, design or construction, an end to subsidies for HEU production that prices LEU alternatives out of the market, voluntary declarations of HEU holdings, and an assessment of the inventory needs for HEU use in military vessels. The more ambitious steps, including fissile-material-free zones, could follow.

3.131 **Sensitive Nuclear Materials for Non-Civilian Use.** The progress made in reducing the availability of sensitive nuclear materials, and HEU in particular, for civilian use, has not been matched in relation to stocks held for non-civilian purposes. The IAEA safeguards agreements require each state to create a national system for accounting for and control of nuclear material. But most of the world's weapon-useable nuclear material is in nuclear-armed states. Consequently, only a small fraction of the world's HEU and less than half of the world's separated plutonium, is subject to international discipline with respect to nuclear material accountancy. As shown in Table 3.4, 98 per cent of the world's HEU stock is held by the five NPT nuclear weapon states (NWS), with even the other four nuclear-armed states being only marginal players in this respect. The minimization by non-NWS of the use of HEU, including through the conversion of reactors from HEU to low enriched fuel, is therefore not enough to solve the problem in its totality.

3.132 In order for the international community to have confidence in it, an effective nuclear security regime must be comprehensive. That is, it must cover all weapon-useable nuclear material. As noted earlier, there have been significant reductions in non-civilian HEU stocks under the Russia-US Megatons-to-Megawatts agreement. "Yet today, the vast majority of weapon-useable material is not subject to international standards, guidelines, best practices, or mechanisms for international assurance."¹⁰⁶ Bunn points out that between them, Russia and the United States possess over 90 per cent of the world's HEU stockpile, operate more than half the world's HEU-fuelled research reactors and about two-thirds of the reactors with the most dangerous material, provide most of the HEU-fuelled reactors and the HEU fuel for them to the rest of the world, and yet co-chair the Global Initiative to Combat Nuclear Terrorism which has identified HEU (and plutonium) minimization as a key priority.¹⁰⁷

3.133 A comprehensive, universal and enforceable nuclear materials control system would be invaluable. The national commitments made by states at the Nuclear Security Summits are minimal, not ambitious, and there is no common rigorous methodology to assess progress against agreed benchmarks. In addition to funding problems, lack of technically qualified personnel and technological capabilities, most developing countries simply put higher priority on their more pressing concerns of poverty alleviation and economic development. And they quickly revert to the illegitimacy-of-the-NPT-regime

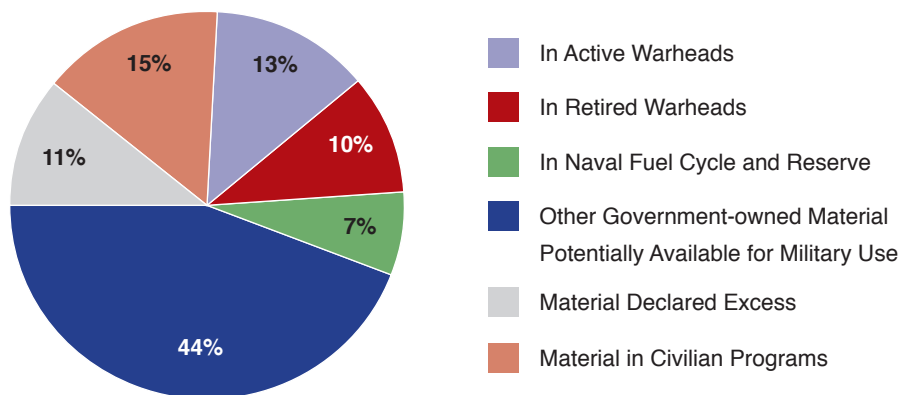
105. Hinderstein, Newman and Reistad, "From HEU minimization to elimination," pp. 83-95.

106. "Options for Strengthening the Global Nuclear Security System," p. 9.

107. Bunn, "HEU Consolidation: The U.S. and Russian Pictures."

argument to note that the US emphasis on nuclear security distracts attention from the lack of major progress on nuclear disarmament. Some developing countries fear that this is a trap by the industrialized countries to deny them scientific and technological advances. They provide confidential reporting on HEU stocks under IAEA safeguards agreements. But there is no binding transparency or public declarations regime of HEU holdings, military non-explosive stockpiles, inventories of material resulting from nuclear disarmament, material in excess of defence needs, and material in active and reserve stockpiles for military and naval propulsion.

Figure 3.7: Categories of Weapon-Useable Nuclear Materials Globally (2012)



Source: "Options for Strengthening the Global Nuclear Security System," Global Dialogue on Nuclear Security Priorities (Washington DC: Nuclear Threat Initiative, 2 October 2012).

3.134 The challenge is to devise systems and procedures that secure non-civilian nuclear materials and facilities to international standards and best practices while maintaining the necessary confidentiality for commercial or national security reasons. In the global stockpile of weapon-useable materials comprising 1,440 tonnes of HEU and 492 tonnes of separated plutonium, almost all HEU (1,400 tonnes) and about half of the plutonium remain outside civilian programs. No nuclear security system will be effective, therefore, "without somehow ensuring that these large quantities of materials are under effective security."¹⁰⁸ A modest and cautious start could be made by voluntarily bringing some of the non-civilian nuclear material that is not being used in nuclear weapons under international standards and best practices, for example through UNSCR 1540 reporting, certifications, and unilateral declarations.

¹⁰⁸ "Options for Strengthening the Global Nuclear Security System," p. 10.

3.135 It could be argued that military-relevant material, like nuclear weapons themselves, already has a much higher level of protection: hence the point of the earlier comment that HEU and plutonium stocks for civilian purposes must have weapon-standard protection in order for them to be secure. But while non-civilian nuclear material under military protection is generally better protected than civilian material, not all material – even weapons themselves – and facilities under military protection can be assumed to be totally safe, as exemplified in the unauthorized transfer of six nuclear weapons across the United States in 2007.

3.136 Moreover, not all nuclear material for non-civilian use is under military protection. Warhead components, warheads undergoing maintenance, warheads awaiting dismantlement, and the large stockpiles of US legacy materials, for example, are in the custody of the DOE and under the protection of civilian contractors. On 28 July 2012 three activists – including an 82-year old nun – breached for a few minutes a heavily guarded section of the Y-12 National Security Complex in Oak Ridge, Tennessee that houses several hundred tonnes of weapon-grade HEU and had been assumed to be secure against armed terrorists. This is a government but not a military facility.¹⁰⁹

3.137 A remaining particular challenge is HEU-fuel use in the navies of the world for powering submarines and aircraft carriers. France finished converting to LEU for its small submarine fleet in 2008. But the naval giants Russia and the United States have declined so far even to publicly assess the feasibility of conversion to LEU-fuelled naval reactors for their fleets and they require about one and two tonnes respectively of HEU each year for this purpose.¹¹⁰

§3.8. Nuclear Forensics

3.138 Nuclear forensic analysis is a key technical capability that utilizes signatures inherent to nuclear or other radioactive material to provide information on its source, production and history. It can prove to be useful both before and after a nuclear security event, and also has the potential to be useful in certain contexts in tracing breaches of the non-proliferation regime. As one would expect, the technical capability to detect current, and just as importantly past, suspect activity continues to develop and advance in sophistication.

3.139 When nuclear or radioactive material is found outside and beyond any regulatory control, nuclear forensics becomes relevant. The first task for nuclear forensic experts is to determine the location of the material and make sure that it is secured against loss or theft. Subsequent but just as vital requirements are to identify the source and place of origin of the material, plug the vulnerabilities that allowed it to escape regulatory control, and assist the lax or negligent authorities to enact and enforce laws to prevent recurrence of such incidents.

3.140 Experts in the IAEA Office of Nuclear Security trace the “signatures” of each of the production processes in the manufacture of the nuclear material by examining the

109. “Options for Strengthening the Global Nuclear Security System,” p. 10.

110. Hinderstein, Newman and Reistad, “From HEU minimization to elimination,” p. 89.

isotope content, chemical constituents and physical shape to determine the geological features of the place from which the uranium ore might have been extracted, or the process by which the ore was concentrated into yellowcake, made into nuclear fuel pellets and burned in a reactor. With the help of such specialized forensic techniques, the investigators can usually tell the story of where the material came from, or at least narrow it down to a few places, and retrace its manufacture and use.

3.141 The nuclear forensic analysis of signatures introduced into the material by specific production processes can in some cases determine if the material has been removed from sites or facilities previously deemed secure. By doing so, nuclear forensics can help identify previously unknown nuclear security gaps, deficiencies in materials accounting, control and physical protection systems, at the level of individual facilities as well as states. By determining that an intercepted material originates from a particular state, nuclear forensics can help to highlight the need to improve the nuclear security regime in that state. Identification of a particular facility or state being the source of material in multiple illicit trafficking cases would emphasize issues with existing nuclear security even more.

3.142 Nuclear forensics can also be used before a nuclear security event has taken place, to help prevent unauthorized removal of nuclear or other radioactive material. It can exercise a deterrent function on states as well as individuals. At the state level, the credible attribution potential of nuclear forensics combined with credible assurance of measured response can deter national authorities from actively supporting or contributing in any way to illicit trafficking. The same combination of factors is also likely to encourage governments to introduce improvements into the existing nuclear security regime in their own states, as well as to contribute better to international regulatory and policy measures aimed at advancing nuclear security. The individuals working within states in areas with access to nuclear or other radioactive material may be dissuaded from diverting it if they are made aware that the likelihood of attribution and prosecution is increased by an advanced nuclear forensic capability.

3.143 In order to function as a deterrent for states or individuals, the discipline of nuclear forensic analysis, working in concert with other means of investigation, has to demonstrate the potential to attribute material outside regulatory control to the specific source, and possibly to collect information on a history of unauthorized removal. The success of the deterrent function will depend on the credibility and speed of the attribution process, as well as the degree of certainty of the threatened response measures. Since the nuclear forensic evidence might be less than unequivocal, the investigation process must be at least as accurate, reliable and transparent as deemed acceptable by involved states or stakeholders to justify an appropriate response. The current lack of pre-established clarity concerning certainty and form of response may undermine international and local cooperation required for successful attribution. A number of unresolved technical, legal and policy issues in this area are addressed by international mechanisms such as the Global Initiative to Combat Nuclear Terrorism and the Nuclear Forensics International Technical Working Group; as well as by activities within the NSS framework.

3.144 An IAEA Nuclear Security Series publication on nuclear forensics in 2006 brought together for the first time a concise but comprehensive description of the various tools and procedures of nuclear forensics investigations from the existing scientific literature. It also incorporated the experience accumulated over the preceding decade by law enforcement agencies and nuclear forensics laboratories confronted with cases of illicit events involving nuclear or other radioactive materials.¹¹¹

3.145 In addition, the IAEA helps to build capacity in member states by coordinating research and development, training experts in nuclear forensic methodologies, and providing guidance on the design of a nuclear forensic library. In March 2012, the US NNSA teamed up with the IAEA to organize a workshop in the United States with 24 participants from 12 countries.¹¹² Another IAEA regional training course on introductory nuclear forensics for 24 participants from 10 Asian countries was hosted by the Integrated Support Center for Nuclear Nonproliferation and Nuclear Security in Tokai, Japan. In the three-day (22–24 May 2012) course, the participants were given short overviews of nuclear security threats, the role of nuclear forensics, the IAEA's ITDB resource, nuclear forensics core and advanced capabilities, national nuclear forensics libraries, requirements of a nuclear forensic investigation and legal considerations, and international cooperation in nuclear forensics as well as national response plans for nuclear security events.¹¹³

§3.9. Role of Nuclear Industry

3.146 As with global governance in general, global nuclear governance is being increasingly shared between state, intergovernmental (for example the IAEA) and non-state (for example WANO and WINS, already mentioned earlier in this chapter) actors. This is especially true of the nuclear industry, where there exists significant public-private cross-ownership, not just partnership. Commercial, non-proliferation and nuclear security interests can overlap or collide between industry and government stakeholders, and accountabilities in managing nuclear risks have to be shared between parliaments and boardrooms. Just as nuclear security events will add to the financial and commercial costs of the nuclear industry, so industry can help governments to raise the costs of proliferation.

3.147 Providing nuclear security must be a shared responsibility between state authorities and the nuclear industry. Industry's "comparative advantage includes its knowledge of increasingly complex supply chains for hardware and technology exports and its ability to deploy such knowledge to prevent proliferation."¹¹⁴ In the changing global nuclear energy landscape, the integrated nature of the nuclear industry both vertically (across the different levels of the global supply chain) and horizontally (across

111. IAEA, *Nuclear Forensics Support* (Vienna: Nuclear Security Series No. 2, 2006), <http://www-pub.iaea.org/books/iaea-books/7401/Nuclear-Forensics-Support>.

112. "NNSA, IAEA Offer Nuclear Forensics Training," *Global Security Newswire*, 9 March 2012, <http://www.nti.org/gsn/article/nnsa-iaea-offer-nuclear-forensics-training/>.

113. http://www.jaea.go.jp/04/isn/event/20120522/20120522_en.html.

114. Martine Letts, "Nuclear security: Partner with industry," *The Interpreter* (Sydney: Lowy Institute, 28 March 2012), <http://www.lowyinterpreter.org/post/2012/03/28/Nuclear-security-The-case-for-a-PPP.aspx>.

the different political jurisdictions) puts a premium on active government–industry collaboration to manage the risks and dangers of the three nuclear “Ss” of safety, safeguards and security.

3.148 The cooperation between state authorities and the operators is probably the main determining factor in the effectiveness of a nuclear security system, because legislation and regulations cannot compensate if industry fails to implement the necessary measures. While the state authorities can identify current and anticipated threats, it is the industry that must translate those assessments into practical measures at facility level. The operator understands the vulnerabilities of a facility, knows the vital areas that need to be protected and probably owns the equipment and employs the manpower needed to perform security tasks. If an incident does occur, it will first and foremost be the operators in charge of nuclear facilities who will have to deal with nuclear and radiological risks associated with it. This was the case, for example, with TEPCO in Fukushima in March 2011. At the same time, confidentiality must be maintained of any information that is sensitive from a commercial competition point of view, or the industry sector will withhold cooperation.

3.149 Some survey work was done by the Lowy Institute in Sydney on behalf of ICNND. Overall, the nuclear industry took the view that nuclear non-proliferation and security were primarily the responsibility of governments and not of the nuclear energy industry. That said, they subscribed to the same broad goals, believed it to be part of their social responsibility and were prepared to work with governments to prevent, limit or place conditions on the spread of developing dual-use technology to stop it from being abused by rogue regimes and associated networks. While only governments can put in place regulatory regimes, industry can play a critical role in reporting suspicious activities or patterns. But there is some industry scepticism on the value of more restrictive measures.¹¹⁵ Sharing information on best practice among industry can be done while respecting the confidentiality surrounding the specific aspects of security measures at facility level.

3.150 The importance of the industry was recognized in the Nuclear Security Summits, where special events and sessions were devoted to exploring how state authorities and industry can work more effectively together. Yet, at the Seoul NSS, even though Australia’s Prime Minister Julia Gillard noted that “we should find mechanisms to foster co-operation between governments and the private sector;” industry was given only a side-event.¹¹⁶ The Nuclear Security Summit initiated the discussion of how to ensure that operators are using the highest standards while taking these issues into account. This issue will be explored more fully at the 2014 NSS in the Netherlands.

115. Martine Letts, “Companies ponder their role in non-proliferation and nuclear safety,” *Australian Uranium: A Quarterly Bulletin from the Australian Uranium Association* 12 (2010), pp 5–6, http://lowyinstitute.cachefly.net/files/pubfiles/Letts%2C_Companies_ponder_their_role.pdf.

116. Quoted in Letts, “Nuclear security: Partner with industry.”

§3.10. Nuclear Security and Safety Interface

3.151 Both nuclear safety and security are concerned with public safety and health, but they differ with respect to the events that are to be prevented. Nuclear safety aims at unintended events, such as natural disasters, human mistakes or interruptions; and nuclear security aims to prevent intended malicious acts. In contrast to the definition of nuclear security given at the start of this chapter, the IAEA defines nuclear safety as “The achievement of proper operating conditions, prevention of accidents or mitigation of accident consequences, resulting in protection of workers, the public and the environment from undue radiation hazards.”¹¹⁷

3.152 Useful progress has now been made in recognizing the synergy between the two concepts. Meeting shortly after the anniversary of the nuclear meltdown in Fukushima, the Seoul NSS highlighted “the nexus between nuclear security and nuclear safety,” and it did so with a starkness that was absent in Washington:

7. Acknowledging that safety measures and security measures have in common the aim of protecting human life and health and the environment, we affirm that nuclear security and nuclear safety measures should be designed, implemented and managed in nuclear facilities in a coherent and synergistic manner. We also affirm the need to maintain effective emergency preparedness, response and mitigation capabilities in a manner that addresses both nuclear security and nuclear safety. In this regard, we welcome the efforts of the IAEA to organize meetings to provide relevant recommendations on the interface between nuclear security and nuclear safety so that neither security nor safety is compromised.¹¹⁸

3.153 The common goal of the interface between nuclear safety and security is the protection of people, society and the environment by preventing any large release of radioactive material.¹¹⁹ The threshold of unacceptable risk may be presumed to be the same for both and both adopt the strategy of defence in depth based on layers of protection that begin with prevention and move to detection and response. Accordingly, many elements and actions enhance both security and safety simultaneously. For example, the containment structure at a nuclear power plant not only prevents the significant release of nuclear material in case of an accident, but also provides a robust shield in the event of a terrorist attack.¹²⁰

3.154 It appears to be generally recognized now that safety-security overlaps are to be found in:

- > *Regulation.* It is a good idea to have a single site licence that incorporates safety and security issues rather than two separate licensing systems, one each for safety and security.
- > *Design.* The planning of a nuclear facility should be done with both safety and security as integral elements, rather than a focus on the safety aspect with security “bolted on” later.

117. IAEA, “The Interface Between Safety and Security at Nuclear Power Plants,” INSAG-24. A report by the International Nuclear Safety Group (Vienna: IAEA, 2010), p. 3, paragraph 7; <http://www-pub.iaea.org/books/iaeabooks/8457/The-Interface-Between-Safety-and-Security-at-Nuclear-Power-Plants>.

118. 2012 Seoul Nuclear Security Summit, “Seoul Communiqué,” http://www.thenuclearsecuritysummit.org/userfiles/Seoul%20Communiqué_FINAL.pdf.

119. IAEA, “Interface Between Safety and Security at Nuclear Power Plants,” p. 3, paragraph 9.

120. IAEA, “Interface Between Safety and Security at Nuclear Power Plants,” p. 1, paragraph 3.

- > *Risk assessment.* It is better to have an integrated approach to risk assessment, rather than two separate assessments, one for safety and one for security.
- > *Training.* Personnel should be sensitized to both safety and security issues as part of their training.

§3.11. Nuclear Security Culture

3.155 There are six groups of actors responsible for the proper development of security culture. States, organizations, managers in organizations, personnel, public and the international community fulfil the different tasks relevant for the realization of nuclear security culture through dialogue and coordination.¹²¹ The role played by WINS, as already mentioned earlier in this chapter, is especially important in this regard. There are also additional bilateral and other collaborative arrangements and practices. In a report released during the Seoul 2012 NSS, for example, China said that in the two years since the first NSS in April 2010, it had cooperated with the IAEA, the United States and other countries in conducting 20 training courses and seminars for more than 500 nuclear security workers. The IAEA, United States, Canada and “several other countries” had partnered with China to construct a Centre of Excellence on Nuclear Security in Beijing that will in time provide security training to other Asia–Pacific countries.¹²²

3.156 Similarly, the approach taken by India’s Global Centre for Nuclear Energy Partnership – like the Gulf Nuclear Energy Infrastructure Institute (GNEII), and the European Project to offer nuclear security courses at the European Nuclear Safety Training and Tutoring Institute in France – recognizes the importance of an integrated approach to security, safety, and safeguards in the design of these “centres of excellence.” Other existing and proposed centres “should develop appropriate links and collaborations with nuclear safety organizations to foster close working relations and the sharing of best practices and lessons learned, especially in the field of human resource development and threat assessment exercises.”¹²³ There should also be a standardization of training at the different centres to common norms and benchmarks. All such efforts will help to instil a culture of nuclear security among all stakeholders.

3.157 Nuclear security culture is discussed in the IAEA Nuclear Security Series No. 7 Implementing Guide, and described there as the “assembly of characteristics, attitudes and behaviour of individuals, organizations and institutions which serves as a means to support and enhance nuclear security.”¹²⁴ Each characteristic is made up of various components, including beliefs and management systems, which together contribute to greater nuclear security. The publication consists of four main chapters: an introduction to the topic, nuclear security and nuclear security culture, roles and responsibilities of institutions and individuals, and characteristics of the nuclear security culture.

121. IAEA, *Nuclear Security Culture*, p. 7.

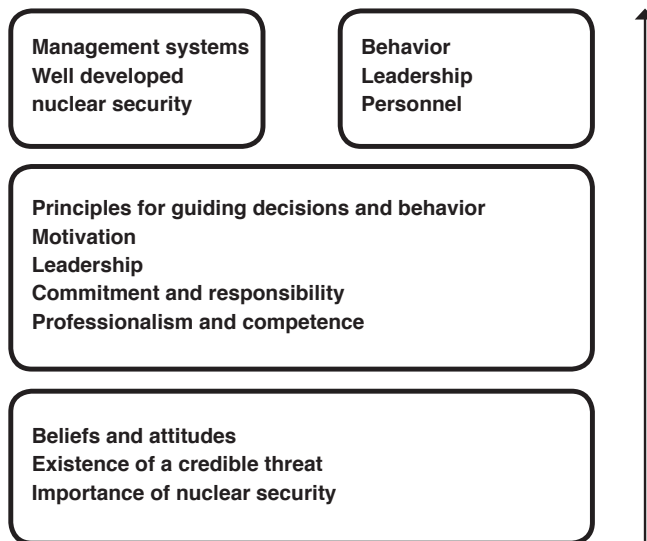
122. Xinhua, “China makes progress on nuclear security: report,” *People’s Daily Online*, 27 March 2012, <http://english.peopledaily.com.cn/90883/7770383.html>.

