

V. Developments in the Nuclear Suppliers Group

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Many of the states that produce items that can be used in weapon of mass destruction (WMD) programmes cooperate on strategic trade controls in informal, non-legally binding, multilateral trade-control regimes with limited memberships.¹ In the case of nuclear material, equipment and technology, the relevant regime is the Nuclear Suppliers Group (NSG).² Its 46 participating states, along with the European Commission and the chair of the Zangger Committee as permanent observers, meet annually in a consensus-based, decision-making plenary in addition to intersessional preparatory and technical meetings.³

At the 2011 NSG plenary meeting, held on 23–24 June, in Noordwijk, the Netherlands, the participating states discussed and revised the NSG guidelines and debated its relationships with India, among other things. The revised guidelines imposed additional conditions on the transfer of sensitive nuclear fuel cycle materials, equipment and technologies for use in uranium enrichment and reprocessing of spent fuel (ENR) to states that do not already possess them.

Revision of the guidelines for export of sensitive technology

The origins of the discussion and key points of contention

The NSG first publicly released its guidelines in 1978, via the International Atomic Energy Agency (IAEA), and since then has revised them several times.⁴ The guidelines require suppliers to base decisions on the export of

¹ The term 'strategic trade controls' is often defined as including conventional arms as well as dual-use items including software and technology. In strategic trade controls, the term 'dual-use' refers to items that may be used in WMD (nuclear, biological and chemical weapons) or their means of delivery. In the nuclear context, including in the NSG guidelines, dual-use items are defined differently as those with both nuclear and non-nuclear applications.

² The other regimes are the Australia Group, the Missile Technology Control Regime (MTCR), and the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies. For brief descriptions and lists of the participants in these regimes and the Zangger Committee see annex B in this volume. On developments in 2011 in the MTCR and the Wassenaar Arrangement see chapter 10, section II, in this volume. For earlier developments see previous editions of the SIPRI Yearbook and, specifically on the NSG, see Anthony, I., Ahlström, C. and Fedchenko, V., *Reforming Nuclear Export Controls: The Future of the Nuclear Suppliers Group*, SIPRI Research Report no. 22 (Oxford University Press: Oxford, 2007).

³ The Zangger Committee was established to discuss export control issues related to the 1968 Non-Proliferation Treaty (NPT) and to find a common interpretation of Article III.2 of the treaty, including of the term 'equipment or material especially designed and prepared for the processing, use or production of special fissionable material'. See Anthony et al. (note 2), pp. 13–16.

⁴ IAEA, Communication received from certain member states regarding guidelines for the export of nuclear material, equipment or technology, INFCIRC/254, Feb. 1978. Prior to the 2011 revision the most recent version of the NSG guidelines was in IAEA, Communication received from the Per-

specified nuclear and nuclear-related items on certain conditions. The recipient should guarantee that the items will not be used for a nuclear explosive device (paragraph 2) and it should implement a comprehensive safeguards agreement with the IAEA. The supplier should make provisions regarding future arrangements for the physical protection of nuclear materials and facilities and regarding re-transfer controls, and it should be 'satisfied that the transfers would not contribute to the proliferation of nuclear weapons or other nuclear explosive devices' or be 'diverted to acts of nuclear terrorism' (paragraph 10). Suppliers should also have 'in place legal measures to ensure the effective implementation of the Guidelines, including export licensing regulations, enforcement measures, and penalties for violations' (paragraph 11). The guidelines include control lists of items to which specific restrictions apply and 'catch-all' controls for unlisted items with a nuclear end-use. A 'safety clause' states that transfers may be made to a non-nuclear weapon state without a safeguards agreement with the IAEA 'only in exceptional cases when they are deemed essential for the safe operation of existing facilities' (paragraph 4). In these cases, the nuclear supplier should 'inform and, if appropriate, consult in the event that they intend to authorize or to deny such transfers'.

The NSG guidelines are not legally binding and are thus only enforceable if a participating state integrates them into national law; they leave scope for national interpretation, in particular regarding certain subjective criteria.⁵ Importantly, the guidelines present a minimum standard, and national governments may impose stricter conditions of supply.

