Reaching Critical Will

2010 NPT Review Conference Action Plan

- The Peaceful Uses of Nuclear Energy -

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Monitoring Report

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Contents

Introduction

The multilateral field of arms control, disarmament, and the non-proliferation of nuclear weapons has been marked by important developments in the recent year; one of the most significant was the 2010 nuclear Non-Proliferation Treaty (NPT) Review Conference. After four weeks of negotiations in May 2010, states parties to the NPT adopted a final document for the first time since 2000. In that final document, states agreed on 64 actions in order to implement the obligations contained in the three "pillars" of the NPT: nuclear disarmament, nuclear non-proliferation, and the peaceful uses of nuclear energy. In addition, it contains a decision to convene a conference for the establishment of a zone free of weapons of mass destruction in the Middle East and to appoint a Special Coordinator on the issue.

The final document and its action plan have been called successes by many governments, but the negotiations and previous drafts of this action plan highlight a resistance by the nuclear weapon states to accept any concrete commitments on nuclear disarmament and, in response, reluctance by some non-nuclear weapon states to agree on further substantial measures to deal with non-proliferation challenges, while promoting the so-called "virtues" of nuclear energy. The document was carefully crafted and modified to stay within the "red lines" of every delegation and it was, as the Chair described it, the best that could be offered at that point in time.

A final document is just a document, and states must now make significant progress in implementing it in order to move forward. The international community—states and civil society—have expressed frustration with the pace and scope of nuclear disarmament. The degree of compliance of some states parties with the NPT's provisions, and the lack of universality of that Treaty give rise to serious concerns or suspicions. The Comprehensive Test Ban Treaty (CTBT) has yet to enter into force 15 years after it was opened for signature and the Conference on Disarmament is still unable to make progress on the negotiation of a treaty to prohibit the production of fissile material for weapons purposes, or on any other nuclear disarmament issues.

Since the adoption of the action plan, significant events have changed how we perceive this document. On 11 March 2011 a powerful tsunami resulting from a 9.0 magnitude earthquake off the coast of Japan hit the Fukushima Daiichi nuclear power plant, damaging four of six reactors at the site. Following this catastrophe, some states are reviewing their national energy policies and concerns about the sustainability and security of nuclear energy have gained renewed attention. More and more governments and people around the world are starting to question the continued development of nuclear energy.

In light of the context described above, Reaching Critical Will, the Geneva Centre for Security Policy and the United Nations Institute for Disarmament Research (UNIDIR) are cooperating in a project aimed at providing a platform for examining the degree of implementation and operationalisation of the action plan in the three NPT "pillars". The project is supported by the Swiss Federal Department of Foreign Affairs as well as the Geneva Branch of the United Nations Office for Disarmament Affairs (UNODA).

This research report is our contribution to this project, where we have reviewed the implementation of one part of the actions as set out in the 2010 NPT Review Conference action plan, the third pillar on peaceful uses of nuclear energy. Similar research reports on the other two pillars will also be released: non-proliferation in September 2011 and nuclear disarmament in January 2012.

The project is formed to work to provide factual and clear information on the status of the implementation of the NPT Action Plan on peaceful uses of nuclear energy. The empirical data for this first part of the project was collected during the period of April to June 2011.

The research has been done through extensive review of publicly available information and through a survey aimed at the countries possessing nuclear power plants. The survey was individually designed to fit each state's nuclear power status. The answers were used to help guide the third round of information seeking, to verify the information each individual state contributed. The research is not a full technical investigation of all related facts, but is an attempt to provide an overview of states' compliance with the NPT action plan and to capture the most significant developments since May 2010 under actions 47 to 64. The research has been carried out within the limits of available resources, such as time, publicly available information, and limited participation of states in our survey. We encourage states and organizations to submit any comments or feedback to us.

We would like to thank the other partners of this project, the GCSP and UNIDIR, and we are particularly grateful to Dr. Christian Schoenenberger, Head of the Task Force on Nuclear Disarmament and Non-Proliferation at the Swiss Federal Department of Foreign Affairs for his support of this project and for Reaching Critical Will.

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Summary of implementation of actions

Action 47: Respect each country's choices and decisions in the field of peaceful uses of nuclear energy without jeopardizing its policies or international cooperation agreements and arrangements for peaceful uses of nuclear energy and its fuel cycle policies.

Action 48: Undertake to facilitate, and reaffirm the right of States parties to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy.

Action 49: Cooperate with other States parties or international organizations in the further development of nuclear energy for peaceful purposes, with due consideration for the needs of the developing areas of the world.

Action 50: Give preferential treatment to the non-nuclear-weapon States parties to the Treaty, taking the needs of developing countries, in particular, into account.

Action 51: Facilitate transfers of nuclear technology and international cooperation among States parties in conformity with articles I, II, III, and IV of the Treaty, and eliminate in this regard any undue constraints inconsistent with the Treaty.

Action 52: Continue efforts, within IAEA, to enhance the effectiveness and efficiency of its technical cooperation programme.

Action 53: Strengthen the IAEA technical cooperation programme in assisting developing States parties in the peaceful uses of nuclear energy.

Action 54: Make every effort and to take practical steps to ensure that IAEA resources for technical cooperation activities are sufficient, assured and predictable.

Action 55: Encourage all States in a position to do so to make additional contributions to the initiative designed to raise 100 million dollars over the next five years as extra budgetary contributions to IAEA activities, while welcoming the contributions already pledged by countries and groups of countries in support of IAEA activities.

Action 56: Encourage national, bilateral and international efforts to train the necessary skilled workforce needed to develop peaceful uses of nuclear energy.

Action 57: Ensure that, when developing nuclear energy, including nuclear power, the use of nuclear energy must be accompanied by commitments to and ongoing implementation of safeguards as well as appropriate and

effective levels of safety and security, consistent with States' national legislation and respective international obligations.

Action 58: Continue to discuss further, in a non-discriminatory and transparent manner under the auspices of IAEA or regional forums, the development of multilateral approaches to the nuclear fuel cycle, including the possibilities of creating mechanisms for assurance of nuclear fuel supply, as well as possible schemes dealing with the back-end of the fuel cycle without affecting rights under the Treaty and without prejudice to national fuel cycle policies, while tackling the technical, legal and economic complexities surrounding these issues, including, in this regard, the requirement of IAEA full scope safeguards.

Action 59: Consider becoming party, if they have not yet done so, to the Convention on Nuclear Safety, the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the International Convention for the Suppression of Acts of Nuclear Terrorism, the Convention on the Physical Protection of Nuclear Material, and to ratify its amendment so that it may enter into force at an early date.

Action 60: Promote the sharing of best practices in the area of nuclear safety and security, including through dialogue with the nuclear industry and the private sector, as appropriate.

Action 61: Encourage States concerned, on a voluntary basis, to further minimize highly enriched uranium in civilian stocks and use, where technically and economically feasible.

Action 62: Transport radioactive materials consistent with relevant international standards of safety, security and environmental protection, and to continue communication between shipping and coastal States for the purpose of confidence-building and addressing concerns regarding transport safety, security and emergency preparedness.

Action 63: Put in force a civil nuclear liability regime by becoming party to relevant international instruments or adopting suitable national legislation, based upon the principles established by the main pertinent international instruments.

Action 64: The Conference calls upon all States to abide by the decision adopted by consensus at the IAEA General Conference on 18 September 2009 on prohibition of armed attack or threat of attack against nuclear installations, during operation or under construction.

Chapter 1
Respect and facilitate peaceful uses of nuclear energy

- **Action 47**: Respect each country's choices and decisions in the field of peaceful uses of nuclear energy without jeopardizing its policies or international cooperation agreements and arrangements for peaceful uses of nuclear energy and its fuel cycle policies.
- **Action 48**: Undertake to facilitate, and reaffirm the right of States parties to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy.
- **Action 51**: Facilitate transfers of nuclear technology and international cooperation among States parties in conformity with articles I, II, III, and IV of the Treaty, and eliminate in this regard any undue constraints inconsistent with the Treaty.

Introduction

The commitments under this category of the action plan are very vague and difficult to quantify. States committed themselves to "respect", "facilitate", and "reaffirm" the right of states to use nuclear energy, but no consistent and internationally agreed definition of these terms in the context of the NPT and the right to peaceful uses of nuclear energy exists. States debate if action 47 implies an "obligation" of states with nuclear power to transfer technology to non-nuclear states that are party to the NPT. It is also difficult to ascertain systematically how the facilitation of such transfers has been achieved in the past or what the reaction to such facilitation has been. These questions are beyond the scope of this report.

By examining statements at the IAEA General Conference, IAEA press releases, and IAEA reports and documents, we have sought to find any potential critiques or concerns about current procedures of cooperation in the peaceful uses of nuclear energy. Additionally we reviewed statements delivered during the United Nations General Assembly General Debate and its First Committee. Some states have raised the issue in international fora and called for equal treatment of NPT states parties trying to pursue nuclear energy.

Existing restrictions on the development and trade of nuclear technology

The Nuclear Suppliers Group (NSG) is a group of nuclear supplier countries that seeks to contribute to non-proliferation efforts by drawing up guidelines for nuclear experts and nuclear-related exports. The NSG member states argue that its guidelines aim to ensure that the nuclear trade for peaceful purposes does not contribute to the proliferation of nuclear weapons or other nuclear explosive devices while at the same time does not hinder international trade and cooperation in the nuclear field. The first set of NSG guidelines governs the export of items that are especially designed or prepared for nuclear use. These include: (i) nuclear material; (ii) nuclear reactors and

equipment therefore; (iii) non-nuclear material for reactors; (iv) plants and equipment for the reprocessing, enrichment and conversion of nuclear material and for fuel fabrication and heavy water production; and (v) technology associated with each of the above items.[1] The second set of guidelines governs the export of nuclear related dual-use items and technologies, that is, items that can make a major contribution to an unsafeguarded nuclear fuel cycle or nuclear explosive activity, but that have non-nuclear uses as well, for example in industry.[2]

The members of the NSG are: Argentina, Australia, Austria, Belarus, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Kazakhstan, Republic of Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, the United Kingdom, and the United States

The Zangger Committee consists of a group of nuclear supplier states. Its objective is to reach a common understanding on (i) the definition of "equipment or material especially designed or prepared for the processing, use or production of special fissionable material;" and (ii) the conditions and procedures that would govern exports of such equipment or material in order to meet the obligations of Article III of the NPT on the basis of fair commercial competition. The Committee is an informal group and its decisions are legally-binding upon its members. The Committee maintains and updates a list of equipment that may only be exported if safeguards are applied to the recipient facility (called the "Trigger List" because such exports trigger the requirement for safeguards); and allows members to coordinate on nuclear export issues. The relative informality of the Zangger Committee has enabled it to take the lead on certain non-proliferation issues that would be more difficult to resolve in the NSG.

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

These two export control regimes have been criticized for putting additional restrictions on nuclear technology exports, and thereby effectively preventing countries from participating in the fullest possible exchange of activities for developing peaceful uses of nuclear energy. This criticism has continued after the adoption of the NPT action plan. For example, at the September 2010 general debate of the General Assembly, the Cuban representative argued that "the existence of a club of the privileged and the countries of the South denial of the right to a peaceful use of nuclear energy should cease."[3]

The NPT states that "all the parties to the treaty undertakes to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy"[4] and that states must be subject to full scope IAEA safeguards.[5]

However, members of these two export control regimes argue that all members of the NPT are able to enjoy the benefits of peaceful uses of nuclear energy "in accordance with their international obligations."[6] What these "international obligations" should consist of is difficult to objectively define without a decision by, for example, the NPT Review Conference. Some members of these export control regimes want to include the IAEA additional protocol, together with other decisions from other fora, such as UN Security Council resolutions and resolutions from the IAEA Board of Governors. Others believe that it should only include the original comprehensive safeguard agreement, as was agreed upon at the time of the conclusion of the NPT in 1968.