123. Alan Heyes, “An Assessment of the Nuclear Security Centers of Excellence,” *Policy Analysis Brief* (Muscatine, Iowa: Stanley Foundation, May 2012), pp. 6–7.

124. IAEA, *Nuclear Security Culture*, IAEA Nuclear Security Series No. 7, Implementing Guide (Vienna: IAEA, 2008), p. 3; <http://www-pub.iaea.org/MTCD/publications/PDF/Pub1347_web.pdf>.

3.158 The IAEA organizes a variety of training activities and workshops that are based on findings from the work of advisory missions. One of the IAEA programs relevant to security culture is the International Physical Protection Advisory Service (IPPAS) whose objective is to support states to develop and improve their national nuclear security. Four countries – France, Netherlands, Sweden and the United Kingdom – have received a review mission of the IAEA's IPPAS since the Washington Summit, and Australia, Finland, the Republic of Korea, Romania and the United States have presented plans in this regard.

Figure 3.8: Characteristics of Nuclear Security Culture



Source: IAEA, Nuclear Security Culture, p.18.

3.159 “International assurances” refer to activities undertaken, information shared, or measures implemented voluntarily by one party to provide confidence to others of the effectiveness of nuclear security within the jurisdiction of the first party.¹²⁵ They can include “conformity assessments,” as used for example by the International Organization for Standardization (ISO) to show that a product, service or system meets the requirements specified in an ISO standard; information sharing and annual reports on nuclear security regulations and issues; physical protection assessments; certification of nuclear security personnel to agreed baseline qualifications and training; bilateral cooperation programs; and peer review mechanisms.

3.160 IAEA IPPAS missions offer one example of a peer review mechanism that helps to provide international assurance. Since the first such mission in 1996, 56 IPPAS missions in 37 countries have been performed.¹²⁶ The IAEA IPPAS checks if a country’s laws and regulations conform to IAEA guidance, but not the effectiveness of the implementation of the guidelines. Others gain confidence from the very fact that a state agrees to host an

125. Adapted from “Options for Strengthening the Global Nuclear Security System,” p. 6.

126. <http://www.nrcsecurityconference.org/slides/Dec5/IPPAS.pdf>.

IPPAS mission, as Australia will in 2013, for it indicates a national commitment to evaluate and strengthen nuclear security. But the state has no obligation to implement the recommendations and report on them. According to the NTI Nuclear Materials Security Index, 17 countries published either regulations or an annual report, and 13 countries published both, on nuclear security issues as of 2011.¹²⁷

3.161 In addition to acknowledging the nuclear security and safety interface, it is worth noting also that there is a close relationship between nuclear non-proliferation and nuclear security. While the non-proliferation regime was designed to defend against state level proliferation it also provides an important, if by itself insufficient, line of defence against terrorists acquiring nuclear materials, equipment and technologies. Application of safeguards [particularly an effective state system of accounting for and control of nuclear material (SSAC)], export controls and the like are all fundamental to the security of nuclear material, technology and equipment and to preventing illicit trafficking. Similarly, agreement on measures to limit the spread of uranium enrichment and reprocessing would reduce the risk of both state and non-state misuse of these materials. All of this also can be described as developing a robust nuclear security culture.

3.162 If a robust nuclear security culture is to be created, some existing gaps will have to be filled. The catalogue of incidents listed in Box 3.1 is suggestive of gaps in the existing national and multilateral machinery of nuclear security. These include lack of universality, binding standards, transparency and accountability mechanisms, compulsory IAEA oversight, and insufficient attention to nuclear weapons. The measures adopted by the Washington and Seoul Nuclear Security Summits in 2010 and 2012 are said to suffer from three serious flaws: they are recommendations for voluntary action by states; they are uneven and inconsistent between different states; and they lack built-in accountability requirements and mechanisms. Given the gravity of the threat, a credible and effective nuclear security regime requires the opposite three attributes: mandatory, legally binding, and globally uniform standards and monitoring-cum-verification systems. It is not enough to “encourage” states to share best practices and to cooperate with the IAEA in securing the essential and disposing of surplus nuclear material. A nuclear terrorist attack would unleash profound security, political, economic and social consequences.

3.163 That said, the international community must weigh in the balance whether an instrument capable of attracting strong political support like the Code of Conduct on Radioactive Sources is, for the present, a better outcome than a poorly supported legally binding instrument. David Santoro recommends the cultivation of “nuclear security champions” with in-depth understanding of the political, legal, economic, social and technological aspects of the subject as an effective means of fostering a culture of nuclear security at the state level.¹²⁸ This would add to the current efforts, for example of the IAEA with its International Nuclear Security Education Network,¹²⁹ and of the MacArthur Foundation’s initiative on support for graduate and post-doctoral interdisciplinary training in nuclear security.¹³⁰

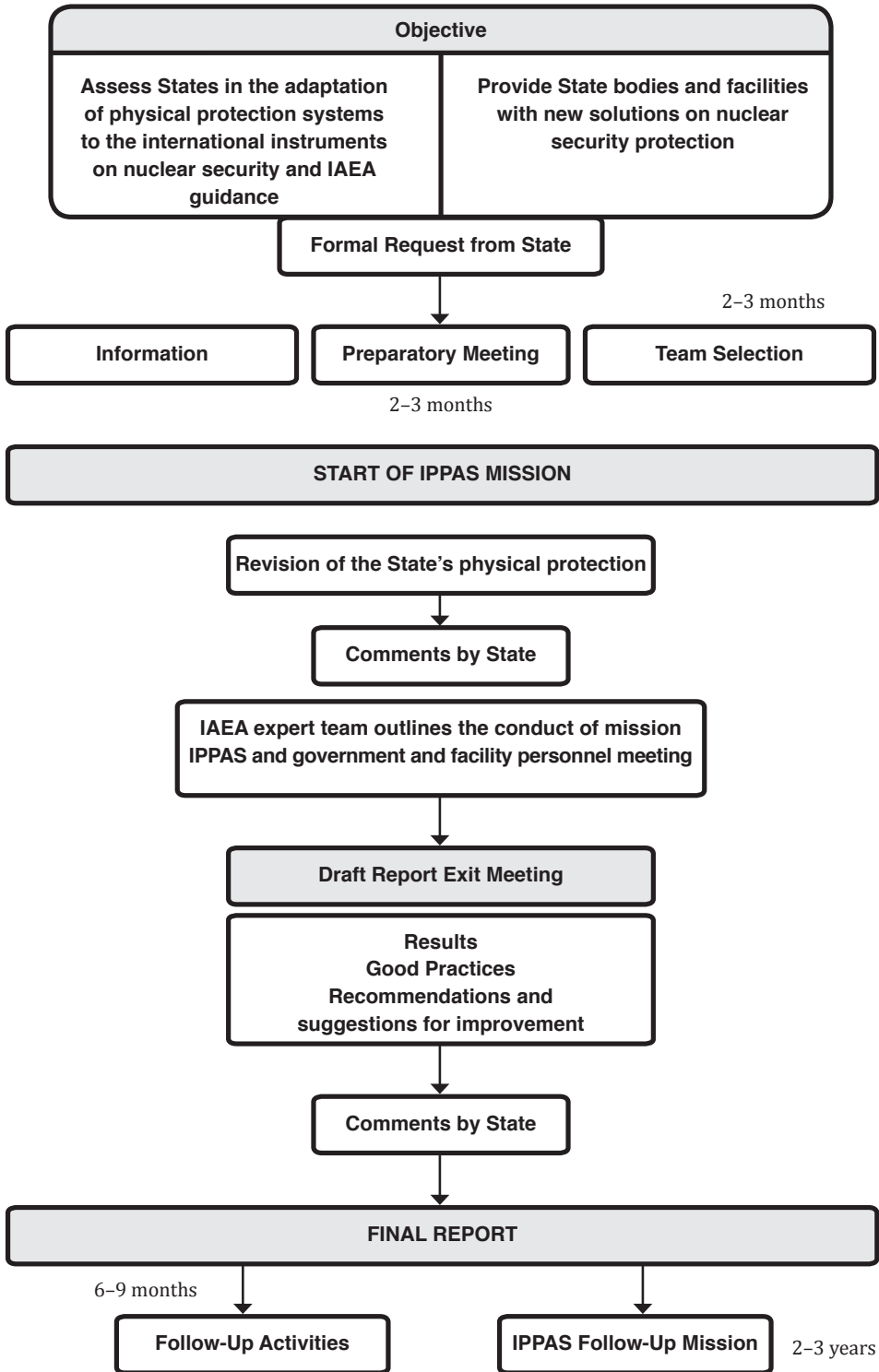
127. “Options for Strengthening the Global Nuclear Security System,” p. 7.

128. David Santoro, “Championing Nuclear Security,” Carnegie Endowment for International Peace, 10 September 2012, <http://carnegieendowment.org/2012/09/10/championing-nuclear-security/dsz1>.

129. <http://www-ns.iaea.org/security/workshops/insen-wshop.asp>.

130. <http://www.macfound.org/info-grantseekers/grantmaking-guidelines/ips-grant-guidelines/>.

Figure 3.9: IPPAS Mission Process



Source: IAEA, <http://www--ns.iaea.org/security/ippas.asp>.

4. PEACEFUL USES OF NUCLEAR ENERGY

- §4.1 Overview
- §4.2 Objectives and General Strategy
- §4.3 Nuclear Cooperation
- §4.4 Mitigating Proliferation Risks
- §4.5 Nuclear Safety and Security Commitments

§4.1 Overview

4.1 The overarching international objective in relation to peaceful uses of nuclear energy is to ensure that the benefits of nuclear energy are available to all states that choose to use it, on equitable terms and through international cooperation, while also ensuring that the use of nuclear energy does not lead to the proliferation of nuclear weapons and does not endanger human and environmental health and safety.

4.2 The use of nuclear energy for peaceful purposes is one of the three fundamental pillars of the NPT, along with nuclear disarmament and non-proliferation. The treaty sets out general peaceful use rights and obligations but does not detail approaches for determining compliance with such rights and obligations. This has resulted in a long-standing debate over compliance with NPT peaceful use rights and obligations. In recent years, a focus of this debate has been the extent to which the NPT mandates development of the most proliferation-sensitive nuclear technologies – enrichment and reprocessing.

4.3 The renewed interest in nuclear energy for power generation underscores the importance of timely resolution of differences within the international community on peaceful uses of nuclear energy issues. Politicization of peaceful uses issues, to the extent that it exists, is against the interests of the vast majority of states, be they holders of advanced nuclear technology, countries that aspire to a peaceful nuclear power program or countries unlikely ever to want to develop nuclear power.

4.4 **Nuclear Cooperation.** NPT parties at successive treaty review conferences have elaborated the basic NPT peaceful use provisions with respect to nuclear cooperation. For example, Action 51 from the 2010 NPT Review Conference called upon states parties to “Facilitate transfers of nuclear technology and international cooperation among States parties in conformity with articles I, II, III, and IV of the Treaty, and eliminate in this regard any undue constraints inconsistent with the Treaty.”



4.5 The wide uptake of nuclear power and nuclear applications, and the fact that many developing countries have been able to conclude nuclear supply agreements with supplier countries, suggest that national status and supplier non-proliferation practices are not a practical impediment to legitimate nuclear trade and cooperation. Of the 30 states, plus Taiwan, operating nuclear power programs, almost 40 per cent are developing countries. The majority of the 29 states planning or proposing nuclear power programs are developing countries, and of the seven of those states most likely to proceed with nuclear power in the near term, six are developing countries. Looking ahead, the lower capital costs and simplified operational requirements of the innovative small power reactor designs currently being developed could make nuclear power more accessible to additional developing countries.

4.6 Non-power applications of nuclear technology are also spread widely. Of the 54 states (plus Taiwan) operating research reactors, well over half are developing countries. In terms of the IAEA's Technical Cooperation Programme, which covers nuclear power-related and non-power applications, projects are being undertaken in 123 states and territories, the great majority of which are developing countries. Funding available for this program has increased over the years but debate on its adequacy continues, including the degree of reliance on extra-budgetary and in-kind contributions. This debate should continue within the discussion of the IAEA's system wide budgetary difficulties.

Overall Evaluation of Nuclear Cooperation: **Significant Progress.** NPT 2010 commitments and ICNND 2009 recommendations are generally being met. There are grounds for criticism that technical cooperation assessed funding has not increased more – though it has increased substantially over the years – but the additional funding provided by a number of states is consistent with the increase called for in the NPT 2010 Action Plan.

4.7 **Mitigating Proliferation Risks.** The nuclear non-proliferation, disarmament and peaceful use pillars of the NPT are closely related and mutually reinforcing. Effective nuclear non-proliferation measures provide confidence that peaceful nuclear trade and cooperation can proceed without contributing to nuclear weapons proliferation. Also vital is confidence that effective nuclear safety and security measures will apply.

4.8 National export controls coordinated by the Nuclear Suppliers Group (NSG) are the principal means by which nuclear suppliers give effect to the requirement that exports be consistent with their non-proliferation obligations [see Chapter 2 for detailed discussion]. With export controls now established as an international norm, including through UN Security Council Resolution 1540, the NSG and its members have an important contribution to make through assisting non-members develop and apply effective nuclear export controls.

4.9 However, little progress has been made in a number of areas with important implications for peaceful nuclear cooperation. An inclusive approach which respects state sovereignty and rights to development is critical. The international community is broadly agreed that limiting the spread of sensitive nuclear technology is in the interests of all states and making this choice will involve substantial practical benefits to countries looking to develop peaceful nuclear energy programs. But the need remains to reach a shared understanding on how to translate this general principle into practical steps and concrete actions.

4.10 There has been no progress on addressing the potential problems of national enrichment and reprocessing capabilities in non-nuclear-weapon states. These capacities inadvertently or deliberately provide such states with the technical capacity to produce nuclear weapons in a relatively short time. Likewise, the prospective spread of fast breeder reactors and plutonium fuels in the future will present serious challenges unless addressed. Highly enriched uranium (HEU) minimization is proceeding, though large quantities of HEU remain in the civil cycle; no effort has been made to minimize the use of plutonium in the civil nuclear power sector (as mixed oxide – MOX – fuel).

*Overall Evaluation of Mitigating Proliferation Risks: **Some Progress.** Most states are meeting their NPT peaceful use commitments, but non-compliance cases – especially Iran and North Korea – are cause for concern. Issues of nuclear latency and hedging are not being addressed. The spread of sensitive nuclear technology and the prospective spread of fast reactors and plutonium fuels in the future will present serious challenges unless addressed. HEU minimization is proceeding, though large quantities of HEU remain in the civil cycle; but no effort has been made to minimize plutonium (as MOX). The establishment of two fuel banks and the work of the International Framework for Nuclear Energy Cooperation (IFNEC) are positive developments, but further elaboration of multilateral approaches, and the uptake of these approaches, have a long way to go.*

4.11 **Safety and Security Commitments.** Nuclear safety and security have global ramifications for peaceful nuclear use but continue to be seen mainly as national concerns. A more appropriate balance is needed between national and international interests and responsibilities. This should include increased focus on the development of and adherence to international standards, as well as greater transparency and accountability.

4.12 Participation rates in existing nuclear safety and security treaties and other instruments remain inconsistent with the consequences significant nuclear safety or security incidents have for global confidence in peaceful nuclear energy. One state, Iran, operating a nuclear power reactor, is yet to join the principal treaty on nuclear safety – the Convention on Nuclear Safety (CNS). A number of states operating power reactors

are yet to join the 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Treaty participation in the area of nuclear security is similarly inadequate. The principal convention on nuclear security, the 1980 Convention on the Physical Protection of Nuclear Material (CPPNM) has 148 parties, well short of universality. Seven years after the 2005 Amendment extending application of the CPPNM was opened for signature, less than two thirds of the ratifications required for its entry into force have been obtained.

Overall Evaluation of Safety and Security Commitments: **Some Progress.** Not all states with significant nuclear activities have joined the Convention on Nuclear Safety (CNS), and there is a lack of international standards, transparency and accountability. Many states with power reactors remain outside the liability regimes. On nuclear security, many states remain outside the Convention on the Physical Protection of Nuclear Material (CPPNM), and there are insufficient ratifications/accessions for the Amended CPPNM to enter force. Again there is a lack of international standards, transparency and accountability.

§4.2 Objectives and General Strategy

4.13 The right to the peaceful use of nuclear energy is one of the three pillars of the NPT, the other two being non-proliferation and disarmament. A key objective of the NPT is to ensure that nuclear energy is indeed used only for peaceful purposes and does not contribute to the proliferation of nuclear weapons. Accordingly, Article IV of the NPT affirms the right of states to use nuclear energy for peaceful purposes, provided this is in conformity with the non-proliferation obligations of the treaty and IAEA safeguards are applied to verify fulfilment of these obligations.

4.14 The need for effective control of nuclear energy to ensure that it is used only for peaceful purposes was one of the first issues addressed by the United Nations when it was established in 1946. A number of proposals were examined, including placing all nuclear materials under the control of an international agency, but the United States and the Soviet Union were unable to reach agreement on these.

4.15 Following the Soviet Union's first nuclear test in 1949, attention turned to preventing the further proliferation of nuclear weapons. Recognizing the right of countries to exploit nuclear energy, the United States proposed a policy of cooperation under peaceful use guarantees in President Dwight Eisenhower's "Atoms for Peace" speech to the UN General Assembly in December 1953. This initiative led to the establishment of the IAEA in 1957, and subsequently to the negotiation of the NPT in 1968 and its entry into force in 1970.

4.16 The NPT does not in fact specifically define *peaceful purposes* and *peaceful uses*. What is encompassed, in effect, is anything not within two other categories of nuclear activity contemplated by the treaty, viz:

- > The manufacture or other acquisition of nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices, which activities are proscribed for all but the five countries recognized by the NPT as nuclear-weapon states (NWS); and
- > Non-peaceful purposes that are not proscribed – that is, non-explosive military purposes such as naval propulsion reactors. It is clear from the wording of Article III and international practice¹ that these activities are not *peaceful purposes*. Accordingly their status is ambiguous in terms of the “inalienable right” referred to in paragraph 1 of Article IV, and they are outside the scope of the cooperation envisaged under paragraph 2 of Article IV.

4.17 The lack of a clear definition of peaceful purposes leaves a grey area with respect to nuclear latency and nuclear hedging, problems which were neither adequately foreseen nor appropriately addressed at the time the NPT was negotiated. These are discussed further in section 4.4.

4.18 For present purposes, the overarching international objective in relation to peaceful uses of nuclear energy may be described as being to ensure that the benefits of nuclear energy are available to all states that choose to use it, on equitable terms and through international cooperation; while also ensuring that the use of nuclear energy does not lead to the proliferation of nuclear weapons and does not endanger human and environmental health and safety. The strategies to advance this objective are discussed in the remainder of this chapter, under three headings as follows:

4.19 **Cooperation in developing peaceful applications.** The main NPT provision is Article IV.2, and the principal 2010 NPT Review Recommendations are Actions 48 to 51. Key questions here include: are states meeting the commitment to cooperate in developing peaceful applications of nuclear energy, and is due consideration being given to the needs of developing countries?

4.20 **Mitigation of proliferation risks associated with peaceful purposes.** The main NPT provision is Article II, and the principal 2010 NPT Review Conference recommendation is Action 61 on minimization of the use of highly enriched uranium. ICNND recommendations 34 to 38 are more specific. Key questions here include: do IAEA safeguards provide sufficient assurance against possible misuse of nuclear programs for non-peaceful purposes, are further institutional and technical measures needed to mitigate proliferation risk, and can states exercise effectively the right to use nuclear energy for peaceful purposes without needing to develop proliferation-sensitive stages of the fuel cycle? Proliferation risk issues are addressed in more detail in Chapter 2.

1. As reflected for example in paragraph 14 of the IAEA model NPT safeguards agreement, INFCIRC/153.

4.21 Ensuring peaceful nuclear programs are conducted safely and securely. Safety and security are not specifically referred to in the NPT, but they are covered by other treaties and in Actions 57, 59, 60, 62 and 63 of the 2010 NPT Review Conference. The key question here is: are states, in conducting their nuclear programs, applying standards of nuclear safety and security sufficient to ensure protection of other states from the consequences of nuclear accidents or terrorist acts? Nuclear security issues are discussed in more detail in Chapter 3.

§4.3 Nuclear Cooperation

4.3.1 Among States

4.22 An essential aspect of peaceful uses of nuclear energy under the NPT is the commitment to international cooperation, set out in Article IV.2. Prior to the treaty, nuclear cooperation, including supply of nuclear facilities, equipment and nuclear materials, took place under bilateral agreements between supplier and recipient states. In economic terms bilateral cooperation remains the most substantial form of nuclear cooperation, through supply of reactors, nuclear fuel and nuclear services. At the multilateral level, the main vehicle for nuclear cooperation is the IAEA and its Technical Cooperation Programme, discussed in the next section.

4.23 Nuclear Power. The NPT established a much broader basis for peaceful use commitments and verification, extending beyond supplied items and materials to all of the nuclear material and activities in a state. In so doing, the NPT has established the conditions under which nuclear trade has been able to grow to its current global scale. The NPT and the IAEA safeguards system have provided confidence to states that they are able to cooperate in the peaceful use of nuclear energy without contributing to the proliferation of nuclear weapons.

4.24 Nuclear energy provides just over 12 per cent of global electricity.² There are 30 states, plus Taiwan, operating nuclear power programs (Table 4.1). Almost 40 per cent of these (12 out of 31) are developing countries.³ The IAEA reports that there are 29 states planning or proposing nuclear power programs. The IAEA does not identify these but indicates that most are developing countries.⁴ Using a conservative figure of seven for those states most likely to proceed with nuclear power in the near term,⁵ six of these are developing countries.

