UNIDIR

UNITED NATIONS

UNITED NATIONS INSTITUTE FOR DISARMAMENT RESEARCH

Global Nuclear Security
Building Greater Accountability and Cooperation

Pavel Podvig

UNIDIR/2011/9

Global Nuclear Security

Building Greater Accountability and Cooperation

Pavel Podvig

UNIDIR
United Nations Institute for Disarmament Research
Geneva, Switzerland

UNITED NATIONS

New York and Geneva, 2011

About the cover

In October 2010, the US National Nuclear Safety Administration (NNSA) announced the removal of more than 450kg (more than 1,000lbs) of Russian-origin high-enriched uranium (HEU) spent fuel from Poland. The nuclear material was sent back to Russia in a series of five shipments over 12 months.

Here, HEU is awaiting secure transportation by rail.

Image courtesy of the National Nuclear Safety Administration.

NOTE

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

*
* *

The views expressed in this publication are the sole responsibility of the author. They do not necessarily reflect the views or opinions of the United Nations, UNIDIR, its staff members or sponsors.

UNIDIR/2011/9

UNITED NATIONS PUBLICATIONS

The United Nations Institute for Disarmament Research (UNIDIR)—an autonomous institute within the United Nations—conducts research on disarmament and security. UNIDIR is based in Geneva, Switzerland, the centre for bilateral and multilateral disarmament and non-proliferation negotiations, and home of the Conference on Disarmament. The Institute explores current issues pertaining to the variety of existing and future armaments, as well as global diplomacy and local tensions and conflicts. Working with researchers, diplomats, government officials, NGOs and other institutions since 1980, UNIDIR acts as a bridge between the research community and governments. UNIDIR's activities are funded by contributions from governments and donor foundations.

www.unidir.org

CONTENTS

FOREWORD

The first Nuclear Security Summit, which brought together heads of states and high-level delegations from 47 states in Washington DC in April 2010, was an important milestone in strengthening the international nuclear security regime. The Summit brought highest-level political attention to the issues of preventing nuclear terrorism and securing nuclear materials and facilities. Participants at the Summit made a number of specific commitments towards these goals. The follow-on Summit that will be held in Seoul in March 2012 will provide an important opportunity to build on the success of the Washington meeting by advancing the nuclear security agenda and taking actions to further strengthen the commitment of the international community to confront the threat of nuclear terrorism.

This study provides an overview of the international agreements, programmes and institutional arrangements that constitute the core of the existing international nuclear security regime. It demonstrates that despite the progress made by the Nuclear Security Summit there remain significant challenges to securing nuclear materials and to preventing nuclear terrorist attacks that will require multilateral action.

The large amounts of weapon-usable nuclear materials that have been produced worldwide will present a constant security risk for many years to come. Although the Russian Federation and the United States have made some progress towards eliminating their military stocks, new nuclear material—military and civilian—is still being produced and substantial amounts of plutonium and high-enriched uranium remain in use in a range of applications. The existing international conventions do not impose strong obligations regarding security of all categories of material and do not require states to adhere to minimum protection standards or to report on the implementation of nuclear security measures. Some of these issues could be addressed by strengthening the existing agreements, in particular by bringing into force the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material and the International Convention for the Suppression of Acts of Nuclear Terrorism. Other issues, such as ensuring security of military material or creating a system that would provide transparency and accountability in nuclear security, will be much harder to deal with.

In addition to legal obligations, an efficient nuclear security regime requires the development of institutions that will provide states with technical advice and assistance and facilitate the exchange of information and best practices. The International Atomic Energy Agency will undoubtedly remain the main source of technical and legal expertise on virtually all aspects of nuclear security. It is, however, focused mainly on civilian nuclear material. As this study demonstrates, multinational cooperation efforts, modelled after the successful Cooperative Threat Reduction Program or the G8 Global Partnership, could provide substantial flexibility in addressing urgent nuclear security problems in the areas that are out of reach of the Agency.

This study is part of the ongoing UNIDIR project on nuclear security that aims to provide policymakers with analysis of challenges and opportunities in the field. We hope that it will help practitioners and policy experts in their efforts to strengthen the international regime to combat the threat of nuclear terrorism.

Theresa Hitchens
Director
UNIDIR

ABOUT THE AUTHOR

Pavel Podvig is an independent analyst based in Geneva, where he runs the research project "Russian Nuclear Forces". He started his work on arms control at the Center for Arms Control Studies at the Moscow Institute of Physics and Technology (MIPT), which was the first independent research organization in Russia dedicated to the analysis of technical issues of disarmament and non-proliferation. Podvig led the Center for Arms Control Studies project that produced the book *Russian Strategic Nuclear Forces* (MIT Press, 2001). In recognition of his work in Russia, the American Physical Society awarded him the Leo Szilard Lectureship Award of 2008 (with Anatoli Diakov). Podvig worked with the Program on Science and Global Security at Princeton University, the Security Studies Program at the Massachusetts Institute of Technology and the Center for International Security and Cooperation at Stanford University. His current research focuses on the Russian strategic forces and nuclear weapons complex, as well as technical and political aspects of nuclear non-proliferation, disarmament, missile defence and the US–Russian arms control process. Podvig is a member of the International Panel on Fissile Materials. He has a physics degree from MIPT and a PhD in political science from the Moscow Institute of World Economy and International Relations.

ACKNOWLEDGEMENTS

The author would like to thank the staff of UNIDIR for their support and help during the work on this project.

Special thanks to the Government of the Republic of Korea for funding this project.

INTRODUCTION

The international nuclear security regime, which provides the legal and institutional framework for the protection of nuclear material and nuclear facilities, is increasingly recognized as one of the key elements of the international security system. Nuclear security is particularly important in today's international security environment, which is characterized by increased interdependence of states in the globalized world and by the growing threat from subnational groups and terrorist networks that could exploit the benefits of greater openness and connectivity of the international community for criminal purposes. While being at the centre of attention since the early days of the nuclear age, nuclear security began to gain prominence during the 1990s, when most of the attention was directed at protecting material and facilities of the former Soviet Union. This task gained an additional urgency after the September 2001 attacks on the United States of America, which clearly demonstrated that terrorist groups have the determination to inflict massive casualties and seek the means to do so. Indeed, it was reported that Al-Qaida had expressed interest in acquiring access to nuclear materials and expertise, albeit without result. The 2003 discovery of the illicit nuclear trade and trafficking network run by A.Q. Khan proved that control over the flow of technology, information and material is becoming increasingly difficult, emphasizing the importance of establishing firm control over nuclear material at the point of origin.

Protection of nuclear material is indeed one of the most effective ways of preventing the catastrophic consequences that could result from terrorists gaining access to a nuclear explosive device. Producing weapon-grade material is the single most difficult part of the process of building a nuclear explosive device and the only one that is out of reach of the capabilities of a subnational group. On the other hand, once the material is acquired, a terrorist group would almost certainly be capable of producing a device that could deliver a sizable nuclear yield. The destructive consequences of a terrorist nuclear explosion used against any country are difficult to overestimate, especially if we take into account the serious long-term economic and social disruption that would likely be produced by an attack of this kind.

One of the most serious challenges facing nuclear security efforts is the striking contrast between the amount of material that would be required to produce a nuclear explosive device and the quantities of material that have to be secured—several kilograms and several hundred tonnes respectively. The International Atomic Energy Agency (IAEA) in its safeguard activities assumes that the significant quantity of plutonium and uranium-235 as 8kg and 25kg respectively, providing a reference point for an estimate of the amount of material that is required to build a weapon.[1] At the same time, the global stock of fissile material is estimated to be almost 1,475 tonnes of high-enriched uranium (HEU) and 485 tonnes of separated plutonium, which is enough for producing more than a hundred thousand weapons.[2] Accounting for and protecting all this material is clearly a serious challenge.

About 98% of this material is held by nuclear-weapon states, with the Russian Federation and the United States holding the largest share of the stockpile—they had 770 and 607 tonnes of HEU, and 128 and 99.5 tonnes of weapon-grade plutonium, respectively, in 2010.[3] Other nuclear-weapon states have considerably smaller stocks—the amount of HEU in France, the United Kingdom and China is estimated to be 31, 21.2 and 16 tonnes respectively. Weapon-grade plutonium holdings of these states are estimated to be 6, 7.6 and 1.8 tonnes. Also, France and the United Kingdom have rather large stocks of separated civilian plutonium, reported to be about 56 and 84.4 tonnes at the end of 2009. The weapon states outside of the Nuclear Non-Proliferation Treaty (NPT)—India, Pakistan, Israel and North Korea—have even smaller stocks. The amounts of HEU in these countries are estimated to be 0.4, 2.1 and 0.1 tonnes respectively (North Korea does not appear to have significant amounts of HEU at the moment), while the amounts of plutonium are 0.5, 0.1, 0.65 and 0.035 tonnes. Non-nuclear-weapon states possess about 7 tonnes of uranium-235 in HEU and about 55 tonnes of separated civilian plutonium.[4]

Nuclear-weapon states party to the NPT discontinued production of fissile materials for military purposes, while the weapon states outside of the NPT are believed to produce weapon materials. Russia and the United States declared some of their military HEU and plutonium excess to national security purposes and are implementing programmes to eliminate this excess material by blending down the HEU and burning plutonium in power reactors. As of 2010, the two states have blended down more than

540 tonnes of HEU. More than 200 tonnes of HEU and at least 88 tonnes of plutonium are awaiting elimination.[5]

As these numbers show, despite the efforts to eliminate the HEU and plutonium that was produced during the Cold War, large quantities of weapon-grade material remain in use. In addition to the material in weapons, significant amounts of HEU are still being used in naval and research reactors, and large amounts of separated plutonium produced by civilian nuclear programmes are routinely processed and transported as part of an effort to use it in power reactors. No state has yet demonstrated a practical and reliable way to eliminate plutonium stocks, and indeed a number of states plan to expand the use of plutonium in their civilian programmes, which would lead to even more widespread presence of the material. Moreover, even the successful weapon material elimination efforts, such as the US–Russian Megatons to Megawatts programme that blends down Russian military-origin HEU to produce low-enriched uranium fuel for power reactors, carry substantial risks, since they involve regular transportation of large quantities of HEU.[6]

Security of nuclear facilities is also recognized as an important problem that needs international attention. Nuclear safety accidents at nuclear power plants and other nuclear facilities have demonstrated that the environmental and economic impact of these accidents can be severe. So far, none of the accidents was caused by sabotage or a terrorist attack, but it is possible that the damage to a nuclear reactor or a fuel-cycle facility caused by a malicious act would be comparable to or exceed that caused by the force of nature or an error. For example, in the recent safety accident at the Fukushima nuclear power plant in Japan, it was the loss of power supply that caused most of the damage to the reactors, leading to a serious crisis the full consequences of which are still difficult to estimate. While in this particular case the power supply was destroyed by a tsunami, it is not inconceivable that the same effect could be produced by a deliberate attack. The experience of terrorist attacks on the United States in September 2001 suggests that the resources that would be needed for an attack on a nuclear facility may well be within reach of an organized and well-funded terrorist group.

Although nuclear weapon-usable materials and nuclear facilities present the most significant security risk, the potential of non-weapon radioactive materials to cause damage and lead to social and economic disruption

should also be taken into account, especially since these materials are used in a variety of applications and the accounting for all radioactive sources is an extremely difficult task. The relative accessibility of radiological sources means that the probability of their use in a terrorist attack is likely to be higher than that of weapon material, even though the consequences of such an attack would not be as devastating.

Protection of nuclear material and facilities involves a broad range of activities on the international level as well as in individual countries. It should include implementation of proper material control and accounting measures, coordination of efforts of law enforcement and intelligence agencies in conducting accurate threat assessment, implementation of robust physical protection systems for material and facilities, establishment of an authoritative and independent regulatory body, and fostering a nuclear security culture in all organizations that deal with nuclear materials. International law recognizes that each state has responsibility for implementing these measures and for providing adequate protection for the material in its possession. At the same time, the international community has established a set of international arrangements that help to create and maintain the international nuclear security regime. The legal instruments that constitute the core of this regime are the Convention on the Physical Protection of Nuclear Material, the International Convention for the Suppression of Acts of Nuclear Terrorism, UN Security Council resolutions 1373 and 1540, and the Global Initiative to Combat Nuclear Terrorism. The key international programmes that work on securing nuclear material and facilities are those run by the IAEA, the Cooperative Threat Reduction programme, the Global Threat Reduction Initiative and the Group of Eight (G8) Global Partnership.

Although the current arrangements provide a solid basis for dealing with nuclear security problems, the system needs to be constantly updated to reflect the changing nature of the threat and to take advantage of the opportunities provided by international cooperation. One of the major initiatives designed to facilitate this process was launched at the Nuclear Security Summit held in Washington in April 2010. The summit made a strong commitment to strengthening the nuclear security regime and to elevating nuclear security to one of the highest priorities on the international security agenda. The Nuclear Security Summit process will continue with the second meeting that will be held in Seoul in March 2012, which is expected to build on the progress that was made

at Washington. This study presents an overview of the key elements of the current international nuclear security regime and discusses proposals aimed at strengthening its existing accountability arrangements as well as the challenges of expanding the scope of the regime and creating an institutional framework for global nuclear security efforts.

KEY ELEMENTS OF THE CURRENT NUCLEAR SECURITY REGIME

Convention on the Physical Protection of Nuclear Material

The Convention on the Physical Protection of Nuclear Material is one the key international agreements in the area of nuclear security. An agreement of this kind that would regulate physical security of sensitive nuclear materials was first proposed by the United States in 1974. This proposal was endorsed by the NPT Review Conference in 1975, opening the way for negotiations, which began in 1977. The text of the Convention was adopted at a meeting of government representatives in Vienna in October 1979 and it was opened for signatures in March 1980. The Convention entered into force in February 1987, after the twenty-first state deposited its instrument of ratification. As of October 2010, 145 states have ratified the Convention. A meeting of the states parties held in July 2005 adopted an Amendment that expanded the Convention's scope as discussed below. The Amendment, however, has not yet entered into force.