Comments in international fora

As in previous years before the action plan was adopted, developing states have used international fora such as the General Assembly to highlight the right of all states to use nuclear technology peacefully. However, most references after May 2010 are generic calls for the inalienable right to develop nuclear energy and few countries have specified any incidents of lack of respect for their choices.

During the United Nations General Assembly General Debate the Non-Aligned Movement and the African Union called for "justice and equal treatment for all concerned nations"[7]. As during the NPT Review Conference,[8] Cuba expressed concerns regarding the denial of the right to a peaceful use of nuclear energy.[9]

Several states reasserted the right to peaceful uses of nuclear energy during the United General Assembly First Committee debate. Nigeria, Iran, Kenya, China, Chile, Senegal, and others asserted that all states parties to the NPT have the right to develop nuclear energy for peaceful purposes. South Africa's delegation argued that restricting access to the nuclear fuel cycle impedes states' rights to pursue the technology. It asserted that such pursuits should remain "sovereign" decisions based on domestic needs. While it recognized the proliferation implications associated with the transfer of nuclear technology, South Africa's ambassador maintained that these concerns should not lead to "unwarranted restrictions and controls over the legitimate peaceful use of nuclear energy." [10]

On 26–27 May 2011, the G8 met in Deauville, France, and agreed on a declaration on "Renewed commitment for freedom and democracy". In this declaration, the governments of Canada, France, Italy, Russia, United States, Germany, Japan, the United Kingdom, and the European Union declared their support for "the exchange, in conformity with the obligations of the NPT, of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy, in particular for developing countries."[11]

Interpretation difficulties

These three actions are subject to interpretation of both the wording in the specific actions as well as relevant provisions of the NPT itself. For example, Action 51 asks states to facilitate transfers "in conformity with articles I, II, III and IV of the Treaty, and eliminate in this regard any undue constraints inconsistent with the Treaty". Article III states that safeguards are to be "applied on all source or special fissionable material in all peaceful nuclear activities within the territory of such State under its jurisdiction, or carried out under its control anywhere." This opens up debate about

whether safeguards should be interpreted as they were set out in 1968 or in a more comprehensive manner to incorporate the additional protocol as some states call for. Whether or not these actions are being implemented would therefore require a comprehensive legal analysis and interpretation of the action and its provisions, as well as of articles I, II, III, and IV of the NPT itself. It is beyond the scope of this monitoring report to carry out such an interpretation, as for example it would need to be determined if "facilitate and reaffirm the right of States parties to participate in, the fullest possible exchange of equipment, materials and scientific and technological information" imply an obligation of nuclear states to transfer technology to non-nuclear states or not.

Conclusion

Many states continue to highlight the importance of having the right to develop nuclear energy for peaceful purposes and to have the ability to participate in nuclear technology exchange programmes. At the same time, there are few examples of states parties making additional and publicly visible efforts to make sure that all states can participate in nuclear energy exchanges. The statement by the G8 shows that countries continue to support the notion of exchange of technology for development of nuclear energy, but it remains difficult to assess what this actually means in practice.

It is therefore appropriate to conclude that states parties are currently appearing to comply with the obligations under action 47, 48, and 51 of the 2010 NPT action plan, but that disagreement on the implementation of these commitments are based on the interpretation of certain wording in the action plan and the NPT itself.

It is beyond the scope of this research paper to make a legal determination of what such concepts as "facilitate transfers of nuclear technology" or the legality of trade restrictions through the NSG would actually mean. It would require a more comprehensive examination of the right to peaceful use of nuclear energy, the right of states to apply export restrictions on technologies to prevent proliferation, and how these actions and commitments are interpreted in light of the context and purpose of the NPT itself. Such an examination would need to be done by international legal experts in order to get an authoritative interpretation.

References

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Chapter 2
Cooperation amongst states

Action 49: Cooperate with other States parties or international organizations in the further development of nuclear energy for peaceful purposes, with due consideration for the needs of the developing areas of the world.

Action 50: Give preferential treatment to the non-nuclear-weapon States parties to the Treaty, taking the needs of developing countries, in particular, into account.

Introduction

States continue to cooperate on the development of nuclear energy for peaceful purposes in a variety of ways. We have reviewed IAEA activities by looking at ongoing programmes and projects, such as cooperation programmes, training courses, and Coordinated Research Projects. For bilateral cooperation deals, we looked at governmental announcements and press releases as well as newspaper reports and articles. We took answers to the questionnaires we sent to government representatives in Geneva and Vienna as indications of new forms of co-operation and developments.

On Action 50, we decided to look at the different nuclear deals with non-nuclear weapon states parties to the NPT and nuclear deals with non-NPT states. We took the US-India agreement as an example of what such a deal could entail and have looked at the number of agreements and content of agreements made with non-NPT parties since May 2010. We found significant difficulties with defining "preferential treatment" and therefore it has been complicated to review the implementation of action 50. However, the sheer number of agreements concluded with India shows that "preferential treatment" for states parties to the NPT is not taking place.

Action 49

New cooperation programmes and training courses since May 2010

IAEA Technical Cooperation Programmes initiated in 2010[12]

- TUR/9/017; "Enhancing the Turkish Atomic Energy Authority's capability for regulatory oversight of construction, commissioning and operation of new nuclear power plants;
- KAZ/7/002; Kazakhstan; "Supporting Assessment of the Territory of the Semipalatinsk Nuclear Test Site for Further Economic Use";

- INT/0/085; Interregional project; "Sharing best practices for the design and management of technical cooperation projects";
- ECU/8/028; Latin America Section; "Upgrading a Gamma Irradiation Facility for multipurpose use";
- OMA/9/002; Asia and Pacific Section; "Strengthening the National Regulatory Infrastructure for radiological Safety and Occupational Exposure Control in Oman;
- UAE/9/008; Asian and Pacific Section; "Supporting for Development of National Nuclear Power Infrastructure for Electricity Generation in United Arab Emirates";
- Vietnam; signed its first Country Programme Framework (CPF) on 22 February 2011 for the period 2010-2015; and
- Mexico; signed its first CPF on 19 November 2010 for the period 2010-2015.

Regional cooperation training courses have continuously taken place since May 2010 in the Latin America and Caribbean Region, under the umbrella ARCAL:[13]

- C7-RLA-6.064-001,. "Regional Training Course on Assessment of Total Energy Expenditure and Physical Activity Using Nuclear Techniques" 14-18 June 2010; and
- C7-RLA-0.038-002, "Regional Training Course on Leadership and Management for Introducing and Expanding Nuclear Power Programmes" 1-12 November 2010.

Regional training courses within RCA (Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific):[14]

- "IAEA WMD PAEC Training Course on Implementation of LLW repository Development Project".

Regional training courses and conferences have also taken place in the African region, both between members of the African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA) and between non-members.[15]

The Technical Cooperation Division for Europe carried out an extensive number of workshops in late 2010. The workshops targeted mainly the following countries: Armenia, Azerbaijan, Belarus, Bulgaria, Czech Republic, Greece, Hungary, Kazakhstan, Lithuania, Poland, Romania, Russian Federation, Slovakia, Slovenia, and Ukraine. [16]

Numerous Coordinated Research Projects have taken place or are currently taking place among IAEA member states since May 2010. Most relevant to the NPT action plan are the projects under the following programmes: Division of Physical and Chemical Science, Department of Nuclear Energy, and Division of Nuclear Fuel Cycle and Waste Technology. The current active biggest projects are F23029, "Radiation Treatment of Wastewater for Reuse with Particular Focus on Wastewater Containing Organic Pollutants," including member countries Portugal, Turkey, Republic of Korea, Romania, Poland, Japan, Italy, Hungary, Egypt, and Brazil. Another additional project is T21026, "Treatment of Irradiated Graphite to

Meet Acceptance Criteria for Waste Disposal," involving Lithuania, Ukraine, Switzerland, Germany, United Kingdom, and the Russian Federation. Furthermore, Romania, Bulgaria, Russian Federation, and the United States are currently conducting L53002, "Increasing NPP Performance through Process-oriented Knowledge Management Approach". [17]

Multilateral efforts

On 7 May 2010 the Nuclear Suppliers Group (NSG) decided to amend the Part 2 Guidelines[18], in order to more clearly define the standard of implementation that all Participating Governments of the NSG regard as essential for the fulfilment of the Guidelines. The new text includes updates of certain standards in line with decisions made by the International Organization for Standardization, such as a one-dimensional length measurement error parameter and the same value for that error parameter for establishing export control thresholds. This control is based on the tested actual performance of the machine rather than the manufacturer's specification.

New bilateral cooperation agreements since May 2010

France-China: The deal signed on 4 November 2010 in Paris will allow the two countries to work together on nuclear reactors, fuel recycling, and uranium extraction. Selling the products of the collaboration to third parties will be considered.[19]

France-UK: In November 2010 France and the UK signed a nuclear treaty that will establish a centre in the UK to develop testing technology and another on in France to carry out the testing.[20]

China-Viet Nam: A nuclear cooperation agreement was reached in 2010. [21] It includes both the exchange of technology and training of personnel.[22]

China-South Africa: During the visit of President Zuma in Beijing on the 24 August 2010, talks about China building a nuclear power plant in South Africa were taking place.[23]

France-Chile: The two countries signed a deal promoting the exploration and development of uranium and the possible transfer of nuclear technology. The agreement on "institutional cooperation in nuclear energy" was signed by CCHEN and CEA in February 2011. [24]

France-Jordan: The two countries signed a nuclear cooperation agreement in July 2010. Incorporated in that agreement is a uranium mining agreement that might lead to an open-pit uranium mine, the necessary training of personnel, including scholarships for students, and nuclear technology, which will be offered by both French AREVA and Japanese Mitsubishi Heavy Industries.[25]

France-Saudi Arabia: On 22 February 2011, the two countries signed a peaceful nuclear deal that will allow Saudi Arabia to study French nuclear technology, its financial requirements, and implications for developing qualified national human resources.[26]

France-South Africa: As part of a broader nuclear cooperation agreement on the sharing of nuclear fuel and technology[27] reached on 2 March 2011, France (Areva) will be assisting in trainings of nuclear experts.[28]

Russia-Australia: On 11 November 2010 the Australia-Russia Nuclear Cooperation agreement entered into force. Australia will supply Russia with uranium in line with existing safeguards agreements and the agreement allows the two parties to cooperate on peaceful uses of nuclear technology and collaboration on nuclear safeguards and security.[29]

Russia-Venezuela: Russia is to build two nuclear reactors in Venezuela, but no specific timeframe was announced.[30] However, due to the nuclear disaster in Japan, the Venezuelan President has put the nuclear energy programme on hold.[31]

Russia-Viet Nam: Russia is to build the first nuclear power plant in Viet Nam. It will be built by the State Atomic Energy Corporation Rosatom affiliated company JSC Atomstroyexport, the Electricity of Vietnam (EVN) will be the construction customer. The agreement provides for turn-key construction of two nuclear power units of Ninh Thuan-1 nuclear power plant (NPP) of 1200 MW capacity each to the Russian technology.[32]

US-Chile: The US and Chile have signed a nuclear accord that will allow training of Chilean nuclear engineers.[33]

US-Russia-Canada: The three countries are establishing a counterterrorism centre in Russia to train personnel to protect nuclear sites in Russia.[34]

US-Viet Nam: The US and Vietnam are reported to hold negotiations on sharing nuclear fuel and civilian nuclear technology. This is an agreement to expand previous cooperation deals on peaceful uses of energy.[35]

Japan-Jordan: In September 2010 the two countries signed a nuclear cooperation deal through which Japan will assist in the construction and operation of a local reactor and in studies on radioisotopes and radiation.[36]

Japan-Republic of Korea: In December 2010 the two countries signed a cooperation agreement that will enable the transfer of nuclear related materials and technologies between the two countries.[37]

Japan-Turkey: In December 2010 the two countries signed a memorandum of understanding for the construction of a nuclear power plant in Turkey.[38] On 28 May, Turkey urged Japan to reopen the negotiations that were put on hold due to the aftermath of the earthquake and tsunami on 8 March 2011.[39]

Japan-Vietnam: On 22 Oct 2010 the two countries agreed to cooperate on nuclear power plant technologies and materials.[40] On 20 January 2011 they signed an agreement covering additional aspects of the peaceful uses of nuclear energy.[41]

South Africa-Republic of Korea: In October 2010 the two states signed a nuclear deal[42] to design and build nuclear power plants in South Africa.[43]

Trilateral cooperation agreements
Brazil-Turkey-Iran: On 24 May 2010, Iran officially declared its agreement with the Joint Declaration by the Foreign Ministers of Iran, Brazil, and Turkey, which was signed on 17 May 2010 in Tehran.[44] The deal stipulates that Tehran will ship 1,200kg of low enriched uranium (LEU) to Turkey in return for fuel rods to make medical isotopes. The LEU will continue to be the property of Iran and both Iran and the IAEA would be allowed to monitor and observe the safekeeping of the LUE in Turkey.