2. IAEA, *International Status and Prospects for Nuclear Power 2012*. GOV/INF/2012/12-GC(56)/INF/6 (Vienna: IAEA, 15 August 2012), Table B.1, p. 3.

3. States with nuclear power that are defined by the World Bank (2012) as “developing countries” (<http://data.worldbank.org/about/country-classifications/country-and-lending-groups>) are: Argentina, Armenia, Brazil, Bulgaria, China, India, Iran, Mexico, Pakistan, Romania, South Africa and Ukraine. The World Bank definition also includes Russia, but Russia is not counted as a developing country in this report on the basis that it is a leading nuclear power.

4. IAEA, *International Status and Prospects for Nuclear Power 2012*.

5. The seven are Bangladesh, Belarus, Lithuania, Poland, Turkey, UAE and Vietnam. All but Poland are categorized as developing countries by the World Bank.

Table 4.1: World Nuclear Energy (January 2013)

	Operating reactors		Reactors under construction	
	Number	Total Capacity (GWe)	Number	Total Capacity (GWe)
Argentina	2	0.9	1	0.7
Armenia	1	0.4		
Belgium	7	5.9		
Brazil	2	1.9	1	1.2
Bulgaria	2	1.9		
Canada	19	13.7		
China	17	12.8	29	28.8
Czech Republic	6	3.8		
Finland	4	2.7	1	1.6
France	58	63.1	1	1.6
Germany	9	12.1		
Hungary	4	1.9		
India	20	4.4	7	4.8
Iran	1	0.9		
Japan	3	3.1	3	4.0
Korea, Republic of	23	20.8	4	5.0
Mexico	2	1.3		
Netherlands	1	0.5		
Pakistan	3	0.7	2	0.6
Romania	2	1.3		
Russia	33	23.6	11	9.3
Slovak Republic	4	1.8	2	0.8
Slovenia	1	0.7		
South Africa	2	1.8		
Spain	8	7.6		
Sweden	10	9.4		
Switzerland	5	3.3		
Taiwan, China	6	5.0	2	2.6
Ukraine	15	13.1	2	1.9
UAE			1	1.3
United Kingdom	16	9.2		
United States	104	101.5	1	1.2
	390	331.1	68	65.4
Japan - shutdown reactors	48	41.3		

Source: IAEA, <http://www.iaea.org/PRIS/WorldStatistics/OperationalReactorsByCountry.aspx>

4.25 The long-term impact of the Fukushima accident on planned nuclear programs is not yet clear. The accident is likely to make nuclear power more expensive through higher capital costs, due to more rigorous safety requirements, and higher finance costs, reflecting lenders' reappraisal of commercial risk. The World Energy Council has reported that the Fukushima accident has not so far led to a significant retraction in nuclear power programs outside Europe, except in Japan. While progress in many national programs has been delayed, there is no indication that these countries' pursuit of nuclear power has declined in response to Fukushima.⁶ The German and Japanese governments announced the phase-out of nuclear power, but it appears (January 2013) that the new Japanese government will re-examine its predecessor's decision. The Chinese government decided to cancel planned Generation II reactors and replace them by Generation III models, a move that will bring safety benefits but will increase costs and slow down China's nuclear expansion in the near term. Also in the Asian region, India has affirmed its plans to boost its nuclear capacity up to 15-fold by 2032, and Taiwan, South Korea and Vietnam are proceeding with announced plans. Indonesia and Thailand have delayed nuclear power until after 2020. However Malaysia announced *after* Fukushima that it is considering the option of nuclear power.

4.26 Of the 54 states (plus Taiwan) currently operating research reactors, well over half (31) are developing countries.⁷ Apart from research reactors, statistics are not readily available on the number of states in which non-power nuclear applications are used, but this would include most if not all the world's states. In terms of the IAEA's Technical Cooperation Programme, which covers nuclear power-related and non-power applications, projects are being undertaken in 123 states and territories,⁸ the great majority of which are developing countries.

4.27 The Action Plan from the 2010 NPT Review Conference elaborated on the implementation of nuclear cooperation, inter alia calling on parties to give preferential treatment to the non-NWS, particularly taking into account the needs of developing countries, and to facilitate transfers of nuclear technology and cooperation among states parties, eliminating any undue constraints inconsistent with the treaty.⁹

4.28 The figures cited above demonstrate that nuclear energy has brought benefits to a great many states, including many developing countries. The fact that the uptake of nuclear power by developing countries has not been greater reflects practical constraints, such as the high capital costs of power reactors, human and technical infrastructure requirements, and electricity grid capacity. In the near term, the main growth in nuclear power in developing countries will be where the technology is already well established – particularly China and India. Looking ahead, a number of innovative small power reactor designs¹⁰ are under development, with features more suited to conditions in developing countries, including lower power levels, life-time or long-life fuel cores and modular construction and operation. The lower capital costs and simplified operational requirements of these reactors could make nuclear power more accessible to a number of developing countries.

6. World Energy Council, *Nuclear Energy One Year After Fukushima*, 2012, http://www.worldenergy.org/documents/world_energy_perspective_nuclear_energy_one_year_after_fukushima_world_energy_council_march_2012_1.pdf

7. IAEA, *Research Reactor Database*, 2012, <http://nucleus.iaea.org/RRDB/RR/ReactorSearch.aspx?rf=1>.

8. IAEA, *Annual Report 2011* (Vienna: IAEA, 2012), <http://www.iaea.org/Publications/Reports/Anrep2011/index.html>.

9. Actions 50 and 51 respectively – see section 4.3.1 below.

10. Small reactors are defined by the IAEA as less than 300 MWe.

4.29 Few states have developed indigenous nuclear technology and few produce nuclear materials. The uptake of nuclear power and other nuclear applications has been enabled by nuclear cooperation among states. Today no state has a wholly self-reliant nuclear energy program; there is a global market in nuclear equipment, technology, materials and services. The nuclear market operates on a commercial basis – there is no known case of a state being excluded, other than on grounds of proliferation concern.

4.30 The commitment to cooperate applies only to peaceful uses, and is subject to the other provisions of the NPT, for example Article IV.1 (which in turn refers to Articles I and II) and Article III. This is reflected in the wording of Action 51 from the 2010 NPT Review Conference. A state party considering cooperation, or asked for cooperation, may take into account the other party's performance with respect to NPT obligations, for example whether there have been safeguards violations (Article III) or whether there are grounds for concern regarding Article II (the commitment not to seek nuclear weapons). These considerations are reflected in national export controls (discussed in more detail in Chapter 2).

4.31 National export controls on nuclear equipment, nuclear-related materials and technology, and specified *dual-use* items are coordinated by the Nuclear Suppliers Group (NSG). These controls are fully consistent with the NPT, giving effect to the requirements of Articles I and II of the treaty. The NSG membership includes several major developing countries, for example Argentina, Brazil, China, Kazakhstan, Mexico, South Africa and Turkey.¹¹

4.32 Apart from export controls applied by states, the technology holders (for example URENCO, TENEX, BNFL (British Nuclear Fuels Limited) and AREVA) themselves are very cautious about the states to whom they supply. In enrichment, URENCO and TENEX supply only on a black box basis, so that technology is not transferred. These issues are discussed further in section 4.4.

4.33 The fact that non-proliferation practices have not been a practical impediment to legitimate nuclear trade is demonstrated by the uptake of nuclear power and nuclear applications, discussed above, and by the many developing countries that have been able to conclude nuclear cooperation agreements with supplier countries. For example, states with nuclear supply agreements with the United States include Argentina, Bangladesh, Brazil, Colombia, Egypt, India, Indonesia, Kazakhstan, Morocco, South Africa, Thailand and the UAE. Further US agreements are being negotiated with Jordan and Vietnam.

4.34 Other Forms of Nuclear Cooperation. While nuclear energy is usually thought of in terms of nuclear power, non-power nuclear applications are also very important. These include the use of nuclear techniques in areas such as human health, food and agriculture, and physical and chemical sciences. Developing countries have benefitted particularly in these areas. Nuclear cooperation among states is not limited to nuclear trade, but includes non-power nuclear applications and also training, capacity-building,

11. Other NSG members categorized by the World Bank as developing countries are Bulgaria, Latvia, Lithuania, Romania and Ukraine.

sharing of experience, and so on, in areas including facility operations and the “3 Ss” – safeguards, safety and security.

4.35 Statistics are not readily available on the number of states in which non-power nuclear applications are used, but this would include most if not all the world’s states. Mostly cooperation in non-power applications is provided through the IAEA. Under the IAEA’s Technical Cooperation Programme, which covers nuclear power-related and as well as non-power applications, projects are being undertaken in 123 states and territories,¹² the great majority of which are developing countries, including 30 Least Developed Countries. The IAEA’s program is discussed further in section 4.3.2.

4.36 In addition to cooperation provided through the IAEA, there are many bilateral and regional projects and programs. There are too many examples to list here, but mention can be made of a few: IAEA Regional Cooperative Agreements – in Africa, Asia-Pacific, Arab states, and Latin America; the International Framework for Nuclear Energy Cooperation (IFNEC – see further below); global and regional cooperation and assistance programs operated by the European Union (EU) and many governments, particularly (because of its scale) the United States; establishment of regional training centres and centres of excellence on nuclear safeguards and nuclear security, for example by China, India, Japan and South Korea; the Asian Nuclear Safety Network (ANSN); and the Asia-Pacific Safeguards Network (APSN). A recent initiative is the Gulf Nuclear Energy Infrastructure Institute (GNEII), opened in Abu Dhabi in 2011: this is a joint US/UAE venture aimed at strengthening nuclear energy security, safeguards and safety infrastructure development throughout the Gulf region. There are also the industry-based World Association of Nuclear Operators (WANO), dealing with nuclear safety, and the World Institute for Nuclear Security (WINS).

4.3.2 Role of the IAEA in Nuclear Cooperation

4.37 All of the IAEA’s program areas (safeguards, nuclear safety, nuclear security, nuclear energy, and nuclear sciences and applications), include elements of cooperation, training and capacity-building for IAEA member states. The IAEA’s main vehicle for nuclear cooperation, however, is the Technical Cooperation Programme. While all IAEA member states are eligible for technical support, “in practice technical cooperation activities tend to focus on the needs and priorities of less developed countries.”¹³

4.38 Because the IAEA’s statute does not expressly refer to a Technical Cooperation Programme, this program is not funded as part of the agency’s regular budget, but primarily through voluntary contributions from member states to the Technical Cooperation Fund (TCF). Contributions are based on an assessed share of a target amount set by the member states in consultation with the IAEA secretariat. These extra-budgetary funds are supplemented by other resources and in-kind contributions provided by a number of states.

12. IAEA, *Annual Report 2011*, p. 14.

13. IAEA, *Our Work, Technical Cooperation*, <http://www.iaea.org/technicalcooperation/programme/index.html>.

4.39 The Technical Cooperation report for 2011 indicates that the IAEA was able “to expand its role in contributing to the global development agenda through its technical cooperation (TC) programme.” The report notes the comparative advantages of nuclear technologies, applications and techniques for contributing to sustainable development within the framework of the UN Millennium Development Goals (MDGs), the Programme of Action for the Least Developed Countries for the Decade 2011–2020 and the concept of a “green economy.”¹⁴ The 2011 TCF expenditures by technical field are set out in Table 4.2.

Table 4.2: 2011 IAEA Technical Cooperation Fund Expenditure by Technical Field

Field	Expenditure €million	Per Cent of total
Nuclear fuel cycle	22.544	27.0
Human health	15.200	18.3
Nuclear safety	13.412	16.1
Human capacity development	7.994	9.6
Radioisotope production & radiation technology	6.935	8.3
Food and agriculture	6.312	7.6
Nuclear power	3.520	4.2
Environment	2.481	3.0
Water resources	1.270	1.5

Source: IAEA, *Technical Cooperation Report for 2011, Supplement*, p. 36.

4.40 The IAEA provides the foundation for international cooperation on nuclear energy infrastructure, offering a wide range of services, publications and meetings to assist member states intending to develop nuclear power. In 2009, the IAEA began providing Integrated Nuclear Infrastructure Review missions to member states. These cover the comprehensive infrastructure required for building a nuclear power program including safeguards, security and safety. The missions, shown in Table 4.3, have been carried out in seven states – Bangladesh, Belarus, Indonesia, Jordan, Thailand, UAE and Vietnam – and a mission is being planned for Turkey.

4.41 The IAEA also offers the Integrated Regulatory Review Service (IRRS), designed to enhance the effectiveness of the regulatory infrastructure of states for nuclear, radiation, radioactive waste and transport, safety and security of radioactive sources, by reviewing both regulatory technical and policy issues against IAEA safety standards and good practice in other states. The Technical Cooperation Programme also delivers substantial assistance to IAEA member states on developing the infrastructure necessary for a nuclear power program.

14. Report of the Director General, *Technical Cooperation Report for 2011*, GC(56)/INF/4 (Vienna: IAEA, July 2012), p. 5; <http://www.iaea.org/technicalcooperation/Pub/Ann-Reports/index.html>.

Table 4.3: IAEA Integrated Nuclear Infrastructure Review Missions

INIR Missions	Conducted in or Planned for	Review Status	Other Information
Bangladesh	2011	Phases I & II	
Indonesia	2009	Phase I	
Jordan	2009	Phase I	
Thailand	2010	Phase I	
UAE ^a	2011	Phase II	
Vietnam	2009	Phase I	
Jordan ^b	2011	Follow-up	Follow-up mission to 2009 mission
Belarus	2012	Phase I & II ^c	
Poland	2012	Phase I	
Vietnam	2012	Phase II	On-going
Jordan	2013	Phase II	Tentatively planned
South Africa ^d	2013	Self-evaluation	Tentatively planned
Turkey ^e	2013	Self-evaluation	Tentatively planned

a. <http://www.iaea.org/NuclearPower/Downloads/Infrastructure/files/UAE-INIR-Mission-January-2011-Report.pdf>.

b. First follow-up mission ever conducted (source: <http://www.iaea.org/NuclearPower/News/2012/2012-04-10-INIG.html>).

c. <http://www.iaea.org/newscenter/news/2012/belarusnp.html>.

d. <http://www.necsa.co.za/Article/e23147b1-e19c-4a26-ae7d-38dd2528155d/6/laea-to-conduct-nuclear-infrastructure-mission-to-sa- october-.aspx>.

e. <http://www.iaea.org/NuclearPower/News/2012/2012-11-14-INIG.html>.

Source: IAEA's INIR website: <http://www.iaea.org/NuclearPower/Infrastructure/home.html>

4.42 In non-power applications, the IAEA collaborates closely with other relevant international agencies, such as the Food and Agriculture Organization (FAO), the World Health Organization (WHO) and the United Nations Environment Programme (UNEP), to ensure that TC projects are conducted in priority areas.

4.43 In 2011 member states' contributions to the TCF were €60.5 million. Additional resources – other income, further extra-budgetary and in-kind contributions – amounted to €21.4 million, making an overall total of €81.9 million (approximately USD 114 million).¹⁵ Resources available to the TCF in 2011 represented an increase of almost 60 per cent over the resources available a decade earlier, in 2002 (€51.5 million) – even allowing for inflation, a substantial increase. Active projects at the end of 2011 totalled 681, with an additional 80 projects in the process of being closed.¹⁶ In addition, the IAEA Peaceful Uses Initiative, launched in 2010, “has become an important vehicle to raise extra-budgetary contributions for IAEA activities in the peaceful uses of nuclear technology.”¹⁷

4.44 There are regular calls for the resources to the TCF to be increased. In this regard, the additional resources of €21.4 million contributed to the TCF in 2011 are consistent with the additional contributions of \$100 million over five years called for in NPT 2010

15. IAEA, *Technical Cooperation Report for 2011*, Supplement, p. 3.

16. IAEA, *Annual Report 2011*, p. 97.

17. *Understanding the Peaceful Uses Initiative* (Vienna: IAEA 2012), <http://www.iaea.org/newscenter/news/2012/pui.html>.

Action 55. The suggestion that developing countries would benefit by increasing the funding of the TCF needs careful analysis. Typically each year the TCF underspends available funding, for example for 2011 the IAEA reported that the implementation rate for the TCF was 74 per cent.¹⁸ Making better use of the available funds would bring increased benefit without increased funding levels. The TC Programme has been criticized on a number of grounds, including that recipients include a number of high- or relatively high-income states that can well afford to pay for IAEA services,¹⁹ and that there is inadequate review and follow-up of project completion and outcomes.²⁰

4.45 On the first point, it is noted that in 2011 the Europe region received some 48 per cent of TCF assistance, compared with Africa and Asia/Pacific, each around 18 per cent, and Latin America 12 per cent. As shown in Table 4.2, over 31 per cent of TCF expenditure was for projects relating to the nuclear fuel cycle and nuclear power, and 16 per cent for nuclear safety – all very important areas, but it could be asked whether those states active in these areas, certainly states operating or building nuclear facilities, should be able to afford to pay for IAEA services. These costs would be marginal compared with the costs of a nuclear power program.

4.46 Regarding the second point, the IAEA's TC review processes are undergoing improvement. For further increases to TCF funding to be warranted, it should be demonstrated that the current program is fully efficient, current funding is being fully utilized, planned outcomes are being achieved, including in subsequent years, and that funding is targeted at those in genuine need.

§4.4 Mitigating Proliferation Risks

4.4.1 Safeguards, Technology and National Supply Policies

4.47 Uranium enrichment and reprocessing, the key processes required for producing nuclear fuel at the front end and the back end of the fuel cycle, can also be used for producing fissile material²¹ for nuclear weapons – indeed, they were first developed for this purpose. Accordingly, mitigating proliferation risk is largely concerned with ensuring that these technologies are used only for peaceful purposes.

4.48 The international community is broadly agreed that limiting the spread of these sensitive nuclear technologies is in the interests of all states and making this choice will involve substantial practical benefits to countries looking to develop peaceful nuclear energy programs. But an inclusive approach which respects state sovereignty and rights to development is critical. There is a need to reach a shared understanding on how to translate this general principle into practical steps and concrete actions.

18. IAEA, *Technical Cooperation Report for 2011*, p. vii.

19. Trevor Findlay, *Unleashing the Nuclear Watchdog* (Waterloo, Ontario: Centre for International Governance Innovations, 2012), p. 87.

20. Findlay, *Unleashing the Nuclear Watchdog*, p. 87, citing reviews by the IAEA's Office of Internal Oversight and the US General Accounting Office.

21. HEU (highly enriched uranium) and separated plutonium.

4.49 The need for special arrangements for these technologies was recognized at the very beginning of the nuclear era, and proposals were advanced for the internationalization of nuclear programs.²² Agreement could not be reached, however, and nuclear programs have proceeded since on a national basis. Consequently, efforts to mitigate proliferation risk have a major place in the international agenda. There is no magic bullet to eliminate all proliferation risk – no current nuclear fuel cycle is completely proliferation proof. But a combination of institutional and technical measures can give needed robustness to non-proliferation efforts, and also to counter-terrorism efforts.

4.50 Central to these efforts is the NPT. This, however, does not specifically address the use of any particular nuclear technology and requires only that non-NWS conduct nuclear activities only for peaceful purposes under verification by IAEA safeguards. It has now become apparent that the NPT does not deal adequately with the issue of proliferation-sensitive technology.

4.51 When the NPT was negotiated it was thought that in practice enrichment and reprocessing programs would be limited to the NWS and a small number of other advanced industrialized states. Today, in addition to the five recognized NWS and the other four nuclear-armed states, there are at least eight states that have demonstrated enrichment capability, and five that have demonstrated reprocessing capability, ten states in all, with some states having both (Table 4.4).

Table 4.4: States with Demonstrated Enrichment and/or Reprocessing Capability

NWS	Nuclear-Armed States		Other States	
These states have both enrichment and reprocessing capabilities	Enrichment capability	Reprocessing capability	Enrichment and reprocessing capabilities	
United States	India	Argentina	Belgium	Brazil
Russia	Pakistan	Australia	Italy	Germany
UK	North Korea	Iran		Japan
France	Israel*	Netherlands		
China		South Africa		

* Israel has neither confirmed nor denied nuclear-armed status.

Source: Centre for Nuclear Non-proliferation and Disarmament.

4.52 An issue neither clearly foreseen nor adequately addressed in the NPT is the distinction between nuclear latency and nuclear hedging. “Nuclear latency” refers to the situation where a state has established, under an apparently peaceful nuclear program, *dual-use* capabilities – uranium enrichment and/or reprocessing. Nuclear latency might be considered *inadvertent*: a state with enrichment or reprocessing capabilities thereby has the basic capability to produce fissile material for nuclear weapons, though it may well have – at least in foreseeable circumstances – no intention of doing so.

22. The Acheson-Lilienthal and Baruch plans considered by the UN Atomic Energy Commission in the 1940s.

4.53 It is not impossible that even a state as firmly committed to non-proliferation as Japan could change its position in the future. Some commentators refer to such a state as a *virtual* nuclear-weapon state. However, as well as weapons-useable fissile material, other capabilities would be required for weaponization, including suitable delivery systems, and Japan does have a longstanding and strongly held commitment against pursuing nuclear weapons. Nonetheless, it does illustrate the problem of enrichment and reprocessing capabilities being in national hands.²³

4.54 If nuclear latency is supposedly inadvertent, nuclear hedging refers to a deliberate national strategy of establishing the option of relatively rapid acquisition of nuclear weapons, based on an indigenous technical capacity to produce them within a relatively short time frame – ranging from several weeks to a few years.²⁴ Nuclear hedging could result in *virtual* arms races, with the risk of degenerating very quickly into real arms races, break-out from the NPT, and even nuclear war. The existence of suspected nuclear hedging programs undermines the confidence and stability that the NPT is intended to promote. There is no doubt that the larger the number of states perceived as *virtual* nuclear-armed states, the greater the potential destabilizing effect on the non-proliferation regime.