The debate on revising the NSG guidelines regarding ENR can be traced back to a US initiative in 2001, in response to Russia's controversial invoking of the safety clause when exporting nuclear fuel to India.⁶ However, the clause was not affected by the 2011 guideline revision as the discussion changed course.⁷

manent Mission of Brazil regarding certain member states' guidelines for the export of nuclear material, equipment and technology, INFCIRC/254/Rev.9/Part 1, 7 Nov. 2007; and IAEA, Communication received from certain member states regarding guidelines for transfers of nuclear-related dual-use equipment, material, software and related technology, INFCIRC/254/Rev.8/Part 2, 30 June 2010. Part 2 was not revised in 2011.

⁵ The EU Dual-use Regulation 428/2009, which is directly applicable law within the EU, refers to EU member states' commitments and obligations as members of export control regimes, including the NSG, thus making the guidelines a legal obligation. Council Regulation (EC) no. 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, *Official Journal of the European Union*, L134, 29 May 2009. See also Wetter, A., *Enforcing European Union Law on Exports of Dual-use Goods*, SIPRI Research Report no. 24 (Oxford University Press: Oxford, 2009).

⁶ Anthony, I., 'Multilateral export controls', *SIPRI Yearbook 2002*, pp. 752–55.

⁷ Viski, A., 'The revised Nuclear Suppliers Group guidelines: a European Union perspective', Non-proliferation Papers no. 15, EU Non-proliferation Consortium, May 2012, <<http://www.nonproliferation.eu/activities/activities.php>>.

The public disclosure in 2003 of the A. Q. Khan network, which had sold uranium enrichment technology, gave a strong impetus to the debate on ENR export restrictions. In 2004 US President George W. Bush proposed that the NSG should ban the spread of ENR capacity to countries that do not already possess it.⁸ This proposal failed to find consensus within the NSG, but it did prompt the group to begin discussions on revising its ENR guidelines, and a draft revision was circulated in 2008.⁹

Agreeing a list of specific criteria that countries would have to meet to be eligible to receive ENR transfers proved difficult. The biggest controversies revolved around an objective criterion—a requirement that the recipient had agreed an additional safeguards protocol with the IAEA—and certain subjective criteria. Subjective criteria in the draft included a requirement for suppliers to ‘exercise vigilance’ and to consider such factors as (a) ‘Whether the recipient has a credible and coherent rationale’ for pursuing ENR capability ‘in support of civil nuclear power generation programmes’, (b) ‘Whether the transfer would have a negative impact on the stability and security of the recipient state’, and (c) ‘General conditions of stability and security’.¹⁰ The United States proposed three additional subjective criteria designed to prevent non-nuclear weapon states from replicating sensitive nuclear technology.¹¹ One of these was a ‘black box approach’ that would prevent recipients from gaining access to sensitive technology, which the USA referred to as ‘standard commercial practice’.¹²

The proposed ‘objective’ requirement for an additional safeguards protocol proved to be particularly contentious. Argentina, Brazil and South Africa objected to it, although on different grounds. South Africa argued that, as a matter of principle, voluntary agreements such as an additional safeguards protocol should not be made a requirement.¹³ Neither Argentina

⁸ The White House, ‘President announces new measures to counter the threat of WMD’, Remarks at the National Defense University, Washington, DC, 11 Feb. 2004, <<http://georgewbush-whitehouse.archives.gov/news/releases/2004/02/20040211-4.html>>; and Hibbs, M., *The Future of the Nuclear Suppliers Group* (Carnegie Endowment for International Peace: Washington, DC, 2011), p. 29.

⁹ The draft ‘Revised Paragraph 6 and 7 of INFCIRC 254/Part I’, 20 Nov. 2008, is published in McGoldrick, F., *Limiting Transfers of Enrichment and Reprocessing Technology: Issues, Constraints, Options* (Harvard Kennedy School, Belfer Center for Science and International Affairs: Cambridge, MA, May 2011), appendix 2.

¹⁰ ‘Revised Paragraph 6 and 7 of INFCIRC 254/Part I’ (note 9), p. 62.

¹¹ Anthony, I. and Bauer, S., ‘Controls on security-related international transfers’, *SIPRI Yearbook 2009*, p. 467.

¹² US Embassy in Buenos Aires, ‘Argentina shares concerns over proposed NSG restrictions of enrichment and reprocessing technology transfers with visiting DOE NNSA Administrator D’Agostino’, Cable to US State Department, no. 08BUENOSAIRE1552, 13 Nov. 2008, <<http://wikileaks.org/cable/2008/11/08BUENOSAIRE1552.html>>.