The deal came to a halt when the fourth set of UN sanctions entered into force on 9 June 2010, followed by decisions of the US Congress and the EU to approve new bilateral sanction measures. Russia, which in the past has been reluctant to impose sanctions, supported the UN sanctions.[45] As a reaction to the UN sanctions, Iran postponed the talks on the above mentioned agreement. President Ahmadinejad said "It's a punishment to teach them a lesson to know how to have a dialogue with nations".[46] Since then no further development has been made on the Brazil-Turkey-Iran agreement.

Action 50

US-India nuclear deal
The US-India nuclear deal was concluded well before the 2010 NPT action plan was adopted. However, as this was the first time such a deal was concluded with a non-NPT state party, it has set a standard for similar deals through the waiver that was granted for nuclear energy deals with India by the Nuclear Suppliers Group (NSG).

In 2005, US President George W. Bush and India's Prime Minister Manmohan Singh released a joint statement lifting the US moratorium on nuclear trade with India. The resulting 123 Agreement was published in August 2007, approved by the Nuclear Suppliers Group (NSG) in September 2008, and in October of the same year by the US Congress. The waiver approved by the NSG on 6 September 2008 allows any NSG member to trade with India, which means countries other than the United States can engage in nuclear trade with India.

In this agreement, India has committed itself to selective safeguards of the IAEA, strengthening the security of its nuclear arsenals, placing a moratorium on nuclear weapons testing (but not committing to signing and ratifying the CTBT) and working towards negotiations of a Fissile Material Cut-off Treaty (FMCT). US companies were to build nuclear reactors and India would be eligible to buy US dual-use nuclear technology, "including materials and equipment that could be used to enrich uranium and process plutonium, potentially creating the material for nuclear bombs."[47]

The agreement was received by the international community with mixed feelings and it has been criticized over the fact that the forty-five countries in the NSG have made a decision on behalf of the 189-strong membership of the NPT. Objections have been raised that the NSG has never been given the authority to reinterpret the NPT, overturn NPT decisions or violate existing international standards. When the

NSG waiver was approved in 2008, Namibia, Kazakhstan, Mongolia, Russia, France, Argentina, United Kingdom, and Canada joined the US in approving nuclear trade agreements with India.

Ahead of the NGS annual plenary meeting in the Netherlands the United States have circulated a "Food for Thought" paper[48] as a follow-up to the announcement on 8 November 2010 when President Obama announced his support for Indian membership of the NSG.[49]

On 23 and 24 June 2011, the NSG's annual plenary meeting took place in Noordwijk, the Netherlands. During this meeting, the NSG took the following actions;

- agreed to strengthen its guidelines on the transfer of sensitive enrichment and reprocessing technologies,
- reviewed the status of adherence to the Additional Protocol
- continued to consider all aspects of the implementation of the 2008 Statement on Civil Nuclear Cooperation with India and discussed the NSG relationship with India.[50]

The NSG also called upon all states to "exercise vigilance and make best efforts to ensure that none of their exports of goods or technologies contribute to nuclear weapons programmes".[51]

While the full decision is still unreleased, it is reported to recommend that members "not authorize the transfer of enrichment and reprocessing facilities and equipment and technology" to any country that has not entered the NPT, a complete inspections arrangement with the International Atomic Energy Agency and the IAEA Additional Protocol, which permits closer U.N. scrutiny of atomic sites in signatory nations.[52]

The guidelines would not prevent India from importing nuclear power reactors from NSG member nations, but government officials in New Delhi have suggested it might curb such purchases from countries that rule out access to nuclear fuel enrichment and reprocessing systems. Firms in the United States, France, and Russia hope to make such reactor sales to the South Asian state. India has not received enrichment and reprocessing systems from NSG member nations in the past, but according to reports, the new rules explicitly restrict exports of such materials.[53]

Shortly after the annual NSG meeting, US Secretary of State, Ms. Hillary Clinton stated at a press conference that the new guidelines on the enrichment and reprocessing technology "should not be construed as detracting from the Indo-US civilian nuclear deal". She further emphasized, "the US remains fully committed to expanding our civil nuclear cooperation with India" and that the NSG "clean waiver was an important joint accomplishment for both our governments and we stand by it." "Nothing", she said, about "the new ENR transfer restrictions agreed to by the NSG members should be construed as detracting from the unique impact and importance of the US-India civil nuclear agreement or our commitment to full civil nuclear cooperation".[54]

Since the adoption of the NPT action plan, several new deals and cooperation agreements have been concluded.

New cooperation agreements between NPT state parties and non-NPT state parties

China-Pakistan: In June 2010, China planned to provide Pakistan with two new nuclear reactors. Spokespeople emphasised that the reactors were for peaceful uses, in line with Chinese international obligations and under IAEA supervision.[55] In March 2011 China announced it was to sell further nuclear reactors to Pakistan.[56]

France-India: On 6 December 2010 France and India signed a civil nuclear deal.[57] The "Commissariat à l'Energie Atomique et aux Energies Alternatives – CEA" for France and the "Department of Atomic Energy – DAE" for India concluded a Cooperation Agreement in the field of Nuclear Science and Technology for peaceful uses of nuclear energy with the aim of establishing a general framework to enhance their collaboration and signed a specific implementation agreement in the field of education and research. It is expected that two French nuclear reactors will be built at Jaipur. [58]

Russia-India: Russia agreed to supply India with another two civilian nuclear reactors in Tamil Nadu.[59]

US-India: The US and India signed in late July 2010 an agreement for the reprocessing of spent fuel.[60] The agreement enables India to reprocess United States-obligated nuclear material under the IAEA safeguards. On 19 March 2011 the US announced it was still very much committed to the deal despite the incidents in Japan.[61]

Canada-India: During the G20-summit the two states signed an agreement that permits members of Canada's nuclear industry to cooperate with designated civilian nuclear installations under International Atomic Energy Agency (IAEA) safeguards in India. [62]

Japan-India: The two foreign ministers of Japan and India held talks on civil nuclear cooperation agreements in August and October 2010.[63] So far nothing has been signed and in light of the events in March 2011 priorities might have shifted, though both countries will continue to discuss possible ways of cooperation.[64]

Kazakhstan-India: On 16 April 2011 the two countries signed an intergovernmental framework agreement that covers research, technology transfer and exploration of uranium in Kazakhstan.[65]

United Kingdom-India: In July 2010, the UK government agreed to lift a ban on the export of nuclear technology and components to India.[66] A UK Civil Nuclear Power trade delegation of eight leading UK companies coordinated by the UK Nuclear Industry Association (NIA) and led by UK Business Ambassador Lady Barbara Judge, Director & Former Chairman of the UK Atomic Energy Authority and a Member of the UK Nuclear Development Forum visited India in February 2011 to explore the possibility of potential business partnerships with leading Indian companies organizations in the civil nuclear sector.[67]

Tanzania-India: In March 2011, Tanzania's prime minister expressed a wish that India would invest in uranium mining in Tanzania.[68]

Conclusion

Nuclear energy continues to be a source of extensive international cooperation. The number of technical cooperation initiatives through the IAEA continues to rise and so does bilateral cooperation among states. Immediate connection to the NPT action plan, however, is difficult to ascertain, since no significant increase in training or cooperation activities since May 2010 can be detected. IAEA Technical Cooperation Programmes (TCP) and regional cooperation under the umbrella of the respective regional division of the TCP mostly focus on the training of personnel and the education of experts. Bilateral cooperation among states also includes the training of personnel but mainly focus on the exchange of nuclear technology and expertise.

Nuclear energy agreements amongst NPT state parties are numerous and continue to be concluded. The earthquake and tsunami in Japan and the following disaster at the Fukushima nuclear power plant have given pause to some negotiations and some states are reconsidering their continued use or development of nuclear power, but most states continue to expand their nuclear options. States are therefore considered to comply with action 49.

When comparing the amount and scope of cooperation of NPT states parties with nuclear weapon-possessors not party to the NPT, especially the increased and fast cooperation expansion with India since the NSG exception was granted, shows that the line between non-NPT states and NNWS of the NPT is diminishing.

This is a cause for concern especially since the NSG has never been given the authority to reinterpret the existing international standards. Action 50 of the NPT action plan requests states to give preferential treatment to the non-nuclear-weapon States parties to the Treaty. The increasing number of deals and widening scope of nuclear cooperation with India has inevitably raised concerns about the compliance with this action and will continue be a source of significant disagreement at future NPT conferences, and this especially since the U.S. has now formally introduced the issue of the India's membership in the NSG. While the recent amendment to the NSG guidelines might be used to decrease the likelihood of Indian expansion of its nuclear weapons programme through foreign purchases of weapons-making technologies, countries like the United States have made it clear that it will not affect the peaceful nuclear technology trade with this non-member of the NPT.

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Chapter 3
Cooperation with the IAEA

Action 52: Continue efforts, within IAEA, to enhance the effectiveness and efficiency of its technical cooperation programme.

Action 53: Strengthen the IAEA technical cooperation programme in assisting developing States parties in the peaceful uses of nuclear energy.

Action 54: Make every effort and to take practical steps to ensure that IAEA resources for technical cooperation activities are sufficient, assured and predictable.

Action 55: Encourage all States in a position to do so to make additional contributions to the initiative designed to raise 100 million dollars over the next five years as extra budgetary contributions to IAEA activities, while welcoming the contributions already pledged by countries and groups of countries in support of IAEA activities.

Introduction

The action plan contained several actions related to states' cooperation with the International Atomic Energy Agency (IAEA). The commitments continue to be rather vague and lack concrete ways of measuring implementation.

In order to evaluate implementation of "enhancing the effectiveness" and "strengthening" the technical cooperation (TC) programme, we have looked at newly established programmes within the IAEA and the ongoing discussion about the source of funding for the technical cooperation fund.

In order to examine the resources of the technical cooperation programme, we aimed to compare the target figure set by the IAEA Board of Governors with the pledged amounts by governments and the rate of attainment of those pledged amounts. 2009, the year prior to the adoption of the NPT action plan, was used as a comparison. However, the IAEA does not release pledged amounts or rate of attainment of individual states, only total numbers. In addition, the official pledged amounts for 2010 will not be released until the IAEA General Conference in September 2011, and as of December 2010, the rate of attainment was only published in restricted documents that are not available to the public. It is therefore impossible to make an accurate examination of how states parties ensure that IAEA resources for technical cooperation activities are sufficient, assured, and predictable. It is only possible to make an estimated guess based on the target figure set by the IAEA Board of Governors and the likelihood of states meeting this target.

By sending out questionnaires to government representatives in Geneva and Vienna, we attempted to investigate how much money states parties have

contributed to the initiative designed to raise $100 million as extra budgetary contributions.