4.55 **Safeguards.** When the NPT was concluded, it was assumed that IAEA comprehensive safeguards would provide timely warning of any misuse of nuclear facilities, giving the international community opportunity to intervene before a proliferator has time to turn diverted nuclear material into nuclear weapons. However, centrifuge enrichment technology presents a serious challenge to this objective – the relative ease of concealing centrifuge plants and the potential speed of break-out mean that in certain circumstances,²⁵ adequate warning time cannot be guaranteed. Even if removal of enriched uranium from safeguards, or use of a safeguarded facility for high enrichment,²⁶ is detected immediately, the time required for international deliberations could mean that practical intervention is not possible within the necessary timeframe.

4.56 Similar timeliness issues are raised where stocks of separated plutonium are held. The risks are exacerbated where high-fissile (weapon-grade) plutonium is involved, for example with fast breeder reactors or large “research” reactors.²⁷ There is a real concern that if plutonium is diverted, and the state has been able to make the necessary preparations in advance, the plutonium could be turned into nuclear weapons before effective intervention is possible.

4.57 Where proliferation-sensitive facilities and materials are involved, it is essential to have the most effective form of safeguards. Today this includes measures under the IAEA’s Additional Protocol, together with the most advanced safeguards technologies –

23. This concern is reinforced by the occasional comments by some Japanese political figures about the need to maintain fuel cycle capabilities in order to ensure a nuclear weapon option, or “strategic deterrence.”

24. Ariel E. Levite, “Never Say Never Again: Nuclear Reversal Revisited,” *International Security* 27:3 (Winter 2002/03), pp. 59–88.

25. For example a state that has an industrial-scale enrichment facility, or the capability to establish undeclared enrichment facilities for upgrading LEU diverted from safeguards.

26. One problem here is that production of HEU is not prohibited – if a state started to do this, vital time could be lost on legalistic arguments.

27. Such as Iran’s Arak reactor.

remote monitoring, a “safeguards by design” approach for facilities, and so on. Although the number of states that have concluded Additional Protocols continues to grow – by 18 since the 2010 NPT Review Conference – several states with sensitive nuclear programs still remain outside this most effective form of safeguards (see Chapter 2). As important as universalization of the Additional Protocol is, however, the practical limitations to safeguards outlined here indicate the case against over-reliance on safeguards – non-proliferation is also dependent on other technical countermeasures and on institutional measures, especially establishing multilateral rather than national control of proliferation-sensitive nuclear facilities.

4.58 Technology. Technical approaches to mitigating proliferation risk involve avoiding or minimizing the production and use of proliferation-sensitive materials, and building proliferation resistance into facilities and technology. While the focus of proliferation resistance is on possible misuse by states, measures taken for proliferation resistance can also contribute to nuclear security through protecting nuclear materials and facilities against access and misuse by non-state actors. For example, avoidance/elimination of weapon-grade materials in civil nuclear programs reduces the risk of terrorists being able to produce a workable nuclear explosive device.

4.59 Technical measures for proliferation resistance include avoiding production of weapon-grade material and introducing technical barriers to producing such material; ensuring nuclear material is difficult to access (for example through high radiation levels) in order to increase the difficulties of diversion by states or theft/seizure by terrorists; and avoiding separation of plutonium from spent fuel, at least as a pure product.

4.60 International efforts to minimize production and use of proliferation-sensitive materials have been focused on highly enriched uranium (HEU). The principal use of HEU in civil programs has been as fuel for research reactors. HEU is also used as an irradiation target material for production of medical isotopes. These efforts have had considerable success: since 1978, 62 HEU-fueled research reactors have been converted to use LEU fuel and 17 HEU reactors have been shut down in 36 states. In the medical-isotope industry, most producers have committed to convert their reactors and targets to use LEU by 2015. However, some 70 tons of HEU remain in the civil sector²⁸, and remaining reactor conversions are expected to take another decade or more.

4.61 Similar attention has not been given to use of plutonium fuels. Plutonium obtained through reprocessing spent fuel has been in commercial use as reactor fuel, mainly in the form of MOX – a mix of plutonium and uranium oxides – since the 1980s. Currently MOX is used in over 30 power reactors, mostly in Europe. The plutonium currently used in MOX fuel is reactor grade, having an isotopic composition well outside the weapon-grade range. It would be difficult for a sub-state group to successfully explode a device made from this material, and the yield would be uncertain. A much higher risk would be presented if MOX was produced from weapon-grade plutonium – from the terrorism as well as the proliferation perspective, production of weapon-grade plutonium in civil programs should be avoided.

28. NTI, *Civilian HEU Reduction and Elimination Resource Collection*, <http://www.nti.org/analysis/reports/civilian-heu-reduction-and-elimination/>.

4.62 The main risk of weapon-grade plutonium being produced and used in the civil cycle comes from the prospective use of fast breeder reactors. In the established fast breeder reactor design, the reactor core, containing the fuel, is surrounded by a uranium “blanket” in which neutrons are captured to produce further plutonium. A major issue from the non-proliferation perspective, however, is that plutonium produced in fast breeder reactor blankets has a very high proportion of the isotope Pu-239, well within the weapon-grade range. This combination of producing weapon-grade plutonium and reprocessing presents obvious proliferation concerns. Moreover, use of separated weapon-grade plutonium on a commercial scale could present a major terrorism risk.

4.63 This problem is recognized at the technical level and reactor designs are being considered in which plutonium would be produced outside the weapon-grade range. The international programs coordinating research in this area - INPRO²⁹ and GIF³⁰ - include proliferation-resistance amongst the major development criteria. Of particular importance is the development of advanced spent fuel treatments – such as electro-metallurgical processing (otherwise known as pyro-processing) – which will enable plutonium recycle without separation. Plutonium will not be produced as a purified material, but will remain in a highly radioactive mix with fission products and other spent fuel materials. This highly radioactive mix will be made into new fuel using robotic equipment. In 2010 the US and South Korea agreed to a joint study of pyro-processing, particularly proliferation resistance aspects.

4.64 Another approach promoted by some is the thorium fuel cycle, which avoids the production of plutonium. India has a long-standing interest in developing the thorium fuel cycle, and more recently China has commenced a substantial research program in this area.

4.65 India has major thorium reserves, and the possible use of thorium reactors has been under discussion there for decades. In June 2012 R. K. Sinha, Chairman of India’s Atomic Energy Commission, announced plans for a thorium power plant. About two decades would be needed to assess the performance of the thorium reactor before replicating the initial prototype in significant numbers.³¹ The current Indian vision for the thorium fuel cycle, however, raises proliferation and terrorism concerns: use of plutonium “driver fuel” is an essential aspect, and this would be weapon-grade plutonium produced in fast breeder reactors.

4.66 In China, it is reported that Jiang Mianheng (son of former President Jiang Zemin) has been given a start-up budget of USD 350 million to lead a project at China’s prestigious National Academy of Sciences. By January 2013, he had already recruited 140 PhD scientists to work full-time on thorium power at the Shanghai Institute of Nuclear and Applied Physics and planned to increase the number to 750 staff by 2015. The Chinese believe they have enough thorium to power their electricity needs for 20,000 years.³²

29. INPRO is the IAEA’s International Project on Innovative Nuclear Reactors and Fuel Cycles – see <http://www.iaea.org/INPRO/about.html>

30. GIF is the Generation IV International Forum, a collaboration amongst 12 countries and the EU – see www.gen-4.org

31. Ashok Pradhan, “India to establish nuclear reactor that uses thorium as fuel: Atomic Energy Commission,” *Times of India*, 27 June 2012.

32. Quoted in Ambrose Evans-Pritchard, “China blazes trail for ‘clean’ nuclear power from thorium,” *The Telegraph*

4.67 The chief scientific adviser to the United Kingdom government, Sir John Beddington, conceded in September 2012 that although the benefits of thorium are “often overstated,” it does have some “theoretical advantages regarding sustainability, reducing radiotoxicity and reducing proliferation risk.”³³ That said, the thorium fuel cycle is not entirely proliferation resistant: uranium (or plutonium) fuels are required for initial reactor fuelling cycles, and possibly thereafter as driver fuel, and uranium-233, which is produced through irradiation of thorium, can be used in nuclear weapons. U-233 is difficult to produce as a pure material (in the reactor it is produced in association with U-232, which makes weapons use impracticable). However, there are certain reactor concepts in which U-233 can be recovered without U-232 – it is essential for proliferation risk analysis to take this into account.

4.68 Progress in the development of technical approaches can be hard to demonstrate, given the long lead times with some of the technologies involved, but adoption of proliferation resistance as an important criterion in INPRO and GIF is encouraging. The non-proliferation regime benefits from the fact that, to date, enrichment and reprocessing – which provide the capabilities to produce the materials required for nuclear weapons – are not more widespread. The regime also benefits from HEU and separated plutonium not being widespread in civil programs. It is essential for the international community to take the steps necessary not only to maintain this situation, but to reduce the availability of proliferation-sensitive technologies and materials. (See Chapter 2 for further discussion of this issue, and non-proliferation policy generally.)

4.69 **National Supply Policies.** National policies on the supply of nuclear materials, equipment and technology subject to non-proliferation conditions are one of the earliest forms of risk mitigation. Nuclear suppliers reserve the right to decide what they will supply, who to, and under what terms. Supplier conditions were the basis for the earliest form of safeguards, under which suppliers required the right to verify that supplied items remained in peaceful use. Today supply policies coordinated by the NSG remain an important part of the non-proliferation regime.

4.4.2 Multilateralizing the Nuclear Fuel Cycle

4.70 The needs of states with nuclear power programs, or planning such programs, can be outlined as follows: reliable access to reactors and fuel on secure, non-discriminatory and equitable terms; reliable access, also on such terms, to fuel cycle services, especially for used fuel management; support in establishing regulatory systems; support through training and capacity building; and sharing of expertise in reactor operations, nuclear safety and nuclear security. These needs can, and arguably should, be met through development of a new international framework for the nuclear fuel cycle – a framework based on international cooperation rather than an emphasis on national programs in proliferation-sensitive areas.

(London), 6 January 2013, http://www.telegraph.co.uk/finance/comment/ambroseevans_pritchard/9784044/China-blazes-trail-for-clean-nuclear-power-from-thorium.html. See also the critical analysis by Andrew T Nelson of the US Los Alamos National Laboratory, “Thorium: Not a near-term commercial nuclear fuel,” *Bulletin of the Atomic Scientists*, September 2012, <http://bos.sagepub.com/content/68/5/33>.

33. Evans-Pritchard, “China blazes trail for ‘clean’ nuclear power from thorium.”

4.71 Every state has a legitimate interest in security of energy supply, but it is neither necessary nor cost effective for every state with a nuclear power program to develop uranium enrichment and reprocessing facilities. In principle, national enrichment programs are not viable except for states with large power programs operating twenty or more reactors. Viability is even more difficult in current circumstances where global enrichment capacity is adequate and increased demand can be readily met by existing enrichers. Most analysts conclude that reprocessing is not economic in current circumstances. Because possession of enrichment and reprocessing capabilities could increase international tensions – potentially leading to “virtual” arms races – and also because of the technical complexity and high costs, most states have not sought to establish these capabilities.

4.72 While energy independence may be cited as justification for a national fuel cycle, few states are in a position to achieve real independence. Apart from technological capabilities, not many states have uranium resources sufficient to maintain a nuclear power program independent of external supply. For most states international cooperation is likely to be a necessity, and for all states such cooperation will offer major advantages. Participation in international fuel cycle arrangements will lead to better outcomes than pursuing national independence.

4.73 Consideration of these issues internationally took a negative turn when the George W Bush Administration proposed that states not currently operating commercial enrichment or reprocessing facilities should permanently renounce these technologies. Many states, particularly in the Non-Aligned Movement, saw this as an attempt to entrench existing technology holders in a monopoly position. As a consequence, even international fuel bank proposals have been opposed as in some way furthering an agenda of denial. To counter these negative sentiments it will be necessary to demonstrate that alternatives to national fuel cycle programs offer security of supply on non-discriminatory and equitable terms, with advantages through collaborative approaches (for example in used fuel management), as well as the obvious advantages of mitigating proliferation risk.

4.74 **IFNEC and International Fuel Banks.** Much work is underway on proposals for practical and attractive alternatives to national programs in proliferation-sensitive areas. A number of proposals have been made to reflect these ideas. The proposal showing most progress is the International Framework for Nuclear Energy Cooperation (IFNEC), the successor to the Global Nuclear Energy Partnership (GNEP). GNEP started as a US initiative, but IFNEC now has a substantial international character, having grown to 32 participating states – including 17 developing countries – and 31 observer states, many of which can be expected to become full members.³⁴

4.75 A key feature of IFNEC is that participating states are not asked to renounce any rights. IFNEC has adopted a pragmatic approach – to set aside unproductive political arguments about national “rights” and instead focus on practical problems and solutions.

34. IFNEC members as of December 2012 were: Argentina, Armenia, Australia, Bahrain, Bulgaria, Canada, China, Estonia, France, Germany, Ghana, Hungary, Italy, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Lithuania, Morocco, Netherlands, Oman, Poland, Romania, Russia, Senegal, Slovenia, South Korea, UAE, Ukraine, United Kingdom, and United States. See www.ifnec.org.

IFNEC has two Working Groups, on Infrastructure Development and Reliable Nuclear Fuel Services, and has also convened a Finance Workshop. IFNEC has made good progress in developing the concept of comprehensive fuel service arrangements, including fuel leasing, to meet the need for reliable fuel supply and to provide used fuel disposition options. The basic idea is that nuclear suppliers would commit to provide nuclear consumers with long-term whole-of-life fuel service assurances – suppliers would provide fresh fuel and take back used fuel, or otherwise assist with used fuel management. The practical and economic benefits of this international cooperation would be such that nuclear consumers have no legitimate reason for pursuing national programs in proliferation-sensitive technologies.

4.76 The IFNEC approach of establishing strong practical and economic advantages for states not to pursue sensitive technologies has considerable merit, but in itself it is not sufficient. First, it does not address the problem cases, except indirectly in the longer term. If IFNEC succeeds in establishing an international norm of behaviour against new national enrichment and reprocessing programs, this would be helpful in isolating those who act against this norm, but this is a long way off. The need to deal with Iran, and others that may insist on establishing fuel cycle programs in dubious circumstances, is more immediate (see further the section on Iran in Chapter 2).

4.77 Second, arrangements that are mostly commercial in nature might not offer sufficient assurance to states concerned about long-term security of supply. States are likely to have greater confidence in arrangements where assurances are legally binding in international law, that is, are based on a treaty-level umbrella. It would provide additional confidence if the IAEA were given an oversight role in these arrangements, to ensure that decisions are taken on an objective non-discriminatory basis.

4.78 Third, the IFNEC concept does not address existing enrichment and reprocessing programs. Some of these programs are of potential strategic concern, and all of them provide the operating state with nuclear latency. This is not only a non-proliferation issue, it is also an issue for disarmament. As nuclear disarmament progresses, the potential for rapid break-out from disarmament commitments will be just as great a concern as the potential for break-out from non-proliferation commitments. Furthermore, non-NWS being asked to accept restrictions on national nuclear programs are likely to argue that the new approaches should be non-discriminatory and apply also to the nuclear-armed states. Accordingly, concepts are needed for the transitioning of all nationally controlled enrichment and reprocessing programs to an appropriate alternative model within a realistic timeframe.

4.79 An important complement for international approaches such as those being developed in IFNEC is the establishment of international fuel banks as a fuel provider of last resort in case supply arrangements fail. There are now two such fuel banks – one established by Russia at the International Uranium Enrichment Centre (IUEC) at Angarsk, and one being established in Kazakhstan, under IAEA auspices and with funding assistance by the Nuclear Threat Initiative (NTI) and a number of IAEA member states.

4.80 Multinational Control. The most practical alternative to national control of sensitive nuclear programs is some form of multinational control, of the kind referred to in the NSG Guidelines:

If enrichment or reprocessing facilities, equipment or technology are to be transferred, suppliers should encourage recipients to accept, as an alternative to national plants, supplier involvement and/or other appropriate multinational participation in resulting facilities. Suppliers should also promote international (including IAEA) activities concerned with multinational regional fuel cycle centres.³⁵

As already noted, international operation of the nuclear fuel cycle was proposed unsuccessfully in the 1940s. This was looked at again by the International Nuclear Fuel Cycle Evaluation (INFCE) in the 1970s³⁶, and by the IAEA's study of proposals for multilateral approaches in 2005.³⁷

4.81 A key objective of the multinational approach is to establish technical and institutional barriers against a state attempting to misuse enrichment and reprocessing capabilities. The less control an individual state has over such capabilities, the harder it will be to misuse them. Of course no barrier can be totally effective – a state can always seize facilities regardless of who owns and operates them – but arrangements such as black box³⁸ technology can be important in making misuse more difficult, providing more time for international intervention. Multinational approaches will also help ensure best practice standards of nuclear safety and security in the most sensitive parts of the fuel cycle.

4.82 Multinational approaches are not an unrealistic aspiration – examples already exist, like the European enrichment group URENCO and the International Uranium Enrichment Centre (IUEC) at Angarsk, Siberia. The IUEC was established by Russia in 2007, with the mission *To ensure equal and assured access for all countries to the benefits of atomic energy*.³⁹ Russia invites other states to join the IUEC as shareholders. The benefits include a guaranteed supply of fuel and services. Kazakhstan, Ukraine and Armenia have joined, and several others have indicated interest.

4.83 The precedents of URENCO and IUEC have important characteristics that can be built upon in future models, for example: a treaty providing for mutual oversight of facility operations (URENCO); consumers having product supply guarantees and equity participation (IUEC); or supply of sensitive technology only on a *black box* basis (URENCO, also Russian practice).

4.84 Drawing all this together, a possible model for future fuel cycle arrangements could be along the following lines.

- > Fuel suppliers and fuel consumers form comprehensive partnerships covering all aspects of the fuel cycle, including fuel supply guarantees and cooperation in safety

35. NSG Guidelines, INFCIRC/254/Rev.10/Part 1, paragraph 6(e).

36. IAEA, *Report of the International Nuclear Fuel Cycle Evaluation*, 1980.

37. IAEA, *Multilateral Approaches to the Nuclear Fuel Cycle*, 2005, <http://www-pub.iaea.org/books/IAEABooks/7281/Multilateral-Approaches-to-the-Nuclear-Fuel-Cycle>

38. The “black box” concept implies transfer of complete turnkey systems and facilities, without transfer of enabling design and manufacturing technology, under conditions that do not permit or enable replication of the facilities.

39. See <http://eng.iuec.ru>.

and security, fuel fabrication, and management of used fuel and high level waste:

- partnership arrangements, including fuel guarantees, are covered by treaty, with provisions binding in international law and under IAEA oversight;
 - these include fallback arrangements in case of supplier default.
- > Sensitive facilities – enrichment and reprocessing – are operated by fuel suppliers under multination arrangements
- where possible, technology is provided to the operator on a *black box* basis, as is currently the case with URENCO supplying the United States and France, and TENEX supplying China;
 - fuel consumers have the opportunity for equity participation in the facilities, including profit-sharing;
 - fuel consumers are involved in facility operations (without accessing sensitive technology) as an additional measure to assure against misuse of the facility.

4.85 Gaining support for multilateralization of proliferation-sensitive stages of the fuel cycle will be a challenge, but already there are practical precedents, for example Russia's IUEC and the URENCO enrichment group. What is needed now is to change the focus from national fuel cycle programs to the common interests of non-proliferation, energy security and strengthened international cooperation.

§4.5 Nuclear Safety and Security Commitments

4.86 The primary focus of this section is on nuclear safety: nuclear security is discussed in greater detail in Chapter 3 of this report. But it is increasingly being acknowledged, for example at the 2012 Nuclear Security Summit, that there is a significant connection between these issues, not least in that failures in safety protection may create opportunities for sabotage. The close connection between nuclear security and nuclear safety is recognized by the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM) which, when it enters into force, will extend the convention to include protection of nuclear facilities against sabotage.

4.87 Sometimes, existing gaps can be detected and identified by national oversight authorities. For example, on 23 August 2012, the Comptroller and Auditor General of India tabled a highly critical report in parliament on the Atomic Energy Regulatory Board (AERB) that pointed to several deficiencies in India's nuclear regulatory authority.⁴⁰ The AERB has failed to prepare a nuclear and radiation safety policy despite being mandated to do so when constituted in 1983. It has no direct role in conducting independent assessments and monitoring to ensure the safety of personnel working in nuclear power plants. It does not have a detailed inventory of all radiation sources to ensure effective compliance with regulations for the safe disposal of spent sources, so that it could not be verified whether or not radioactive waste had actually been disposed of. India lacks a legislative framework for decommissioning of nuclear power plants.

40. P. Sunderarajan, "CAG pulls up AERB for not preparing nuclear safety policy," *The Hindu*, 24 August 2012, <http://www.thehindu.com/todays-paper/tp-national/article3814528.ece>.

4.88 The Fukushima nuclear accident in 2011 underscores the connection between safety and security. Terrorists might well attempt to replicate an accident of this kind, for example by sabotaging a reactor's cooling system and emergency power supply or by sabotaging spent fuel ponds.

4.89 The international concerns have been reinforced by the conclusions of the Kurokawa panel's findings for the Japanese parliament, that:

The TEPCO Fukushima Nuclear Power Plant accident was the result of collusion between the government, the regulators and TEPCO, and the lack of governance by said parties. They effectively betrayed the nation's right to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly "manmade." We believe that the root causes were the organizational and regulatory systems that supported faulty rationales for decisions and actions...⁴¹

It was reported, for example, that workers at the crippled Fukushima No. 1 nuclear plant were ordered to cover their dosimeters – pocket-sized devices that emit an alarm when high radiation levels are detected – with lead plates in order to keep the radiation level readings low enough to keep working. Those who demurred because of safety or legal considerations were told by a senior TEPCO official that they would lose their jobs and be blacklisted from employment at other nuclear plants.⁴²

4.90 For reasons of both safety and security concerns, the principal lesson of the Fukushima accident is that nuclear activities cannot be regarded as the exclusive province of individual states – nuclear activities have potential consequences well beyond the borders of any one state. While the primary responsibility for nuclear safety and security rests with each state, every state is a stakeholder in how well other states meet this responsibility. A major nuclear accident will have global consequences. Even if an accident does not result in significant trans-boundary contamination, there will be an impact on confidence in and support for nuclear energy. Likewise, a nuclear detonation or major nuclear sabotage by terrorists will have global repercussions.