¹³ Hibbs, M., ‘New global rules for sensitive nuclear trade’, Nuclear Energy Brief, Carnegie Endowment for International Peace, 28 July 2011, <<http://carnegieendowment.org/2011/07/28/new-global-rules-for-sensitive-nuclear-trade/4atv>>; and US Embassy in Pretoria, ‘South Africa: amending NSG guidelines’, Cable to the US State Department, no. 09PRETORIA2, 2 Jan. 2009, <<http://wikileaks.org/cable/2009/01/09PRETORIA2.html>>.

nor Brazil has signed an additional protocol with the IAEA; instead, the Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials (Agencia Brasileño–Argentina de Contabilidad y Control de Materiales Nucleares, ABACC) is based on a safeguards agreement signed by the agency, the two countries and the IAEA, which Argentina and Brazil insisted made signing of an additional protocol unnecessary.¹⁴

Several countries, including South Africa, were concerned that some proposed criteria might limit their option to develop a civil nuclear programme in the future.¹⁵ A number of countries, including Canada, the Netherlands, South Africa and Turkey, voiced objections to the subjective criteria in the draft.¹⁶ Canada was also among those that objected to the USA's black box proposal.¹⁷

A fundamental underlying issue is the justification for limiting ENR supplies and the scope for allowing legitimate civilian uses of highly enriched uranium (HEU) and plutonium. There are currently four legitimate uses of HEU: fast neutron reactors, nuclear-powered submarines, research reactors, and medical diagnosis and treatment. Plutonium has fewer civilian applications, including use in mixed oxide (MOX) fuel, but poses a particular proliferation risk due to the small quantity required for a nuclear weapon.

The revised guidelines of 2011

At the 2011 NSG plenary, participating states could not agree on language for the imposition of the subjective criteria. They therefore settled on conditioning the transfer of nuclear technology on signing an additional safeguards protocol and on the importing state being in full compliance with its IAEA obligations. The concluding statement of the 2011 plenary referred to the decision to strengthen the guidelines, and the updated text was published one month later, in a *note verbale* to the IAEA.¹⁸

The 2011 revision focused on paragraph 6 ('Special controls on sensitive exports') and paragraph 7 ('Special arrangements for export of enrichment facilities, equipment and technology'). The previous version of paragraph 7

¹⁴ Agreement between the Republic of Argentina, the Federal Republic of Brazil, the Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials and the International Atomic Energy Agency for the Application of Safeguards (Quadripartite Agreement), signed 13 Dec. 1991, <http://www.abacc.org.br/?page_id=150&lang=en>; and Viski (note 7).

¹⁵ Hibbs (note 13).

¹⁶ Viski (note 7).

¹⁷ US Embassy in Rome, 'G-8 nonproliferation directors group meeting', Cable to US State Department, no. 09ROME1240, 10 Nov. 2011, <<http://wikileaks.org/cable/2009/11/09ROME1240.html>>; and US Embassy in Buenos Aires (note 12).

¹⁸ Nuclear Suppliers Group, 'NSG public statement', NSG Plenary, Noordwijk, 23–24 June 2011, <<http://www.nuclearsuppliersgroup.org/Leng/05-public.htm>>; and IAEA, Communication received from the Permanent Mission of the Netherlands regarding certain member states' guidelines for the export of nuclear material, equipment and technology, INFCIRC 254/Rev.10/Part I, 26 July 2011.

required the recipient to seek the consent of the supplier before using the transferred facility or technology to enrich uranium beyond 20 per cent. Apart from requesting suppliers to ‘encourage . . . supplier involvement and/or other appropriate multinational participation’, the previous version only required suppliers to ‘exercise restraint in the transfer of sensitive facilities, technology and material usable for nuclear weapons or other nuclear explosive devices’ but did not define the term ‘restraint’.¹⁹ The 2011 revision for the first time further specifies conditions for the transfer of ENR technology, both regarding the decision on whether such a transfer can take place, and if so, how.

According to the new version of paragraphs 6 and 7, the decision on whether a transfer of ENR facilities, equipment or technology can take place is to be based on the following minimum objective criteria.