Action 52 and 53

New technical cooperation programmes since May 2010

- TUR/9/017; "Enhancing the Turkish Atomic Energy Authority's capability for regulatory oversight of construction, commissioning and operation of new nuclear power plants."
- KAZ/7/002; Kazakhstan; "Supporting Assessment of the Territory of the Semipalatinsk Nuclear Test Site for Further Economic Use."
- INT/0/085; Interregional project; "Sharing best practices for the design and management of technical cooperation projects".
- ECU/8/028; Latin America Section; "Upgrading a Gamma Irradiation Facility for multipurpose use"
- OMA/9/002; Asia and Pacific Section; "Strengthening the National Regulatory Infrastructure for radiological Safety and Occupational Exposure Control in Oman.
- UAE/9/008; Asian and Pacific Section; "Supporting for Development of National Nuclear Power Infrastructure for Electricity Generation in United Arab Emirates".
- Vietnam; signed its first Country Programme Framework (CPF) on 22 February 2011 for the period 2010-2015.
- Mexico; signed its first CPF on 19 November 2010 for the period 2010-2015.

Other developments

As of 17 February 2011, InTouch, an interactive online communication platform for the IAEA technical cooperation community, is operational. At this stage, InTouch allows registered users to complete and maintain their professional profile online, and to apply for a fellowship, scientific visit, training course or meeting, or for expert/lecturer assignments. InTouch also maintains an online history of the participation of registered users in the TC programme. In addition, InTouch provides a search engine linked to TC's database of resource institutions offering training and expertise, and also offers programme information and guidelines.[69]

Action 54

Development of the voluntary financing of the technical cooperation programme

2009

In September 2008, the Board of Governors recommended the target figure of $85 million for voluntary contributions to the Agency's Technical Cooperation Fund for 2009.[70] As of 31 December 2009, pledges against the 2009 Technical Cooperation Fund (TCF) target totalled $79.9 million. This amounts to 94.0% of the $85.0 million target. The rate of attainment, based on the figure of $77.5 million received as at 31 December 2009, was 91.1%, reflecting unpaid pledges of slightly less than $2.4 million (much of this was subsequently received in January

2010).[71] The IAEA does not release public figures of the payments by individual states.

2010
In June 2009, the Board of Governors recommend the target figure of $85 million for voluntary contributions to the Agency's Technical Cooperation Fund for 2010.[72] The final report by the IAEA on the pledges against the 2010 TCF will not be released until September 2011. As of 31 December 2010, the rate of attainment on payments to the TCF will only published in the Technical Cooperation Report, which is a restricted document. These numbers for 2010 will therefore not available to the public.

2011
In June 2010, the Board of Governors recommended the target figure of $86 million for voluntary contributions to the Agency's Technical Cooperation Fund for 2011.[73] This is an increase of $1 million from the previous year. The final report by the IAEA on the pledges against the 2011 TCF will not be released until September 2012.

2012
In June 2011, the Board of Governors recommended the target figure of $88.75 million for voluntary contributions to the Agency's Technical Cooperation Fund for 2012.[74] This is an increase of $2.75 million from the previous year. The final report by the IAEA on the pledges against the 2012 TCF will not be released until September 2013.

Discussion about the source of funding
The Technical Cooperation Fund (TCF) is currently being financed through voluntary contributions of member states. During the plenary discussion of the General Conference in September 2010, Bulgaria[75], Indonesia[76], Malaysia[77], Poland[78], and Zimbabwe[79] called for sufficient, assured and predictable resources for the TCF. Others, like Switzerland[80], Liechtenstein[81], and the Netherlands[82], suggested the IAEA should apply established United Nations standards since technical cooperation was its primary and fundamental task and therefore should be funded under the regular budget.[83] Guatemala emphasised that the fund should no longer depend on increases in voluntary contributions, but get more resources from the regular budget.[84] South Africa called the current system a "fundamental mistake"[85] and endorsed the view that "member states should ensure that extrabudgetary funds did not replace regular and predictable funds for core activities".[86] Indonesia underlined the importance of the technical cooperation programme for developing countries and stressed that it should not be politicised in any way.[87] Iran regretted that "the notion of political interference" had left its mark in the field of technical cooperation.[88]

In its resolution on the "Strengthening of the Agency's technical cooperation activities"[89] the IAEA General Conference stresses the need to work on achieving the goal of sufficient, assured and predictable resources for the TCF and welcomes the meeting of a working group on financing the agency's activities.[90] The working group will comprehensively review the nature of the technical cooperation resources and discuss ways of making the TCF sufficient, assured and predictable.

It will also address the relationship between the levels of the overall budget and the TCF.[91]

Action 55

Peaceful uses initiative
At the 2010 NPT Review Conference, the United States announced that it would supplement support for peaceful uses of nuclear energy with $50 million in additional funding over the next five years as part of President Obama's Peaceful Uses Initiative (PUI). The US delegation also called on other countries to join it in supporting this effort to expand the IAEA's ability to provide member states with access to the peaceful applications of nuclear energy.[92] According to a US State Department brochure, more than $6 million has already been committed to projects.[93] Japan has announced during the 2010 IAEA General Conference that it would contribute 3.5 million dollars.[94]

So far, Monaco, New Zealand and South Korea have announced that they will join this initiative, but did not specify how much money they would contribute.[95] Sweden and the EU are reported to be considering joining this initiative, but as of June 2011, no official decision has been taken and no concrete figures have been discussed.

Conclusion
The technical cooperation programmes are continuing as normal and new ones are initiated constantly. There is nothing that indicates that states parties are not complying with action 52 and 53.

Between 2010 and 2012, the Board of Governors increased the estimated target figure for the TCF with over three million dollars. If states parties continue to pledge and pay in the same rate as they did in 2009, the funding for the technical cooperation programme should increase from its 2009 levels. Based on the target figures, action 54 can be considered to be complied with by the IAEA member states as a group. The discussion about the sources of funding for the TCF should be further considered.

Action 55 encourages states to make additional contributions to the initiative designed to raise 100 million dollars. So far, the United States and Japan have publicly announced a figure for this, 50 million dollars respectively 3.5 million dollars. However, only 6 million dollars from U.S. funding are currently committed to projects. Other countries have announced that they either will or are considering contributing to this initiative, but no figures have been made public. In order to fully implement action 55, states would need to increase their publicly pledged donations.

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Chapter 4
Nuclear safety and security

Action 56: Encourage national, bilateral and international efforts to train the necessary skilled workforce needed to develop peaceful uses of nuclear energy.

Action 57: Ensure that, when developing nuclear energy, including nuclear power, the use of nuclear energy must be accompanied by commitments to and ongoing implementation of safeguards as well as appropriate and effective levels of safety and security, consistent with States' national legislation and respective international obligations.

Action 60: Promote the sharing of best practices in the area of nuclear safety and security, including through dialogue with the nuclear industry and the private sector, as appropriate.

Introduction

This set of actions focuses on nuclear safety and security. While action 57 addresses commitments to and implementation of safeguards, it is still has a strong focus on peaceful uses of nuclear energy. We have therefore chosen to leave the issue of implementation of safeguards in relationship to non-proliferation to the next monitoring report, which will focus on the actions concerning the second pillar.

The actions concerning nuclear safety and security have been put into question due to the recent nuclear disaster in Japan. It is difficult to find independent information regarding this disaster at this stage and to make a factual examination of the level of safety and security of the Fukushima plant, however it is clear that the problems are much greater than initially revealed and that meltdowns have occurred. The disaster has been ranked a 7, the same as Chernobyl.

Aside from research from the Union of Concerned Scientists (UCS) in the United States, we have not been able to find any similar independent sources that comprehensively examine safety problems on a national level. So the lack of concrete information from other countries does not signal that the safety problems that were reported in Fukushima and certain other countries are unique.

Action 56

International and regional training

The IAEA and its Regional Groups (ARCAL, Asia and Pacific Regional Group) continue to hold various workshops to train the necessary skilled workforce to deal with different steps in the nuclear fuel cycle. A significant increase in training activity could not be detected from previous years.

Regional cooperation training courses have continuously been taken place since May 2010 in the Latin America and Caribbean Region, under the umbrella

ARCAL.[96] For example; (C7-RLA-6.064-001) 'Regional Training Course on Assessment of Total Energy Expenditure and Physical Activity Using Nuclear Techniques' 14-18 June 2010, (C7-RLA-0.038-002) ' Regional Training Course on Leadership and Management for Introducing and Expanding Nuclear Power Programmes' 1-12 November 2010.

Regional training courses have also taken place within RCA[97] (Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific), such as "IAEA WMD PAEC Training Course on Implementation of LLW repository Development Project".

Regional training courses and conferences have also taken place in the African region, both between members of the African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA) and non-members.[98]

The Technical Cooperation Division for Europe carried out an extensive number of workshops in late 2010.[99] The workshops targeted mainly the following countries: Armenia, Azerbaijan, Belarus, Bulgaria, Czech Republic, Greece, Hungary, Kazakhstan, Lithuania, Poland, Romania, Russian federation, Slovakia, Slovenia, and Ukraine.

New bilateral training agreements

France-Jordan: The two countries signed a nuclear cooperation agreement in July 2010. Incorporated in that agreement are an uranium mining agreement, which might lead to an open-pit uranium mine, the necessary training of personnel, including scholarships for students, and nuclear technology, which will be offered by both French AREVA and Japanese Mitsubishi Heavy Industries[100]

France-South Africa: As part of a broader nuclear cooperation agreement on the sharing of nuclear fuel and technology[101] reached on 2 March 2011, France (Areva) will be assisting in trainings of nuclear experts.[102]

US-Chile: The US and Chile have signed a nuclear accord that will allow training of Chilean nuclear engineers.[103]

US-Russia-Canada: The three countries are establishing a counterterrorism centre in Russia to train personnel to protect nuclear sites in Russia.[104]

Action 57

Most nuclear energy programmes of states parties to the NPT are accompanied by the implementation of the necessary IAEA safeguards, as well as appropriate and effective levels of safety and security. However, there are still some countries that have not yet signed and ratified the basic IAEA comprehensive safeguards agreement. There have been reports of violations of safeguards, especially in the cases of Iran and Syria. This however applies more to the safeguards in relation to non-proliferation and will be dealt with in the next monitoring report on the second pillar. The Fukushima accident has also raised concerns over the safety and security of nuclear energy facilities.

Steps towards signing and ratifying the IAEA Safeguards Agreements[105]

- Since May 2010, IAEA Safeguards have entered into force in the following states: Andorra (18 Oct 2010); Chad (13 May 2010); Montenegro (4 March 2011); Mozambique (1 March 2011); Pakistan (15 April 2011); and Rwanda (17 May 2010)
- Romania acceded to the IAEA safeguards on 1 May 2010
- Djibouti signed the safeguards agreements on 27 May 2010

NPT states that do not yet have a comprehensive safeguard agreement in force

- States that have signed but not yet put into force the CSG agreements:[106]
  Benin (7 June 2005), Cape Verde (28 June 2005), The Republic of the Congo (13 April 2010), Djibouti (27 May 2010), Timor-Leste (6 October 2009), Togo (29 November 1990)

- States for which CSG agreements have been approved by the Board of Governors but have not yet been signed:[107]
  Equatorial Guinea (13 June 1986), Vanuatu (8 Sep 2009)

- States that have not yet submitted CSG agreements to the Board of Governors for its consideration:[108]
  Eritrea, Guinea, Guinea Bissau, Liberia, Micronesia, São Tomé & Principe, Somalia

Existing IAEA standards

- Convention on Nuclear Safety[109]
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management[110]
- Convention on Early Notification of a Nuclear Accident[111]
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency[112]
- Code of Conduct on the Safety and Security of Radioactive Sources[113]
- Code of Conduct on the Safety of Research Reactors[114]

Safety problems

Japan:
In March 2011, a powerful tsunami generated by a magnitude-9.0 earthquake out at sea slammed into the Fukushima Daiichi nuclear power plant, damaging four of six reactors at the site. A series of fires were set off, after the cooling systems failed. The failure of the cooling system was caused by damage to power supplies by the tsunami. The lack of power meant water stopped circulating and began to boil, creating steam. Venting hydrogen gas from the reactors caused explosions, forcing engineers to use seawater in an effort to cool overheating reactor cores. Originally classified as International Nuclear and Radiological Event Scale (INES) Level 5, the severity was raised to INES Level 7 on 12 April 2011 when a new

estimate suggested higher levels of radiation than previously thought had leaked from the plant.[115]

Media has reported that the IAEA raised concerns over two years ago about the Japanese nuclear facilities' capability to withstand powerful earthquakes.[116]

Though Japan has an advanced nuclear energy industry, this crisis highlighted that current equipment used in the Fukushima reactors might not have been seismically sound. Independent information and evaluation of the safety and security of the Japanese nuclear power plants is difficult to find at this point, most information comes from the Japanese government itself or the IAEA. The Japanese government has released a report to the IAEA Ministerial Conference on Nuclear Safety, where it highlights some of the safety and security failures at Fukushima both of preventive measures and the adequacy of responses.[117] Aside from structural issues such as the design of construction and the failing of power and cooling systems, emergency response, poor communication and unprepared and untrained personnel posed problems in dealing with aftermath of the tsunami.