4.91 Fukushima demonstrated that neither individual states nor the international community as a whole are well served by relying exclusively on national oversight of nuclear activities. If a leading state such as Japan has difficulties with nuclear regulation and emergency management, what can be expected with smaller states, and those planning new nuclear programs? Fukushima shows the need to find a more appropriate balance between national and international interests and responsibilities in the conduct of nuclear energy. There is a need for greater international cooperation and collaboration, together with international transparency and accountability.

41. *The official report of The Fukushima Nuclear Accident Independent Investigation Commission - Executive summary* (Tokyo: National Diet of Japan, 2012), p. 16.

42. Jun Sato, Chiaki Fujimori, Miki Aoki, Tamiyuki Kihara and Takayuki Kihara, "TEPCO subcontractor used lead to fake dosimeter readings at Fukushima plant," *Asahi Shimbun*, 21 July 2012, <http://ajw.asahi.com/article/0311disaster/fukushima/AJ201207210069>.

Box 4.1. The Fukushima Nuclear Meltdown 2011

The meltdown of three nuclear reactors at Fukushima in March 2011 was caused as a consequence of the massive earthquake and tsunami to hit eastern Japan that month, through loss of emergency electrical supply needed to maintain systems vital to safety. But the tragedy also showed up major deficiencies in Japan's nuclear disaster preparedness arrangements and vulnerabilities in Japan's nuclear security governance.

Not only had neither the Tokyo Electric Power Co. (TEPCO) nor the government failed to construct a protection wall high enough to withstand a tsunami after a major earthquake, they had failed to adopt a multi-redundancy approach to secure power supplies at Fukushima No. 1 plant, and therefore were unable to mitigate the severity of the crisis as the critical cooling systems shut down.

The system vulnerability shown up in March 2011 was foreseeable and had been imagined. American specialists had in fact identified the very elements worst affected as the possible targets of terrorist attack: spent fuel pools, cooling systems, and backup electricity (see Associated Press, "Following U.S. antiterrorism advice might have prevented meltdowns," *Japan Times*, 4 April 2012). Since 9/11 the US has adopted a multi-redundancy approach to power supply to reactors as a precaution against a possible nuclear terrorist attack. But in Japan the risk was ignored – apparently because it was modelled against nuclear terrorists, not natural disasters.

The lesson of Fukushima is that both existing and planned nuclear reactor plants must pay full attention to the safety–security interface, including access control mechanisms, at the plant design stage. There should be common, mandatory standards for the siting, construction and operation of nuclear power plants, and for treatment of spent fuel and nuclear waste.

4.92 Participation in treaties. The international interest in non-proliferation is long-recognized, through a number of treaties and institutions, notably the NPT and the IAEA safeguards system. The international interest in nuclear safety and nuclear security is also of fundamental importance, but regrettably less well reflected both in uptake of the relevant treaties, and in the comparatively weak commitments under those treaties. Too much of the international governance arrangements in these areas is voluntary. There is nothing remotely equivalent to IAEA safeguards inspections. Participation in relevant treaties is uneven, a key nuclear security treaty – the 2005 Amendment to the CPPNM – still has insufficient parties to enter into force, and there is an absence of international transparency and accountability mechanisms.

4.93 Participation in the key nuclear safety and security conventions is shown in Tables 4.5 and 4.6 respectively. While universalization of these conventions is a major goal, it is especially important to have the participation of all the states with significant nuclear activities⁴³ – in the interest of space the tables focus on these states.

43. As defined by the IAEA – primarily applies to states with nuclear facilities.

Table 4.5: States with Significant Nuclear Activities: Participation in Nuclear Safety Conventions (indicated by shaded squares) (2011/2012)

	Nuclear Safety Convention	Joint Convention on Spent Fuel and Radwaste	Early Notification Convention	Nuclear Assistance Convention
Algeria	signed			
Argentina				
Armenia				
Australia				
Austria				
Bangladesh				
Belarus				
Belgium				
Brazil				
Bulgaria				
Canada				
Chile				
China				
Colombia				
Congo, DR			signed	signed
Czech Rep				
Denmark				
Egypt	signed			
Estonia				
Finland				
France				
Georgia				
Germany				
Ghana				
Greece				
Hungary				
India				
Indonesia				
Iran				
Iraq				
Israel	signed			
Italy				
Jamaica				
Japan				
Kazakhstan				
Latvia				
Libya				
Lithuania				
Malaysia				
Mexico				

Table 4.5 continued

	Nuclear Safety Convention	Joint Convention on Spent Fuel and Radwaste	Early Notification Convention	Nuclear Assistance Convention
Morocco	signed			
Netherlands				
Nigeria				
North Korea			signed	signed
Norway				
Pakistan				
Peru		signed		
Philippines	signed	signed		
Poland				
Portugal				
Romania				
Russia				
Serbia				
Slovakia				
Slovenia				
South Africa				
South Korea				
Spain				
Sweden				
Switzerland				
Syria	signed		signed	signed
Tajikistan				
Thailand				
Turkey				
Ukraine				
UK				
United States				
Uzbekistan				
Venezuela				
Vietnam				

Source: IAEA

4.94 After the Chernobyl accident in 1986, governments and industry realized that substantial steps were needed to regain public confidence in nuclear energy. This prompted a series of new agreements – particularly the Convention on Nuclear Safety (CNS), the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident. In contrast, after the Fukushima accident the international response has been surprisingly muted. With some notable exceptions, governments and industry do not seem to understand the damage to public confidence

and the need for change, to move from state primacy to greater international cooperation and accountability.

4.95 The 1994 CNS is the principal treaty on nuclear safety. The Convention applies to power reactors, but many states without power reactors have joined to show their support for safety principles. The convention has 75 parties.⁴⁴ States that have not become parties include Iran – the only state with a power reactor not a party – and Egypt (which has signed but not yet ratified), which plans to establish a nuclear power program.

4.96 Another major treaty on nuclear safety is the 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. This applies primarily to spent fuel and radioactive waste resulting from civilian nuclear reactors and applications, and to planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities. The joint convention also imposes obligations in relation to the trans-boundary movement of spent fuel and radioactive waste, and the safe management of disused sealed sources. It has 64 parties.⁴⁵ It is of concern that a number of states operating power reactors are not party to this Convention, namely Armenia, India, Iran, Mexico and Pakistan.

4.97 The 1986 Convention on Early Notification of a Nuclear Accident and the 1986 Convention on Assistance in the Case of a Nuclear Accident each has 114 parties, including all of the states with power reactors and most of the states with significant nuclear activities. Exceptions include North Korea and Syria (each of which has signed) and Uzbekistan and Venezuela.

4.98 As noted in the preceding chapter on nuclear security (section 3.3.1), the principal convention on nuclear security – and currently the only legally binding multilateral instrument dealing with nuclear security – is the 1980 Convention on the Physical Protection of Nuclear Material (CPPNM). As noted in the last chapter, the CPPNM is some way from achieving universality, and by mid-December 2012 the 2005 Amendment to the CPPNM had received only 61 of the 99 ratifications required for it to enter into force. Similarly, it was noted in section 3.3.2 of the last chapter that significant states are yet to become party to the 2005 International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT).

4.99 **Standards and accountability.** Compared to non-proliferation and safeguards, international governance in nuclear safety and nuclear security is weak. The IAEA has only a recommendatory role. By its statute, the IAEA is authorized to develop and promulgate nuclear safety standards.⁴⁶ As with safeguards, the statute provides that states may conclude arrangements giving the IAEA authority to apply safety standards. To date however no such arrangements have been concluded by any state.

44. As at 5 April 2012.

45. As at 2 August 2012.

46. IAEA Statute Article III.A.6.

Table 4.6: States with Significant Nuclear Activities: Participation in Nuclear Security Conventions (indicated by shaded squares)

	CPPNM	CPPNM Amendment	ICSANT
Algeria			
Argentina			signed
Armenia			
Australia			
Austria			
Bangladesh			
Belarus			
Belgium			
Brazil			
Bulgaria			signed
Canada			signed
Chile			
China			
Colombia			signed
Congo, DR			
Czech Rep			
Denmark			
Egypt			signed
Estonia			signed
Finland			
France			signed
Georgia			
Germany			
Ghana			signed
Greece			signed
Hungary			
India			
Indonesia			
Iran			
Iraq			
Israel			signed
Italy			signed
Jamaica			signed
Japan			
Kazakhstan			
Latvia			
Libya			
Lithuania			
Malaysia			signed
Mexico			
Morocco			
Netherlands			

Nigeria		
North Korea		
Norway		signed
Pakistan		
Peru		
Philippines		signed
Poland		
Portugal		signed
Romania		
Russia		
Serbia		
Slovakia		
Slovenia		
South Africa		
South Korea		signed
Spain		
Sweden		signed
Switzerland		
Syria		signed
Tajikistan		signed
Thailand		signed
Turkey		
Ukraine		
UK		
United States		signed
Uzbekistan		
Venezuela		
Vietnam		

Sources: CPPNM IAEA, 17 Oct. 2012
A/CPPNM IAEA, 12 Dec. 2012
ICSANT UN Treaties Collection Database, 20 Jan. 2013

4.100 The statute, which was concluded in 1956 before awareness of nuclear security issues had developed, makes no specific reference to nuclear security. This has led some states to question whether the IAEA should have any role in nuclear security – though the reference in the statute to “standards of safety for protection of health and minimization of danger to life and property”⁴⁷ can certainly be interpreted to encompass nuclear security. Reflecting this lack of specific reference to nuclear security, much of the IAEA’s work in this area is funded by voluntary contributions rather than through its regular budget. In nuclear security the IAEA’s role is limited to recommendations and advice.

4.101 The CNS is described as an “incentive instrument.” Parties are committed to apply fundamental safety principles but there are no detailed or binding standards. The IAEA promulgates nuclear safety standards, but the application of these is voluntary. When the convention was negotiated some states proposed an active monitoring role for the IAEA, but this was not agreed.

47. IAEA Statute Article III.A.6.

4.102 The CPPNM sets out broad security standards and the 2005 CPPNM Amendment (not yet in force) sets out fundamental principles, but there are no detailed or binding security standards. The IAEA promulgates nuclear security guidelines, but as with nuclear safety standards, application of these guidelines is voluntary.

4.103 The CNS has a broad peer review process, which requires each party to report on its national implementation of the convention. These national reports are discussed at meetings held every three years. While many parties publish their reports, formally these reports and the discussion of them are confidential to the parties. By contrast, the CPPNM has neither any mechanism for reporting national implementation, nor even any mechanism for the parties to convene meetings.

4.104 The absence of binding standards makes it all the more important to have mechanisms for external review of nuclear safety and security implementation, and sharing of best practices in these areas. External review is not just about compliance, but helps share best practice and can be vital in identifying overlooked vulnerabilities. At present peer review is the only mechanism for external review.

4.105 As noted above, the CNS has a mandatory peer review process at the level of national implementation. More specific peer reviews, including at the facility level, are offered by the IAEA and by the non-government World Association of Nuclear Operators (WANO). IAEA reviews are entirely voluntary – there is no obligation to invite a review or to follow its recommendations. In October 2011 the members of WANO, which include nearly all the world’s nuclear power reactor operators, agreed to regular mandatory peer review of nuclear safety at power reactors. This is a welcome development – but the WANO process, like the IAEA review process, lacks transparency. Outsiders have no way of knowing how well the process works in practice.

4.106 Unlike nuclear safety, in nuclear security there is no form of mandated peer review process. The need to avoid compromising security should not be used as an excuse for avoiding external review. The managed access concept is well established, and states can readily establish appropriate procedures. The members of WANO have endorsed mandatory peer review – it is to be hoped that the members of WINS (which in many cases are the same entities as in WANO) will do the same.

4.107 The Fukushima accident led to the calling of two high-level nuclear safety meetings in 2011, the first by IAEA Director General Yukiya Amano on 20–24 June and the second by the United Nations Secretary-General Ban Ki-moon on 22 September. The IAEA meeting resulted in the adoption of an action plan on nuclear safety. However, this plan is seen by a number of states as failing to meet international expectations, containing few new commitments and little in the way of increased transparency or safety peer reviews.⁴⁸ A number of states, notably France, proposed mandatory, regular and transparent external safety inspections. This was resisted by the United States, India, China and Pakistan, among others.

4.108 At the September 2011 meeting, Secretary-General Ban called for “greater

48. Reuters, “IAEA states divided on how to best to boost nuclear safety,” <http://www.reuters.com/article/2011/09/13/nuclear-safety-iaea-idUSL5E7KD11Y20110913>.

transparency and open accountability,” and for stronger international safety standards. President Nicolas Sarkozy of France said that while the IAEA plan was a step in the right direction, the world could not accept different states having different standards. “The highest requirements must be applied to everybody on all continents,” he said. “This must go through a harmonization of technical safety standards.”

4.109 Despite the position taken by France and several others, at this stage nuclear safety remains very much a matter of national prerogative. Fukushima shows the risks in this. For example, the IAEA and others had identified the issue of inadequate regulatory independence in Japan over a number of years, but only after Fukushima did the Japanese government accept this criticism and introduce more effective arrangements.

4.110 Most recently, the IAEA and the Japanese government convened the Fukushima Ministerial Conference on Nuclear Safety in Koriyama, Fukushima Prefecture, 15–17 December 2012. According to the Chairpersons’ Summaries from this conference, participants noted the importance of peer review missions and transparency of the results of these, as well as ensuring that regulatory bodies operate in an open and transparent manner. The Summaries note that “there has been considerable focus on enhancing the international peer review mechanisms for nuclear operators and regulators worldwide, as well as on promoting openness and transparency to ensure that stakeholders – in particular the public – can hold industry and regulators properly to account, thereby enhancing trust and confidence.” The Chairpersons’ Summaries also note that “One of the most effective actions to strengthen nuclear safety worldwide is for member states to utilize the IAEA safety standards as broadly and effectively as possible in a consistent manner.”

4.111 While the discussion at the Fukushima Conference is encouraging, serious consideration of binding safety standards and international inspections seems to be as far away as ever. Currently there is resistance from key states to the idea of binding nuclear safety standards and international safety inspections. Until governments are prepared to give the IAEA an active monitoring role in nuclear safety, for example through concluding bilateral agreements with the agency as is done with safeguards, their commitment to substantial reform of nuclear safety governance will be open to question.

4.112 Today the idea of an international nuclear security inspectorate is anathema to most national security officials. For the future, states should seriously consider how an international security inspection process could be developed so as to operate to mutual benefit.

4.113 The importance of international accountability needs to be recognized. In nuclear safety at least there is the reporting process under the CNS. There is no similar process in nuclear security for national reporting on adherence to the conventions, IAEA recommendations, and so on. The only current mechanism is reporting under Security Council Resolution 1540 – this contains some reporting requirements for nuclear security, but to date there has been no substantial follow-up on this particular aspect.

4.114 Liability for Nuclear Damage. Recognition of the possibility of transboundary damage from a nuclear accident led to the conclusion of several international conventions dealing with international compensation issues. The principal conventions are the 1960 Convention on Third Party Liability in the Field of Nuclear Energy (the Paris Convention) – open only to members of the Organisation for Economic Co-operation and Development (OECD); the 1963 Convention on Civil Liability for Nuclear Damage (the Vienna Convention); and the 1997 Convention on Supplementary Compensation for Nuclear Damage (CSC) – developed as an umbrella for the other conventions.⁴⁹ Participation in these conventions is shown in Table 4.7.

Table 4.7: Participation in Liability Conventions by States with Nuclear Power

State	Convention	State	Convention
Argentina	Vienna, CSC	Mexico	Vienna
Armenia	Vienna	Netherlands	Paris
Belgium	Paris	Pakistan	
Brazil	Vienna	Romania	Vienna, CSC
Bulgaria	Vienna	Russia	Vienna
Canada		Slovak Republic	Vienna
China		Slovenia	Paris
Czech Republic	Vienna	South Africa	
Finland	Paris	South Korea	
France	Paris	Spain	Paris
Germany	Paris	Sweden	Paris
Hungary	Vienna	Switzerland	Paris
India	CSC signed	Ukraine	Vienna
Iran		UK	Paris
Japan		United States	CSC

Source: Centre for Nuclear Non-Proliferation and Disarmament.

4.115 The Convention on Supplementary Compensation is not yet in force – entry into force requires ratification by five states with a minimum installed nuclear capacity of 400,000 megawatts thermal, roughly equivalent to 120,000 megawatts electrical (MWe). To date four states (Argentina, Morocco, Romania and the United States) have ratified, with a total installed capacity of 103,700 MWe. Eleven other states have signed, including three with nuclear power programs (Czech Republic, India and Ukraine). If and when these three ratified, this would be sufficient for the convention to enter into force.

49. In addition to these conventions there is the Convention Supplementary to the Paris Convention of 1963 (Brussels Supplementary Convention) and a number of protocols amending the Paris and Vienna Conventions, and the 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention.

4.116 With some variations, these conventions set out the following basic principles:

- > Strict liability of the nuclear operator (that is, claimants do not have to prove fault);
- > Exclusive liability of the operator – all claims are brought against the operator;
- > Exclusive jurisdiction in the courts of the state in which the accident occurs;
- > Mandatory insurance cover – the operator must insure to the liability limit;
- > Limitation of the operator's liability in amount and in time. Beyond the limit the state and/or operators collectively take responsibility for paying compensation. The liability limit differs depending on the convention.

4.117 Over half the world's reactors are in states that are outside the Paris and Vienna Conventions. Some have ratified or signed the Convention on Supplementary Compensation (for example United States, India), which is not yet in force. A number of significant nuclear power states, including Canada, China, Japan and South Korea, have not joined any of the conventions. The situation is exacerbated by the two major nuclear power states, France and the United States, supporting different conventions – France the Paris Convention and the United States the Convention on Supplementary Compensation. Those outside these two conventions are waiting to see which prevails. The IAEA has been seeking to establish a single liability regime – the Convention on Supplementary Compensation is considered a possible basis for such a regime – but so far without success.

4.118 If a major nuclear accident occurs in a state outside the Paris or Vienna Conventions, claimants will be dependent on the domestic legislation of the state concerned. This would result in uncertainty not only for the victims of an accident, but for other parties that rightly or wrongly might become the subject of litigation, such as reactor vendors and fuel fabricators (the latter concern has been raised about India's liability legislation). Every effort should be made to establish a single international liability regime and to universalize it with all states that have nuclear reactors joining it.

PART II
SPECIFIC
COMMITMENTS AND
RECOMMENDATIONS

PART II: SPECIFIC COMMITMENTS AND RECOMMENDATIONS

A. NPT REVIEW CONFERENCE 2010: ACTION PLAN

AGREED FOLLOW-ON ACTIONS

PARAGRAPHS WHERE DISCUSSED IN STATE OF PLAY REPORT

STATE OF PLAY AS AT DECEMBER 2012

I. Nuclear Disarmament



A. Principles and objectives

Action 1: All States parties commit to pursue policies that are fully compatible with the Treaty and the objective of achieving a world without nuclear weapons. 1.18–31



Action 2: All States parties commit to apply the principles of irreversibility, verifiability and transparency in relation to the implementation of their treaty obligations. 1.32–53



B. Disarmament of nuclear weapons

Action 3: In implementing the unequivocal undertaking by the nuclear-weapon States to accomplish the total elimination of their nuclear arsenals, the nuclear weapon States commit to undertake further efforts to reduce and ultimately eliminate all types of nuclear weapons, deployed and non-deployed, including through unilateral, bilateral, regional and multilateral measures. 1.18–31
1.54–94











Action 4: The Russian Federation and the United States of America commit to seek the early entry into force and full implementation of the Treaty on Measures for the Further Reduction and Limitation of Strategic Offensive Arms and are encouraged to continue discussions on follow-on measures in order to achieve deeper reductions in their nuclear arsenals. 1.21
1.30
1.79–86




Action 5: The nuclear-weapon States commit to accelerate concrete progress on the steps leading to nuclear disarmament, contained in the Final Document of the 2000 Review Conference, in a way that promotes international stability, peace and undiminished and increased security. To that end, they are called upon to promptly engage with a view to, inter alia: 1.18–31
1.233–36




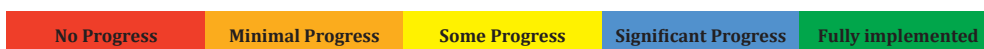
- | | | | |
|----|---|----------|---|
| a. | Rapidly moving towards an overall reduction in the global stockpile of all types of nuclear weapons, as identified in action 3; | 1.54–94 |  |
| b. | Address the question of all nuclear weapons regardless of their type or their location as an integral part of the general nuclear disarmament process; | 1.54–94 |  |
| c. | To further diminish the role and significance of nuclear weapons in all military and security concepts, doctrines and policies; | 1.104–46 |  |
| d. | Discuss policies that could prevent the use of nuclear weapons and eventually lead to their elimination, lessen the danger of nuclear war and contribute to the non-proliferation and disarmament of nuclear weapons; | 1.88–94 |  |
| e. | Consider the legitimate interest of non-nuclear-weapon States in further reducing the operational status of nuclear weapons systems in ways that promote international stability and security; | 1.153–74 |  |
| f. | Reduce the risk of accidental use of nuclear weapons; and | 1.165–74 |  |
| g. | Further enhance transparency and increase mutual confidence. | 1.36–45 |  |

Action 6: All States agree that the Conference on Disarmament should immediately establish a subsidiary body to deal with nuclear disarmament, within the context of an agreed, comprehensive and balanced programme of work. 1.87 

C. Security assurances

Action 7: All States agree that the Conference on Disarmament should, within the context of an agreed, comprehensive and balanced programme of work, immediately begin discussion of effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons, to discuss substantively, without limitation, with a view to elaborating recommendations dealing with all aspects of this issue, not excluding an internationally legally binding instrument. The Review Conference invites the Secretary-General of the United Nations to convene a high-level meeting in September 2010 in support of the work of the Conference on Disarmament. 1.136–46 

Action 8: All nuclear-weapon States commit to fully respect their existing commitments with regard to security assurances. Those nuclear-weapon States that have not yet done so are encouraged to extend security assurances to non-nuclear-weapon States parties to the Treaty. 1.136–46 



Action 9: The establishment of further nuclear-weapon-free zones, where appropriate, on the basis of arrangements freely arrived at among States of the region concerned, and in accordance with the 1999 Guidelines of the United Nations Disarmament Commission, is encouraged. All concerned States are encouraged to ratify the nuclear-weapon-free zone treaties and their relevant protocols, and to constructively consult and cooperate to bring about the entry into force of the relevant legally binding protocols of all such nuclear-weapon-free zones treaties, which include negative security assurances. The concerned States are encouraged to review any related reservations.