1. The recipient is party to and ‘in full compliance’ with the 1968 Treaty on the Non-proliferation of Nuclear Weapons (Non-Proliferation Treaty, NPT).²⁰

2. The recipient has not been identified in a report by the IAEA Secretariat as currently being in breach of its safeguards obligations.

3. The recipient adheres to NSG guidelines and has reported to the UN Security Council that it implements ‘effective export controls as identified in’ UN Security Council Resolution 1540.²¹

4. The recipient has ‘concluded an inter-governmental agreement with the supplier including assurances regarding non-explosive use, effective safeguards in perpetuity, and retransfer’.

5. The recipient has ‘made a commitment to the supplier to apply mutually agreed standards of physical protection based on current international guidelines’.

6. The recipient has ‘committed to IAEA safety standards and adheres to accepted international safety conventions’.

7. The recipient ‘has brought into force a Comprehensive Safeguards Agreement, and an Additional Protocol . . . or, pending this, is implementing appropriate safeguards agreements in cooperation with the IAEA, including a regional accounting and control arrangement for nuclear materials, as approved by the IAEA Board of Governors’.²²

¹⁹ IAEA, INFCIRC/254/Rev.9/Part 1 (note 4), paras 6, 7.

²⁰ For a summary and other details of the NPT see annex A in this volume.

²¹ UN Security Council Resolution 1540, 28 Apr. 2004. Resolution 1540 obliges all states to, among other things, refrain from supporting by any means non-state actors from developing, acquiring, manufacturing, possessing, transporting, transferring or using nuclear, biological or chemical weapons and their delivery systems. It imposes binding obligations on all states to establish domestic controls to prevent the proliferation of such weapons, including by establishing appropriate controls over related materials.

²² IAEA, INFCIRC 254/Rev.10/Part I (note 18), para. 6.

The revised text on safeguards provides a compromise. While an additional safeguards protocol is not an absolute condition of supply, the text indicates that efforts to sign an additional safeguards protocol should be evident even where a regional safeguards agreement is in place. The ABACC, however, issued a statement interpreting the language as beginning to recognize the Argentine–Brazilian–IAEA agreement ‘as an alternative criterion to the Additional Protocol’.²³

The subjective criteria were kept rather vague. The revised guidelines require NSG suppliers to take ‘into account at their national discretion, any relevant factors as may be applicable’. The term ‘restraint’ was maintained, while adding that this should apply in particular to countries that include entities subject to active denials relating to Part 2 of the guidelines (on nuclear-related dual-use goods) from more than one NSG participant.²⁴

The new version of paragraph 7 reinforces previous provisions. Suppliers should now seek a ‘legally-binding undertaking’ from the recipient state that transferred ENR facilities, equipment or technology not be used or modified for enrichment beyond 20 per cent. An additional new requirement placed on suppliers is to ‘seek to design and construct’ facilities and equipment in a way that precludes the possibility of enrichment beyond 20 per cent ‘to the greatest extent practicable’.

While the revised text encourages states to go as far as they can to ensure that sensitive technologies are not replicated, it falls short of the black box proposals advocated by the USA. The new version of paragraph 7 provides that the transfer of ‘enabling design and manufacturing technology’ should be avoided and specifies that suppliers should seek acceptance from recipients of transfer conditions that ‘do not permit or enable replication of the facilities’. However, an exception permitting cooperation to develop potential new enrichment technologies is included.²⁵

Other Nuclear Supplier Group discussions during 2011

During its 2011 plenary the NSG ‘discussed brokering and transit issues and agreed to consider options [for] how to best reflect these matters in the guidelines’.²⁶ This reflects developments in national and international strategic trade controls, where discussions, decisions and implementation efforts have broadened from the traditional focus on controlling exports to encompass a wider range of activities, including the control of transit, trans-shipment, financing and brokering. These developments are in

²³ ABACC, ‘Nuclear Suppliers Group (NSG) recognizes the Quadripartite Agreement as an alternative criterion to the Additional Protocol’, 28 June 2011, <<http://www.abacc.org.br/?p=3846>>. The ABACC statement quotes a note from the Brazilian Foreign Ministry.

²⁴ IAEA, INFCIRC 254/Rev.10/Part I (note 18), para. 6.

²⁵ IAEA, INFCIRC 254/Rev.10/Part I (note 18), para. 7.