The goal of the Convention is to prevent the theft or unauthorized use of nuclear material and, when amended, sabotage of nuclear facilities. In order to achieve the original goals of the Convention, member states assumed obligations to provide adequate physical protection of nuclear material that is used for peaceful purposes during its use, storage and transport. Key provisions of the Convention cover international transport of nuclear material, but some provisions also apply to domestic transport as well.[7] It should be noted that the Convention does not explicitly require states to provide physical security for their military nuclear material. The Convention also establishes a list of offenses that involve nuclear materials. Member states undertake to make these offenses punishable and to submit offenders to the international system of extradition.

The central provision of the Convention requires states parties to ensure that any nuclear material that is used for peaceful purposes is protected

during international transport or transit according to the standards established in annex I of the Convention, which is an integral part of the agreement.[8] The second annex lists categories of material that should guide the states in establishing the appropriate level of physical security. Nuclear materials that are covered by the Convention are those that contain unirradiated plutonium and uranium enriched in uranium-235 or uranium-233. Irradiated fuel that contains these isotopes also falls into the category of materials covered by the Convention.[9] Depending on the overall amount and type of nuclear material in a shipment, it is classified into one of the three categories. Category I material is provided maximum protection that must include, among other measures, physical barriers, restricted access, assurances of personnel trustworthiness and close communication with an appropriate response force. Category III material, the least sensitive category provided protection, must be stored in facilities with restricted access and any international transport of this material should requires coordination between the sender and recipient of the shipment.[10]

The Convention also requires that no state should initiate a transfer of nuclear material to or from another state without receiving assurances that the material will be appropriately protected during transport and at the source or destination. Similar requirements are applied to the material in transit.[11]

To facilitate coordination of efforts in the area of physical security, the Convention requires member states to designate a national authority that has responsibility for physical protection of nuclear materials and to notify the IAEA and member states of the agency that would serve as a point of contact in cases when coordination of action regarding the material is required. Article 5 of the Convention establishes a basic framework for member states to effectively coordinate their actions to prevent or to respond to theft of nuclear material. In the event of loss of nuclear material or a threat of such loss, a state could provide other parties and international organizations with information about the incident and ask for assistance, if necessary. Other states could provide that assistance, if so requested. To facilitate cooperation in recovery of nuclear material or in responding to various threats, the Convention protects confidentiality of the information its members might exchange during these operations.

Another important element of the cooperation framework established by the Convention is the mechanism for exchange of information on physical security. This could include information on the design of physical protection measures, their implementation and improvement. This exchange can be done by member states directly or through international cooperation. Although the Convention does not explicitly mention the IAEA, the Agency plays the key role in these exchanges by providing information and guidance on physical security. This programme is described in the section below dealing with IAEA activities.

As noted above, the obligation to implement physical protection measures contained in the Convention is applied only to nuclear material that is used for peaceful purposes that is in international transport or in storage that is associated with such transport. This excludes the material in domestic use, storage or transport as well as all military-related material. Regarding domestic use, storage and transport of nuclear material, the Convention specifies that the key requirements concerning the minimal protection levels, as well as categorization of the nuclear material, do not apply there.[12] In addition, the Convention emphasizes that it covers only material that is used for peaceful purposes, which means that transfers of military-related material, whether international or domestic, is beyond its scope.[13] Another limitation of the original Convention that was recognized by the member states was the lack of commitments to protect nuclear facilities from sabotage.

Along with the limits of the scope of the Convention, it also lacks a mechanism that would set a common standard for physical protection measures and allow member states to report on implementation of the measures required by the Convention. Although the Convention provides a set of general obligations and guidelines, implementation of specific physical protection measures is left to individual members. These measures could follow the guidance provided by IAEA in its documents Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225) and Physical Protection Objectives and Fundamental Principles.[14] However, member states have no obligation to follow the IAEA recommendations or implement them in full. Also, each state could ask IAEA for assistance in designing its national physical protection system or in conducting an assessment of already implemented measures, but there is no mechanism that would allow the IAEA or individual members of the Convention to initiate such a review.

In November 1999, the Director General of the IAEA convened an informal meeting of experts that was asked to consider the need and scope of possible revisions of the Convention. The process initiated by that meeting produced a set of recommendations intended to strengthen the physical security of nuclear materials. This work, which was completed in May 2001, formed the basis for the Amendment to the Convention.[15]

The expert group recommended expanding the scope of the Convention to cover domestic use, storage and transport and to the protection of nuclear materials and facilities from sabotage. It also suggested incorporating the IAEA Physical Protection Objectives and Principles into the text of the Convention and adding relevant definitions.

It is equally important to consider the subjects that the expert meeting agreed should not be included in the Convention. The group recommended against including a direct obligation to implement the requirements of INFCIRC/225. It also rejected proposals to establish mandatory reporting requirements, a peer review mechanism or mandatory oversight of the implementation of physical protection. Military materials and facilities were also left outside of the scope of the Convention.[16]

These recommendations formed the basis for further work on the Amendment to the Convention, which was considered and approved at the Amendment Conference held in July 2005. The approved Amendment included several important changes to the Convention. First, it extended the scope of the Convention to cover domestic use, storage and transport of nuclear material and to nuclear facilities used for peaceful purposes. However, the Convention still does not require states to implement for domestic materials a specific level of protection as described in the annexes.[17] Second, while leaving responsibility for implementation of the physical protection measures to the member states, the Amendment emphasized the importance of establishing, implementing and maintaining an effective physical protection regime.[18] It also includes a direct requirement to establish or designate a competent authority responsible for implementation of the key physical protection provisions. Finally, the Amendment integrated the Convention the Fundamental Principles of Physical Protection of Nuclear Material and Nuclear Facilities along with the obligation to apply these principles to the extent it is "reasonable and practicable."[19]

The Amendment Conference agreed with the recommendation to leave military material and facilities outside of the scope of the Convention—the amended text would explicitly exclude this material.[20] Also, the approved amendments do not contain provisions that would strengthen the reporting and peer review mechanisms of the physical protection regime.[21]

The agreed text of the Amendment was sent to the member states in July 2005. For it to enter into force, it requires ratification by the two thirds of the states parties of the Convention. As of October 2011, however, only 49 states have submitted their documents of approval, so the Amendment has not yet entered into force.

International Convention for the Suppression of Acts of Nuclear Terrorism

The goal of the International Convention for the Suppression of Acts of Nuclear Terrorism is to establish a legal regime that would help prevent the use of nuclear materials for terrorist purposes. Development of the Convention began in the 1990s as a reaction to a growing realization of dangers associated with the existence of large stockpiles of nuclear material that were produced during the Cold War. The international arrangements that existed at the time, namely the Convention on the Physical Protection of Nuclear Material, did not include military material in their scope, leaving a gap in the international legal regime that regulates nuclear security issues.

Practical work on the Convention began after UN General Assembly resolution 51/210 of 17 September 1996 created an ad hoc committee that was asked to elaborate on the issue.[22] The committee developed a draft of the Convention that was based on the text presented by Russia in 1998. This work was completed by 2005, when the Convention was opened for signature. By 2011, the Convention had been signed by 115 states, 77 of which ratified the agreement. The Convention entered into force on 7 July 2007.

The key obligation of the Convention is to establish legal responsibility under national laws for acts of nuclear terrorism and to create an international legal framework that would ensure prosecution of such activities. Also, the Convention creates an obligation to undertake certain measures aimed at preventing acts of nuclear terrorism, which in practice

extends the requirement to provide physical protection of nuclear materials and facilities beyond materials in peaceful use, covered by the Physical Protection Convention.

In its definition of nuclear material, the Convention follows the definition adopted by the Physical Protection Convention—it covers plutonium and uranium enriched in isotopes uranium-235 or uranium-233. It also introduces a definition of radioactive material that includes nuclear material and covers other categories of material that have radiological properties that could cause death, serious injury or substantial damage to property or the environment.[23] The Convention also provides a definition of "device", which includes not only a nuclear explosive device, but a radioactive material dispersal device as well. The two latter definitions allow the Convention to cover a broad range of materials and devices that could be used to commit acts of terrorism.

From the point of view of nuclear security, one of the most important obligations that is imposed on states by the Convention is contained in article 8, which requires the member states "to adopt appropriate measures to ensure the protection of radioactive material, taking into account relevant recommendations and functions of the International Atomic Energy Agency". Unlike the requirement of the Physical Protection Convention, which explicitly specifies that the states only assume an obligation to apply physical protection measures to nuclear materials used for peaceful purposes during international transport, the Convention for the Suppression of Acts of Nuclear Terrorism extends this obligation to all nuclear material and facilities, regardless of their peaceful or military nature or whether the materials are in transport, and to other radioactive materials as well. Although the Convention does not provide a mechanism that would ensure compliance with this provision, including this requirement was nevertheless a significant development, especially given that during the discussions of amendments to the Physical Protection Convention states were reluctant to extend their commitments to military facilities and material.

The Convention also explicitly introduced a reference to the physical protection standards developed by the IAEA, creating a mechanism that could potentially help develop a common security standard and strengthen nuclear security arrangements in response to new emerging threats.

In order to facilitate prevention and prosecution of acts of international nuclear terrorism, the Convention requires member states to exchange information on the issues relevant to these goals. In particular, member states undertake an obligation to transfer to other parties any information that they may have of acts of international nuclear terrorism or of preparation of such acts. This provision also requires member states to notify the Secretary-General of the United Nations of the competent authorities that would serve as points of contacts in exchanges of this kind. Information about these contact points is then transmitted to all parties and to the IAEA.[24]

The Convention does not state explicitly that the IAEA could play a role in any of the information exchanges. Neither does it assign the IAEA a role in coordinating a response to acts of nuclear terrorism or in preventing such acts. It implicitly allows member states to include the IAEA in information exchanges by specifying that they could share information with international organizations "where appropriate".[25] Also, in those cases when states have seized radioactive material in the context of dealing with an act of nuclear terrorism, it could request the IAEA for assistance and then has to inform the IAEA about disposition of this material. The IAEA then has to transmit this information to other states parties.[26]

According to article 3 of the Convention, its scope is limited to offenses that are committed in an international context, that is, it does not apply to acts committed within a single state or to offenses in which the offender and victims are nationals of one state. This, however, applies primarily to the determination of appropriate jurisdiction over persons who commit offenses that the Convention considers acts of nuclear terrorism. The obligations of member states to provide physical protection of all radioactive materials are not affected by this provision.

UN Security Council resolution 1373

The UN Security Council adopted resolution 1373 on 28 September 2001, shortly after the terrorist attack on the United States of 11 September 2001. The main goal of the resolution was to adopt a number of measures to combat international terrorism. Most of these measures are directed at suppressing and criminalizing the financing of terrorism and at preventing support of terrorist activities. Regarding nuclear security, the resolution called upon all states to intensify exchange of information, including

information on traffic in explosives and sensitive materials and on the threat posed by the possession of weapons of mass destruction (WMD) by terrorist groups. The resolution also calls upon all states to participate through bilateral and multilateral arrangements in preventing acts of terrorism.[27]

Resolution 1373 did not impose any additional obligations regarding nuclear security or protection of radioactive materials. However, the resolution created a mechanism that allowed the United Nations to monitor progress in these areas and to issue recommendations to states regarding cooperation on a number of issues related to nuclear security. The resolution established the Counter-Terrorism Committee of the Security Council, which is responsible for strengthening the ability of UN Member States to work towards the goals of the resolution. The Committee works on a permanent basis and its activities include country visits and country reports, technical assistance, and help with sharing of best practices. The Committee holds regular meetings and issues annual reports that provide an update on the status of implementation of resolution 1373.

The annual reports are based on country visits carried out by members of the Committee. They provide an assessment of the status of various international agreements relevant to counter-terrorism activity. In particular, the reports look into the status of the Convention on the Physical Protection of Nuclear Material and its 2005 Amendment and of the International Convention for the Suppression of Acts of Nuclear Terrorism.[28] It should be noted that the Committee does not seem to have the authority or the capacity to assess the effectiveness of nuclear security measures carried out by individual states or to verify compliance of member states with regulations in this area. Nevertheless, the work of the Committee represents an example of an accountability mechanism the experience could be useful in other areas.

UN Security Council resolution 1540

Adoption of resolution 1540 was a response of the international community to the growing threat of proliferation of WMD by non-state actors. The extent of this threat was demonstrated by the discovery of the A.Q. Khan nuclear proliferation network in 2003. The network is believed to be responsible for supplying nuclear materials, equipment and expertise to a number of states that sought to develop covert nuclear weapon

programmes. The resolution, which was passed by the UN Security Council on 28 April 2004, was designed to give the international community the tools to combat proliferation activities of non-state actors.

The central provisions of resolution 1540 include obligations of Member States to deny support to national groups engaged in proliferation of WMD and to pass laws that criminalize such activities. The resolution also requires states to establish effective controls over WMD materials, which should include an appropriate accounting and control system, physical security measures, border controls and effective export control measures.[29] Also, states are required to report on the measures that they have taken to implement the resolution. Recognizing that some states may require assistance in implementing these measures, the resolution invited the states in a position to provide such assistance to help develop the legal and regulatory infrastructure necessary for the successful implementation of the resolution.[30]

The resolution created a Committee of the Security Council that received reports from individual states and reported on implementation of the resolution to the Security Council.[31] Initially, the Committee was created with a set term of two years, but in 2006, 2008 and then in 2011 the mandate of the Committee was extended to two, three and ten years respectively.[32] The Committee carries out its work by analysing the information on implementation of resolution 1540 submitted by Member States. In 2006, 2008 and 2011 the Committee submitted reports to the Security Council, which outlined the steps made by Member States to implement the resolution and suggested further measures to achieve its goals.[33] In 2009, the Committee completed a comprehensive review of the status of implementation of resolution 1540.[34]

The Committee is one of the few international mechanisms that allow the international community to monitor compliance with Member States' obligations to take measures to secure nuclear materials by providing adequate accounting and control and physical protection systems.[35] Reports submitted by states specify the status of legislation that regulates these issues. In most cases the reports contain information about specific laws and directives that apply to each area regulated by resolution 1540, which are then consolidated by the Committee in a standardized format. In the area of nuclear material accounting and control, the Committee asks states to submit information on specific measures to account for and to

secure production, use, storage and transport of nuclear materials. States are also asked to give specific information on regulations for physical protection of facilities, materials and transport, as well as on licensing of nuclear installations, entities and use of material. The Committee also requests and collects information on personnel reliability programmes. Finally, states report on their national regulatory authority and status of their agreements with IAEA, including safeguards agreements. In each category, a state provides detailed information about regulation of the activity itself as well as about enforcement of the regulation.[36]

While the Committee developed the format that is used for presenting information reported by states, the resolution does not require any specific format for a country report. Neither does it specify the accounting or physical security standards that should be applied to the material addressed by the resolution, to nuclear and other radioactive materials in particular. At the same time, the preamble of the resolution explicitly mentions the standards required by the Convention on the Physical Protection of Nuclear Materials and those recommended by the IAEA Code of Conduct on the Safety and Security of Radioactive Sources as examples of "effective measures to account for, secure and physically protect sensitive materials". This reference to the Physical Protection Convention and to the IAEA Code of Conduct could be interpreted as indicating that Member States should consider these standards in developing laws and regulations that cover these areas.