1.143
2.124-53



D. Nuclear testing

Action 10: All nuclear-weapon States undertake to ratify the Comprehensive Nuclear-Test-Ban Treaty with all expediency, noting that positive decisions by nuclear-weapon States would have the beneficial impact towards the ratification of that Treaty, and that nuclear-weapon States have the special responsibility to encourage Annex 2 countries, in particular those which have not acceded to the Treaty on the Non-Proliferation of Nuclear Weapons and continue to operate unsafeguarded nuclear facilities, to sign and ratify.

2.170



Action 11: Pending the entry into force of the Comprehensive Nuclear-Test-Ban Treaty, all States commit to refrain from nuclear-weapon test explosions or any other nuclear explosions, the use of new nuclear weapons technologies and from any action that would defeat the object and purpose of that Treaty, and all existing moratoriums on nuclear-weapon test explosions should be maintained.

2.170
2.175



Action 12: All States that have ratified the Comprehensive Nuclear-Test-Ban Treaty recognize the contribution of the conferences on facilitating the entry into force of that Treaty and of the measures adopted by consensus at the Sixth Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty, held in September 2009, and commit to report at the 2011 Conference on progress made towards the urgent entry into force of that Treaty.

2.176-77




Action 13: All States that have ratified the Comprehensive Nuclear-Test-Ban Treaty undertake to promote the entry into force and implementation of that Treaty at the national, regional and global levels.

2.176-77




Action 14: The Preparatory Commission for the Comprehensive Nuclear–Test–Ban Treaty Organization is to be encouraged to fully develop the verification regime for the Comprehensive Nuclear–Test–Ban Treaty, including early completion and provisional operationalization of the international monitoring system in accordance with the mandate of the Preparatory Commission, which should, upon entry into force of that Treaty, serve as an effective, reliable, participatory and non–discriminatory verification system with global reach, and provide assurance of compliance with that Treaty. 2.179




E. Fissile materials


Action 15: All States agree that the Conference on Disarmament should, within the context of an agreed, comprehensive and balanced programme of work, immediately begin negotiation of a treaty banning the production of fissile material for use in nuclear weapons or other nuclear explosive devices in accordance with the report of the Special Coordinator of 1995 (CD/1299) and the mandate contained therein. Also in this respect, the Review Conference invites the Secretary–General of the United Nations to convene a high–level meeting in September 2010 in support of the work of the Conference on Disarmament. 2.182–97




Action 16: The nuclear–weapon States are encouraged to commit to declare, as appropriate, to the International Atomic Energy Agency (IAEA) all fissile material designated by each of them as no longer required for military purposes and to place such material as soon as practicable under IAEA or other relevant international verification and arrangements for the disposition of such material for peaceful purposes, to ensure that such material remains permanently outside military programmes. 2.198–217



Action 17: In the context of action 16, all States are encouraged to support the development of appropriate legally binding verification arrangements, within the context of IAEA, to ensure the irreversible removal of fissile material designated by each nuclear–weapon State as no longer required for military purposes. 2.198–217





Action 18: All States that have not yet done so are encouraged to initiate a process towards the dismantling or conversion for peaceful uses of facilities for the production of fissile material for use in nuclear weapons or other nuclear explosive devices. 2.218–31





F. Other measures in support of nuclear disarmament

Action 19: All States agree on the importance of supporting cooperation among Governments, the United Nations, other international and regional organizations and civil society aimed at increasing confidence, improving transparency and developing efficient verification capabilities related to nuclear disarmament. 1.36–53






Action 20: States parties should submit regular reports, within the framework of the strengthened review process for the Treaty, on the implementation of the present action plan, as well as of article VI, paragraph 4 (c), of the 1995 decision entitled “Principles and objectives for nuclear non–proliferation and disarmament,” and the practical steps agreed to in the Final Document of the 2000 Review Conference, and recalling the advisory opinion of the International Court of Justice of 8 July 1996. 1.43–45 


Action 21: As a confidence–building measure, all the nuclear–weapon States are encouraged to agree as soon as possible on a standard reporting form and to determine appropriate reporting intervals for the purpose of voluntarily providing standard information without prejudice to national security. The Secretary–General of the United Nations is invited to establish a publicly accessible repository, which shall include the information provided by the nuclear–weapon States. 1.43–45 


Action 22: All States are encouraged to implement the recommendations contained in the report of the Secretary–General of the United Nations (A/57/124) regarding the United Nations study on disarmament and non–proliferation education, in order to advance the goals of the Treaty in support of achieving a world without nuclear weapons. 1.215–18 


II. Nuclear Non–proliferation

Action 23: The Conference calls upon all States parties to exert all efforts to promote universal adherence to the Treaty, and not to undertake any actions that can negatively affect prospects for the universality of the Treaty. 2.22–35 







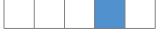


Action 24: The Conference re–endorses the call by previous review conferences for the application of IAEA comprehensive safeguards to all source or special fissionable material in all peaceful nuclear activities in the States parties in accordance with the provisions of article III of the Treaty. 2.36–45 

Action 25: The Conference, noting that 18 States parties to the Treaty have yet to bring into force comprehensive safeguards agreements, urges them to do so as soon as possible and without further delay. 2.38–39 

Action 26: The Conference underscores the importance in complying with the non–proliferation obligations, addressing all compliance matters in order to uphold the Treaty’s integrity and the authority of the safeguards system. 2.67–87 

Action 27: The Conference underscores the importance of resolving all cases of non–compliance with safeguards obligations in full conformity with the IAEA statute and the respective legal obligations of Member States. In this regard, the Conference calls upon Member States to extend their cooperation to the Agency. 2.67–87 





<p>Action 28: The Conference encourages all States parties which have not yet done so to conclude and to bring into force additional protocols as soon as possible and to implement them provisionally pending their entry into force.</p>	2.46–50	
<p>Action 29: The Conference encourages IAEA to further facilitate and assist the States parties in the conclusion and entry into force of comprehensive safeguards agreements and additional protocols. The Conference calls on States parties to consider specific measures that would promote the universalization of the comprehensive safeguards agreements.</p>	2.61–66	
<p>Action 30: The Conference calls for the wider application of safeguards to peaceful nuclear facilities in the nuclear-weapon States, under the relevant voluntary offer safeguards agreements, in the most economic and practical way possible, taking into account the availability of IAEA resources, and stresses that comprehensive safeguards and additional protocols should be universally applied once the complete elimination of nuclear weapons has been achieved.</p>	2.42–45	
<p>Action 31: The Conference encourages all States parties with small quantities protocols which have not yet done so to amend or rescind them, as appropriate, as soon as possible.</p>	2.40–41	
<p>Action 32: The Conference recommends that IAEA safeguards should be assessed and evaluated regularly. Decisions adopted by the IAEA policy bodies aimed at further strengthening the effectiveness and improving the efficiency of IAEA safeguards should be supported and implemented.</p>	2.51–60	
<p>Action 33: The Conference calls upon all States parties to ensure that IAEA continues to have all political, technical and financial support so that it is able to effectively meet its responsibility to apply safeguards as required by article III of the Treaty.</p>	2.88–96	
<p>Action 34: The Conference encourages States parties, within the framework of the IAEA statute, to further develop a robust, flexible, adaptive and cost-effective international technology base for advanced safeguards through cooperation among Member States and with IAEA.</p>	2.58–60	
<p>Action 35: The Conference urges all States parties to ensure that their nuclear-related exports do not directly or indirectly assist the development of nuclear weapons or other nuclear explosive devices and that such exports are in full conformity with the objectives and purposes of the Treaty as stipulated, particularly, in articles I, II and III of the Treaty, as well as the decision on principles and objectives of nuclear non-proliferation and disarmament adopted in 1995 by the Review and Extension Conference.</p>	2.97–105	
<p>Action 36: The Conference encourages States parties to make use of multilaterally negotiated and agreed guidelines and understandings in developing their own national export controls.</p>	2.103	




<p>Action 37: The Conference encourages States parties to consider whether a recipient State has brought into force IAEA safeguards obligations in making nuclear export decisions.</p>	<p>2.107–10</p>	
<p>Action 38: The Conference calls upon all States parties, in acting in pursuance of the objectives of the Treaty, to observe the legitimate right of all States parties, in particular developing States, to full access to nuclear material, equipment and technological information for peaceful purposes.</p>	<p>2.104 4.22–36</p>	
<p>Action 39: States parties are encouraged to facilitate transfers of nuclear technology and materials and international cooperation among States parties, in conformity with articles I, II, III and IV of the Treaty, and to eliminate in this regard any undue constraints inconsistent with the Treaty.</p>	<p>2.97–104 4.22–36</p>	
<p>Action 40: The Conference encourages all States to maintain the highest possible standards of security and physical protection of nuclear materials and facilities.</p>	<p>3.1–163</p>	
<p>Action 41: The Conference encourages all States parties to apply, as appropriate, the IAEA recommendations on the physical protection of nuclear material and nuclear facilities (INFCIRC/225/Rev.4 (Corrected)) and other relevant international instruments at the earliest possible date.</p>	<p>3.32–34 3.77–80</p>	
<p>Action 42: The Conference calls on all States parties to the Convention on the Physical Protection of Nuclear Material to ratify the amendment to the Convention as soon as possible and encourages them to act in accordance with the objectives and the purpose of the amendment until such time as it enters into force. The Conference also encourages all States that have not yet done so to adhere to the Convention and adopt the amendment as soon as possible.</p>	<p>3.36–43</p>	
<p>Action 43: The Conference urges all States parties to implement the principles of the revised IAEA Code of Conduct on the Safety and Security of Radioactive Sources, as well as the Guidance on the Import and Export of Radioactive Sources approved by the IAEA Board of Governors in 2004.</p>	<p>3.60–61</p>	
<p>Action 44: The Conference calls upon all States parties to improve their national capabilities to detect, deter and disrupt illicit trafficking in nuclear materials throughout their territories, in accordance with their relevant international legal obligations, and calls upon those States parties in a position to do so to work to enhance international partnerships and capacity-building in this regard. The Conference also calls upon States parties to establish and enforce effective domestic controls to prevent the proliferation of nuclear weapons in accordance with their relevant international legal obligations.</p>	<p>2.97–105 2.154–56 3.108–11</p>	





Action 45: The Conference encourages all States parties that have not yet done so to become party to the International Convention for the Suppression of Acts of Nuclear Terrorism as soon as possible. 3.44–50 


Action 46: The Conference encourages IAEA to continue to assist the States parties in strengthening their national regulatory controls of nuclear material, including the establishment and maintenance of the State systems of accounting for and control of nuclear material, as well as systems on regional level. The Conference calls upon IAEA Member States to broaden their support for the relevant IAEA programmes. 3.73–95
3.112–15 


III. Peaceful Uses of Nuclear Energy


Action 47: Respect each country’s choices and decisions in the field of peaceful uses of nuclear energy without jeopardizing its policies or international cooperation agreements and arrangements for peaceful uses of nuclear energy and its fuel cycle policies. 4.22–36 


Action 48: Undertake to facilitate, and reaffirm the right of States parties to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. 4.13–21 


Action 49: Cooperate with other States parties or international organizations in the further development of nuclear energy for peaceful purposes, with due consideration for the needs of the developing areas of the world. 4.22–46 


Action 50: Give preferential treatment to the non–nuclear–weapon States parties to the Treaty, taking the needs of developing countries, in particular, into account. 4.24–46 

Action 51: Facilitate transfers of nuclear technology and international cooperation among States parties in conformity with articles I, II, III, and IV of the Treaty, and eliminate in this regard any undue constraints inconsistent with the Treaty. 4.24–36 

Action 52: Continue efforts, within IAEA, to enhance the effectiveness and efficiency of its technical cooperation programme. 4.37–46 

Action 53: Strengthen the IAEA technical cooperation programme in assisting developing States parties in the peaceful uses of nuclear energy. 4.37–46 

Action 54: Make every effort and to take practical steps to ensure that IAEA resources for technical cooperation activities are sufficient, assured and predictable. 4.43–46 

Action 55: Encourage all States in a position to do so to make additional contributions to the initiative designed to raise 100 million dollars over the next five years as extra–budgetary contributions to IAEA activities, while welcoming the contributions already pledged by countries and groups of countries in support of IAEA activities. 4.44 



<p>Action 56: Encourage national, bilateral and international efforts to train the necessary skilled workforce needed to develop peaceful uses of nuclear energy.</p>	<p>4.34–46</p>	
<p>Action 57: Ensure that, when developing nuclear energy, including nuclear power, the use of nuclear energy must be accompanied by commitments to and ongoing implementation of safeguards as well as appropriate and effective levels of safety and security, consistent with States’ national legislation and respective international obligations.</p>	<p>3.151–54 4.55–57 4.86–113</p>	
<p>Action 58: 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.</p>	<p>4.80–85</p>	
<p>Action 59: Consider becoming party, if they have not yet done so, to the Convention on Nuclear Safety, the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the International Convention for the Suppression of Acts of Nuclear Terrorism, the Convention on the Physical Protection of Nuclear Material, and to ratify its amendment so that it may enter into force at an early date.</p>	<p>4.92–98</p>	
<p>Action 60: Promote the sharing of best practices in the area of nuclear safety and security, including through dialogue with the nuclear industry and the private sector, as appropriate.</p>	<p>3.146–54 4.99–113</p>	
<p>Action 61: Encourage States concerned, on a voluntary basis, to further minimize highly enriched uranium in civilian stocks and use, where technically and economically feasible.</p>	<p>4.60</p>	
<p>Action 62: Transport radioactive materials consistent with relevant international standards of safety, security and environmental protection, and to continue communication between shipping and coastal States for the purpose of confidence-building and addressing concerns regarding transport safety, security and emergency preparedness.</p>	<p>3.107 4.86–113</p>	
<p>Action 63: Put in force a civil nuclear liability regime by becoming party to relevant international instruments or adopting suitable national legislation, based upon the principles established by the main pertinent international instruments.</p>	<p>4.114–18</p>	



Action 64: The Conference calls upon all States to abide by the decision adopted by consensus at the IAEA General Conference on 18 September 2009 on prohibition of armed attack or threat of attack against nuclear installations, during operation or under construction.



IV. The Middle East, particularly implementation of the 1995 Resolution on the Middle East

... 7. The Conference emphasizes the importance of a process leading to full implementation of the 1995 Resolution on the Middle East. To that end, the Conference endorses the following practical steps:

(a) The Secretary-General of the United Nations and the co-sponsors of the 1995 Resolution, in consultation with the States of the region, will convene a conference in 2012, to be attended by all States of the Middle East, on the establishment of a Middle East zone free of nuclear weapons and all other weapons of mass destruction, on the basis of arrangements freely arrived at by the States of the region, and with the full support and engagement of the nuclear-weapon States. The 2012 Conference shall take as its terms of reference the 1995 Resolution;



(b) Appointment by the Secretary-General of the United Nations and the co-sponsors of the 1995 Resolution, in consultation with the States of the region, of a facilitator, with a mandate to support implementation of the 1995 Resolution by conducting consultations with the States of the region in that regard and undertaking preparations for the convening of the 2012 Conference. The facilitator will also assist in implementation of follow-on steps agreed by the participating regional States at the 2012 Conference. The facilitator will report to the 2015 Review Conference and its Preparatory Committee meetings;



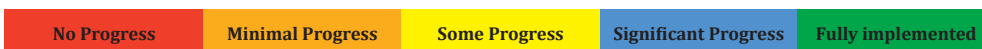
(c) Designation by the Secretary-General of the United Nations and the co-sponsors of the 1995 Resolution, in consultation with the States of the region, of a host Government for the 2012 Conference;



(d) Additional steps aimed at supporting the implementation of the 1995 Resolution, including that IAEA, the Organisation for the Prohibition of Chemical Weapons and other relevant international organizations be requested to prepare background documentation for the 2012 Conference regarding modalities for a zone free of nuclear weapons and other weapons of mass destruction and their delivery systems, taking into account work previously undertaken and experience gained;



(e) Consideration of all offers aimed at supporting the implementation of the 1995 Resolution, including the offer of the European Union to host a follow-on seminar to that organized in June 2008.



Other regional issue [DPRK]

The Conference strongly urges the Democratic People’s Republic of Korea to fulfil the commitments under the Six–Party Talks, including the complete and verifiable abandonment of all nuclear weapons and existing nuclear programmes in accordance with the September 2005 joint statement, and urges the Democratic People’s Republic of Korea to return, at an early date, to the Treaty and to its adherence with its IAEA safeguards agreement. The Conference also calls on the Democratic People’s Republic of Korea and all States parties to fully implement all relevant nuclear non–proliferation and disarmament obligations. The Conference reaffirms its firm support for the Six–Party Talks and remains determined to achieve the satisfactory and comprehensive resolution to the issues involved through diplomatic means.

1.95–103



B. NUCLEAR SECURITY SUMMITS 2010 & 2012: COMMITMENTS

COMMITMENT

PARAGRAPHS WHERE DISCUSSED IN STATE OF PLAY REPORT
 STATE OF PLAY AS AT DECEMBER 2012

Washington Summit 2010



[A. Global Nuclear Security Architecture]

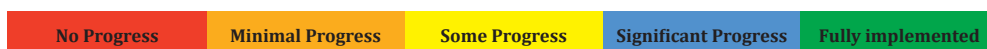
[ICSANT] Recognizing the importance of the International Convention for the Suppression of Acts of Nuclear Terrorism as an important legally binding multilateral instrument addressing threats posed by acts of nuclear terrorism:







- | | | | |
|---|---|---------|--|
| 1 | Participating States Parties to the Convention will work together to achieve universality of the Convention, as soon as possible; | 3.41 | |
| 2 | Participating States Parties to the Convention will assist States, as appropriate and upon their request, to implement the Convention; and | 3.44–50 | |
| 3 | Participating States Parties to the Convention encourage discussions among States Parties to consider measures to ensure its effective implementation, as called for in Article 20 of the Convention. | 3.44–50 | |

[CPPNM] Recognizing the importance of the Convention on the Physical Protection of Nuclear Material, as the only multilateral legally binding agreement dealing with the physical protection of nuclear material in peaceful uses, and the value of the 2005 Amendment to the Convention in strengthening global security:

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|---|---|---------|--|
| 1 | Participating States Parties to the Convention will work towards its universal adherence and where applicable, to accelerate the ratification processes of the Amendment to the Convention and to act for early implementation of that Amendment; | 3.36–43 | |
| 2 | Participating States Parties to the Convention call on all States to act in accordance with the object and purpose of the Amendment until such time as it enters into force; and | 3.39 | |

[UNSCR 1540] Noting the need to fully implement United Nations Security Council Resolution (UNSCR) 1540 (2004) on preventing non-State actors from obtaining weapons of mass destruction (WMD), their means of delivery and related materials, in particular as it relates to nuclear material:



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| <p>1 Participating States support the continued dialogue between the Security Council committee established pursuant to UNSCR 1540 and States and support strengthened international cooperation in this regard, in accordance with relevant United Nations resolutions and within the framework of the United Nations Global Counterterrorism Strategy;</p> | <p>3.51–55</p> |  |
| <p>2 Participating States support the activities of the Security Council committee established pursuant to UNSCR 1540 to promote full implementation;</p> | <p>3.53–55</p> |  |
| <p>3 Participating States recognize the importance of complete and timely reporting as called for by UNSCR 1540, and will work with other States to do so, including by providing technical support or assistance, as requested;</p> | <p>3.55</p> |  |
| <p>4 Participating States note the outcome of Comprehensive Review by the Security Council committee established pursuant to UNSCR 1540, including the consideration of the establishment of a voluntary fund, and express their support for ensuring the effective and sustainable support for the activities of the 1540 Committee;</p> | <p>3.51–55</p> |  |
| <p>5 With respect to the nuclear security–related aspects of Paragraph 3, sections (a) and (b) of UNSCR 1540, Participating States recognize the importance of evaluating and improving their physical protection systems to ensure that they are capable of achieving the objectives set out in relevant International Atomic Energy Agency (IAEA) Nuclear Security Series documents and as contained in the document “Physical Protection of Nuclear Material and Nuclear Facilities,” (INFCIRC/225); and</p> | <p>3.52 –54</p> |  |
| <p>6 Participating States in a position to do so are encouraged to provide technical assistance to those States that request it through appropriate mechanisms, including through the Committee’s efforts to match needs with available resources.</p> | <p>3.51–55</p> |  |

[B. Role of the IAEA]

Welcoming IAEA activities in support of national efforts to enhance nuclear security worldwide and commending the work of the IAEA for the provision of assistance, upon request, through its Nuclear Security Programme and for the implementation of the Nuclear Security Plan 2010 – 2013, approved by the Board of Governors in September 2009 and noted by the IAEA General Conference, and welcoming IAEA programs to advance new technologies to improve nuclear security and nuclear materials accountancy.






Recognizing that the IAEA is facilitating the development by member states, in the framework of the Nuclear Security Series, of guidance and recommendations relating to the prevention and detection of, and response to, theft, sabotage, unauthorized access and illegal transfer, or other malicious acts involving, inter alia, nuclear material, and associated facilities, and is providing guidance in developing and implementing effective nuclear security measures.