In the same report, the Japanese government suggests actions to be taken to address these security and safety problems. The suggested actions vary from reassessing the danger posed by earthquakes and tsunamis, redesigning safety structures, securing the power supply and alternative cooling systems in case of an accident, to the enhancement of training responding to severe accidents.[118]

On 16 June, 2011, the IAEA presented its final report from the fact-finding expert mission of the Fukushima Daiichi NPP accident. The report outlined 15 main conclusions;

1. The IAEA Fundamental Safety Principles provide a robust basis in the relation to the circumstances of the Fukushima accident and cover all the areas of lessons learned from the accident.
2. Given the extreme circumstances of this accident the local management of the accident has been conducted in the best way possible.
3. There were insufficient defence-in-depth provisions for tsunami hazards.
4. The safety of the Tokai Dai-ni and Fukushima Dai-ni should be evaluated and secured for the present state of the plant and site and the changed hazard environment.
5. An updating of regulatory requirements and guidelines should be performed reflecting the experience and data obtained during the earthquake and tsunami.
6. Japan has a well organized emergency preparedness and response system as demonstrated by the handling of the Fukushima accident.
7. Dedicated and devoted officials and workers, and a well organized and flexible system made it possible to reach an effective response even in unexpected situations and prevented a larger impact of the accident on the health of the general public and facility workers.
8. A suitable follow up programme on public exposures and health monitoring would be beneficial.
9. There appears to have been effective control of radiation exposures on the affected sites despite the severe disruption by the events.

10. The IAEA Safety Requirements and Guides should be reviewed to ensure that the particular requirements in design and severe accident management for multi-plant sites are adequately covered.
11. There is a need to consider the periodic alignment of national regulations and guidance to internationally established standards and guidance, for inclusion in particular of new lessons learned from global experiences of the impact of external hazards.
12. The Safety Review Services available with IAEA-ISSC would be useful in assisting Japan's development in the following areas; external event hazard assessment; walk downs for plants that will start up following a shutdown; and pre-earthquake preparedness.
13. A follow-up mission should look in detail at lessons to be learned from the emergency response on and off the site.
14. A follow-up mission should be conducted to seek lessons from the effective approach used to provide large scale radiation protection in response to the Fukushima accident.
15. A follow-up mission to the 2007 IRRS should be conducted in light of the lessons to be learned from the Fukushima accident and the above conclusions to assist in any further development of the Japanese nuclear regulatory system.[119]

Canada

In March 2011, a leak was discovered at the Pickering Nuclear Generating Station. Demineralised water reached Lake Ontario and even though officials said it caused no risk to the population critics express concerns about the potential nuclear contamination of Lake Ontario in case of a severe accident. The leak has been stopped and the faulty pump replaced.[120]

United Kingdom

The Office of Nuclear Regulation publishes quarterly statements of nuclear in nuclear incidents at nuclear installations[121] and quarterly site reports.[122] It reported of nine incidents at nuclear installations in Britain in the period from 2010 – 2011. Incidents include unplanned shutdowns, leaks and defective pumps of the cooling system.[123]

United States:

The Union of Concerned Scientists (UCS) published a report in March 2011 on the U.S. Nuclear Regulatory Commission (NRC) and nuclear power plant safety in 2010.[124] They report of fourteen so-called near-misses, where security problems, equipment failure, poor maintenance of equipment and poor training of personnel led to incidents that could have had severe consequences. The UCS called for more thorough inspections by the NRC and more responsible approach of the owners of the nuclear plants when dealing with security issues.

Statements, resolutions, and conferences

In September 2010, the IAEA General Conference adopted its annual resolution on nuclear security.[125] The resolution is not much different from previous years and continues to call on all member states to maintain the highest possible standards of security and physical protection of nuclear materials and facilities.

On 26–27 May 2011, the G8 met in Deauville, France, and agreed on a declaration on "Renewed commitment for freedom and democracy". In this declaration, the

governments of Canada, France, Italy, Russia, United States, Germany, Japan, the United Kingdom, and the European Union adopted a whole chapter on nuclear safety, emphasizing that nuclear safety should be addressed as a top priority on the G8 agenda. In this declaration, the G8 urged countries "to complete periodic review of safety assessments and to carry out assessments at every stage of a nuclear installation's lifetime, building on experience, and we reaffirm the high priority that we place on safety in the siting and design of new reactors, and the necessity of continuous improvement, learning from incidents and accidents everywhere." The declaration also called upon the IAEA to "consider the relevant IAEA standards to identify issues that may warrant examination and revision in light of the Fukushima accident, and, in particular, to consider developing or improving additional standards for the construction and operation of nuclear power plants in seismically hazardous areas, as well as in areas that might be otherwise exposed to other external events, taking into account their integrated impact."[126]

The Fifth Review Meeting of the Convention on Nuclear Safety (CNS) convened in Vienna, Austria, from 4-14 April 2011. During the ten days of meetings, delegations from 61 of the 72 countries that are "Contracting Parties" to the Convention discussed long-term safety issues, as well as the unfolding nuclear emergency at the Fukushima Daiichi power plant in Japan. As a result of the Japanese disaster, the contracting parties are carrying out safety reviews of their nuclear installations, including re-examining the nuclear power plants' safety measures that defend against extreme external events. The Contracting Parties stated that the learning process following the Fukushima accident will continue as more information is acquired and analyzed. A Second Extraordinary Meeting for states parties to the Convention of Nuclear Safety will be held in August 2012 to analyze the Fukushima accident.[127]

On 20 May 2011 United Nations Secretary General Ban Ki Moon has announced the launching of a "UN system-wide study on the implications of the accident at the Fukushima Daiichi nuclear power plant".[128] It is intended to "highlight the need to strengthen the capacity of the relevant international organisations".[129] The report will be presented at the High-Level Meeting on Nuclear Safety and Security on 22 September 2011 in New York.[130] In his address to the IAEA Ministerial Conference on Nuclear Security on 20 June 2011 he stated that nuclear safety is a "global public good"[131] and an evolving process and expressed the hope that lessons of Fukushima will help to move this process forward, "so that countries will reflect on their current system of nuclear safety and promote a renewed culture of nuclear safety".[132]

The IAEA Ministerial Conference on Nuclear Security met on 20 June 2011 in Vienna. They underline the responsibility of states and industry to implement existing IAEA safety standards and stress the need to draw lessons from the accident at Fukushima Daiichi after both IAEA and Japan have given "a comprehensive and fully transparent"[133] assessment of the events. They also emphasise the need to "improve national, regional and international emergency preparedness and response to nuclear accidents"[134] and underline the need for states embarking on nuclear power programmes to "create an appropriate nuclear safety infrastructure based on IAEA safety standards and relevant guidance and assistance".[135]

As a reaction to the accident at Fukushima the European Union (EU) has decided to review the safety of all EU nuclear plants on the basis of "comprehensive and transparent risk and safety assessments".[136] The Western European Nuclear Regulators' Association (WENRA) of the European Nuclear Safety Regulators Group (ENREG) has put forward a proposal on 23 March 2011 for stress tests on European nuclear power plants[137] and on 1 June 2011 operators started reviewing their facilities and will report on it 9 December 2011.[138] ENREG will also host a Conference on Nuclear Safety in Brussels on 28/29 June 2011.

On 25 May 2011 the Ministers and Heads of Delegations of Austria, Greece, Ireland, Latvia, Liechtenstein, Luxembourg, Malta, and Portugal made a declaration critically reviewing various aspects in connection with nuclear power. They reiterated the risks that remain in association with the nuclear power option and the need to draw lessons from the events in Japan. They requested a reassessment of the design basis for installations and that safety margins are clearly identified. Furthermore they emphasised that the "transboundary nature of the risks associated with nuclear power should be considered in the context of States' collective responsibility for the health and environment of their citizens which demands that the interest and concerns of other States, (…), are taken into account by nuclear states in relation to all nuclear projects and installations".[139]

In the spring of 2012 the second Nuclear Security Summit will review states' progresses of the implementation of their commitments in Seoul.[140]

Action 60

There has been some effort to promote the sharing of best practices.

IAEA Technical Cooperation Programmes
INT/0/085. Sharing best practices for the design and management of technical cooperation projects: To enhance the effectiveness of the technical cooperation programme by sharing best practices for design and management of TC projects across regions. The project is in an exercise aimed to enhance the effectiveness of the technical cooperation programme and in no way alters the established principles of the TC programme but is aimed to improve the manner in which the Agency is providing TC.[141]

IAEA Communication Tool
InTouch: Interactive communication platform to enhance communication between actors. It allows registered users to complete and maintain their professional profile online, and to apply for a fellowship, scientific visit, training course or meeting, or for expert/lecturer assignments. InTouch also maintains an online history of the participation of registered users in the TC programme. In addition, InTouch provides a search engine linked to TC's database of resource institutions offering training and expertise, and also offers programme information and guidelines.[142]

G8 Summit
The Nuclear Safety and Security Group (NSSG) of the G8 submitted its report in May 2011. The NSSG shared best practices and lessons learned in implementing the International Initiative on 3S-Based Nuclear Energy Infrastructure and identified several key findings on safety, security, and safeguards.[143]

Conclusion

The Fukushima accident has raised significant concerns around the world about the safety of nuclear energy. While states parties might be implementing action 57 as it is phrased, the significance of this action is evolving. The IAEA has convened a five-day Ministerial Conference on Nuclear Safety, following the 11 March 2011 nuclear accident at TEPCO's Fukushima Daiichi Nuclear Power Station in Japan, to learn lessons from the accident and to strengthen nuclear safety throughout the world. The IAEA, with the support of the Japanese government, also conducted a preliminary mission to find facts and identify initial lessons to be learned from the accident at Fukushima and share this information across the world nuclear community. However, no independent examination of the Fukushima accident and its consequences has yet taken place. Safety issues are becoming an increasingly important factor for the peaceful uses of nuclear energy and will play a more central role in future discussions.

Progress on action 56 and 60 is not overwhelming, but neither insignificant. Neither action requires any increase; it mainly calls upon states to encourage training programmes and to promote sharing of best practices. It is clear that much more attention will be devoted to these issues in the future. We have not detected any decrease of training programmes, and new initiatives for sharing of best practices have taken place.

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Chapter 5
The nuclear fuel cycle

Action 58: Continue to discuss further, in a non-discriminatory and transparent manner under the auspices of IAEA or regional forums, the development of multilateral approaches to the nuclear fuel cycle, including the possibilities of creating mechanisms for assurance of nuclear fuel supply, as well as possible schemes dealing with the back-end of the fuel cycle without affecting rights under the Treaty and without prejudice to national fuel cycle policies, while tackling the technical, legal and economic complexities surrounding these issues, including, in this regard, the requirement of IAEA full scope safeguards.