The reporting done by the Committee relies on the information provided by Member States as the Committee itself does not have the authority to independently verify accuracy of that information or adequacy of the measures that have been implemented, or to assess how the respective laws and regulations are enforced. Nevertheless, the information exchange mechanism created by resolution 1540 is an extremely important development, for the data collected by the Committee give a fairly accurate picture of the status of nuclear security legislation in a reporting state and help identify gaps in nuclear security regulations that the state should address. The Committee encourages Member States to identify areas that need improvement and to develop an action plan that outlines steps to strengthen their domestic legislation. The work of the international community on implementation of resolution 1540 has demonstrated a promising approach towards achieving greater transparency and

accountability in the area of non-proliferation of WMD and in the area of nuclear security in particular.

Global Initiative to Combat Nuclear Terrorism

The Global Initiative to Combat Nuclear Terrorism was launched by Russia and the United States at the 2006 G8 summit meeting in St. Petersburg.[37] The initiative is a partnership of states that made a commitment of working together on a number of shared nuclear security principles. These principles recognize the obligations under the existing international arrangements—the Convention on the Physical Protection of Nuclear Materials with the 2005 Amendment, the International Convention on the Suppression of Acts of Nuclear Terrorism and UN Security Council resolutions 1373 and 1540.

The Statement of Principles of the Initiative includes specific commitments of the member states. Among the most important commitments are the development of accounting, control and protection systems for nuclear and radiological materials, enhancement of security of nuclear facilities, improvement of detection capabilities to prevent illicit trafficking in nuclear and other materials, and development of mechanisms of information exchange and cooperation. The Statement also includes measures directed at denying terrorists access to financial and economic resources. Partners in the Initiative undertake to implement these measures on a voluntary basis.

In 2011, the Initiative included 82 partners, with the IAEA, the European Union, INTERPOL and the UN Office on Drugs and Crime participating as observers. Russia and the United States are co-chairing the initiative; Spain serves as Coordinator of the Implementation and Assessment Group.[38] The initiative conducts multilateral activities and exercises aimed at sharing best practices in order to strengthen states' ability to combat nuclear terrorism.

The Initiative does not impose any new obligations on its partners, but it does serve as a useful instrument of improving effectiveness of the existing nuclear security regime and facilitating information exchange among the participating states.

IAEA Nuclear Security Programme

The IAEA has been involved in nuclear security activity from the early 1970s, when it developed recommendations for the physical protection of nuclear material and actively participated in the drafting of the Convention on the Physical Protection of Nuclear Material. At that time it also offered member states a range of courses on physical protection. Subsequently, the Agency worked on updating its recommendations and guidelines and further developed its assistance and advisory programmes aimed at helping member states strengthen their nuclear security and physical protection programmes.

In 1997, the Agency established the Security of Material Programme to manage its activities in physical protection of nuclear and other radioactive material and its efforts to combat illicit trafficking in these materials.[39] Reflecting the growing importance of nuclear security issues, in 2002 the Agency transferred the Office of Physical Protection and Material Security from the Department of Safeguards to the newly created Department of Nuclear Safety and Security, where it became the Office of Nuclear Security.[40] The Office is responsible for planning, implementation and evaluation of all nuclear security activities of the Agency. It also manages the extrabudgetary Nuclear Security Fund, which consolidates voluntary contributions of member states to support these activities.

Establishment of the Office of Nuclear Security and of the Nuclear Security Fund were recommended to the IAEA Board by the first Nuclear Security Plan that was approved in March 2002.[41] In September 2005, the IAEA Board of Governors approved the plan for 2006–2009, and in August 2009 for 2010–2013, which is the IAEA Nuclear Security Plan that is currently in force.[42]

To provide better guidance to the states in their work on implementing nuclear security measures, in 2006 the IAEA started developing a series of publications known as Nuclear Security Guidelines.[43] This series includes several categories of documents—Nuclear Security Fundamentals that contain basic principles for implementing nuclear security and provide a basis for recommendations, Recommendations and Implementing Guides that provide detailed guidance on specific nuclear security measures and their implementation, and Technical Guidance that include reference manuals and training and service guides. Development of these documents

is done in close cooperation with member states and with participation of technical experts. To ensure proper vetting of these materials, the IAEA submits the documents to all member states for a 120-day review period prior to publication. Once completed, the Nuclear Security Guidelines will form a comprehensive guide on all aspect of nuclear security and physical protection.

Guidelines on Physical Protection of Nuclear Material and Nuclear Facilities

The IAEA has been involved in the nuclear security issues from the early days of its existence. In the 1970s, it took the initiative in developing physical protection recommendations and guidelines that were published as IAEA document INFCIRC/225, *Physical Protection of Nuclear Material*, in 1975. The current version of the document is INFCIRC/225/Rev.5, which was published in January 2011. This document is one of the central publications of the IAEA Nuclear Security Guidelines series described above.

IAEA recommendations are widely considered to be the international standards for the physical protection of nuclear material and facilities. The key international agreements that regulate issues of nuclear security refer to the IAEA guidelines as a reference for implementing physical security measures, even though they may not make these guidelines legally binding. Some agreements, for example those that IAEA concludes with states that receive technical assistance or some bilateral nuclear cooperation agreements, include implementation of the INFCIRC/225 measures as a condition of assistance.

According to INFCIRC/255/Rev.5, the objective of the nuclear security regime is "to protect persons, property, society, and environment from malicious acts involving nuclear material and other radioactive material".[44] The goal of physical protection, which is an essential component of the nuclear security regime, is to protect against theft or other unauthorized removal of nuclear material, locate and recover missing nuclear material, protect material and facilities against sabotage, and mitigate and minimize the radiological consequences of sabotage.[45] The document outlines 12 fundamental principles that should guide development of the physical security regime. It should be noted that these principles were included

in the Amendment to the Convention for the Protection of Nuclear Material.[46]

The first fundamental principle establishes that a state is fully responsible for establishment, implementation and maintenance of a physical protection regime.[47] Other principles detail this requirement—a state is responsible for development of a regulatory and legislative framework to govern physical protection, for appointment of a competent authority that will implement that framework, and for ensuring responsibility of license holders (operators or shippers) for implementing physical protection measures.[48]

Another important fundamental principle that should guide the development of the physical protection regime requires a state to use current evaluation of the threat as a basis for protection measures.[49] This requires a state to conduct a threat assessment and, if necessary, to define a design-basis threat that would be used to develop specific measures to protect nuclear materials and facilities against unauthorized removal or sabotage. Importantly, the guidelines require a state to establish a mechanism that will ensure that the competent authority responsible for physical protection has access to all information that is relevant to the threat assessment, requiring a state to design appropriate mechanisms for the sharing of intelligence and law enforcement data. Also, the guidelines directly instruct states to consider insiders in their threat assessments.

According to the fundamental principles, to manage the risk associated with unauthorized removal of nuclear material or sabotage of nuclear facilities, the nuclear security regime should rely on a graded approach and defence in depth.[50] The graded approach dictates that a state should provide a higher level of protection against the events that would result in more serious consequences. To facilitate implementation of this principle, the document provides a categorization of nuclear material along with the recommended level of protection for each category. Defence in depth requires implementation of several layers and methods of protection, which would rely on different technological or organizational solutions to ensure that a failure of one component does not undermine the effectiveness of the entire system.

A series of fundamental principles addresses the issue of sustainability of the nuclear security regime. These principles emphasize the importance of

security culture, quality assurance and confidentiality of information that describes security measures.[51]

Finally, the nuclear security regime should include contingency plans that would be activated in the event of unauthorized removal of nuclear material or sabotage of a nuclear facility or material.[52] These plans should be developed by all entities that deal with nuclear materials or operate nuclear facilities. These plans should be an integral part of the response plan developed by the state authority responsible for nuclear security.

Taken together, the fundamental principles provide a framework for development and implementation of specific nuclear security and physical protection measures. The Nuclear Security Guidelines provide detailed requirements for these measures as well.

The categorization of nuclear material suggested by the Guidelines is in agreement with the categorization provided in the Convention on the Physical Protection of Nuclear Material.[53] The only difference is in treatment of irradiated fuel—the Guidelines suggest that in domestic use, storage and transport, a state may have some flexibility in assigning a category to this material, while the Convention, which deals only with nuclear material in international transport, is more restrictive in that regard.

The description of physical protection measures that are required for each category of material in the Guidelines is also consistent with the requirements of the Physical Protection Convention, although it is much more detailed. The Guidelines describe requirements for limiting access to the material storage area, specific physical protection levels and requirements for contingency plans that should be applied for each category of material.

The Guidelines also include requirements for protection of nuclear facilities from sabotage. These measures do not have corresponding requirements in the original Physical Protection Convention or in the amended Convention, although the Amendment does require states to protect their nuclear facilities and nuclear material against sabotage. The Nuclear Security Guidelines describe measures that the state authority and facility operators should implement in order to protect the facilities and material and to mitigate potential radiological consequences of sabotage.

The Guidelines contain requirements for measures against unauthorized removal of nuclear material during transport. These are in agreement with the obligations regarding protection of materials in international transport that are imposed on states by the Physical Protection Convention, but they provide a much more detailed description of the measures that the state and the shipper should undertake to provide adequate security of transported nuclear material and to protect it from sabotage. The Guidelines also describe requirements for measures to locate and recover nuclear material in case of an unauthorized removal or to mitigate consequences of sabotage.

These principles and guidelines create a strong basis for the design and implementation of an effective nuclear security regime. Implementation and maintenance of these measures ensure compliance with the requirements of the Convention on the Physical Protection of Nuclear Material in its original form, which is currently in force, as well as with the Amendment to the Convention. The Guidelines, however, are not legally binding and states are not required to implement them in full to be in compliance with their obligations under the Physical Protection Convention or other international nuclear security agreements. Also, while the IAEA plays a leading role in the development of the Guidelines, it has no direct role in monitoring or enforcing compliance with the requirements.

IAEA Safeguards

One of the most important missions of the IAEA is the administering of safeguards that are designed "to ensure that special fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose".[54] This definition shows that the scope of IAEA safeguards is normally limited to the materials and equipment provided by the Agency. However, the Agency can also apply safeguards at the request of the parties as part of an international treaties or agreements. In the most important example, the IAEA manages the safeguard regime of the NPT, which requires all non-nuclear weapon states to reach an agreement with the IAEA that would allow the Agency to apply safeguards to their nuclear materials and facilities. These agreements are normally known as Comprehensive Safeguard Agreements or INFCIRC/153 safeguards.[55] These agreements may be complemented by an Additional Protocol that expands the authority of the Agency to monitor

nuclear activities of member states.[56] The IAEA safeguards could be applied outside of the NPT as well, for example as part of arrangements with some states that do not have a Comprehensive Safeguards Agreement in place (these are known as INFCIRC/66 safeguards) or bilateral or multilateral agreements between IAEA member states.[57]

The role of the safeguards, as defined by the IAEA Statute, is limited to a specific mission of verifying that nuclear material that is placed under safeguards is not diverted to nuclear weapons or other nuclear explosive devices and that safeguarded facilities are not used for military purposes. It is important to emphasize that this mission does not include assurances of nuclear security of the safeguarded material or facilities. According to the IAEA Statute, the rights and responsibilities of the Agency related to application of safeguards to a nuclear facility, either with respect to its own project or to other arrangements, include approval of the facility "only from the viewpoint of assuring that it will not further any military purpose, that it complies with applicable health and safety standards, and that it will permit effective application of the safeguards".[58] Furthermore, the statute explicitly authorizes the Agency "to require the observance of any health and safety measures prescribed by the Agency," but does not give it similar authority regarding nuclear security or physical protection measures.[59]

To some extent, the material control and accounting measures required by the IAEA as part of the safeguards process help to ensure nuclear security of the safeguarded nuclear material or facility, since they provide accountability that is an integral part of nuclear security arrangements. However, the IAEA cannot require implementation of physical protection measures at the safeguarded facilities. Moreover, there is no mechanism that would allow IAEA inspectors to report problems with physical protection at the facilities that it safeguards to the host state or to IAEA headquarters. The model safeguard agreement specifies that the information obtained during the implementation of the safeguards cannot be used for any other purposes.[60] This restriction is somewhat different in the Additional Protocol, which does not explicitly prohibit other uses of information as long as the Agency maintains a "stringent regime" to ensure effective protection of confidential information.[61] The confidentiality regime that provides protection of information is established by IAEA Board of Governors documents GOV/2897 and GOV/2959, which were approved in 1997. These documents, however, have not been publicly released.

Another limitation of the safeguards administered by the IAEA is that their scope does not include facilities and material related to military activity. Also, most of the civilian facilities in nuclear-weapon states have not been placed under safeguards. From the nuclear security point of view this means that a significant fraction of activity that involves nuclear materials that need physical protection is being conducted outside of IAEA safeguards.