Noting that pursuit of the objectives of this Work Plan will not be interpreted so as to alter the mandate or responsibilities of the IAEA:




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|--|----------------|--|
| <p>1 Participating States note that the IAEA’s Nuclear Security Series of documents provides recommendations and guidance to assist States in a wide range of aspects of nuclear security, and encourage the widest possible participation by all its member states in the process;</p> | <p>3.76–80</p> | |
| <p>2 Participating States in a position to do so, will work actively with the IAEA towards the completion and implementation, as appropriate, of the guidance provided by the Nuclear Security Series, and to assist, upon request, other States in doing so;</p> | <p>3.76–80</p> | |
| <p>3 Participating States in particular welcome and support the IAEA’s efforts to finalize the fifth revision of the recommendations contained in INFCIRC/225, which will be published in the Nuclear Security Series;</p> | <p>3.77–78</p> | |
| <p>4 Participating States recognize the importance of nuclear material accountancy in support of nuclear security and look forward to the completion of the technical guidance document on “Nuclear Material Accountancy Systems at Facilities”;</p> | <p>3.79</p> | |
| <p>5 Participating States will endeavor to incorporate, as appropriate, the relevant principles set out in the Nuclear Security Series documents, into the planning, construction, and operation of nuclear facilities;</p> | <p>3.81–82</p> | |
| <p>6 Participating States, when implementing their national nuclear security measures, will support the use of the IAEA Implementing Guide on the Development, Use and Maintenance of the Design Basis Threat to elaborate their national design basis threat as appropriate, to include the consideration of outsider and insider threats;</p> | <p>3.81–82</p> | |



- | | | |
|--|-----------------------------|---|
| <p>7 Participating States welcome the IAEA’s efforts to assist States to develop, upon request, Integrated Nuclear Security Support Plans to consolidate their nuclear security needs into integrated plans for nuclear security improvements and assistance;</p> | <p>3.81–82</p> |  |
| <p>8 Participating States recognize the value of IAEA support mechanisms such as the International Physical Protection Advisory Service missions to review, as requested, their physical protection systems for civilian nuclear material and facilities; and</p> | <p>3.81–82
3.158–60</p> |  |
| <p>9 Participating States call upon all member states of the IAEA in a position to do so to provide the necessary support to enable the IAEA to implement these important activities.</p> | <p>3.83–84
3.89</p> |  |

[C. International Cooperation]

Noting the contributions to the promotion of nuclear security by the U.N. and initiatives such as the Global Initiative to Combat Nuclear Terrorism, the G–8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, as well as other bilateral, regional, multilateral, and nongovernmental activities within their respective mandates and memberships:

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|--|-----------------|---|
| <p>1 Participating States will work together, as appropriate, to ensure that nuclear security cooperation mechanisms are complementary, reinforcing, efficient, consistent with related IAEA activities, and appropriately matched to identified needs in those States requesting assistance;</p> | <p>3.96–111</p> |  |
| <p>2 Participating States encourage, where appropriate, expanded participation in and commitment to international initiatives and voluntary cooperative mechanisms aimed at improving nuclear security and preventing nuclear terrorism; and</p> | <p>3.100–11</p> |  |
| <p>3 Participating States welcome the intent of the members of the G–8 Global Partnership, in a position to do so, to undertake additional programming to enhance nuclear security.</p> | <p>3.100–11</p> |  |



[D. Nuclear Materials]





Recognizing States’ rights to develop and use nuclear energy for peaceful purposes, and noting the responsibility of each State for the use and management of all nuclear materials and facilities under its jurisdiction and recognize that highly enriched uranium and separated plutonium are particularly sensitive and require special precautions:

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|--|------------------------------------|--|
| <p>1 Participating States will consider, where appropriate, the consolidation of national sites where nuclear material is held;</p> | <p>3.130</p> | |
| <p>2 Participating States will continue to exercise particular care in ensuring the safe and secure transport of nuclear materials, both in domestic and international transport;</p> | <p>3.34–35
3.107
3.119</p> | |
| <p>3 Participating States, where appropriate, will consider on a national basis the safe, secure and timely removal and disposition of nuclear materials from facilities no longer using them;</p> | <p>3.120–30</p> | |
| <p>4 Participating States will continue to exercise particular care in securing and accounting for separated plutonium, taking into consideration the potential of various forms for use in a nuclear explosive device;</p> | <p>3.120–24
4.60–68</p> | |
| <p>5 Participating States will consider, where appropriate, converting highly-enriched-uranium fuelled research reactors, and other nuclear facilities using highly enriched uranium, to use low enriched uranium, where it is technically and economically feasible;</p> | <p>3.120–30</p> | |
| <p>6 Participating States, as appropriate, will collaborate to research and develop new technologies that require neither highly enriched uranium fuels for reactor operation nor highly enriched uranium targets for producing medical or other isotopes, and will encourage the use of low enriched uranium and other proliferation-resistant technologies and fuels in various commercial applications such as isotope production;</p> | <p>3.128–29
4.58–68</p> | |
| <p>7 Participating States in a position to do so will provide assistance to those States requesting assistance to secure, account for, consolidate, and convert nuclear materials; and</p> | <p>3.121–30</p> | |
| <p>8 Participating States will consider how to best address the security of radioactive sources, as well as consider further steps as appropriate.</p> | <p>3.60–61
3.129</p> | |






[E. National Nuclear Security Regulations]

Mindful of the responsibilities of every Participating State to maintain effective nuclear security and a robust domestic regulatory capacity:

- 1 Participating States will establish and maintain effective national nuclear security regulations, including the periodic review and adjustment of the regulations as the State considers appropriate; 3.112–15 
- 2 Participating States undertake to maximize regulatory independence, consistent with each State’s particular legal and institutional structures; 3.112–15 
- 3 Participating States will undertake to build regulatory capacity and ensure sufficiently trained and fully vetted professional nuclear security staff and adequate resources, taking into account current needs and future expansion of their respective nuclear programs; and 3.112–15 
- 4 Participating States will pursue the review and enforcement of compliance with national nuclear security regulations as a matter of priority. 3.112–15 

[F. Nuclear Industry]

Understanding the role of the nuclear industry, including the private sector, in nuclear security and recognizing that national governments are responsible for standard setting within each State:

- 1 Participating States will work, in guiding the nuclear industry, to promote and sustain strong nuclear security culture and corporate commitment to implement robust security practices, including regular exercises and performance testing of nuclear security features, consistent with national regulations; 3.146–50 
- 2 Consistent with State requirements, Participating States will facilitate exchange of best practices, where legally and practically feasible, in nuclear security in the nuclear industry, and in this respect, will utilize relevant institutions to support such exchanges; not only strategic but all classes of weapons, and not only deployed weapons but those in storage and those awaiting destruction (but still capable of reconstitution and deployment) as well. [7.8; 18.1–3] 3.146–50 
- 3 Participating States encourage nuclear operators and architect/engineering firms to take into account and incorporate, where appropriate, effective measures of physical protection and security culture into the planning, construction, and operation of civilian nuclear facilities and provide technical assistance, upon request, to other States in doing so. 3.146–50 




[G. Nuclear Security Culture]


Emphasizing the importance of the human dimension of nuclear security, the need to enhance security culture, and the need to maintain a well-trained cadre of technical experts:

- 1** Participating States will promote cooperation, as appropriate, among international organizations, governments, industries, other stakeholders, and academia for effective capacity building, including human resources development in nuclear security programs;


3.155–63


- 2** Participating States will encourage the creation of and networking among nuclear security support centres for capacity building to disseminate and share best practices and will support IAEA activities in this area;


3.155–63


- 3** Participating States encourage the creation of adequate national nuclear security capacities, and encourage supplier countries and technology suppliers to support those capacities in the recipient countries, including human resources development through education and training, upon request and consistent with each State’s particular legal and institutional structures;


3.155-63


- 4** Participating States will encourage an integrated approach to education and training and institutional capacity building by all stakeholders having a key role in establishing and maintaining adequate security infrastructure; and

3.155–60


- 5** Participating States will encourage the implementation of national measures to ensure the proper management of sensitive information in order to prevent illicit acquisition or use of nuclear material, and, where appropriate, will support bilateral and multilateral capacity building projects, upon request.

3.155–63




[H. Information Exchange]

Underscoring the value of exchanging accurate and verified information, without prejudice to confidentiality provisions, to detect, prevent, suppress, investigate, and prosecute acts or attempted acts of illicit nuclear trafficking and nuclear terrorism:




- 1** Participating States will strive to improve their national criminal laws, as needed, to ensure that they have the adequate authority to prosecute all types of cases of illicit nuclear trafficking and nuclear terrorism and commit to prosecuting these crimes to the full extent of the law;


3.98–104


- 2** Participating States are encouraged to develop and apply mechanisms to expand sharing of information on issues, challenges, risks and solutions related to nuclear security, nuclear terrorism and illicit nuclear trafficking in a comprehensive and timely manner; and

3.98–104


- 3** Participating States are encouraged to develop methods and mechanisms, where appropriate, to enhance bilateral and multilateral collaboration in sharing urgent and relevant information on nuclear security and incidents involving illicit nuclear trafficking.

3.98–104



[I. Nuclear Forensics]

Noting the IAEA’s and Participating States’ work in the field of nuclear detection and nuclear forensics, aimed at assisting States in connection with the detection of and response to illicitly trafficked nuclear material, and determination of its origin, and recognizing the importance of respecting provisions on confidentiality of information:

- 1** Participating States will consider taking further steps, nationally, bilaterally or multilaterally, to enhance their technical capabilities, including the appropriate use of new and innovative technologies, to prevent and combat illicit nuclear trafficking;

3.143–45


- 2** Participating States will explore ways to work together to develop national capacities for nuclear forensics, such as the creation of national libraries and an international directory of points of contact, to facilitate and encourage cooperation between States in combating illicit nuclear trafficking , including relevant IAEA activities in this area; and

3.143–45


- 3** Participating States will explore ways to enhance broader cooperation among local, national and international customs and law enforcement bodies to prevent illicit nuclear trafficking and acts of nuclear terrorism, including through joint exercises and sharing of best practices.

3.144–45







Seoul Summit 2012

We will continue to use the Washington Communiqué and Work Plan as a basis for our future work in advancing our nuclear security objectives. At this Seoul Summit, we agree that we will make every possible effort to achieve further progress in the following important areas:

Global Nuclear Security Architecture


- 1 We recognize the importance of multilateral instruments that address nuclear security, such as the Convention on the Physical Protection of Nuclear Material (CPPNM), as amended, and the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT). We therefore encourage the universal adherence to these Conventions. We urge states in a position to do so to accelerate their domestic approval of the 2005 Amendment to the CPPNM, seeking to bring the Amendment into force by 2014. We acknowledge the important role of the United Nations (UN) in promoting nuclear security, support the UN Security Council Resolutions 1540 and 1977 in strengthening global nuclear security, and welcome the extension of its mandate. We will strive to use the IAEA Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Rev.5) document and related Nuclear Security Series documents, and reflect them into national practice. 3.32–72 

- 2 We recognize the contributions since the 2010 Summit of international initiatives and processes such as the Global Initiative to Combat Nuclear Terrorism (GICNT) and Global Partnership against the Spread of Weapons and Materials of Mass Destruction, within their respective mandates and memberships. We welcome the wider participation in the GICNT and the Global Partnership and value its extension beyond 2012. Noting the importance of strengthening coordination and complementarity among nuclear security activities, we welcome the proposal of the IAEA to organize an international conference in 2013. We welcome contributions from the industry, academia, institutes and civil society that promote nuclear security. 3.62–72 




Role of the IAEA


- 3** We reaffirm the essential responsibility and central role of the IAEA in strengthening the international nuclear security framework, and recognize the value of the IAEA Nuclear Security Plan 2010–2013. We will work to ensure that the IAEA continues to have the appropriate structure, resources and expertise needed to support the implementation of nuclear security objectives. To this end, we encourage States in a position to do so and the nuclear industry to increase voluntary contributions to the IAEA’s Nuclear Security Fund, as well as in-kind contributions. We also encourage continued IAEA activities to assist, upon request, national efforts to establish and enhance nuclear security infrastructure through its various support programs, and encourage States to make use of these IAEA resources.

3.73–95 

Nuclear Materials

- 4** Recognizing that highly enriched uranium (HEU) and separated plutonium require special precautions, we reemphasize the importance of appropriately securing, accounting for and consolidating these materials. We also encourage States to consider the safe, secure and timely removal and disposition of nuclear materials from facilities no longer using them, as appropriate, and consistent with national security considerations and development objectives.


3.116–30 
- 5** We recognize that the development, within the framework of the IAEA, of options for national policies on HEU management will advance nuclear security objectives. We encourage States to take measures to minimize the use of HEU, including through the conversion of reactors from highly enriched to low enriched uranium (LEU) fuel, where technically and economically feasible, taking into account the need for assured supplies of medical isotopes, and encourage States in a position to do so, by the end of 2013, to announce voluntary specific actions intended to minimize the use of HEU. We also encourage States to promote the use of LEU fuels and targets in commercial applications such as isotope production, and in this regard, welcome relevant international cooperation on high-density LEU fuel to support the conversion of research and test reactors.

3.120–30 




Radioactive Sources

- 6 Taking into account that radioactive sources are widely used and can be vulnerable to malicious acts, we urge States to secure these materials, while bearing in mind their uses in industrial, medical, agricultural and research applications. To this end, we encourage States in a position to do so to continue to work towards the process of ratifying or acceding to the ICSANT; reflect into national practices relevant IAEA Nuclear Security Series documents, the IAEA Code of Conduct on the Safety and Security of Radioactive Sources and its supplementary document on the IAEA Guidance on the Import and Export of Radioactive Sources; and establish national registers of high- activity radioactive sources where required. We also commit to work closely with the IAEA to encourage cooperation on advanced technologies and systems, share best practices on the management of radioactive sources, and provide technical assistance to States upon their request. In addition, we encourage continued national efforts and international cooperation to recover lost, missing or stolen sources and to maintain control over disused sources.

3.60–61 


Nuclear Security and Safety

- 7 Acknowledging that safety measures and security measures have in common the aim of protecting human life and health and the environment, we affirm that nuclear security and nuclear safety measures should be designed, implemented and managed in nuclear facilities in a coherent and synergistic manner. We also affirm the need to maintain effective emergency preparedness, response and mitigation capabilities in a manner that addresses both nuclear security and nuclear safety. In this regard, we welcome the efforts of the IAEA to organize meetings to provide relevant recommendations on the interface between nuclear security and nuclear safety so that neither security nor safety is compromised. We also welcome the convening of the High Level Meeting on Nuclear Safety and Security initiated by the UN Secretary-General, held in New York on 22 September 2011. Noting that the security of nuclear and other radioactive materials also includes spent nuclear fuel and radioactive waste, we encourage States to consider establishing appropriate plans for the management of these materials.


3.151–54
4.86–113 




Transportation Security

- 8 We will continue efforts to enhance the security of nuclear and other radioactive materials while in domestic and international transport, and encourage States to share best practices and cooperate in acquiring the necessary technologies to this end. Recognizing the importance of a national layered defense against the loss or theft of nuclear and other radioactive materials, we encourage the establishment of effective national nuclear material inventory management and domestic tracking mechanisms, where required, that enable States to take appropriate measures to recover lost and stolen materials. 3.107 3.34–35 

Combating Illicit Trafficking


- 9 We underscore the need to develop national capabilities to prevent, detect, respond to and prosecute illicit nuclear trafficking. In this regard, we encourage action-oriented coordination among national capacities to combat illicit trafficking, consistent with national laws and regulations. We will work to enhance technical capabilities in the field of national inspection and detection of nuclear and other radioactive materials at the borders. Noting that several countries have passed export control laws to regulate nuclear transfers, we encourage further utilization of legal, intelligence and financial tools to effectively prosecute offenses, as appropriate and consistent with national laws. In addition, we encourage States to participate in the IAEA Illicit Trafficking Database program and to provide necessary information relating to nuclear and other radioactive materials outside of regulatory control. We will work to strengthen cooperation among States and encourage them to share information, consistent with national regulations, on individuals involved in trafficking offenses of nuclear and other radioactive materials, including through INTERPOL’s Radiological and Nuclear Terrorism Prevention Unit and the World Customs Organization. 3.108–11 

Nuclear Forensics


- 10 We recognize that nuclear forensics can be an effective tool in determining the origin of detected nuclear and other radioactive materials and in providing evidence for the prosecution of acts of illicit trafficking and malicious uses. In this regard, we encourage States to work with one another, as well as with the IAEA, to develop and enhance nuclear forensics capabilities. In this regard, they may combine the skills of both traditional and nuclear forensics through the development of a common set of definitions and standards, undertake research and share information and best practices, as appropriate. We also underscore the importance of international cooperation both in technology and human resource development to advance nuclear forensics. 3.138–45 



Nuclear Security Culture

- 11** Recognizing that investment in human capacity building is fundamental to promoting and sustaining a strong nuclear security culture, we encourage States to share best practices and build national capabilities, including through bilateral and multilateral cooperation. At the national level, we encourage all stakeholders, including the government, regulatory bodies, industry, academia, nongovernmental organizations and the media, to fully commit to enhancing security culture and to maintain robust communication and coordination of activities. We also encourage States to promote human resource development through education and training. In this regard, we welcome the establishment of Centers of Excellence and other nuclear security training and support centers since the Washington Summit, and encourage the establishment of new centers. Furthermore, we welcome the effort by the IAEA to promote networking among such centers to share experience and lessons learned and to optimize available resources. We also note the holding of the Nuclear Industry Summit and the Nuclear Security Symposium on the eve of the Seoul Nuclear Security Summit. 3.155–63 

Information Security

- 12** We recognize the importance of preventing non–state actors from obtaining information, technology or expertise required to acquire or use nuclear materials for malicious purposes, or to disrupt information technology based control systems at nuclear facilities. We therefore encourage States to: continue to develop and strengthen national and facility–level measures for the effective management of such information, including information on the procedures and protocols to protect nuclear materials and facilities; to support relevant capacity building projects; and to enhance cyber security measures concerning nuclear facilities, consistent with the IAEA General Conference Resolution on Nuclear Security(GC(55)/Res/10) and bearing in mind the International Telecommunication Union Resolution 174. We also encourage States to: promote a security culture that emphasizes the need to protect nuclear security related information; engage with scientific, industrial and academic communities in the pursuit of common solutions; and support the IAEA in producing and disseminating improved guidance on protecting information. 3.105–06 



International Cooperation

13 We encourage all States to enhance their physical protection of and accounting system for nuclear materials, emergency preparedness and response capabilities and a relevant legal and regulatory framework. In this context, we encourage the international community to increase international cooperation and to provide assistance, upon request, to countries in need on a bilateral, regional, and multicultural level, as appropriate. In particular, we welcome the intent by the IAEA to continue to lead efforts to assist States, upon request. We also reaffirm the need for various public diplomacy and outreach efforts to enhance public awareness of actions taken and capacities built to address threats to nuclear security, including the threat of nuclear terrorism. We will continue to make voluntary and substantive efforts toward strengthening nuclear security and implementing political commitments made in this regard. We welcome the information on the progress made in the field of nuclear security since the Washington Summit provided by the participants at this Seoul Summit. The next Nuclear Security Summit will be held in the Netherlands in 2014.