Introduction

While the action only contains an obligation to "continue to discuss further," progress in multilateral approaches to the nuclear fuel cycle has been significant. We've examined the discussions in the IAEA and in regional forums regarding this issue.

Low Enrichment Uranium Bank

On 3 December 2010, the International Atomic Energy Agency (IAEA) Board of Governors agreed to establish a nuclear fuel bank, endorsing a long discussed proposal without a dissenting vote from any of the 35 members. This new plan will set up a reserve of low-enriched uranium (LEU) under IAEA control.

In the vote, which came on the second day of the Board's two-day meeting in Vienna, 28 countries supported the plan and six abstained. Pakistan was absent. The tally marked a shift from the vote a year earlier on another fuel bank proposal, authorizing Russia to set up a fuel reserve at the Angarsk site in Siberia. On that vote, eight countries voted against the plan and three abstained.[144]

In 2006, the Nuclear Threat Initiative (NTI), a private US organization, pledged $50 million for such a reserve on the condition that IAEA member states donate another $100 million and that the Board approve the plan. NTI originally said the plan had to be in place within two years, but since then has agreed to three one-year extensions. Pledges from the United States, the European Union, Kuwait, the United Arab Emirates, and Norway have combined to meet the $100 million goal, with the last pledge, Kuwait's, coming in March 2009.

According to a background memo that the IAEA Secretariat issued in January 2010, the $150 million should be enough funding for the purchase and delivery of 60 to 80 metric tons of low-enriched uranium (LEU), enriched to a level of less than 5 percent uranium-235. That is roughly the amount of LEU needed for a full core of a typical power reactor, once the LEU is fabricated into reactor fuel.

Should an IAEA Member State´s LEU supply be disrupted, and the supply cannot be restored by the commercial market, state-to-state arrangements, or by any other such means, it may call upon the IAEA LEU bank to secure LEU supplies, without distorting the commercial market. This initiative does not diminish in any way states' rights to establish or expand their own nuclear fuel production.[145]

Requirements for supply
LEU from the bank will only be supplied to a member state that fulfils the following criteria:[146]

- The member state is experiencing an LEU supply disruption and is unable to secure LEU from the commercial market, or through state-to-state arrangements, or by any other such means;
- The IAEA has made a conclusion that there has been no diversion of declared nuclear material and there are no issues relating to safeguards implementation in the requesting state; and
- The member state has brought into force a comprehensive safeguards agreement requiring the application of IAEA safeguards to all its peaceful nuclear activities.

Recipient state's obligations
The recipient state shall conclude a Supply Agreement with the Agency and through it undertake that:[147]

- The LEU from the IAEA LEU bank can only be used for fuel fabrication for the generation of energy at a nuclear power plant;
- The LEU may not be used to manufacture any nuclear weapon or nuclear explosive device, nor for any other military purpose;
- It shall not further enrich, reprocess, retransfer or re-export the LEU unless the IAEA agrees;
- It shall apply the applicable IAEA safeguards, safety standards and physical protection measures to the LEU; and
- It shall take responsibility for all liability for any nuclear damage that may be caused by a nuclear incident associated with the use, handling, storage or transport of the LEU supplied under the Agreement.

Host state
The IAEA LEU bank shall be located in one or more member states that are prepared to host the bank:[148]

- For the IAEA's LEU bank effective operation, the IAEA will ensure that the host state or states apply IAEA safeguards, safety standards, safety measures, and physical protection measures to the LEU in the bank;
- The host state shall grant the Agency the right to transport LEU to and from the IAEA LEU bank as determined by the Agency; and
- If necessary, guaranteed transit arrangements shall be concluded with states neighbouring the host state.

So far, Kazakhstan is the only country that has declared an interest in hosting the bank.[149]

Donor Pledges
The following countries have pledged to support the nuclear fuel bank:[150]

• European Union: up to €25 million;
• Kuwait: US$10 million;
• Norway: US$5 million - paid in full;
• United Arab Emirates: US$10 million;
• United States: US$49 540 000 - paid in full; and
• Nuclear Threat Initiative: US$50 million.

The IAEA Statute provides the Agency with the authority to carry out the activities that are necessary to establish and operate an IAEA LEU bank.

Other fuel bank initiatives
On 27 November 2009, the IAEA Board of Governors approved the initiative of the Russian Federation to establish a reserve of LEU for the supply of LEU to the IAEA for its member states. The fuel bank's operator, Rosatom, announced on 1 December 2010 that the fuel bank stores 120 tonnes of low-enriched uranium.[151]

Nuclear Fuel Assurance
The proposal put forward during the IAEA Board of Governors meeting in March 2011 by the United Kingdom aims to assure the availability of nuclear fuel. A supplier state would promise "not to interrupt the supply of enrichment services (to a recipient state) for non-commercial reasons."[152] Unlike the IAEA LEU bank in Angarsk, this proposal does not include the stockpiling of fuel. Instead supplier and recipient come to a contractual agreement guaranteeing an uninterrupted supply. The proposal was adopted on 10 March 2011.[153]

Statements in the General Conference of the IAEA in September 2010
During the last IAEA General Conference some states, including the United Kingdom, Ukraine, Germany, the Netherlands, Kuwait and Belgium on behalf of the European Union, confirmed the need to further discuss multilateral approaches to the nuclear fuel cycle. Austria expressed concerns that the risks of nuclear power outweigh the advantages and expanding it might increase the risk of proliferation, especially since there was no multilateral framework for the nuclear fuel cycle in place. Slovenia and Singapore also stated that multilateral approaches to the fuel cycle could contribute to nuclear security and non-proliferation. The establishment of a nuclear fuel bank in Angarsk, Russia was welcomed by several states and the Netherlands called for countries to move forward and consider further proposals that were made in this context. Switzerland welcomed the fuel bank but reminded states that the debate on technical, legal, economic and political aspects had not yet taken place. Comparing the Plenary Discussions in 2009 and 2010 the debate about multilateral approaches to the nuclear fuel cycle had not deepened significantly.[154]

Conclusion
The decision to establish a new nuclear fuel bank under the auspices of the IAEA is one of the most significant developments since the action plan was adopted in May 2010. The decision was made in the IAEA, and therefore complies with the requirement of the action. The financial support and the continued support through

statements from a group of states show a continued commitment to this topic.

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Chapter 6
Conventions

Action 59: Consider becoming party, if they have not yet done so, to the Convention on Nuclear Safety, the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the International Convention for the Suppression of Acts of Nuclear Terrorism, the Convention on the Physical Protection of Nuclear Material, and to ratify its amendment so that it may enter into force at an early date.

Action 63: Put in force a civil nuclear liability regime by becoming party to relevant international instruments or adopting suitable national legislation, based upon the principles established by the main pertinent international instruments.

Introduction

The two actions concerning treaties and international regimes are relatively straightforward. While the commitment in action 59 is relatively weak and only obliges states parties to "consider" becoming a party, we have examined how many states party to the NPT are not yet member of these treaties and how this has changed since the adoption of the action plan. Since the Fukushima disaster, this action is considered in a new light. Despite its voluntary nature, nuclear safety and security is becoming increasingly important and more attention to these conventions and instruments are essential.

While national legislation for civil nuclear liability regimes for 189 states party to the NPT is difficult to access and examine, we have looked at the main international instruments for civil nuclear liability and made a similar examination as with action 59.

Action 59

Nuclear conventions

International Convention for the Suppression of Acts of Nuclear Terrorism

- Parties: 77
- Signatories: 115
- Changes since May 2010: Lesotho (22 September 2010 ratification), Nauru (24 August 2010 accession), Netherlands (30 June 2010 acceptance), St. Vincent and the Grenadines (8 July 2010 accession), Tunisia (28 September 2010 accession)

Convention on Nuclear Safety:

All countries with operating nuclear power plants are now parties to the Convention. 11 signatory countries have not yet ratified the convention

- Parties: 72
- Signatures: 11
- Changes since May 2010: Bahrain (09 February 2011 entry into force), Bosnia and Herzegovina (16 September 2010 entry into force), Kazakhstan (08 June 2010 entry into force), Saudi Arabia (16 June 2010 entry into force), Tunisia (20 July 2010 entry into force), Vietnam (15 July 2010 entry into force)

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency:
- Parties: 105
- Signatories: 68
- Changes since May 2010: none

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management:
- Parties: 58 parties
- Signatories: 42
- Changes since May 2010: Indonesia (30 June 2011 entry into force), Gabon (28 July 2010 entry into force), Kazakhstan (08 July 2010 entry into force), Montenegro (07 November 2010 entry into force),

Convention on Early Notification of a Nuclear Accident:
- Parties: 110
- Signatories: 69
- Changes since May 2010: Georgia (05 November 2010 entry into force), Bahrain (4 June 2011 entry into force)

Convention on the Physical Protection of Nuclear Material:
- Parties: 145
- Signatures: 44
- Changes since May 2010: Bahrain (09 June 2010 entry into force), Lao P.D.R. (29 October 2010 entry into force), Lesotho (17 September 2010 entry into force)

Amendment to Convention on the Physical Protection of Nuclear Material:
- Parties: 47
- Remaining states needed to bring amendment into force: 50
- States parties to the Convention that have not yet ratified the amendment: 98 (Afghanistan, Albania, Andorra, Argentina, Armenia, Azerbaijan, Bahamas, Bangladesh, Belarus, Belgium, Bolivia, Botswana, Brazil, Burkina Faso, Cambodia, Cameroon, Canada, Cape Verde, Central African Republic, Colombia, Comoros, Costa Rica, Cuba, Cyprus, Democratic Republic of Congo, Djibouti, Dominica, Dominican Republic, Ecuador, El Salvador, Equatorial Guinea, Finland, France, Georgia, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Honduras, Iceland, Ireland, Israel, Italy, Jamaica, Japan, Republic of Korea, Kuwait, Lao P.D.R., Lebanon, Lesotho, Luxembourg, Madagascar, Malta, Marshall Islands, Mexico, Monaco, Mongolia, Montenegro, Morocco, Mozambique, Namibia, Netherlands, New Zealand, Nicaragua, Niue, Oman, Pakistan, Palau, Panama, Paraguay, Peru,

Philippines, Qatar, Rwanda, Saint Kitts and Nevis, Senegal, Serbia, Slovakia, South Africa, Sudan, Swaziland, Sweden, Tajikistan, Macedonia, Togo, Tonga, Trinidad & Tobago, Turkey, Uganda, Tanzania, United States, Uruguay, Uzbekistan, and Yemen.)

Recent developments

The Fifth Review Meeting of the Convention on Nuclear Safety (CNS) convened in Vienna, Austria, from 4-14 April 2011. During the ten days of meetings, delegations from 61 of the 72 countries that are contracting parties to the Convention discussed long-term safety issues, as well as the unfolding nuclear emergency at the Fukushima Daiichi power plant in Japan. As a result of the Japanese disaster, the contracting parties are carrying out safety reviews of their nuclear installations, including re-examining the nuclear power plants' safety measures that defend against extreme external events.

Eight contracting parties did not submit a National Report, Bahrain, Bosnia and Herzegovina, Jordan, Kazakhstan, Libyan Arab Jamahiriya, Mali, Saudi Arabia, and Sri Lanka. 11 contracting parties, Bahrain, Bangladesh, Bosnia and Herzegovina, Jordan, Kuwait, Libyan Arab Jamahiriya, Mali, Republic of Moldova, Saudi Arabia, Sri Lanka, and Uruguay, did not attend the Review Meeting.[155]

A Second Extraordinary Meeting for states parties to the Convention of Nuclear Safety will be held in August 2012 to analyze the Fukushima accident.[156]

Statements and declarations

On 26–27 May 2011, the G8 met in Deauville, France, and agreed on a declaration on "Renewed commitment for freedom and democracy". In this declaration, the governments of Canada, France, Italy, Russia, United States, Germany, Japan, the United Kingdom and the European Union adopted a whole chapter on nuclear safety, emphasizing that the vital importance of nuclear safety which should be addressed as a top priority on the G8 agenda. The G8 urged countries that have not yet done so to ratify the Convention on Early Notification of a Nuclear Accident, Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, Convention on Nuclear Safety, and Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Regarding the Convention on Nuclear Safety, the G8 welcomed the extraordinary meeting of contracting parties that will take place in August 2012 to review measures that could strengthen the Convention, notably regarding safety objectives, the responsibility of governments for timely and sufficient measures on accident prevention and management, including the adjustment of procedures for coordination and interaction between the government, the operator and the safety authority, as well as an effective peer review mechanism.