Since the Agency defines safeguards as an activity that ensures that no nuclear or other material is diverted to military purposes, the application of IAEA safeguards to military nuclear material or at military facilities is essentially impossible. Normally, nuclear-weapon states do safeguard their material and facilities, but their definition of safeguards significantly differs from the one used in the IAEA context. For example, the US Department of Energy in its regulatory activity related to military facilities defines nuclear safeguards as "an integrated system of physical protection, material accounting, and material control measures designed to deter, prevent, detect, and respond to unauthorized possession, use, or sabotage of nuclear materials".[62] Other nuclear-weapon states most likely use similar definitions in their practice of managing military facilities. None of these facilities, however, is eligible for IAEA-administered safeguards as long as they retain their military purpose.

While the IAEA has no mechanism for dealing with military facilities and material of nuclear-weapon states, it does have a procedure that allows the Agency to place civilian facilities and material in these states under safeguards. This applies both to nuclear-weapon states that are parties of the NPT and to those states that are not signatories of the Treaty. Some facilities could be covered by an INFCIRC/66-type safeguard agreement. Also, all nuclear-weapon states members of the NPT have signed Voluntary Offer Agreements with the IAEA, which allow them to place their civilian facilities under safeguards.[63] Under these agreements, the United Kingdom and the United States offered all of their civilian nuclear facilities for safeguards. Russia included a limited number of facilities in the list of those that are subject to IAEA safeguards. France offered all of its civilian facilities that have IAEA-obligated material to IAEA safeguards.[64] China placed under IAEA safeguards all imported civilian nuclear facilities. However, the number of facilities in nuclear-weapon states where the IAEA actually applies safeguards is rather small, since the Agency as a matter of policy

limits application of safeguards to activities in NPT nuclear-weapon states in order to concentrate resources on non-nuclear weapon states.

Even though application of IAEA safeguards is far from being a universally accepted practice, it is expected that the number of safeguarded facilities and amount of material will grow substantially with the projected growth of nuclear power and with the expected progress in nuclear disarmament. Recognizing this challenge, the Agency has been taking steps to strengthen the safeguards system to ensure that it takes advantage of the integration of 3S—safeguards, safety and security—to protect nuclear material from diversion or unauthorized removal. Efforts to integrate 3S at early stages of design of nuclear facilities could provide an important contribution to nuclear security. At the same time, the statutory limitations of the IAEA safeguards system create a situation in which most of the nuclear materials and facilities that need protection, namely those used for military purpose, remain outside of the system.

IAEA Advisory Services

The IAEA Office of Nuclear Security manages a broad range of activities that are designed to strengthen national nuclear security programmes. These activities include advisory services, assistance to states in their efforts to detect security accidents and to respond to them, and development of recommendations and guidelines that are disseminated to IAEA members.

The IAEA can only provide an advisory service at the request of a member state. Once the request is made, the Agency performs the necessary evaluations, sending its experts to the country, if necessary, and then issues its report and recommendations. The Agency could also provide assistance with implementation of its recommendations. In making the request, the state could choose among a number of different advisory services provided by the Agency, from most comprehensive to those that deal with a specific issue of concern.

The International Nuclear Security Advisory Service is designed to address the general issues of nuclear security. These include an examination of the legislative and regulatory nuclear security framework, and of the status of physical protection of nuclear and radioactive material and programmes designed to detect illicit trafficking in nuclear and radioactive material and to provide an adequate response. The service also examines the human

resources development programmes in nuclear security. Recommendations provided by the Agency after the examination serve as a basis for development of an Integrated Nuclear Security Support Plan—a bilateral agreement between the state and the Agency that includes measures to be undertaken to address the issues identified during the review, with IAEA assistance or participation where necessary.

The IAEA also provides the International Physical Protection Advisory Service, which is specifically focused on the implementation of physical protection measures as described in the Agency document *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities* (INFCIRC/225).[65] As part of this review the Agency could provide country-level as well as facility-specific assessment of the status of physical security. It could address issues ranging from government organization and the legislative and regulatory framework to implementation of physical protection measures at specific facilities. The advisory team drafts its assessment report, which lists its conclusions and recommendations, and then discusses it with the host state officials and, if necessary, with representatives of operators of the examined facilities. These discussions produce the final report, which could be used to plan follow-up activities. If requested by the host state, the Agency provides assistance with these activities. It is important to emphasize that all the activities of the Physical Protection Advisory Service, including the results of the assessment and recommendations, are kept confidential and are not released to other member states or to the public.

Other advisory services offered by the IAEA to its members include assessment of a state's system for accountancy and control of nuclear material, an international team of experts advisory service that advises states on their adherence to legal regimes designed to enhance protection against nuclear terrorism, and an integrated regulatory review service, which provides an overview of the regulatory system. A range of other services, on issues ranging from radiation safety to emergency preparedness and from border monitoring to security for major public events, are also available from the Agency.[66]

IAEA advisory services provide member states with ready access to professional expertise in nuclear security as well as other areas. The Agency helps its members to learn about best practices, to identify problems and to develop solutions that might include assistance from the IAEA or other

states, as necessary. This process, however, has its limitations—in order to initiate an evaluation, the IAEA has to receive a request from the state. There is no mechanism that would allow the Agency to identify nuclear security problems in member states and to initiate an evaluation. Even though the Agency through the system of safeguards has access to nuclear facilities and materials, it cannot use the information obtained in the process of applying safeguards to comment on the state of nuclear security or the physical protection regime at the safeguarded facilities. The few cases where the Agency can require implementation of nuclear security measures are those of the facilities being provided as technical assistance or of material received through technical assistance. In these cases, the IAEA Project and Supply Agreement and Agreement for the Provision of Technical Assistance normally require states to implement physical security measures at the facilities provided by the IAEA.[67]

The IAEA reported that, as of 2009, 49 states have Nuclear Security Support Plans at various stages of development or implementation.[68] Also, as of 2008, the International Physical Protection Advisory Service had completed 41 missions in various states.[69] This demonstrates that the advisory system maintained by the IAEA is an invaluable asset that helps improve the security of nuclear material and nuclear facilities worldwide.

IAEA Nuclear Security Plan for 2010–2013

Since 2002, the IAEA has regularly developed a Nuclear Security Plan that reports on the progress in strengthening the nuclear security regime and outlines the goals of the Agency for the next few years. The current plan, Nuclear Security Plan 2010–2013, was approved by the IAEA Board of Directors in August 2009.[70] The Plan is part of the Agency's strategy to "establish and achieve global acceptance of an agreed international framework for nuclear security".[71]

The Plan emphasizes the responsibility of all states for establishing a proper system that would "prevent, detect, and respond to malicious acts involving nuclear and other radioactive material".[72] It also calls attention to the importance of a proper legal and regulatory infrastructure, an effective organizational structure that would deal with protection of nuclear material and response to incidents, and strong technical support. The Plan emphasizes the need to take advantage of the integration of safety, security

and safeguards and to develop and maintain a sustainable nuclear security culture.

The Plan identified four major elements of the IAEA Nuclear Security Programme—needs assessment and information analysis, enhancement of a global nuclear security framework, providing nuclear security services to member states, and risk reduction and security improvement.

To deal with needs assessment and information analysis, the IAEA is developing a data platform that would enable the Agency to consolidate information available from various information sources and databases as well as from open sources. This work recognizes the limitation of the current data management system in which information about various aspects of the Agency's activity is compartmentalized and is not available for the assessment of nuclear security needs. The plan calls for "maintenance and expansion of the Illicit Trafficking Database and other Agency databases, and bringing them into a coherent, comprehensive and secure nuclear security information platform".[73] It is not clear, however, if the new information system would allow the Agency to use the information obtained from its safeguards activities to evaluate various aspects of nuclear security.

Another major mission of the IAEA Nuclear Security Plan includes efforts to strengthen the global nuclear security framework. This activity is directed at enhancing adherence with various international legal instruments relevant to nuclear security. The IAEA has an important role in providing recommendations and guidance that are used in international agreements as baseline standards. For example, as part of this activity, the IAEA has revised INFCIRC/225, *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities*, which can be used as guidance in implementing physical protection measures. These guidelines could also be used to evaluate progress with the implementation of physical protection provisions of Security Council resolution 1540. In addition to the development of the guidelines, the IAEA has made a commitment to facilitate entry into force of the 2005 Amendment to the Physical Protection Convention.[74]

The Nuclear Security Plan makes a strong commitment to improving and expanding the services that it provides to member states. As part of this effort, the Agency will continue to provide a range of evaluation and

peer review services, done upon request. It will also work on developing advice and services tailored for states that are just starting their nuclear programmes. The Agency also plans to invest in the development of a human resources development programme, and educational and training activities.[75]

Finally, the Nuclear Security Plan commits the Agency to work on risk reduction and security improvement. As part of this effort, the IAEA will provide assistance to states that request help with improving safety of nuclear facilities or facilities that handle radioactive substances. It will also provide support to the programmes that reduce the use of HEU. The Agency will also work on the development of equipment that could help member states deal with consequences of an accident. The Plan emphasizes the importance of developing national nuclear security capacities, but at the same time it recognizes the important role of the IAEA in providing technical expertise and coordination of these activities. The Agency encourages member states to establish centralized nuclear security centres and supports the development of nuclear forensics capabilities.[76]

Programmes that are included in the Nuclear Security Plan 2010–2013 receive funding from the regular IAEA budget and from the extrabudgetary Nuclear Security Fund, which consolidates voluntary contributions of member states. In the past, most of the Nuclear Security Plan activities were dependent on the financing from the Nuclear Security Fund.[77]

US THREAT REDUCTION PROGRAMMES

The development of the international nuclear security regime, which relies on legally binding instruments that provide a framework for common standards, accountability, as well as technical, legislative and regulatory assistance, is the most reliable long-term strategy of confronting the dangers associated with nuclear and other radioactive materials. At the same time, the international community has long realized that some problems require urgent action that goes beyond what is possible within the traditional framework of multilateral cooperation. To deal with the most serious nuclear security problems, the United States took the lead in creating the Cooperative Threat Reduction (CTR) Program. The Program, also known as the Nunn-Lugar Program, began in 1991 as an effort mandated by the US Congress to assist the Soviet Union to safeguard and dismantle its stocks of nuclear, chemical and biological weapons, as well as their delivery systems,

and to prevent proliferation of expertise related to WMD.[78] The Program became one of the most important efforts to address nuclear security issues in Russia and other former Soviet Union states. It is currently managed by the Defense Threat Reduction Agency, which is part of the US Department of Defense. Some elements of the Program, however, are funded and managed by the Departments of Energy and State.

In the area of nuclear security, key CTR projects are focused on providing Russia with assistance in securing nuclear warheads storage sites as well as other military facilities that handle nuclear material, naval fuel storage sites in particular. The Program has also provided assistance with securing nuclear warheads during transport to secure storage or dismantlement, as well as material support, such as railcars with appropriate security and monitoring systems. The Department of Energy is assisting Russia in strengthening its material protection, control and accounting system through its International Nuclear Materials Protection and Cooperation programme.

In 2005, Russia and the United States strengthened the nuclear security component of the CTR Program by signing a document known as the Bratislava Nuclear Security Initiative. In this agreement the two states made a commitment to enhance cooperation in several key areas. In the most important undertaking, they agreed to complete comprehensive security upgrades at nuclear facilities in Russia and include in the list of these facilities all Ministry of Defence storage sites as well as Russian nuclear weapon production facilities.[79] Other elements of the agreement included the expansion of cooperation on emergency response, nuclear security culture, reactor conversion, and sharing of best practices. The security upgrades were completed in 2008, as planned, while work on other elements of the agreement continued.[80] The CTR Program is also working on establishing regional Centers of Excellence for Nuclear Security, which will serve the security programmes in the region, provide training and serve as hubs for the sharing of best practices.[81]

Another key US programme that directly deals with issues of nuclear security is the Global Threat Reduction Initiative (GTRI), which was created in 2004 to consolidate the global non-proliferation efforts of the US Department of Energy. The key goal of these efforts is to help "prevent the acquisition of nuclear and radiological materials for use in weapons

of mass destruction (WMD) and other acts of terrorism".[82] GTRI includes three key programmes that address different aspects of the problem.

The first programme is dedicated to reducing the amount of HEU by converting research reactors that use HEU fuel to LEU fuel. To achieve this goal, the United States works directly with those states and organizations that operate research reactors, providing technical and financial assistance for the conversion process. For those reactors that were supplied by the Soviet Union, the programme works closely with Russia, which contributes to these efforts by developing new fuel designs and supplying the LEU fuel. As of 2011, GTRI had successfully converted 22 research reactors throughout the world and assisted in shutting down an additional 12 reactors.[83] In the Bratislava Initiative, Russia and the United States committed to begin the process of converting research reactors in Russia as well. Negotiations of an agreement that would begin conversion of the first six reactors began in 2010.[84]

The second element of GTRI is an effort to remove nuclear material, mostly contained in fresh or spent fuel of research reactors, from facilities around the world. This programme also works on recovering and disposing of excess and abandoned radiological sources in the United States and abroad. The nuclear material removal programme covers fuel of research reactors and installations that were supplied by the United States and the Soviet Union. This material is normally repatriated to the country of origin, although in some cases the United States brings the material to its own facilities for disposal. This work is done in close cooperation with the IAEA, which provides safeguards for the repatriated material. Since 2004, the programme has returned almost 1,500kg of HEU to Russia and almost 600kg of HEU to the United States.[85]

Finally, GTRI works on protecting the nuclear and radiological material, for which no permanent disposal solution has been found yet. The programme provides technical assistance with safe and secure long-term storage and security upgrades for those facilities that host the material. As part of this activity, GTRI helped Kazakhstan to securely store spent fuel of a shut-down fast reactor that contains plutonium and HEU. It also provided security upgrades at facilities in more than 40 countries hosting more than 960 radiological sources.[86]

The US Department of Energy carries out another activity that is directed at removing HEU from research facilities—the Material Conversion and Consolidation project. In this project the United States provides direct support to Russian research institutes that work with HEU to remove their material from their territory and to blend it down to LEU at one of the two Russian facilities. The programme is expected to reach the goal of blending down 17 tonnes of HEU by the end of 2015.[87]

Activities of the CTR and GTRI will also support the goal of securing all vulnerable nuclear materials in four years, as announced by US President Obama in April 2009.[88] Each of these programmes has already made a substantial contribution towards this goal and they have the experience and infrastructure that allows them to accelerate their efforts.