²⁶ Nuclear Suppliers Group (note 18), p. 2.

response to the evolving nature of procurement for nuclear weapon programmes, technological developments, changes in global trade patterns, the increased availability of non-listed dual-use items and the requirements of UN Security Council Resolution 1540.²⁷

Other issues discussed at the 2011 plenary included adherence to the additional safeguards protocol and ongoing efforts to review the control lists of both trigger and dual-use items.²⁸ In the opening speech by the hosts of the plenary, the Netherlands announced 'outreach missions to the non-NPT countries and to various regions of interest' and 'to potential new Participating Governments'.²⁹ The plenary later discussed a report on outreach to non-NSG countries and announced the development of guidelines.

As in previous years, participating governments also exchanged information on countries and regions of proliferation concern. In this context, Iran and North Korea were specifically named. Notably, Syria was not mentioned in the public statement, although concerns about IAEA observations of non-compliance had been included in the opening speech.³⁰ Moreover, the NSG guidelines require an extraordinary plenary meeting to take place within one month of the IAEA Board of Governors finding a recipient to be in non-compliance with its safeguards obligations, 'at which suppliers will review the situation, compare national policies and decide on an appropriate response'.³¹ However, such a meeting did not take place following the resolution on Syrian non-compliance adopted by the board on 9 June 2011 (see section II above).³²

The NSG's relationship with India

As expected, a key issue discussed at the 2011 plenary was the NSG's relationship with India, specifically whether the revised guidelines affected India's eligibility to receive ENR transfers and its possible membership of the NSG.

The NSG's relationship with India has been a key factor driving and shaping supplier cooperation, discussion and action. The first Indian nuclear explosive test, in 1974, provided the *raison d'être* for the creation of

²⁷ See Bauer, S., Dunne, A. and Mičić, I., 'Strategic trade controls: countering the proliferation of weapons of mass destruction', *SIPRI Yearbook 2011*. 'Non-listed' dual-use items do not appear in national or international control lists but can also be controlled if their intended use is in a WMD or missile programme.

²⁸ Trigger list items are defined as 'especially designed or prepared' for nuclear use. IAEA, INFCIRC 254/Rev.10/Part I (note 18). On dual-use items see note 1.

²⁹ Kronenburg, E., Secretary General of the Dutch Ministry of Foreign Affairs, Opening speech, NSG Plenary, Noordwijk, 23 June 2011, <<http://www.rijksoverheid.nl/ministeries/bz/documenten-en-publicaties/toespraken/2011/06/24/opening-speech-by-ed-kronenburg-secretary-general>>.

³⁰ Kronenburg (note 29).

³¹ IAEA, INFCIRC 254/Rev.10/Part I (note 18), para. 16(e).

³² IAEA, Board of Governors, 'Implementation of the NPT safeguards in the Syrian Arab Republic', Resolution, GOV/2011/41, 9 June 2011; and Official from an NSG country, Communication with author, Mar. 2012.

the NSG. Based on India's non-membership of the NPT and its refusal to allow comprehensive IAEA safeguards covering all of its nuclear activities and facilities, NSG participants agreed not to supply India with nuclear materials, equipment, facilities and technology. This agreement in principle lasted until 2008 when, in a move spearheaded by the USA following the Indian-US Civil Nuclear Cooperation Agreement, the NSG agreed a country-specific exemption from the guidelines.³³ India's re-entry into international nuclear commerce has resulted in it reaching bilateral agreements with, among others, Canada, France, Russia, the UK, the USA and, most recently, South Korea.³⁴ India has an interest both in receiving equipment and technology from advanced nuclear suppliers to implement its ambitious nuclear energy expansion programme and in offering equipment and expertise to countries seeking to begin or to expand nuclear energy production, including countries such as Namibia that can offer uranium in return.³⁵

Indian observers have complained that the 2011 revisions to the NSG guidelines effectively eliminated the 'clean waiver' that India claimed to have received in 2008. Specifically, in 2008 the NSG waived the full-scope safeguards requirement of paragraph 4 of its guidelines and expressly allowed ENR exports, subject to paragraphs 6 and 7. Consternation has been expressed in India that, under the revised 2011 guidelines, it may not be eligible to receive enrichment and reprocessing technology since it is not a party to the NPT.³⁶

During his November 2010 visit to India, US President Barack Obama announced his support for Indian membership of the NSG and the other export control regimes, thus initiating an international debate on the issue. This was further discussed during a visit by the US Secretary of State, Hillary Rodham Clinton, to India in February 2011.³⁷ In a 'food for thought