3.96–111







C. ICNND REPORT 2009: RECOMMENDATIONS

RECOMMENDATION	PARAGRAPHS WHERE DISCUSSED IN STATE OF PLAY REPORT	STATE OF PLAY AS AT DECEMBER 2012
On Overall Disarmament Strategy		
1 Nuclear disarmament should be pursued as a two-phase process: with “minimization” to be achieved no later than 2025, and “elimination” as soon as possible thereafter. Short (to 2012), medium (to 2025) and longer term (beyond 2025) action agendas should reflect those objectives. [7.1–5; see also Sections 17,18, 19]	1.22–31	
2 Short and medium term efforts should focus on achieving the general delegitimation of nuclear weapons, and on reaching as soon as possible, and no later than 2025, a “minimization point” characterised by:	1.30–31 1.233–36	
(a) low numbers: a world with no more than 2,000 warheads (less than 10 per cent of present arsenals);		
(b) agreed doctrine: every nuclear-armed state committed to no first use of nuclear weapons; and		
(c) credible force postures: verifiable deployments and alert status reflecting that doctrine. [7.6–15; see also Sections 6 (on delegitimation) and 17–18]		
3 Analysis and debate should commence now on the conditions necessary to move from the minimization point to elimination, even if a target date for getting to zero cannot now be credibly specified. [7.15–17; see also Section 19]	1.30–31 1.228–32	
On Overall Non-Proliferation Strategy		
4 Nuclear non-proliferation efforts should focus both on the demand side – persuading states that nuclear weapons will not advance their national security or other interests – and the supply side, through maintaining and strengthening a comprehensive array of measures (addressed in following recommendations) designed to make it as difficult as possible for states to buy or build such weapons. [8.9–16; see also Sections 9–15]	2.22–35	
On NPT Safeguards and Verification		
5 All states should accept the application of the Additional Protocol. To encourage universal take-up, acceptance of it should be a condition of all nuclear exports. [9.7]	2.46–50	





- 6 The Additional Protocol and its annexes should be updated and strengthened to make clear the IAEA's right to investigate possible weaponization activity, and by adding specific reference to dual-use items, reporting on export denials, shorter notice periods and the right to interview specific individuals. [9.8–9] 2.46–50 
- 7 With safeguards needing to move from a mechanistic to an information-driven system, there should be much more information sharing, in both directions, on the part of both states and the IAEA, with the agency re-evaluating its culture of confidentiality and non-transparency. [9.10–11] 2.51–60 

On NPT Compliance and Enforcement


- 8 In determining compliance, the IAEA should confine itself essentially to technical criteria, applying them with consistency and credibility, and leaving the political consequences for the Security Council to determine. [9.15] 2.67–82 
- 9 The UN Security Council should severely discourage withdrawal from the NPT by making it clear that this will be regarded as prima facie a threat to international peace and security, with all the punitive consequences that may follow from that under Chapter VII of the UN Charter. [9.20] 2.83–87 
- 10 A state withdrawing from the NPT should not be free to use for non-peaceful purposes nuclear materials, equipment and technology acquired while party to the NPT. Any such material provided before withdrawal should so far as possible be returned, with this being enforced by the Security Council. [9.21–22] 2.84–87 
- 11 All states should make it a condition of nuclear exports that the recipient state agree that, in the event it should withdraw from the NPT, safeguards shall continue with respect to any nuclear material and equipment provided previously, as well as any material produced by using it. [9.23] 2.84–85 

On Strengthening the IAEA


- 12 The IAEA should make full use of the authority already available to it, including special inspections, and states should be prepared to strengthen its authority as deficiencies are identified. [9.24] 2.67–82 
- 13 If the IAEA is to fully and effectively perform its assigned functions, it should be given, as recommended in 2008 by the Zedillo Commission: 2.90–96 




- (a) a one-off injection of funds to refurbish the Safeguards Analytical Laboratory;
- (b) a significant increase in its regular budget support, without a “zero real growth” constraint, so as to reduce reliance on extra-budgetary funding for key functions;
- (c) sufficient security of future funding to enable medium to long-term planning; and
- (d) support from both states and industry in making staff secondments and offering training opportunities. [9.25–27]


14 Consideration should be given to an external review, by the Zedillo Commission or a successor panel, of the IAEA’s organizational culture, in particular on questions of transparency and information sharing. [9.28] 2.96 


On Non-NPT Treaties and Mechanisms


15 The Nuclear Suppliers Group (NSG) should develop a criteria-based approach to cooperation agreements with states outside the NPT, taking into account factors such as ratification of the CTBT, willingness to end unsafeguarded fissile material production, and states’ records in securing nuclear facilities and materials and controlling nuclear-related exports. [10.3–9] 2.121–23 

16 The Proliferation Security Initiative (PSI) should be reconstituted within the UN system as a neutral organization to assess intelligence, coordinate and fund activities, and make both generic and specific recommendations or decisions concerning the interdiction of suspected materials being carried to or from countries of proliferation concern. [10.10–12] 2.156 

On Extending Obligations to Non-NPT States



17 Recognizing the reality that the three nuclear-armed states now outside the NPT – India, Pakistan and Israel – are not likely to become members any time soon, every effort should be made to achieve their participation in parallel instruments and arrangements which apply equivalent non-proliferation and disarmament obligations. [10.13–16] 1.24–31 2.33–35 

18 Provided they satisfy strong objective criteria demonstrating commitment to disarmament and non-proliferation, and sign up to specific future commitments in this respect, these states should have access to nuclear materials and technology for civilian purposes on the same basis as an NPT member. [10.17] 2.33–35 2.121–23 






19 These states should participate in multilateral disarmament negotiations on the same basis as the nuclear-weapon state members of the NPT, and not be expected to accept different treatment because of their non-membership of that treaty. [10.18] 1.24–31 

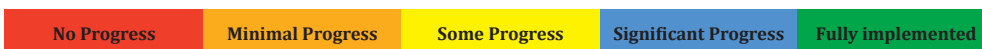


On Banning Testing

- 20 All states that have not already done so should sign and ratify the CTBT unconditionally and without delay. Pending entry into force, all states should continue to refrain from nuclear testing. [11.1–8] 2.170–81 
- 21 All signatories should provide the necessary financial, technical and political support for the continued development and operation of the CTBTO, including completing the global coverage of its monitoring systems, facilitating on-site inspection when warranted, and establishing effective national data centres and information gathering systems. [11.9–12] 2.176–79 

On Limiting the Availability of Fissile Material

- 22 All states should negotiate to an early conclusion in the Conference on Disarmament a non-discriminatory, multilateral, internationally and effectively verifiable and irreversible Fissile Material Cut-off Treaty (FMCT), banning the production of fissile material for nuclear weapons or other nuclear explosive devices. [12.1–14] -- 2.182–97 
- 23 All nuclear-armed states should declare or maintain a moratorium on the production of fissile material for weapon purposes pending the entry into force of such a treaty. [12.15] 2.199–217 
- 24 On the question of pre-existing stocks, a phased approach should be adopted, with the first priority a cap on production; then an effort to ensure that all fissile material other than in weapons becomes subject to irreversible, verified non-explosive use commitments; and with fissile material released through dismantlement being brought under these commitments as weapon reductions are agreed. [12.18] 2.198–231 
- 25 As an interim step, all nuclear-armed states should voluntarily declare their fissile material stocks and the amount they regard as excess to their weapons needs, place such excess material under IAEA safeguards as soon as practicable, and convert it as soon as possible to forms that cannot be used for nuclear weapons. [12.19] 2.199–217 
- 26 The use of HEU in civil research programs should be ended as soon as possible, and the availability and use of separated plutonium in energy programs phased out as viable alternatives are established. [12.20–27] 3.120–30 4.60–63 



On Nuclear Security

- 27** All states should agree to take further measures to strengthen the security of nuclear materials and facilities, including early adoption of the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM) and the most recent international standards, accelerated implementation of the Cooperative Threat Reduction (CTR) and associated programs worldwide, and greater commitment to international capacity building and information sharing. [13.1–16, 22–23]

3.27–72
3.96–111
- 28** At the Global Summit on Nuclear Security in April 2010, and in subsequent follow-up activity, priority attention should be given to the implementation-focused issues identified in Box 13–1. [13.4]

3.28–31
- 29** On the control of material useable for “dirty bombs,” further efforts need to be made to cooperatively implement the Code of Conduct on the Safety and Security of Radioactive Sources, with assistance to states in updating legislation and licensing practice, promoting awareness among users, and generally achieving a safety and security culture. [13.17–21]

3.60–61
- 30** Efforts should continue to be made to establish an intelligence clearing house which would provide a mechanism by which countries might be willing not only to share their intelligence, but also provide the know-how for other countries to interpret and deal with it. [13.22]

3.98–104
- 31** Strong support should be given to the emerging science of nuclear forensics, designed to identify the sources of materials found in illicit trafficking or used in nuclear explosions, including through providing additional resources to the Nuclear Smuggling International Technical Working Group. [13.24–25]

3.138–45






On Nuclear Energy Management

- 32** The use of nuclear energy for peaceful purposes should continue to be strongly supported as one of the three fundamental pillars of the NPT, along with disarmament and non-proliferation. Increased resources should be provided, including through the IAEA’s Technical Cooperation Programme, to assist developing states in taking full advantage of peaceful nuclear energy for human development. [14.1–3]



4.22–46
- 33** Support should be given to the initiative launched at the 2008 Hokkaido Toyako G8 Summit for international cooperation on nuclear energy infrastructure, designed to raise awareness worldwide of the importance of the three Ss – safeguards, security and safety – and assist countries concerned in developing the relevant measures. [14.4–6]

4.36
4.86–113




- 34** Proliferation resistance should be endorsed by governments and industry as an essential objective in the design and operation of nuclear facilities, and promoted through both institutional and technical measures – neither is sufficient without the other. [14.7–8] 4.58–68 
- 35** The increasing use of plutonium recycle, and the prospective introduction of fast neutron reactors, must be pursued in ways which enhance non-proliferation objectives and avoid adding to proliferation and terrorism risks. In particular, a key objective of research and development on fast neutron reactors should be to design and operate them so that weapons grade plutonium is not produced. [14.9–15] 4.62–68 
- 36** International measures such as spent fuel take-back arrangements by fuel suppliers, are desirable to avoid increasing spent fuel accumulations in a large number of states. Particular attention should be paid in this respect to take-back of fuel from initial core loads. [14.13] 4.74–75 
- 37** New technologies for spent fuel treatment should be developed to avoid current forms of reprocessing altogether; and, as they are established, use of MOX fuel in thermal reactors, and conventional reprocessing plants, can be phased out. [12.26] 4.61–68 
- 38** Nuclear industry, and government–industry collaboration, will need to play a greater role in mitigating the proliferation risks associated with a growing civilian nuclear sector worldwide. Industry should become a more active partner with governments in the drafting of regulations and treaties that affect its activities, to ensure that they make operational sense and to encourage compliance. [14.16–24] 3.146–50
4.58–68 

On Multilateralizing the Nuclear Fuel Cycle

- 39** Multilateralization of the nuclear fuel cycle – in particular through fuel banks and multilateral management of enrichment, reprocessing and spent fuel storage facilities – should be strongly supported. Such arrangements would play an invaluable role in building global confidence in the peaceful uses of nuclear energy, and provide an important foundation for a world free of nuclear weapons, for which a necessary requirement will be multilateral verification and control of all sensitive fuel cycle activities. [15.48] 4.70–85 
- 40** Pending the acceptance of more far-reaching proposals, support should be given to voluntary arrangements whereby, in return for assurances of supply, recipient states would renounce the national construction and operation of sensitive fuel cycle facilities for the duration of the agreement. [15.47] 4.70–79 



On Priorities for the 2010 NPT Review Conference

41 The following should be the major priority issues for the 2010 NPT Review Conference: 1.18–31 2.22–35 

(a) Action for Disarmament. Agreement on a twenty-point statement, “A New International Consensus for Action on Nuclear Disarmament” (see Box 16–1), updating and extending the “Thirteen Practical Steps” agreed in 2000.

(b) Strengthening Safeguards and Enforcement. Agreement:

- that all states should accept the application of the Additional Protocol and that, to encourage its universal take-up, acceptance should be made a condition of all states’ nuclear exports;
- to declare that a state withdrawing from the NPT is not free to use for non-peaceful purposes nuclear materials, equipment and technology acquired while party to the NPT;
- to recommend that the Security Council make it clear that any withdrawal will be regarded prima facie as a threat to international peace and security; and

(c) to recommend to states that they make it a condition of nuclear exports that safeguards agreements continue to apply after any such withdrawal. Strengthening the IAEA. Agreement that the IAEA’s budget be significantly increased – without any “zero real growth” constraint, and so as to reduce reliance on extra-budgetary support for key functions – as recommended in 2008 by the Zedillo Commission.








(d) Middle East Weapons of Mass Destruction Free Zone. Agreement that the Secretary-General of the UN should convene an early conference of all relevant states to address creative and fresh ways to implement the 1995 resolution, including the identification of confidence building measures that all key states in the region can embrace, and to commence early consultations to facilitate that.

(e) Nuclear security. Agreement that states should take further measures to strengthen the security of nuclear materials and facilities, including early adoption of the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material and the most recent international standards, accelerated implementation of the cooperative threat reduction and associated programs worldwide, and greater commitment to international capacity building and information sharing.

(f) Peaceful uses. Agreement that the inalienable right to the use of nuclear energy for peaceful purposes remains one of the fundamental objectives of the NPT and to dedicate increased resources, including through the IAEA’s Technical Cooperation Programme, to assist developing states in taking full advantage of peaceful nuclear energy for human development.









On Reducing Weapon Numbers: Bilateral and Multilateral Processes

- 42** The “minimization point” objective should be to achieve no later than 2025 a global total of no more than 2,000 nuclear warheads, with the U.S. and Russia reducing to a total of 500 nuclear weapons each, and with at least no increases (and desirably significant reductions) in the arsenals of the other nuclear-armed states. The objective must be to cut not only strategic but all classes of weapons, and not only deployed weapons but those in storage and those awaiting destruction (but still capable of reconstitution and deployment) as well. [7.8; 18.1–3] 1.54–57 
- 43** To bring the bilateral target within achievable range, the U.S. and Russia should accelerate implementation of the START follow-on treaty now being negotiated, bringing forward the envisaged reductions under this to no later than 2015. [17.13] 1.79–86 
- 44** Once this treaty is ratified, the U.S. and Russia should resume intensive negotiations with a view to reaching a further START agreement no later than 2015, which would bring the total number of warheads down to no more than 1000 for each, and hopefully much less, by the year 2020. [17.12–13] 1.84–86 
- 45** To achieve the minimization point objective of a global maximum of no more than 2,000 warheads, with the nuclear-armed states other than the U.S. and Russia having no more than 1,000 between them, the highest priority need is for all nuclear-armed states to explicitly commit not to increase the number of their nuclear weapons, and such declarations should be sought from them as soon as possible. [17.15–16] 1.54–103 
- 46** To prepare the ground for multilateral disarmament negotiations, strategic dialogues should be initiated by all the nuclear-armed states with each other, and systematic and substantial national studies conducted of all the issues – including missile defence, conventional imbalances and disarmament verification – that will arise at all stages of the process. [17.17–19, 22–24] 1.88–94 
- 47** Consideration should be given to the Conference on Disarmament in Geneva as an appropriate forum for initial consultations, on a formal or informal basis, between all the nuclear-armed states, given the need, if the multilateral disarmament process is to advance, for there to be early agreement on an appropriate negotiating process. [7.9; 17.20–21] 1.87 
- 48** To facilitate future verification processes, in the credibility of which all nuclear-armed states will have a mutual interest, “nuclear archaeology” steps should be taken now by them to ensure that all relevant records are identified, secured and preserved, and relevant measurements and samples are taken. [17.25–26] 1.52–53 







On Nuclear Doctrine: No First Use, Extended Deterrence, and Negative Security Assurances



- 49** Pending the ultimate elimination of nuclear weapons, every nuclear-armed state should make an unequivocal “no first use” declaration, committing itself to not using nuclear weapons either preventively or pre-emptively against any possible nuclear adversary, keeping them available only for use, or threat of use, by way of retaliation following a nuclear strike against itself or its allies. [17.28] 1.122–24 
- 50** If not prepared at this stage to make such a declaration, every nuclear-armed state should at least accept the principle that the sole purpose of possessing nuclear weapons – until such time as they can be eliminated completely – is to deter others from using such weapons against that state or its allies. [7.10; 17.28–32] 1.104–24 
- 51** The allies in question – those presently benefiting from extended deterrence – should be given firm assurances that they will not be exposed to unacceptable risk from other sources, including especially biological and chemical weapons. In this context, continuing strong efforts should be made to promote universal adherence to the Biological and Toxin Weapons Convention and the Chemical Weapons Convention, and to develop more effective ways of ensuring compliance with the former. [17.29] 1.125–35 
- 52** It is particularly important that at least a “sole purpose” statement be made in the U.S. Nuclear Posture Review due for publication early in 2010, placing pressure as this would on other nuclear-armed states to be more forthcoming, and undermining “double standards” arguments at the 2010 NPT Review Conference. [17.32] 1.110–14 
- 53** New and unequivocal negative security assurances (NSAs) should be given by all the nuclear-armed states, supported by binding Security Council resolution, that they will not use nuclear weapons against non-nuclear weapon states. The only qualification should be that the assurance would not extend to a state determined by the Security Council to be in non-compliance with the NPT to so material an extent as to justify the non-application of any NSA. [17.33–39] 1.136–46 
- 54** All NPT nuclear-weapon state members should sign and ratify the protocols for all the Nuclear Weapon Free Zones, and the other nuclear-armed states (so long as they remain outside the NPT) should issue stand-alone negative security assurances for each of them. [16.16] 1.143
2.124-42 



On Nuclear Force Posture: Launch Alert Status and Transparency






- 55** The basic objective is to achieve changes to deployment as soon as possible which ensure that, while remaining demonstrably survivable to a disarming first strike, nuclear forces are not instantly useable. Stability should be maximized by deployments and launch alert status being transparent. [7.12–15; 17.40–50] 1.147–74 
- 56** It is crucial that ways be found to lengthen the decision-making fuse for the launch of any nuclear weapons, and in particular – while recognizing the difficulty and complexity of the negotiating process involved between the U.S. and Russia – that weapons be taken off launch-on-warning alert as soon as possible. [17.43] 1.153–74 
- 57** In order to achieve strategic dialogues capable of making real progress on disarmament, maximum possible transparency in both nuclear doctrine and force postures should be offered by all nuclear-armed states. [17.44] 1.36–45 
- 58** A relaxation of Israel’s policy of complete opacity would be helpful in this respect, but continued unwillingness to do so should not inhibit its engagement in multilateral disarmament negotiations (given that nuclear disarmament can be defined as a process of taking unsafeguarded fissile materials and putting them under international safeguards). [17.45–50] 1.37 1.121 

On North Korea and Iran


- 59** Continuing efforts should be made, within the framework of the Six-Party Talks, to achieve a satisfactory negotiated solution of the problem of North Korea’s overt pursuit of a nuclear weapons program, involving verifiable denuclearization and resumed commitment to the NPT in return for security guarantees and economic assistance. [17.52–56] 1.95–103 
- 60** Continuing efforts should be made by the P5+1, Security Council and IAEA member states to achieve a satisfactory negotiated resolution of the issue of Iran’s nuclear capability and intentions, whereby any retention of any element of its enrichment program would be accompanied by a very intrusive inspection and verification regime, giving the international community confidence that Iran neither has nor is seeking nuclear weapons. [17.57–60] 2.70–82 







On Parallel Security Issues: Missiles, Space, Biological and Conventional Weapons

- 61** The issue of anti-ballistic missile (ABM) systems should be revisited, with a view to allowing the further development of theatre ballistic missile defence systems, including potential joint operations in areas of mutual concern, but setting severe limits on strategic ballistic missile defences. It should be recognized that while, in a world without nuclear weapons, strategic missile defences could play an important stabilizing role as an insurance policy against potential cheaters, they now constitute a serious impediment to both bilateral and multilateral nuclear disarmament negotiations. [18.28–30; see also 2.30–34, 17.18] 1.175–92 
- 62** International efforts to curb missile proliferation should continue, but continued failure to multilateralize the INF should not be used as an excuse for either present party to withdraw from it. [2.35–37] 2.157–67 
- 63** Ongoing attempts to prevent an arms race in outer space (PAROS) at the Geneva Conference on Disarmament, and work at the Vienna-based UN Committee on the Peaceful Uses of Outer Space, should be strongly supported. [18.31] 1.193–98 
- 64** Continuing strong efforts should be made to promote universal adherence to the Biological and Toxin Weapons Convention and the Chemical Weapons Convention, and to develop more effective ways of defending against potential biological attacks, including – for all its difficulties – building a workable Convention verification regime. [17.29; 18.32–33] 1.199–201 
- 65** The issue of conventional arms imbalances, both quantitative and qualitative, between the nuclear-armed states, and in particular the relative scale of U.S. capability, needs to be seriously addressed if it is not to become a significant impediment to future bilateral and multilateral nuclear disarmament negotiations, including by revisiting matters covered in the Treaty on Conventional Armed Forces in Europe (CFE). The development of more cooperative approaches to conflict prevention and resolution may well prove more productive in this context than focusing entirely on arms limitation measures. [18.34–36] 1.202–14 




On Action Agendas: Short, Medium and Longer Term

- 66** The Short Term Action Agenda, for the period between now and 2012 – and including the 2010 NPT Review Conference – should focus on the issues we identify in Box 17–1. 1.22–31
2.30–32 






- 67** Consideration should be given to the possibility of the United Nations General Assembly holding a Special Session on Disarmament late in 2012, as a way of benchmarking the achievements of the short term and defining the way forward. Any decision should be deferred until mid-2010, to allow for reflection on the outcome of the 2010 Review Conference, and whether enough momentum is building to justify the resources and effort involved. [17.2-3] 1.30-31 
- 68** The Medium Term Action Agenda, for the period between 2012 and 2025, should focus on the issues we identify in Box 18-1. 1.22-31 
- 69** The Longer Term Action Agenda, for the period beyond 2025, should focus on establishing the conditions we identify in Box 19-1. 1.22-31 
- 70** Given that questions of cost-burden sharing are likely to arise as disarmament momentum builds over the longer term, it may be helpful for interested states to commission a detailed study on the calculation of disarmament and non-proliferation costs and possible ways of funding them. [18.26-27] 1.30-31 

On Mobilizing and Sustaining Political Will

- 71** Sustained campaigning is needed, through both the traditional and new media and direct advocacy, to better inform policy-makers and those who influence them about nuclear disarmament and non-proliferation issues. Capable non-governmental organizations should be appropriately supported by governments and philanthropic foundations to the extent necessary to enable them to perform this role effectively. [20.7-10] 1.219-24 
- 72** There should be a major renewed emphasis on formal education and training about nuclear disarmament and related issues in schools and universities, focusing on the history of nuclear weapons, the risks and threats involved in their continued deployment and proliferation, and possible ways forward. An associated need is for more specialized courses on nuclear-related issues – from the scientific and technical to the strategic policy and legal – in universities and diplomatic-training and related institutions. [20.11-12] 1.215-18 
- 73** Work should commence now on further refining and developing the concepts in the model Nuclear Weapons Convention now in circulation, making its provisions as workable and realistic as possible, and building support for them, with the objective of having a fully-worked through draft available to inform and guide multilateral disarmament negotiations as they gain momentum. Interested governments should support with appropriate resources the further development of the NWC. [20.38-44] 1.225-32 



- 74** To help sustain political will over time, a regular “report card” should be published in which a distinguished international panel, with appropriately professional and broad-based research support, would evaluate the performance of both nuclear-armed and non-nuclear-armed states against the action agendas identified in this report. [20.49–50]
- This State of Play Report published in 2013 
- 75** Consideration should be given to the establishment of a new “Global Centre on Nuclear Non-proliferation and Disarmament” to act as a focal point and clearing house for the work being done on nuclear non-proliferation and disarmament issues by many different institutions and organizations in many different countries, to provide research and advocacy support for both like-minded governments on the one hand, and civil society organizations on the other, and to prepare the “report card” described above. [20.53]
- CNND established in Canberra in 2011 
- 76** Such a centre might be constructed to perform functions at two levels:
- CNND structure accords with recommendation 
- (a) a base of full time research and advocacy professionals, drawing directly on the resources of a wide international network of well-established associated research centres; and
 - (b) a superstructure, in the form of a governing or advisory board drawn from distinguished global figures of wide-ranging experience, giving their imprimatur as appropriate to the centre’s published reports, policy initiatives and campaigns. [20.51–54]