Development of the CTR model resulted in establishing a multilateral effort to secure nuclear and other WMD materials. The summit meeting of the G8 in Kananaskis, Canada, created the G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction.[89] In launching this program, the G8 states committed to raising $20 billion over 10 years to support cooperation projects that would "address non-proliferation, disarmament, counter-terrorism and nuclear safety issues". This effort was initially concentrated on Russia, but the programme was designed to allow its expansion to other countries as well. Among the priorities outlined in the statement were the destruction of chemical weapons, the dismantlement of decommissioned nuclear submarines, the disposition of fissile materials and the employment of former weapons scientists. In the area of nuclear security, specific projects included in the programme were the development of a nuclear material control and accounting system, improving physical protection of nuclear materials and facilities, and disposal of nuclear material that is declared excess to national security needs.[90] With time, the Global Partnership membership was expanded to include states outside of the G8. Among the contributors to the nuclear security effort of the programme are Canada, Germany, Italy, Norway, the Republic of Korea, Sweden, the United Kingdom, and as well the European Union.[91] The United States remains the principal participant of the nuclear security activities, which mostly stayed within the US–Russian CTR programme. Other Global Partnership states have concentrated on issues that ranged from the elimination of chemical weapons to the dismantlement of decommissioned submarines.[92] In May 2011, the G8 extended the Global Partnership programme beyond 2012

with the understanding that the programme will focus on "nuclear and radiological security, bio-security, scientist engagement, and facilitation of the implementation of [resolution] 1540".[93]

From the point of view of legal arrangements, the basis for the activity of the CTR and GTRI or of the Global Partnership is provided by bilateral agreements that regulate all legal issues that states could encounter in the course of the implementation of specific projects. Some projects might require a multilateral agreement as well, but the key organizational principle remains the same—there is no single multilateral treaty or other legal arrangement that regulates the activities of participants of the partnership activities. These agreements could cover a range of activities or a single project or area of cooperation. For example, to implement the CTR in Russia, the Russian and US governments concluded the CTR Umbrella and Implementation Agreements, which provide a general legal framework for cooperation. These agreements may regulate issues such as funding, status of personnel, and taxes and liabilities. Specific projects might require separate agreements or contracts, which specify details of implementation, responsibilities of parties and other issues.

Projects of the GTRI and Global Partnership appear to follow a similar pattern—most of them include a bilateral umbrella agreement that is supported by a project-specific contract. This gives the programmes significant flexibility, allowing them to connect participants that are directly involved in implementation of a project. At the same time, a structure that relies on bilateral arrangements has its disadvantages as well. Each agreement of this kind has to be negotiated separately between the donor and implementing state. This often complicates the planning, coordination and implementation of projects. Reporting requirements also differ from state to state, which makes it difficult to assess progress and to determine the areas that need the most attention.[94] The involvement of a large number of independent donors may also lead to fragmentation of efforts and favour relatively small projects over a sustained effort to improve the security infrastructure. Finally, the structure of assistance programmes focused on specific projects makes it more difficult to ensure long-term sustainability of the nuclear security arrangements. This has been long recognized as one of the key problems of the US nuclear security assistance programme in Russia.[95]

Despite the challenge of ensuring effective planning and coordination and providing long-term sustainability, CTR, GTRI and the Global Partnership are undoubtedly the most effective nuclear security programmes that have been undertaken by the international community. The main advantage of these projects is that they can address security issues in places that are out of reach of most multinational nuclear security arrangements. In particular, CTR programmes handled security upgrades at Russian nuclear warhead storage facilities, including those that were in operational use. Also, these programmes addressed security concerns during transport of nuclear warheads. None of the existing legally binding treaties, such as the Convention on the Physical Protection of Nuclear Materials, includes these facilities or transport in its scope. This kind of access to military and other facilities that are open to assistance programmes, of course, is directly linked to fact that the assistance is not conditioned on any legally binding obligations or even on a commitment to provide long-term sustainability of the implemented security measures. Still, even without requiring formal obligations, assistance programmes create conditions that strengthen multinational legal regimes and help improve the long-term nuclear security outlook. Also, the flexibility that these programmes provide make them indispensable to the global effort to address the most urgent nuclear security problems.

THE NUCLEAR SECURITY SUMMIT PROCESS

The progress in strengthening the international nuclear security regime that has been made in recent years would have been impossible without the coordinated efforts of governments and international institutions—from the United Nations to the International Atomic Energy Agency—and without constant efforts to address the issues at the highest political level. Nuclear security and safety have been regularly discussed at G7 and G8 meetings.

Starting in the 1990s, most of the attention of the G7 and G8 meetings was focused on the situation in Russia. In April 1996, Russia hosted its first meeting of the G7 states and Russia, which was held as a dedicated Nuclear Safety and Security Summit. The summit declaration of the G8 states affirmed the importance of the efforts to combat illicit trafficking in nuclear material and committed the participating states to increased cooperation in the area of nuclear security. It reaffirmed the fundamental

responsibility of individual sates "to ensure the security of all nuclear materials in their possession and the need to ensure that they are subject to effective systems of nuclear material accounting and control and physical protection".[96] The summit participants called on all states to ratify the Convention on the Physical Protection of Nuclear Material and to follow IAEA recommendations and guidelines in handling the material in their possession.

The 1996 Summit also adopted the Programme for Preventing and Combating Illicit Trafficking in Nuclear Material. The Programme calls for a coordinated effort to ensure safe and secure storage of nuclear material, cooperation between intelligence, customs and law enforcement agencies to prevent transportation and sale of diverted material, and a joint effort to identify and address the illicit supply of nuclear material. It also specified a number of concrete steps toward these goals—from information exchange in the framework of the Physical Protection Convention to placing materials declared excess to national security needs under IAEA safeguards.[97]

The political commitment made at the 1996 G8 Nuclear Safety and Security Summit was an important step towards strengthening the assistance programmes that addressed security issues in Russia, which was undergoing difficult economic and social transformation following the breakup of the Soviet Union. This commitment also prepared the ground for the G8 Global Partnership, which was announced at the 2002 G8 summit in Kananaskis, and for the 2005 Bratislava Nuclear Security Initiative. Nuclear security was also one of the subjects at the 2006 G8 summit meeting in St. Petersburg, where Russia and the United States launched the Global Initiative To Combat Nuclear Terrorism.[98]

The 2010 Nuclear Security Summit

Shortly after taking office in 2009, US President Barak Obama took leadership in accelerating efforts to strengthen nuclear security as part of the broader agenda of moving towards a nuclear-weapon-free world. In his April 2009 speech in Prague, he emphasized the importance of strengthening nuclear security and creating durable international institutions to achieve that goal. He made the commitment to secure all vulnerable nuclear materials in the world within four years and announced the plan to hold a Global Summit on Nuclear Security in 2010. The

Nuclear Security Summit became the focal point of the US administration's efforts to gather support for its nuclear security agenda.

The Nuclear Security Summit, which was held in Washington DC on 12–13 April 2010, brought together representatives of 47 states, 38 of them head of state or head of government. The United Nations, the European Union and the IAEA were also present at the meeting. The Summit issued a communiqué and developed a work plan that contained a set of commitments and agreed specific goals. Summit participants also made national commitments that included country-specific nuclear security measures. Finally, the participants agreed to hold the second Nuclear Security Summit in South Korea in 2012.

The communiqué identified nuclear terrorism as one of the most challenging threats to international security, and nuclear security as the most effective means of preventing terrorists from obtaining nuclear materials. It reaffirmed that states have fundamental responsibility for protecting nuclear materials, facilities and expertise that they possess as well as for maintaining the appropriate legislative and regulatory framework that allows them to achieve this goal. While emphasizing national responsibility, the communiqué called on all states to work cooperatively on nuclear security, requesting and providing assistance as necessary. It recognized that HEU and separated plutonium are particularly sensitive materials and called on all states to take measures to secure, account for and consolidate these materials. The communiqué also asked all states to minimize the use of HEU to the extent it is practically feasible. It reaffirmed the importance of the existing international legal instruments, such as the Convention on the Physical Protection of Nuclear Materials, and the essential role of the IAEA in the international nuclear security framework. Among other statements included in the communiqué were recognition of the importance of cooperation at all levels, the role of nuclear industry and the vital role of security culture.[99]

The work plan adopted at the Summit laid out specific steps towards achieving the goals of the communiqué.[100] First and foremost, the work plan called on states to use the existing international legal instruments to the fullest extent possible. In particular, the states made a commitment to use the mechanisms of the International Convention for the Suppression of Acts of Nuclear Terrorism to increase its effectiveness by actively engaging in cooperation and by discussions of the best practices. The

work plan also commits states to work on achieving entry into force and early implementation of the Amendment to the Convention on Physical Protection of Nuclear Materials. It expressed full support for the implementation of UN Security Council resolution 1540 and emphasized the importance of establishing a nuclear security system that would be capable of achieving the standards recommended by the IAEA in its nuclear security recommendation and guidance documents. Participants of the Summit recognized the essential role of the IAEA and called upon all states to work in close cooperation with the Agency in the efforts to address nuclear security issues and use to the maximum extent the advisory and evaluation services provided by the Agency. The work plan also acknowledged the importance of the G8 Global Partnership and encouraged all states to participate in cooperative nuclear security programmes.

Specific action items of the work plan include a commitment to consolidate sites that hold nuclear material, to promptly remove material from sites that do not use it, and to provide security of the material in both domestic and international transport. Regarding plutonium, the work plan calls upon states to provide appropriate accounting for the material (suggesting that the level of protection might be different for the plutonium produced in civilian reactors versus the military grade material). The plan recommends intensifying efforts, including cooperative programmes when appropriate, to convert nuclear reactors from HEU to LEU fuel and to minimize the use of HEU in other civilian applications, such as the production of medical isotopes. States are encouraged to strengthen their regulatory regimes to foster a strong security culture and guide nuclear industry in implementing robust nuclear security practices. Finally, the work plan calls upon all states to exchange information about illicit nuclear trafficking and nuclear terrorism and work together on establishing national and international forensics expertise to help prevent and combat illicit trafficking.

Most summit participants made national commitments that contained country-specific obligations. These commitments ranged from pledges to ratify the Amendment to the Convention on Physical Protection of Nuclear Material or to join one of the international nuclear security initiatives, to concrete plans to secure, consolidate or remove nuclear material. Most of these measures had been in planning before the Nuclear Security Summit initiative, but the Summit provided a valuable opportunity to accelerate work on some projects or to have states expand their plans.

Among the key commitments made at the Nuclear Security Summit were the signing of a protocol to the US–Russian agreement on plutonium disposition, commitments to convert their research reactors and remove all HEU from their territories made by Ukraine, Chile, Mexico, Kazakhstan and Viet Nam. A number of states made contributions to the IAEA Nuclear Security Fund or announced plans to invite the International Physical Protection Advisory Service security review from the IAEA.

In shaping the outcome of the Nuclear Security Summit its organizers chose to rely on existing nuclear security arrangements and to concentrate on getting participants to undertake additional obligations under the existing legal agreements or to accelerate implementation of nuclear security projects already underway. This approach had the advantage of focusing on the nuclear security instruments that are already available to the international community and that have demonstrated their effectiveness in the past. The Summit concentrated on strengthening these arrangements in order to realize their full potential, rather than on inventing new mechanisms that would risk to divert attention from the already working programmes. However, in choosing this approach the Summit took the risk of not having a clear point at which it could focus the nuclear security effort, for the range of existing arrangements and initiatives is broad and the effectiveness if some of them is difficult to assess.

The first year of implementation of the Nuclear Security Summit work plan demonstrated that the choice made at the Summit was largely justified. Most states made substantial progress towards completing the goals outlined in the commitments made at the Summit. According to an independent evaluation of the implementation of the work plan, about 60% of the commitments had been completed during the first year and the participant were on track to complete another 30%.[101] Among the key achievements of the Nuclear Security Summit Process are the shutdown of the last Russian plutonium production reactor, removal of all HEU from Mexico and Chile, completion of a secure storage site in Kazakhstan that holds spent fuel of the BN-350 reactor containing large amounts of HEU and plutonium, removal of large amount of HEU from Ukraine and preparation for complete removal of HEU from that country. Also, as a result of the Summit, China and the United States signed a memorandum that will allow them to work together on establishing a Nuclear Security Center of Excellence. The Summit also strengthened the Convention on Physical Protection of Nuclear Materials with two states (Germany and the

United Kingdom) ratifying the 2005 Amendment and three more states (Argentina, France and the United States) intensifying their efforts to do so. Armenia, Georgia and the United Kingdom ratified the International Convention for the Suppression of Acts of Nuclear Terrorism and more states, including the United States, are working on ratification.[102]

The Nuclear Security Summit process also encouraged other states to intensify their nuclear security efforts. In particular, in December 2010 Belarus made a commitment to remove all HEU from its territory by 2012.[103] The work on removal of this material had been underway for some time as part of GTRI, but the additional incentive provided by the prospect of participation in the Nuclear Security Summit helped accelerate implementation of the project.

The 2012 Nuclear Security Summit

The 2010 Nuclear Security Summit provided an opportunity to bolster nuclear security worldwide. The commitment to hold the next summit meeting in 2012 demonstrated that the participants believe that the nuclear summit process can make a valuable contribution to global nuclear security efforts. The Republic of Korea agreed to host the 2012 Nuclear Security Summit, which will take place on 26–27 March 2012. The Summit will have the opportunity to advance the agenda of the first Summit and to ensure long-term sustainability of the programmes that were initiated in Washington in 2010.