³³ Nuclear Suppliers Group, 'Statement on Civil Nuclear Cooperation with India', Extraordinary Plenary Meeting, 6 Sep. 2008, Attachment to IAEA, INFCIRC/734 (Corrected), 19 Sep. 2008; and Agreement for cooperation between the Government of India and the Government of the United States of America concerning peaceful uses of nuclear energy, signed 10 Oct. 2008, entered into force 6 Dec. 2008, <<http://www.state.gov/s/1/treaty/tias/2008/>>. On the Indian-US Civil Nuclear Cooperation Initiative, initiated in 2005, see previous editions of the SIPRI Yearbook. On the 2008 NSG decision see Anthony and Bauer (note 11), pp. 467-71. Prior to this, Russia had already provided nuclear fuel to India under the safety clause. See above; and Anthony (note 6).

³⁴ The Indian-South Korean Civil Nuclear Cooperation Agreement was signed on 25 July 2011. Baruah, P., 'India-ROK nuclear cooperation: is it a win-win situation?', Institute of Peace and Conflict Studies, 16 Aug. 2011, <<http://www.ipcs.org/article/india/india-rok-nuclear-cooperation-is-it-a-win-win-situation-3439.html>>.

³⁵ Hibbs (note 8), p. 11; and Rajiv, S. S. C., 'India's accommodation in multi-lateral export control regimes', *Political and Defence Weekly* (New Delhi), 9 Nov. 2011.

³⁶ Varadarajan, S., 'NSG ends India's "clean waiver"', *The Hindu*, 24 June 2011; and Varadarajan, S., 'Challenges ahead for India's nuclear diplomacy', *The Hindu*, 1 Nov. 2011.

³⁷ The White House, 'Joint statement by President Obama and Prime Minister Singh of India', 8 Nov. 2010, <<http://www.whitehouse.gov/the-press-office/2010/11/08/joint-statement-president>>.

paper' of 23 May 2011 circulated by the USA to other NSG members, two options for pursuing Indian membership were presented: either revising the membership criteria 'in a manner that would accurately describe India's situation' or 'recognize' that not all of the criteria published as 'Factors taken into account for [NSG] participation' have to be met.³⁸

No decision was taken on Indian membership during the 2011 NSG plenary, although the concluding statement refers to discussions on the issue. Public proponents include France and Russia.³⁹ A number of countries are reported to oppose the move, but have not done so publicly.⁴⁰ The issue is likely to be discussed again during the 2012 plenary, to be held in the USA, and to fuel the broader discussion on membership criteria and decision-making modalities.⁴¹

Chinese supplies to Pakistan

Some observers have expressed concern that the NSG's exemption for India had set a precedent for other countries—in particular, that it had paved the way for further nuclear cooperation between China and Pakistan—which threatens to further erode the credibility of the NSG.⁴²

In 2010 China indicated that it would proceed with the supply of two new civil nuclear power reactors to Pakistan (Chashma-3 and -4).⁴³ The reactors are to be supplied under a bilateral agreement concluded in 2003, about which China informed the NSG when it joined the group in 2004. China claims that implementation of the 2003 deal did not need NSG approval since China did not join the NSG until 2004. While some NSG participants agreed with this, the USA maintained that this so-called grandfather clause is not applicable based on the information China provided to the NSG at accession.⁴⁴ Options for NSG responses include (a) tacit per-

obama-and-prime-minister-singh-india>; Rajiv (note 35); and Nayar, K. P., 'US push for nuclear club entry', *The Telegraph* (Kolkata), 17 Feb. 2011.

³⁸ Horner, D., 'NSG revises rules on sensitive exports', *Arms Control Today*, vol. 41, no. 6 (July/Aug. 2011). The factors 'taken into account' when admitting a state to the NSG are listed in IAEA, Communication of 1 October 2009 received from the Resident Representative of Hungary to the Agency on behalf of the participating governments of the Nuclear Suppliers Group, INFCIRC/539/Rev.4, 5 Nov. 2009.

³⁹ 'France not bound by new NSG restrictions on nuclear sales to India', *The Hindu*, 24 Oct. 2011; and Radyuhin, V., 'Russia assures India on ENR', *The Hindu*, 15 July 2011.