The G8 also considered a possible strengthening of the other conventions. The final declaration stated that regarding the Convention on Early Notification of a Nuclear Accident, efficiency and substance of notifications on the nuclear accident should be further improved, and the Convention could be amended if necessary.[157]

Action 63

National legislative initiatives

Italy: Legislative Decree No. 31/2010. Sets out rules for the siting, construction and operation on the national territory of nuclear power plants, nuclear fuel fabrication facilities, storage systems for spent fuel and radioactive waste, as well as compensatory measures and public information campaigns. This decree implements the revised rules on the siting on the national territory of nuclear power plants, nuclear fuel fabrication facilities, systems for storing spent fuel and radioactive waste, and establishes:

Slovenia: Act on Liability for nuclear Damage, Treaty No. 77/2010. This act regulates the liability for nuclear damage resulting from peaceful uses of nuclear energy, the insurance of liability for nuclear damage, and the procedure for bringing an action for compensation for nuclear damage.

Sweden: The act on liability and compensation passed by the Swedish parliament in June 2011 gives full liability to the operator of a nuclear facility. It entered into force in January 2011 once the government had taken the relevant decisions. [158]

Germany: Amendment to the Atomic Energy Act extending the operating lifetime of nuclear power plants, (8 December 2010).

Comments in international fora

During the IAEA General Conference in September 2010 Austria expressed interest in the possible the creation of a global nuclear liability regime though the conventions under discussion offered less protection for possible victims than the Austrian regulations in place and "the maximum liability amounts laid down in the Paris and Vienna Conventions were inadequate and that the principle of channelling liability claims was unsatisfactory".[159] France called upon all states to recognise the importance of universalizing a civil nuclear liability regime.[160] The European Union (EU) explained it was examining the various legal regimes in the area of nuclear liability within the EU and possible improvements at the European level.[161]

International Liability Regimes

1960 Paris Convention, 1964 Additional Protocol, 1982 Protocol and 2004 Protocol:[162]
Changes since May 2010: Norway (signed 2004 protocol: 26 November 2010)

Vienna Convention on Civil Liability for Nuclear Damage:[163]
Changes since May 2010: Kazakhstan (deposit: 29 March 2011, entry into force: 29 June 2011), Saudi Arabia (deposit: 17 March 2011, entry into force: 17 June)

Protocol to amend the Vienna Convention on Civil Liability for Nuclear Damage:[164]
Changes since May 2010: Kazakhstan (deposit: 29 March 2011, entry into force: 29 June 2011), Montenegro (deposit: 4 March 2011, entry into force: 4 June 2011),

Poland (entry into force: 21 December 2010), Saudi Arabia (deposit: 17 March 2011, entry into force: 17 June)

Convention on Supplementary Compensation for Nuclear Damage:[165]
Changes since May 2010: India (signature: 27 October 2010)

1963 Brussels Supplementary Convention, 1964 Additional Protocol, 1982 Protocol and 2004 Protocol:[166]
No progress since May 2010

Joint Protocol Relation to the Application of the Vienna Convention and the Paris Convention:[167]
No progress since May 2010

Conclusion

The conventions on nuclear safety and security, as well as civil liability in case of nuclear accident are growing in importance. Therefore, these actions are increasingly crucial to implement in the light of nuclear accidents such as the Fukushima disaster. The conventions in action 59 have seen some modest progress in signatures and ratifications, but it is far from any significant achievement to increase the adherence. Even though the action only obliges states to "consider" becoming parties to these conventions, states need to make further efforts in order to implement action 59.

With regards to international civil liability regimes, moderate progress has been achieved. This is just a very small step forward, as the action includes a concrete commitment that states parties "shall" put such civil liability regime into force.

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Chapter 7
Nuclear materials

Action 61: Encourage States concerned, on a voluntary basis, to further minimize highly enriched uranium in civilian stocks and use, where technically and economically feasible.

Action 62: Transport radioactive materials consistent with relevant international standards of safety, security and environmental protection, and to continue communication between shipping and coastal States for the purpose of confidence-building and addressing concerns regarding transport safety, security and emergency preparedness.

Introduction

These actions are directed at the handling of nuclear materials and the corresponding safety standards. Like many other actions states are encouraged to act but no concrete measures are proposed within the actions themselves.

By looking at existing research and publicly available reports of IAEA meetings we collected information on the developments of HEU stocks of states designated for civil use. With regard to commercial use of HEU a lot of this information is confidential and remains with the producers of HEU.

To track the developments in regard to the transport of radioactive materials, we examined IAEA press releases, decisions, and resolution from multilateral bodies, statements, and reports. Like many other actions, states are encouraged to act but no concrete measures are mandatory through the action itself.

Action 61

Current Stocks of Highly Enriched Uranium (HEU)

There have been efforts both on national and international levels to reduce the use of HEU. The global amount of HEU decreased from about 1600 ± 300 metric tons in 2009[168] to 1475 ± 125 metric tons in 2010[169]. However, separating civil and military use of HEU is difficult. The following table shows which states are currently in possession of HEU and their estimated HEU stocks. Numbers are taken from James Martin Center for Nonproliferation Studies (2011), “Highly enriched Uranium: Who has what?” and comments from Gloan-Vilella, R., Marchesano, M., and S. Williams (2011), “The 2010 Nuclear Security Summit: Status Update”. [170]

Country	Who has what? (Civilian Use only)	Nuclear Security Summit: Status Update (April 2011)
Russia	700,000 kg	It is estimated that Russia has 11,000 nuclear warheads and hundreds of buildings containing nuclear materials, meaning that Russia is central to the broader nuclear security agenda. The United States has a wide variety of programmes in Russia, the functions of which include conducting security upgrades at nuclear facilities, consolidating Russian HEU, and converting Russian reactors to use LEU. These efforts have made varying degrees of progress in recent years. The Government Accountability Office (GAO) reported that the Material Protection, Control and Accounting programme has had the greatest success, conducting security upgrades at over one hundred sites. However, progress in terms of consolidating Russian HEU and converting Russian reactors to use LEU has been more limited.
United States of America	686,600 kg	As of September 2009, the United States had 5,113 nuclear weapons deployed and in reserve, plus several thousand awaiting dismantlement. The majority of its fissile material stockpile is designated for military purposes. For HEU, 260 tons is used for weapons and 230 tons reserved as fuel for naval reactors. (…) The United States concluded an agreement with Russia for each country to dispose of at least 34 tons of weapons-grade plutonium starting in 2018. The United States is also in the process of blending down large amounts of its HEU: it has designated 235 tons of its HEU for blend-down, of which 131 have already been blended down and 104 tons remain to be eliminated.

Country	Who has what? (Civilian Use only)	Nuclear Security Summit: Status Update (April 2011)
Kazakhstan	10,590-10,940 kg	Kazakhstan has by far the largest holdings of HEU of any non-weapon state. This is almost entirely due to the fact that Kazakhstan inherited the Soviet Union's BN-350 reactor. Most of the country's 10,000 kg of HEU consists of spent fuel from that reactor, which was also used to breed plutonium for the Soviet Union's nuclear weapons programme. In November 2010 the United States and other international partners completed a long-term effort to shut down the reactor and provide long-term storage for its spent fuel in a facility in eastern Kazakhstan. This included securing more than 10 tons of HEU and three tons of weapons-grade plutonium.
France	4,850 kg	France has an arsenal of approximately 300 nuclear warheads and extensive civilian stockpiles of fissile materials. France possesses 55.9 tons of plutonium and 4.9 tons of HEU as of its most recent declaration of civilian stocks
Japan	1,200 kg	
United Kingdom	1,404 kg	The United Kingdom possesses a stockpile of 225 nuclear warheads, of which less than 160 are operationally available. According to the most recent British defense review, these numbers are scheduled to be reduced to 180 and 120, respectively, by the mid-2020s. In addition, the United Kingdom also possesses extensive civilian stockpiles of fissile materials, the result of "an extensive program of reprocessing spent fuel from power reactors."

Country	Who has what? (Civilian Use only)	Nuclear Security Summit: Status Update (April 2011)
Canada	1,200 kg	Canada is the world's leading producer of the medical isotope molybdenum-99 (Mo-99), which is widely used in treating cancer, heart disease, and brain disorders. Canada produces this isotope at its National Research Universal (NRU) reactor in Chalk River, which uses HEU targets. The NRU's operating license is currently set to expire in 2016; it is unclear how Canada will proceed after this date.
China	3,200 kg	Little is officially known about the status of China's nuclear weapons and fissile material stockpiles, which Beijing has never disclosed. China is estimated to possess approximately 240 nuclear warheads. China is thought to have stopped producing fissile materials for weapons around 1990, but has never formally made a declaration to this effect. Beijing's current stocks of fissile materials are believed to be entirely devoted to military activities; this may change in the upcoming years if China goes ahead with plans to develop a commercial-scale reprocessing plant.
Germany	920 kg	Germany's HEU stockpiles are predicted to increase in the coming years and cross the 1,000 kg threshold. This is due to the operation of its FRM-II research reactor in Bavaria. Should the reactor continue functioning, Germany "could become the last non-weapon state with a HEU-fueled reactor."
Netherlands	730 - 810 kg	The Netherlands is a major producer of Mo-99 at its HFR research reactor in Petten. The reactor has been converted to use LEU fuel, but still uses HEU targets; as a result, the Netherlands continues to require stockpiles and shipments of HEU.
Belgium	700 - 750 kg	

Country	Who has what? (Civilian Use only)	Nuclear Security Summit: Status Update (April 2011)
South Africa	610 - 760 kg	South Africa is "the only non-weapon state that produced its own stockpile of HEU," which is a legacy of its nuclear weapons programme of the 1980s. South Africa is also a major producer of Mo-99, and it is leading the transition to produce it with LEU. In December 2010, South Africa's Nuclear Energy Corporation delivered the first large-scale shipment of Mo-99 to the United States made using both LEU fuel and targets.
Poland	441 kg	Over the past several years, there have been a number of high-profile HEU removals from Poland. Most notably, in October 2010 the NNSA announced that over 450 kg of HEU had been removed from Poland in five shipments over the previous year. It is unclear how much HEU remains following these removals, which involved clearing out all HEU from Poland's "Ewa" research reactor. The material left is concentrated in the "Maria" reactor, which uses HEU fuel to produce Mo-99, but is on track to convert to LEU fuel in mid-2012.
Ukraine	90 - 150 kg	Prior to 2010, Ukraine's HEU was stored at three locations: a research reactor in Kiev, an experimental facility in Kharkiv, and a critical assembly in Sevastopol. Following on Ukraine's commitment at the Washington summit, the United States completed two removals of HEU from Ukraine in 2010. In May 2010, 56 kg of HEU spent fuel were removed. According to the GAO, this represents "more than a third of Ukraine's HEU inventory." In December 2010 an additional 50 kg of HEU fresh fuel were removed. In June 2011 the Ukraine announced that the complete removal of the HEU stocks is nearly accomplished.