The 2012 Nuclear Security Summit will face several challenges and opportunities. The participants will have to decide whether to extend the process beyond 2012 and make the summit process a permanent element of the international nuclear security architecture. The first Summit already demonstrated the value of a high-level meeting for advancing the nuclear security agenda. The decision, however, would depend on whether the participants could identify an ambitious agenda that requires the high-level support of regular summit meetings.

The initiatives proposed so far have been directed at developing and strengthening the existing nuclear security arrangements.[104] France suggested development of HEU management guidelines that would facilitate international cooperation in research, development and technological support of HEU minimization and management, and would

ensure that HEU minimization does not create barriers to the peaceful uses of nuclear energy. A proposal advanced by Japan calls for improvement of the mechanism for coordination and information sharing regarding transportation of nuclear materials, which would balance cooperation and the need to protect information. Protection of sensitive information is also one of the central elements of the UK proposal. Jordan proposed to expand efforts to combat illicit trafficking and to consider inviting INTERPOL as a participant of the summit meeting. A number of states called for better coordination of the existing activities and regimes.

Some proposals advocate expansion of the scope of the Summit. One possibility, put forward by Germany, would be to consider measures to secure all radioactive material and sources along with nuclear material that can be used for weapons. Another option, discussed after the Fukushima nuclear accident of March 2001, is to consider the issues of nuclear safety. At this point it is difficult to say which initiatives will be supported by participants, but it is already clear that the meeting will be an important opportunity to make progress on a range of issues.

The proposals described above would already set an ambitious agenda for the 2012 Summit. In addition, participants will also consider other issues related to strengthening the nuclear security regime. These include expanding the mission of the Nuclear Security Summit process and integrating it into the broader nuclear disarmament and nuclear non-proliferation agenda. Analysis of the experience of the existing regimes, initiatives and programmes could be used to develop an institutional framework that could bring together the entire range of international nuclear security efforts. Another important issue that the Summit will have an opportunity to address is developing common standards in the area of physical protection and nuclear security in order to facilitate accountability, information exchange and cooperation.

STRENGTHENING THE NUCLEAR SECURITY REGIME

Institutional framework

Efforts to strengthen the international nuclear security regime should include both the development of practical mechanisms for coordination of efforts of individual states and the promotion of universal compliance

with the international legal arrangements that regulate obligations of states in this area. The Nuclear Security Summit process provides a unique opportunity to address these issues by encouraging states to commit to international agreements and by launching new initiatives that would facilitate closer cooperation on nuclear security.

The current nuclear security arrangements already provide a basic framework that should serve as a starting point for new initiatives. For those states that are members of the Convention on the Physical Protection of Nuclear Materials and the International Convention for the Suppression of Acts of Nuclear Terrorism, the conventions create legally binding obligations to protect nuclear material and facilities. UN Security Council resolutions 1373 and 1540 provide some basic elements of accountability. The IAEA serves a key role in developing and disseminating standards and providing technical and legal expertise and advisory services. The G8 Global Partnership and the US CTR programme direct and coordinate implementation of specific nuclear security projects.

The current regime, however, does not address some important aspects of the problem. Most importantly, the scope of the legally binding obligations that exist today is rather limited. The Convention on the Physical Protection of Nuclear Material covers only nuclear material during international transport. The degree of protection that is required by the Convention is specified in very general terms, leaving open the question about whether this protection is adequate against existing threats. The 2005 Amendment to the Physical Protection Convention, which is yet to come into force, does extend its coverage to material in domestic use and to nuclear facilities, but it also does not impose any requirements regarding the level of protection. In fact, the amendment process explicitly rejected the idea of using the IAEA physical security guidelines as a baseline recommendation. The Amendment does include the Fundamental Principles of Physical Protection of Nuclear Material and Nuclear Facilities, but participants are required to follow these only to the extent it is “reasonable and practicable”. Also, the Amendment explicitly excludes military nuclear material from the scope of the Convention.

The International Convention for the Prevention of Acts of Nuclear Terrorism contains an important reference to the IAEA nuclear security guidelines and recommendations. It also implicitly includes military material in its scope, although of the states that have nuclear weapons only China,

India, Russia and the United Kingdom are parties to the Convention. Also, the Convention does not contain a firm obligation to implement nuclear security measures to the full extent that is recommended by the IAEA guidelines. Neither does it provide a mechanism to ensure that the security measures in place can adequately protect the material and facilities against the existing threats.

Resolutions 1373 and 1540 could provide an important starting point for future transparency and accountability arrangements. However, so far the reporting has been limited to the status of legislation that deals with various aspects of nuclear security. It is not clear if the mechanisms of these resolutions could be extended to include reporting on the actual security measures undertaken by states.

The IAEA nuclear security programmes are among the most effective mechanisms for the development of specific legal and technical recommendations in all areas related to nuclear energy, including nuclear security. The IAEA also has a range of services that could provide member states with advice and assistance in implementing specific security measures. However, the IAEA has to rely on states to request its services and does not have the authority to ensure that states follow IAEA recommendations in building their nuclear security systems.

The limits of IAEA advisory services have been demonstrated in the area of nuclear safety. The accident at the Fukushima nuclear power plant demonstrated that a number of recommendations that were included in the IAEA safety standards long before the accident were not properly followed.[105] In particular, the IAEA fact-finding expert mission that was analysing the accident noted in its preliminary review that the national regulators have to have an independent and clearly defined role, suggesting that that was not the case in Japan.[106] The Japanese government in its report also admitted that it needs to ensure independence of its nuclear regulator.[107] The IAEA review also reiterated the need for operators to be prepared for extreme events, indicating that the level of preparedness was not adequate. The fact that the Agency had to call attention to its recommendations after the accident strongly suggests that they had not been implemented to the extent necessary and that the IAEA has limited means of enforcing compliance with its requirements.

The experience of the Fukushima accident suggests that the effectiveness of nuclear security measures taken by states and operators is extremely difficult to assess without subjecting them to an actual nuclear security event. While the IAEA recommendations and advisory services, as well as the Agency's capacity to provide assistance in the case of an accident, will remain an essential element of the nuclear protection regime, the actual effectiveness of these measures remains uncertain.

While legally binding international instruments and formal institutions provide an important foundation for the global nuclear security framework, programmes that are outside of these formal arrangements have proven to be flexible and effective means for addressing the most pressing security problems. The G8 Global Partnership and the US CTR have successfully managed a variety of projects in Russia and other former Soviet states, most of which dealt with military material and facilities. The GTRI has achieved significant progress in securing and removing HEU and radiological sources around the world. To achieve their goals, these programmes have received substantial financial (US$ 20 billion over ten years in the case of the Global Partnership) and political resources in their support.

The success of these programmes suggests that the efforts to strengthen nuclear security must include a component that does not ask states to accept legally binding obligations regarding their material or facilities. While this approach may not address issues of long-term sustainability, it allows the solving of the problems that require the most urgent attention, such as security upgrades at Russian nuclear weapon sites or removal of HEU. The lack of a formal institutional structure of the Global Partnership projects could work to the benefit of the programme, even though it could complicate its implementation. The decentralized structure of the initiative gives it flexibility in directing resources to specific tasks, but on the other hand it means that there is no central authority to coordinate efforts of all participants and consolidate resources.

The distinctive feature of the Global Partnership and CTR is their critical dependence on the political and financial support provided by a single participant—the United States. Although the United States provides the leadership and most of the necessary institutional support for these programmes, in the long run they would benefit from more active participation of other states. The United States is likely to remain the key player in these programmes, but it is also looking for ways to expand

its threat reduction programmes and to bring in more international participation.[108]

A robust global nuclear security system would have to combine all legal and institutional instruments that are available to the international community today. It is equally important to develop the legal nuclear security framework, to assist the IAEA in its efforts to develop sound technical foundations for national programmes, and to strengthen bilateral and multilateral cooperative threat reduction programmes. The Nuclear Security Summit should encourage more states to take a leadership role in nuclear security efforts, similar to the role of the United States, through cooperative threat reduction programmes and make sure that they effectively use the positive experience of the G8 Global Partnership.

Baseline protection and reporting requirements

One of the measures that could help to strengthen the existing international nuclear security regime is the establishment of common standards for nuclear security and development of a transparency and accountability mechanism that would allow states to take full advantage of the international expertise in this area and to ensure that the measures implemented at the national level provide adequate protection of nuclear and other radioactive material. Development and implementation of such measures would be quite challenging, since many states treat nuclear security as a sensitive national security issue and are reluctant to open this area up to international cooperation. Also, an effective nuclear security system requires coordination of a number of institutions that are involved in nuclear security, from intelligence and law enforcement agencies to nuclear regulators and operators, which brings additional complexity to the problem.

The idea of a common nuclear security standard has been discussed before. As described above, during the discussions of the 2005 Amendment to the Convention on the Physical Protection of Nuclear Materials, parties considered including an obligation to implement requirements of INFCIRC/225, *Physical Protection of Nuclear Material and Nuclear Facilities*. This proposal, however, was not approved, along with proposals to establish other mandatory measures—reporting, peer review or oversight of the implementation of the physical protection measures. This means that the renewed effort to create a common baseline physical

security standard would have to find a mechanism that does not involve creating new legal obligations under the Physical Protection Convention. Instead, the new standard would have to rely on a combination of other obligations and political commitments as well as corresponding institutional arrangements that would facilitate coordination and data exchange among all organizations involved in nuclear security. Some potential arrangements of this kind are discussed below.

The key element of a robust nuclear security system is a thorough and accurate assessment of the threat. This principle is codified in the Fundamental Principles of Physical Protection of Nuclear Material and Nuclear Facilities developed by the IAEA and incorporated in the 2005 Amendment to the Physical Protection Convention.[109] The current nuclear security guidelines assume that each state has sole responsibility for conducting its own threat assessment using all information in its disposal. The assessment is normally a function of the state, rather than an operator or a regulatory body, since it should take into account information gathered by the state's intelligence and law enforcement agencies as well as other state institutions. The Fundamental Principles further specify that the threat assessment should consider insider threats and recommend development of a design-basis threat for high-consequence events, but leaves the state with the responsibility for following through on these recommendations and ultimately for the accuracy and completeness of the assessment. Since the threat assessment process often deals with sensitive national security information and involves a great deal of political judgment, it is highly unlikely that states would be willing to closely coordinate their efforts or to share their conclusions. Indeed, openness in this area would not be appropriate, as the information on threat assessment or on design-basis threats might be highly valuable to an attacker and therefore should be protected.

Although threat assessment should remain the prerogative of individual states, some degree of cooperation in this area might be possible. The global nature of international terrorism created a situation in which states should be able to reach an agreement on parameters of a model threat without disclosing sensitive information or getting into areas of political disagreement. Those states that find this basic assessment inadequate could go beyond it and develop their physical protection systems based on their own understanding of the threat. It is important, however, for states to

make a commitment to accept the result of the baseline threat assessment as a starting point for building their nuclear security systems.

Even though the commitment to take the baseline threat into account is unlikely to become legally binding, the process of developing this model threat would offer important benefits. First of all, it could bring together the law enforcement and intelligence agencies with a clear and well-defined mission of developing a common threat model. This process would be even more valuable since these agencies normally do not have a clear communication channel that allows them to exchange information on various aspects of nuclear security. The experience of the CTR and the GTRI has demonstrated that cooperation of law enforcement agencies that are directly involved in providing security of nuclear material during storage and transport is indeed an effective way of strengthening all aspects of nuclear security. Second, the model threat produced in this process could serve as a benchmark for physical protection efforts of all states, including those that may choose not to participate in the common assessment.

Another area that would require close cooperation is the development of a common understanding of the level at which consequences of a nuclear security accident should be considered unacceptable. This understanding, combined with the assessment of the threat, eventually determines the kind of physical protection and other security measures that must be applied to nuclear material or facilities. The experience of past terrorist attacks and nuclear safety incidents has demonstrated that the consequences of these events could be truly global in nature, so international cooperation in this area is entirely appropriate and indeed necessary. This work would require close cooperation of national nuclear regulatory bodies and operators as well as public health officials in assessing radiological consequences of an accident and of national security institutions in dealing with consequences of a terrorist attack. As is the case with threat assessment, creating a mechanism that would allow coordination of efforts of institutions of different states has the additional benefit of opening a channel for communication and information exchange.

A common agreement on baseline parameters of threats and consequences of a nuclear security accident would open the way for developing a set of detailed recommendations on the minimum physical protection and material control and accounting measures that states should undertake to implement at their nuclear facilities. These measures would be in

agreement with the obligations under the Convention on the Physical Protection of Nuclear Materials; they will, however, concentrate on practical steps that states need to implement, rather than on general legal obligations. If the consultation process is successful in bringing together national institutions that have direct responsibility for various aspects of nuclear security, it would help ensure that the recommendations are accepted by all participants as practical guidance.

Efforts to develop the baseline protection standard could be linked with a programme that would financially support specific projects in this area and provide assistance with equipment and expertise when necessary. A programme like that could use the experience of the US–Russian CTR, the GTRI or the G8 Global Partnership, which were designed to provide this kind of assistance. To increase participation, bring additional resources and strengthen the institutional structure of the programme, the assistance effort could use regional Nuclear Security Centers of Excellence to coordinate its activities.

To further strengthen the nuclear security regime, states should consider adopting a mechanism that would provide accountability in the areas of physical security and material control and accounting, for example by reporting on implementation of measure that meet the baseline security standard. The key challenge in this regard would be to develop a mechanism that provides enough transparency and at the same time protects confidential details of specific security measures that have been implemented. One possible solution to this problem includes an information-barrier approach, which would allow a state to confirm that implementation of key security measures has been completed without specifying details or disclosing whether the implemented measures go beyond the minimum requirements. This way a state could report on its compliance with agreed minimum security provisions without compromising sensitive information about its actual security arrangements.

UN Security Council resolution 1540 could provide the necessary legal basis to support the reporting activity. It would be within the resolution's scope, which commits states to develop effective physical protection measures and asks them to submit regular implementation reports. The matrix that was developed by the Committee established by the resolution could also be adapted to include data on physical protection of individual

facilities in a format that would be compatible with the information-barrier approach.