⁴⁰ Krishnan, A., 'China calls for dialogue on India's NSG entry', *The Hindu*, 18 Nov. 2011.

⁴¹ Hibbs (note 8), pp. 23–28.

⁴² Hibbs, M., 'The breach', *Foreign Policy*, 4 June 2010.

⁴³ Dyer, G., Bokhari, F. and Lamont, J., 'China to build reactors in Pakistan', *Financial Times*, 28 Apr. 2010. China had previously supplied 2 reactors (Chashma-1 and Chashma-2) to Pakistan under a bilateral civil nuclear cooperation agreement concluded in 1991. Miglani, S., 'China pursues Pakistan nuclear deal; dilemma in West', Reuters, 15 Dec. 2010, <<http://af.reuters.com/article/energyOilNews/idAFL3E6NF08Q20101215>>; and Hibbs (note 8), pp. 2, 16.

⁴⁴ Hibbs (note 8), p. 15. Germany is one of those that agrees with China's interpretation. Meier, O., 'Germany opposes United States on China–Pakistan nuclear deal', *Arms Control Now*, Arms Control Association, 21 June 2011, <<http://armscontrolnow.org/2011/06/21/germany-opposes-united-states-on-china-pakistan-nuclear-deal/>>.

mission, (b) the recording of objections but taking no action, (c) explicit recognition of the validity of the grandfather clause in this case, (d) agreement with China to proceed with the transaction but to refrain from exporting further reactors, (e) insistence that China must receive an explicit exemption, based on the precedent of the Indian waiver, or (f) urging China to suspend the export until specific conditions of supply to Pakistan are agreed.⁴⁵ This debate illustrates both ambiguities in the grandfather clause and the general difficulty of enforcing voluntary NSG provisions.

The debate on these issues has been further ignited by reports, which had not been confirmed by the Chinese Government, of discussions with China to supply a Chashma-5 plant and two further nuclear reactors (Kanupp-2 and -3).⁴⁶

The future of nuclear export controls

While the establishment of effective export control systems is a necessary foundation for slowing down or preventing proliferation, it is only one element of an effective non-proliferation approach. It must always be seen as complementary to the NPT, as well as to other non-proliferation approaches such as efforts to develop and supply proliferation-resistant nuclear technologies. An issue at the very heart of nuclear non-proliferation is the relationship between the NSG suppliers and those states with nuclear weapons that are outside of the framework of the NPT and the NSG. A crucial and closely related issue is credibility, not only in the relationship between the five nuclear weapon states and the rest of the world, but in the balancing of non-proliferation and commercial interests.

A factor to consider in future will be the expected wider availability of nuclear materials and technology due to increasing reliance on nuclear energy, and the probable resulting demands for an increase in NSG membership. With the notable exception of Germany, which has returned to an earlier decision to give up nuclear energy altogether, it remains to be seen to what extent national nuclear energy plans have been affected by the disaster at Japan's Fukushima Daiichi power plant in 2011.

While advanced nuclear technology has been within the control of a small number of suppliers for many years, this exclusivity has been continually eroded. In addition to the emergence of new countries with

⁴⁵ Hibbs (note 8), p. 15.

⁴⁶ Krishnan, A., 'Pakistan eyeing China's new 1000-MW reactor', *The Hindu*, 15 Nov. 2011. In Nov. 2010 the Pakistani Atomic Energy Commission was reported to have signed a construction agreement with China National Nuclear Corporation (CNNC) for a 5th unit at Chashma. The status of the planned Kanupp-2 and Kanupp-3 reactors is uncertain. World Nuclear Association, 'Nuclear power in Pakistan', Aug. 2011, <<http://www.world-nuclear.org/info/inf08.html>>; and 'Pakistan signs accord for fifth Chinese reactor at Chashma', *Nucleonics Week*, 18 Nov. 2010.

nuclear weapon capabilities, the modus operandi of illicit procurement networks has adapted to restrictions on the direct export of dual-use items from producing countries by using increasingly complex transactions and by increasing use of non-listed, often suboptimal, items. Consequently, in line with broader counter-proliferation activities, decisions and participation in nuclear export controls will have to further adjust to consider relations with non-NSG members and the full range of nuclear trade activities, including brokering, transit, trans-shipment and finance as well as intangible transfers of technology .