Country	Who has what? (Civilian Use only)	Nuclear Security Summit: Status Update (April 2011)
Italy	100 - 200 kg	Italy's HEU stocks are chiefly accounted for by its Tapiro fast-neutron reactor, whose fuel type makes it difficult to convert to LEU fuel. The reactor is used only intermittently.
Belarus	about 170 kg	Prior to 2010, Belarus was estimated to have 170-370 kg of HEU. Belarus was not invited to attend the Washington summit. At the time, its president Alexander Lukashenko declared that his country would never give up its HEU. Nevertheless, in late 2010 the United States helped remove 85 kg of HEU from Belarus in two secret operations, and in December 2010 Belarus pledged to eliminate all of its stocks of HEU by the time of the 2012 Nuclear Security Summit. As a result, South Korea "has agreed to invite Belarus" to the next summit, "contingent upon the completion of its highly enriched uranium removal."
Uzbekistan	< 56 kg	
DPRK	42 kg	The DPRK is estimated to have fewer than five nuclear warheads.
Israel	34 kg	Israel's government maintains extreme secrecy over every aspect of its nuclear development, from its still-unacknowledged nuclear arsenal to its fissile material stockpiles to its nuclear security arrangements. As a result, estimates of its stockpiles are highly uncertain. Israel is believed to possess approximately 80 nuclear weapons.
Pakistan	17 kg (civilian)	Pakistan is thought to possess an arsenal of 90-110 nuclear weapons.This number reflects a significant recent increase, as Pakistan is believed to have doubled its nuclear arsenal over the past several years. Virtually all of its fissile material stockpiles are designated for military use; Islamabad "does not have a civilian plutonium program," and its civilian stocks of HEU are estimated at only 17 kg.

Country	Who has what? (Civilian Use only)	Nuclear Security Summit: Status Update (April 2011)
Serbia	13 kg.	In December 2010 Serbia announced the complete removal of its HEU stocks.
Mexico	12 kg	Mexico's stocks of HEU are "on track to be cleaned out in the next few years."
Czech Republic	0 - 40 kg	The Czech Republic's stocks are "on track to be cleaned out in the next few years."
Austria	5 - 20 kg	
Argentina	8 kg	Argentina's stocks are "in the final stages of clean-out."
Switzerland	5 - 10 kg	
Iran	7 kg	
Libya	5 kg	
Syria	1 kg	
Nigeria	1 kg	
Jamaica	1 kg	
Ghana	1 kg	
India	0 - 10 kg?	India is one of the few countries today that continues to produce both HEU and plutonium. India's production of HEU is chiefly intended to fuel its nuclear submarine propulsion programme, which is believed to be working toward a fleet of three to five nuclear submarines.112 Its nuclear weapons arsenal, believed to contain roughly 80-100 warheads, is based on plutonium. It is estimated that 0.5 tons of its plutonium stockpile are weapons-grade, while the remaining 3.5 tons are reactor-grade.

States that are estimated to have less than one kg HEU: Australia, Brazil, Bulgaria, Chile, Colombia, Denmark, Georgia, Greece, Hungary, Indonesia, Iraq, Libya, Latvia, Norway, Portugal, Philippines, Romania, Slovenia, Republic of Korea, Spain, Sweden, Taiwan, Thailand, Turkey, Viet Nam

Reductions of HEU stockpiles

- Ukraine: In June 2011, the Ukrainian president announced that Ukraine accomplished nearly all of its commitments concerning the removal of enriched uranium from the country's territory. The remaining enriched uranium is to be exported from Ukraine by April 2012 before the start of Seoul 2012 Nuclear Security Summit.[171]

- Serbia: In December 2010, the US National Nuclear Security Administration announced the removal of 13 kilogrammes of Russian-origin highly enriched uranium (HEU) spent fuel from the Vinca Institute of Nuclear Sciences in Serbia. The shipment is the culmination of an eight-year effort to remove all HEU from Serbia and makes that nation the sixth country to eliminate all of its HEU since April 2009.[172]
- China confirmed its MNSR-Shandong reactor, a HEU research reactor, as shutdown in December 2010.[173]
- The Global Threat Reduction Initiative (GTRI) "to reduce and protect vulnerable nuclear and radiological materials located at civilian sites worldwide"[174] continues to promote the reduction of HEU in civilian stocks and use. GTRI worked to remove all HEU from the REZ facility in the Czech Republic in June 2010.[175]

International activities

An IAEA international working group[176] of commercial experts was launched in August 2010 as a result of the "Consultancy on Conversion Planning for Mo-99 Production Facilities from HEU to LEU"[177]. Their effort aims to identify areas of potential multilateral collaboration in support of HEU to LEU conversion at/by the current major producers: NTP, Covidien, AECL/Nordion, and IRE, keeping in mind that processing technology is considered business confidential by all major producers. The group will support the consideration of LEU-based production by future producers such as the facility in Dimitrovgrad, Russia. A technical representative from NIIAR (Russia) participated in the IWG kick-off meeting. Three areas of work were identified during the first meeting: [178] high density, LEU target development, licensing support and commercial availability; front end, adaptive processing technology that will permit the use of the new targets with minimal required changes to existing process; and back-end technologies, including the consideration of uranium recovery and recycling.

The Coordinated Research Project (CRP)[179] on Developing Techniques for Small Scale Indigenous Mo-99 Production Using Low Enriched Uranium (LEU) was initiated in 2005. Currently, 8 agreement holders and 6 contract holders are either developing local production capabilities or supporting the development work of others. A final Research Coordination Meeting will be held in 2011, if the CRP will be completed as projected.[180]

Recent developments under the CRP:[181]

- Brazil (CNEN/SP): Programme to develop LEU fission Mo-99 capacity (underway), initial experiments on LEU alkaline as well as Cintichem technologies.
- Chile (CCHEN): The fission based production, using a LEU foil target and the modified Cintichem process was deferred to 2011.
- Egypt (AEA; INVAP): Commenced hot commissioning turnkey processing facility (in 2010), LEU targets from CNEA, planned production is 2 batches per week @ ~ 100 6-day curries per batch; two IAEA missions in July and August 2010 to assess safety, reactor and production infrastructure readiness, as well as logistics planning. (Those missions were completed. Reports from experts have been received and reviewed by the IAEA. Their input will be combined into a formal reply to the requesting organisation.

The IAEA will continue to encourage and support the EAEA in early commencement of regular production and exploring regional supplies.)

- Kazakhstan (INP): Was expected to complete all technical work related to portable gel generators for use in hospitals and nuclear medicine centres and is currently in the third phase of clinical trials by December 2010.
- Libya (Tajoura): Modified Cintichem, received equipment throughout 2010, planned processing trials (with help from ANL & University of Missouri)
- Pakistan (PINSTECH): Initiated hot commissioning of a turnkey process purchased from Gamma Services Group using 1 HEU target, experiments complete and calculations in progress to support use of self-supplied LEU target, Neutron activation-based production is also taking place but only for R&D purposes.
- Poland (POLATOM): At an advanced stage of development and investment is being sought for infrastructure upgrades necessary to deploy the production technology; seeking investment for the necessary infrastructure
- Romania (INR): Has completed development work on target manufacture and completed processing experiment. The production of ~700 6-day curies could begin in 2010 or early 2011; defining necessary infrastructure upgrades to achieve >3000 6-day curies per week production

Action 62

Most transports of radioactive materials occur between the different stages of the nuclear fuel cycle. Usually materials will be transported in solid form and under the existing regulations. The objective of these regulations is the protection of "people and environment from the effects of radiation during the transport of radioactive material".[182]

Existing international standards for the transport of radioactive materials

- International Maritime Dangerous Goods Code (IMDG Code);
- IAEA Nuclear Security Recommendations on Physical Protection of Nuclear Materials and Nuclear Facilities INFCIRC 225;
- Chapter on "Requirements for Measures Against Unauthorized Removal and Sabotage of Nuclear Material during Transport";
- The Safety of Life at Sea (SOLAS) Convention;
- International Ship and Port Facility Security Code (ISPS Code); and
- IAEA Safety Standards: Regulations for the Safe Transport of Radioactive Material.[183]

Recent developments

Bahrain, Lesotho, and Lao P.D.R. have joined the Convention on the Physical Protection of Nuclear Material.[184]

IAEA Activities[185]

A Transport Safety Conference is planned for 17-21 October 2011 in Vienna to encourage application of appropriate levels of safety and security during transport. The IAEA Transport Safety Standards Committee continues to meet twice a year

[186] and various trainings meetings regarding transport safety are taking place in 2011.[187]

In September 2010 the IAEA General Conference adopted a resolution on "Measures to strengthen international cooperation in nuclear, radiation, transport and waste safety"[188]. The resolution stresses the importance of effective liability mechanisms and application of principles of nuclear liability. Additionally it welcomes the practice of communication between some shipping states and the relevant coastal states but emphasises the importance of improved communication and confidence building measures. It also addresses the question of denial of shipment and calls upon Member States and the Secretariat to support the implementation of an action plan developed by the International Steering Committee on Denials of Shipment of Radioactive Material.

The IAEA General Conference adopts annually a resolution on "Measures to Strengthen International Cooperation in Nuclear, Radiation, Transport and Waste Safety". The part of the resolution that focuses on transport of nuclear material, as in previous years, urges states to that do not have national regulatory documents governing the transport of radioactive material to adopt and implement such documents expeditiously, and urges all member states to ensure that such regulatory documents are in conformity with the current edition of the IAEA's transport regulations.[189]

Reported concerns

During the United Nations General Assembly General Debate in October 2010 the Caribbean Community (CARICOM) expressed concerns about the continuing "transhipment of nuclear and toxic waste through the Caribbean Sea." They reiterated their "strenuous and forceful rejection of the continued use of the Caribbean Sea for the shipment or transhipment of nuclear waste" and called for "a full cessation of this activity in the Caribbean".[190] CARICOM continues to call for states engaged in the transportation of these hazardous materials should enact the necessary domestic legislation to give effect to the provisions of the IAEA Transport Regulations. CARICOM also reiterate its calls for on-going dialogue between shipping states and states in the Caribbean region prior to the transshipment of radioactive materials.[191]

Conclusion

The global amount of HEU has decreased from 2009 to 2010, indicating that some progress has been made. In particular, Serbia and Ukraine have since the NPT Review Conference in May 2010 made significant progress in removing their entire stockpiles of HEU. Despite the voluntary nature of this action, more efforts to reduce HEU should be made. States should also consider measures to increase transparency in the field of fissile material, in order to facilitate reductions in the future.

No significant changes can be mentioned in connection with the transport of radioactive material. IAEA initiatives continue take place and international standards for the transport and communications seem to be complied with. The concerns expressed by CARICOM show that more communication and confidence-building measures are needed to address this issue.

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Chapter 8
Attacks against nuclear installations

Action 64: The Conference calls upon all States to abide by the decision adopted by consensus at the IAEA General Conference on 18 September 2009 on prohibition of armed attack or threat of attack against nuclear installations, during operation or under construction.

Introduction

By looking at news articles, IAEA press releases, and the answers we received from government representatives in Geneva and Vienna, we attempted to investigate whether there have been any armed attacks against nuclear installations.

IAEA GC Decision GC(53)/DEC/13

Prohibition of armed attack or threat of attack against nuclear installations, during operation or under construction (decision adopted on 18 September 2009 during the eleventh plenary meeting):

> The General Conference considered the agenda item 24 entitled "Prohibition of armed attack or threat of attack against nuclear installations, during operation or under construction". The General Conference noted GC(XXIX)/RES/444 and GC(XXXIV)/RES/533, which noted that "any armed attack on and threat against nuclear facilities devoted to peaceful purposes constitutes a violation of the principles of the United Nations Charter, international law and the Statute of the Agency", and a thorough discussion was made on all aspects of the issue. Member States recognized the importance attached to safety, security, and physical protection of nuclear material and nuclear facilities and, in that regard, expressed their views on the importance they attached to the protection of nuclear installations. They also noted the need to have the Agency involved in early notification and assistance in cases of radioactive release from nuclear installations.

Conclusion

There have been no reports of armed attacks or open threats of an attack against nuclear installations, during operation or under construction.