Military stocks and facilities

Any long-term solution to the problems of nuclear security would be impossible without addressing the military stocks of nuclear-weapon states. More than 65% of the global stock of about 2,000 tonnes of weapon-usable nuclear material is either in nuclear weapons or is available to national nuclear weapon programmes. This includes almost 140 tonnes of weapon-grade plutonium that has not been declared excess to national security needs and about 1,200 tonnes of HEU.[110] In addition, most of about 300 tonnes of HEU and plutonium that were designated for disposal remain in the military domain. Although some of that material is in storage, a substantial fraction of it is in operational use or in transport—in nuclear warheads and their components, and in fresh and spent fuel of nuclear submarines. This material is clearly vulnerable to diversion or sabotage and still none of the nuclear-weapon states has a clear obligation to account for security measures taken with regard to its military stock. The only legally accepted obligation regarding military material is included in article 8 of the International Convention for the Suppression of Acts of Nuclear Terrorism, which requires states to "adopt appropriate measures to ensure the protection of radioactive material". This clause is normally interpreted as covering military as well as civilian material. However, as discussed earlier, this provision does not contain a clear accountability mechanism.

It is commonly assumed that nuclear material used for military purposes is afforded a higher degree of protection than civilian material. It is normally in custody of the military, which has the necessary means to provide physical protection of the material and associated facilities. The evidence, however, suggests that military facilities could be as vulnerable as civilian facilities. The lack of transparency that is characteristic of most military organizations presents an additional challenge, since it could lead to situations in which the vulnerabilities are not detected and addressed in time, creating potentially dangerous situations. Military nuclear facilities often have their own regulatory and oversight structures, which makes it more difficult to evaluate the effectiveness of physical protection and other security measures implemented there.

An example of the questionable ability of a military nuclear security system to provide adequate physical protection and material accounting is the system that existed in the Soviet Union. As the breakup of the Soviet Union exposed many problems with security arrangements there, it became clear that even though the system may have worked in the past, it could not deal with evolving modern threats. While the efforts to strengthen the nuclear security arrangements in Russia that were undertaken by the CTR and the G8 Global Partnership addressed many of the problems, there are still unresolved questions about the sustainability of these efforts.

The evidence also suggests that even those nuclear security systems that are believed to be extremely robust are not immune to problems. The August 2007 incident at the US Minot airbase, in which six nuclear warheads were removed from storage and flown on a bomber to another facility, demonstrated that the United States lacks a reliable system to account for locations of nuclear weapons and that the security procedures for handling nuclear warheads have major vulnerabilities.[111] Even though it is unlikely that these particular vulnerabilities could be exploited to divert a nuclear warhead, the fact that they existed is already a reason for concern. The United States reported taking steps to address the problem, but because of the secrecy it is extremely difficult to judge whether the response was adequate.

These two extreme examples demonstrate that military material should not be left outside of the effort to bolster international nuclear security arrangements. The 2010 Nuclear Security Summit communiqué endorsed this view, stating that it is the "fundamental responsibility of states … to maintain effective security of all nuclear materials, which includes nuclear materials used in nuclear weapons".[112] This commitment should be brought into a broader context of nuclear non-proliferation and nuclear disarmament by developing a mechanism that would allow nuclear-weapon states to demonstrate their readiness to assume specific obligations regarding their military nuclear material.

In the context of nuclear disarmament efforts, nuclear-weapon states should assume responsibility for the safe and secure elimination or disposal of the military material in their possession. An obligation to eliminate the material that was used in weapons would significantly strengthen the global nuclear security effort. It would also make a strong case for stopping the production of new weapon material and could help advance negotiations

on a fissile material cut-off treaty. Finally, to advance the nuclear security agenda, nuclear-weapon states should commit to greater transparency concerning their stocks of nuclear material, starting with declarations of their total holdings.

Some of these measures have been implemented already. Russia and the United States made a commitment to eliminate about 740 tonnes of HEU and at least 68 tonnes of weapon-grade plutonium. As of 2010, more than 540 tonnes of HEU have already been blended down. During the 2010 Nuclear Security Summit Russia and the United States finalized a protocol to the plutonium disposition agreement that would allow them to begin practical work on elimination of weapon-grade plutonium. At this point, these elimination programmes are carried out as bilateral or unilateral initiatives, but Russia and the United States could encourage other states to initiate similar efforts as part of the nuclear security work plan.

With respect to the cut-off of fissile material production, all nuclear-weapon states of the NPT have stopped production of new fissile materials for weapons. This should make it easier for Summit participants to use the nuclear security agenda to gather support for a universal ban on new production. The fundamental responsibility of states for the security of nuclear material could be interpreted to include an obligation to limit production of weapon material. The nuclear security framework also provides an opportunity to address the military stocks of nuclear-weapon states outside of the NPT in a non-discriminatory manner.

As far as transparency is concerned, the United Kingdom and the United States have already published information about their fissile material stocks.[113] In the justifications for making these declarations, the two governments directly referred to the importance of the information about the production and stocks of fissile material to the public discussion of safety and security of plutonium and HEU. These declarations provided an important starting point for the efforts to ensure that all states that possess nuclear material have adequate material control and accounting system.

By directly addressing their stocks of military material, the nuclear-weapon states would demonstrate their strong commitment to nuclear security worldwide and the adherence to their NPT obligation to work towards nuclear disarmament.

ANNEX A

Status of the Convention on the Physical Protection of Nuclear Materials and of the International Convention for the Suppression of Acts of Nuclear Terrorism

The table below shows the status of the Convention on the Physical Protection of Nuclear Material, of the 2005 Amendment to that Convention and of the status of the International Convention for the Suppression of Acts of Nuclear Terrorism as of October 2011. States that submitted their instruments of ratification, acceptance or approval are marked with "+", states that have signed, but have not completed the ratification or approval process are marked with "*". Nuclear-weapon state members of the NPT and states that are not NPT members are in bold.

	Convention on the Physical Protection of Nuclear Material	2005 Amendment to the Convention on the Physical Protection of Nuclear Material	International Convention for the Suppression of Acts of Nuclear Terrorism
Afghanistan	+		*
Albania	+		*
Algeria	+	+	+
Andorra	+		*
Antigua and Barbuda	+	+	+
Argentina	+		*
Armenia	+		+
Australia	+	+	*
Austria	+	+	+
Azerbaijan	+		+
Bahamas	+		
Bahrain	+	+	+
Bangladesh	+		+
Belarus	+		+
Belgium	+		+
Benin			*

	Convention on the Physical Protection of Nuclear Material	2005 Amendment to the Convention on the Physical Protection of Nuclear Material	International Convention for the Suppression of Acts of Nuclear Terrorism
Bolivia	+		
Bosnia and Herzegovina	+	+	*
Botswana	+		
Brazil	+		+
Bulgaria	+	+	*
Burkina Faso	+		*
Burundi			+
Cambodia	+		*
Cameroon	+		
Canada	+		*
Cape Verde	+		
Central African Republic	+		+
Chile	+	+	+
China	**+**	**+**	**+**
Colombia	+		*
Comoros	+		+
Costa Rica	+		*
Croatia	+	+	+
Cuba	+		+
Cyprus	+		+
Czech Republic	+	+	+
Democratic Republic of the Congo	+		+
Denmark	+	+	+
Djibouti	+		*
Dominica	+		
Dominican Republic	+		+

	Convention on the Physical Protection of Nuclear Material	2005 Amendment to the Convention on the Physical Protection of Nuclear Material	International Convention for the Suppression of Acts of Nuclear Terrorism
Ecuador	+		*
Egypt			*
El Salvador	+		+
Equatorial Guinea	+		
Estonia	+	+	*
Fiji	+	+	+
Finland	+	+	+
France	**+**		*
Gabon	+	+	+
Georgia	+		+
Germany	+	+	+
Ghana	+		*
Greece	+		*
Grenada	+		
Guatemala	+		*
Guinea	+		*
Guinea-Bissau	+		+
Guyana	+		*
Haiti	*		
Honduras	+		
Hungary	+	+	+
Iceland	+		*
India	**+**	**+**	**+**
Indonesia	+	+	
Ireland	+		*
Israel	**+**		*
Italy	+		*
Jamaica	+		*

	Convention on the Physical Protection of Nuclear Material	2005 Amendment to the Convention on the Physical Protection of Nuclear Material	International Convention for the Suppression of Acts of Nuclear Terrorism
Japan	+		+
Jordan	+	+	*
Kazakhstan	+	+	+
Kenya	+	+	+
Kiribati			+
Korea, Democratic People's Republic of			
Korea, Republic of	+		*
Kuwait	+		*
Kyrgyzstan			+
Lao P.D.R.	+		
Latvia	+	+	+
Lebanon	+		+
Lesotho	+		+
Liberia			*
Libya	+	+	+
Liechtenstein	+	+	+
Lithuania	+	+	+
Luxembourg	+		+
Madagascar	+		*
Malawi			+
Malaysia			*
Mali	+	+	+
Malta	+		*
Marshall Islands	+		
Mauritania	+	+	+
Mauritius			*
Mexico	+		+

	Convention on the Physical Protection of Nuclear Material	2005 Amendment to the Convention on the Physical Protection of Nuclear Material	International Convention for the Suppression of Acts of Nuclear Terrorism
Monaco	+		*
Mongolia	+		+
Montenegro	+		*
Morocco	+		+
Mozambique	+		*
Namibia	+		
Nauru	+	+	+
Netherlands	+	+	+
New Zealand	+		*
Nicaragua	+		+
Niger	+	+	+
Nigeria	+	+	
Niue	+		
Norway	+	+	*
Oman	+		
Pakistan	**+**		
Palau	+		*
Panama	+		+
Paraguay	+		+
Peru	+		+
Philippines	+		*
Poland	+	+	+
Portugal	+	+	*
Qatar	+		*
Republic of Moldova	+	+	+
Romania	+	+	+
Russian Federation	**+**	**+**	**+**
Rwanda	+		*

	Convention on the Physical Protection of Nuclear Material	2005 Amendment to the Convention on the Physical Protection of Nuclear Material	International Convention for the Suppression of Acts of Nuclear Terrorism
Saint Kitts and Nevis	+		
Sao Tome and Principe			*
Saudi Arabia	+	+	+
Senegal	+		*
Serbia	+		+
Seychelles	+	+	*
Sierra Leone			*
Singapore			*
Slovakia	+		+
Slovenia	+	+	+
Solomon Islands			+
South Africa	+		+
Spain	+	+	+
Sri Lanka			+
St. Vincent and the Grenadines			+
Sudan	+		
Swaziland	+		*
Sweden	+		*
Switzerland	+	+	+
Syrian Arab Republic			*
Tajikistan	+		*
Thailand			*
The former Yugoslav Republic of Macedonia	+		+
Timor-Leste			*
Togo	+		*

	Convention on the Physical Protection of Nuclear Material	2005 Amendment to the Convention on the Physical Protection of Nuclear Material	International Convention for the Suppression of Acts of Nuclear Terrorism
Tonga	+		
Trinidad and Tobago	+		
Tunisia	+	+	+
Turkey	+		*
Turkmenistan	+	+	+
Uganda	+		
Ukraine	+	+	+
United Arab Emirates	+	+	+
United Kingdom	**+**	**+**	**+**
United Republic of Tanzania	+		
United States of America	**+**		*
Uruguay	+		*
Uzbekistan	+		+
Yemen	+		
EURATOM	+		

ANNEX B

G8 Global Partnership

The following list includes states and groups of states that are members of the G8 Global Partnership against the Spread of Weapons and Materials of Mass Destruction. The Russia Federation and Ukraine participate in the program as recipients.

Australia
Belgium
Canada
Czech Republic
Denmark
European Union
Finland
France
Germany
Ireland
Italy
Japan
The Netherlands
New Zealand
Norway
Poland
Republic of Korea
Russian Federation
Sweden
Switzerland
Ukraine
United Kingdom
United States

ANNEX C

Participants of the 2010 Nuclear Security Summit

The list is based on "World Leaders and Heads of Delegation Attending the Nuclear Security Summit", White House Press Release, 10 April 2010.

Algeria
Argentina
Armenia
Australia
Belgium
Brazil
Canada
Chile
China
Czech Republic
Egypt
European Union
Finland
France
Georgia
Germany
India
Indonesia
International Atomic Energy Agency
Israel
Italy
Japan
Jordan
Kazakhstan
Republic of Korea
Malaysia
Mexico
Morocco
The Netherlands
New Zealand
Nigeria
Norway
Pakistan
Philippines
Poland
Russian Federation
Saudi Arabia
Singapore
South Africa
Spain
Sweden
Switzerland
Thailand
Turkey
Ukraine
United Arab Emirates
United Kingdom
United Nations
United States
Vietnam

Notes

1 IAEA, *IAEA Safeguards Glossary*, 2001 ed., document IAEA/NVS/3, 2002, para. 3.14.

2 International Panel on Fissile Materials, *Global Fissile Material Report 2010. Balancing the Books: Production and Stocks*, 2010, p. 9.

3 Russia also declared a stock of 47.7 tonnes of separated reactor-grade plutonium. Ibid., p. 27.

4 International Panel on Fissile Materials, *Global Fissile Material Report 2010. Balancing the Books: Production and Stocks*, 2010, pp. 15, 22.

5 Ibid, pp. 13, 19.

6 Pavel Podvig, "The fallacy of the Megatons to Megawatts program", *Bulletin of the Atomic Scientists*, 23 July 2008.

7 See the Convention on the Physical Protection of Nuclear Material, art. 2.1.

8 Ibid., art. 3.

9 Ibid., annex II.

10 Ibid., annex I.

11 Ibid., art. 4.

12 Art. 2, para. 2, of the Convention states that "With the exception of articles 3 and 4 and paragraph 3 of article 5, this Convention shall also apply to nuclear material used for peaceful purposes while in domestic use, storage and transport".

13 International transfers of military nuclear material are rare, but they have occurred in the past. For example, the United States and the United Kingdom transferred HEU and plutonium to each other under a bilateral Agreement of Cooperation. Details of these transactions remain classified, but the transfers involved at least 7.5 tonnes of uranium and 5.4 tonnes of plutonium. US Department of Energy, *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*, rev. 1, draft, 2001 (publicly released 2006), p. 101.

14 IAEA, *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities*, document INFCIRC/225/Rev.5, 2011; IAEA, *Nuclear Verification and Security of Material; Physical Protection Objectives and Fundamental Principles*, document GOV/2001/41, 2001.

15 Maria de Lourdes Vez Carmona, "The International Regime on the Physical Protection of Nuclear Material and the Amendment to the Convention on the Physical Protection of Nuclear Material", *Nuclear Law Bulletin*, no. 76, 2005, p. 37

16 IAEA, *Nuclear Verification and Security of Material; Physical Protection Objectives and Fundamental Principles*, document GOV/2001/41, 2001; Maria de Lourdes Vez Carmona, "The International Regime on the Physical Protection of Nuclear Material and the Amendment to the Convention on the

Physical Protection of Nuclear Material", *Nuclear Law Bulletin*, no. 76, 2005, pp. 37–8.

17 IAEA, *Amendment to the Convention on the Physical Protection of Nuclear Material*, document GOV/INF/2005/10-GC(49)/INF/6, 2005, art. 2A.1.

18 Ibid.

19 Ibid., art. 2A.3.

20 IAEA, *Amendment to the Convention on the Physical Protection of Nuclear Material*, document GOV/INF/2005/10-GC(49)/INF/6, art. 1A.5.

21 IAEA, *Nuclear Verification and Security of Material; Physical Protection Objectives and Fundamental Principles*, document GOV/2001/41, 2001.

22 Rohan Perera, "International Convention for the Suppression of Acts of Nuclear Terrorism", United Nations Audiovisual Library of International Law, 2008, p. 1.

23 International Convention for the Suppression of Acts of Nuclear Terrorism, arts. 1.1, 1.2.

24 Ibid., art. 4.

25 Ibid., art. 4.1(b).

26 Ibid., arts. 18.5, 18.6.

27 Security Council, UN document S/RES/1373, 28 September 2001, paras. 3(a), 3(c).

28 Security Council, *Survey of the implementation of Security Council resolution 1373 (2001) by Member States*, UN document S/2009/620, 3 December 2009, annex, paras. 138ff.

29 Resolution 1540, para. 3.

30 Ibid., para. 7.

31 Ibid., para. 4.

32 Security Council, UN document S/RES/1673, 27 April 2006; Security Council, UN document S/RES/1810, 25 April 2008; and Security Council, UN document S/RES/1977, 20 April 2011.

33 Security Council, *Report of the Committee established pursuant to resolution 1540 (2004)*, UN document S/2006/257, 25 April 2006; Security Council, *Report of the Committee established pursuant to resolution 1540 (2004)*, UN document S/2008/493, 30 July 2008; and Security Council, *Report of the Committee established pursuant to resolution 1540 (2004)*, UN document S/2011/579, 14 September 2011.

34 Security Council, *Final document on the 2009 comprehensive review of the status of implementation of Security Council resolution 1540 (2004): key findings and recommendations*, UN document S/2010/52, 1 February 2010, annex.

35 Resolution 1540, paras. 3(a), 3(b).

36 See the reporting template, pp. 10–11, <www.un.org/sc/1540/matrixtemplate.shtml>.

[37] "Announcing the Global Initiative To Combat Nuclear Terrorism. Joint Statement by U.S. President George Bush and Russian Federation President V.V. Putin", St. Petersburg, 15 July 2006.

[38] See "The Global Initiative to Combat Nuclear Terrorism", at <www.state.gov/t/isn/c18406.htm>

[39] Anita Nilsson, "IAEA Activities, Experience and New Initiatives", in *Proceedings of an International Conference on Nuclear Security: Global Directions for the Future*, IAEA, 2005, p. 201.

[40] A.K. Semmel, "Future Goals and Challenges of the IAEA Nuclear Security Programme", in ibid., p. 211.

[41] IAEA, *Protection Against Nuclear Terrorism: Specific Proposals*, document GOV/2002/10, 2002.

[42] IAEA, *Nuclear Security—Measures to Protect Against Nuclear Terrorism. Progress Report and Nuclear Security Plan for 2006–2009*, document GC(49)/17, 23 September 2005; and IAEA, *Nuclear Security Plan 2010–2013*, document GOV/2009/54-GC(53)/18, 17 August 2009.

[43] See <www-ns.iaea.org/security/nuclear_security_series.asp>.

[44] IAEA, *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities*, document INFCIRC/225/Rev.5, 2011, § 2.1.

[45] Ibid.

[46] See IAEA, *Nuclear Verification and Security of Material. Physical Protection Objectives and Fundamental Principles*, document GOV/2001/41, 15 August 2001.

[47] IAEA, *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities*, document INFCIRC/225/Rev.5, 2011, p. 5.

[48] Ibid., pp. 7, 9, 10.

[49] Ibid., p. 12.

[50] Ibid., pp. 13–15.

[51] Ibid., pp. 15–16.

[52] Ibid., p. 17.

[53] IAEA, *The Convention on the Physical Protection of Nuclear Material*, INFCIRC/274/Rev.1, 1980, annex II.

[54] IAEA Statute, art. III.5.

[55] IAEA, *IAEA Safeguards Glossary. 2001 Edition*, 2002, p. 8.

[56] IAEA, *Model Protocol Additional to the Agreement(s) Between State(s) and the International Atomic Energy Agency for the Application of Safeguards*, document INFCIRC/540, 1997.

[57] *See* IAEA, *IAEA Safeguards Glossary. 2001 Edition*, 2002, p. 8.

[58] IAEA Statute, art. XII.1.

[59] Ibid., art. XII.2.

[60] IAEA, *The Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons*, document INFCIRC/153(Corr.), 1972, para. 5.

[61] IAEA, *Model Protocol Additional to the Agreement(s) Between State(s) and the International Atomic Energy Agency for the Application of Safeguards*, document INFCIRC/540, art. 15.

[62] R.S. Bean, T.A. Bjornard and D.J. Hebditch, "Safeguards-by-Design: An Element of 3S Integration", document IAEA-CN-166/067, IAEA Symposium on Nuclear Safety, April 2009, p. 2.

[63] See <www.iaea.org/OurWork/SV/Safeguards/sir_table.pdf>.

[64] Also, all civilian facilities in France and the United Kingdom are under European Atomic Energy Community (EURATOM) safeguards.

[65] See "International Physical Protection Advisory Service (IPPAS)", <www-ns.iaea.org/security/ippas.asp?s=4&l=26>; and IAEA, "20/20 Vision for the Future. Background Report by the Director General for the Commission of Eminent Persons", February 2008, p. 17.

[66] Jack Boureston and Andrew K. Semmel, "The IAEA and Nuclear Security: Trends and Prospects", The Stanley Foundation Policy Analysis Brief, December 2010.

[67] Maria de Lourdes Vez Carmona, "The International Regime on the Physical Protection of Nuclear Material and the Amendment to the Convention on the Physical Protection of Nuclear Material", *Nuclear Law Bulletin*, no. 76, 2005, p. 32.

[68] IAEA, *Implementation of the IAEA Nuclear Security Plan 2006–2009: Progress Report*, document GOV/2009/53-GC(53)16, 2009, para. 76.

[69] See <www-ns.iaea.org/security/ippas.asp?s=4&l=26>.

[70] IAEA, *Nuclear Security Plan 2010–2013*, document GOV/2009/54-GC(53)/18, 17 August 2009.

[71] Ibid., para. 4.

[72] Ibid., para. 6.

[73] Ibid., para. 34.

[74] Ibid., para. 35.

[75] Ibid., para. 38.

[76] Ibid., para. 44.

[77] For more information, see <www-ns.iaea.org/security/nsf.asp>.

[78] See The Soviet Nuclear Threat Reduction Act of 1991 at <www.fas.org/nuke/control/ctr/docs/hr3807.html>.

[79] "Not so hidden progress", RussianForces.org, 28 February 2005, <http://russianforces.org/blog/2005/02/not_so_hidden_progress.shtml>.

[80] US National Nuclear Security Administration, "U.S. And Russia Complete Nuclear Security Upgrades Under Bratislava Initiative", press release, 23 December 2008.

[81] See Defense Threat Reduction Agency, *Fiscal Year 2011 Budget Estimate, Cooperative Threat Reduction Program*, 2010.

[82] See "Office of Global Threat Reduction" at <http://nnsa.energy.gov/aboutus/ourprograms/nonproliferation/programoffices/officeglobalthreatreduction>.

83 See "GTRI: Reducing Nuclear Threats" at <http://nnsa.energy.gov/mediaroom/factsheets/reducingthreats>.

84 Pavel Podvig, "Rosatom and DoE to study conversion of Russian reactors", International Panel on Fissile Materials, 9 November 2010, <http://www.fissilematerials.org/blog/2010/11/rosatom_and_doe_to_study_.html>.

85 See "GTRI: Reducing Nuclear Threats" at <http://nnsa.energy.gov/mediaroom/factsheets/reducingthreats>.

86 Ibid.

87 Pavel Podvig, "U.S. assistance in securing fissile materials in Russia", International Panel on Fissile Materials, 5 February 2010, <http://www.fissilematerials.org/blog/2010/02/us_assistance_in_securing.html>.

88 "Remarks by President Barack Obama", The White House, 5 April 2009, <http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/>.

89 "The G8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction", Statement by the G8 Leaders, Kananaskis, 27 June 2002.

90 Ibid.

91 "Report on the G8 Global Partnership", 2010 G8 Muskoka Summit.

92 "Global Partnership Working Group—GPWG Annual Report 2010. Consolidated Report Data. Annex A", 2010 G8 Muskoka Summit.

93 "Deauville G8 Declaration. Renewed Commitment for Freedom and Democracy", 28 May 2011.

94 "Global Partnership Working Group—GPWG Annual Report 2010. Consolidated Report Data. Annex A", 2010 G8 Muskoka Summit.

95 US Government Accountability Office, *Progress Made in Improving Security at Russian Nuclear Sites, but the Long-term Sustainability of U.S.-Funded Security Upgrades is Uncertain*, document GAO-07-404, 28 February 2007.

96 *Moscow Nuclear Safety and Security Summit Declaration*, 20 April 1996.

97 Programme for Preventing and Combatting Illicit Trafficking in Nuclear Material, 20 April 1996.

98 "Announcing the Global Initiative To Combat Nuclear Terrorism. Joint Statement by U.S. President George Bush and Russian Federation President V.V. Putin", St. Petersburg, 15 July 2006.

99 *Communiqué of the Washington Nuclear Security Summit*, 13 April 2010.

100 *Work Plan of the Washington Nuclear Security Summit*, 13 April 2010.

101 Robert Golan-Vilella, Michelle Marchesano and Sarah Williams, "The 2010 Nuclear Security Summit: A Status Update", Arms Control Association and Partnership for Global Security Report, 2011, p. 1.

102 "The 2010 Nuclear Security Summit: A Status Update", pp. 4–5, <www.armscontrol.org/reports/NSS_Status>.

103 Pavel Podvig, "Belarus will remove all HEU by 2012", International Panel on Fissile Materials, 1 December 2010, <www.fissilematerials.org/blog/2010/12/belarus_will_remove_all_h.html>.

[104] Kim Bong-Hyun, "Moving toward a Successful Nuclear Security Summit", presentation at the Next Generation Nuclear Security meeting, Vienna, 13 April 2011.

[105] See IAEA, *Organization and staffing of the regulatory body for nuclear facilities: safety guide*, document STI/PUB/1129, 2002, p. 1.

[106] IAEA, *IAEA International Fact Finding Expert Mission of the Nuclear Accident Following the Great East Japan Earthquake and Tsunami. Preliminary Summary*, 2011.

[107] *The Accident at TEPCO's Fukushima Nuclear Power Stations*, report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, June 2011, pp. xii–11.

[108] Committee on Strengthening and Expanding the Department of Defense Cooperative Threat Program, *Global Security Engagement: A New Model for Cooperative Threat Reduction*, The National Academies Press, 2009.

[109] IAEA, *Amendment to the Convention on the Physical Protection of Nuclear Material*, document GOV/INF/2005/10-GC(49)/INF/6, 2005, art. 2A.3, Fundamental Principle G.

[110] International Panel on Fissile Materials, *Global Fissile Material Report 2010. Balancing the Books: Production and Stocks*, 2010, pp. 12, 19.

[111] Joby Warrick and Walter Pincus, "Missteps in the Bunker", *The Washington Post*, 23 September 2007; and Michael Hoffman, "237 nuke handling deficiencies cited since 2001", *The Air Force Times*, 12 February 2008.

[112] *Communiqué of the Washington Nuclear Security Summit*, 13 April 2010.

[113] See International Panel on Fissile Materials, *Global Fissile Material Report 2010. Balancing the Books: Production and Stocks*, 2010, p. 3.

ABBREVIATIONS

CTR	Cooperative Threat Reduction Program
GTRI	Global Threat Reduction Initiative
G8	Group of Eight
HEU	high-enriched uranium
IAEA	International Atomic Energy Agency
LEU	low-enriched uranium
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
WMD	weapons of mass destruction
3S	safeguards, safety and security

UNIDIR

The protection of nuclear material and facilities involves a broad range of activities at the international level as well as in individual countries. International law recognizes that each state has responsibility for implementing these measures and for providing adequate protection for the material in its possession. At the same time, the international community has established a set of arrangements that help to create and maintain the nuclear security regime. This study presents an overview of the elements of the international nuclear security regime and discusses proposals to strengthen its accountability arrangements, as well as the challenges of expanding the scope of the regime and creating a framework for global nuclear security efforts.

Designed and printed by the Publishing Service, United Nations, Geneva
GE.11-01859 — November 2011 — 2,226 — **UNIDIR/2011/9**