

CARNEGIE ENDOWMENT

FOR INTERNATIONAL PEACE



THE FUTURE OF THE **NUCLEAR SUPPLIERS GROUP**



MARK HIBBS

CARNEGIE ENDOWMENT

FOR INTERNATIONAL PEACE

THE FUTURE OF THE
NUCLEAR SUPPLIERS GROUP

MARK HIBBS

WASHINGTON DC ■ MOSCOW ■ BEIJING ■ BEIRUT ■ BRUSSELS

© 2011 Carnegie Endowment for International Peace. All rights reserved.

The Carnegie Endowment does not take institutional positions on public policy issues; the views represented here are the author's own and do not necessarily reflect the views of the Endowment, its staff, or its trustees.

No part of this publication may be reproduced or transmitted in any form or by any means without permission in writing from the Carnegie Endowment. Please direct inquiries to:

Carnegie Endowment for International Peace
Publications Department
1779 Massachusetts Avenue, NW
Washington, D.C. 20036
Tel. +1 202-483-7600
Fax: +1 202-483-1840
www.CarnegieEndowment.org

This publication can be downloaded at no cost
at www.CarnegieEndowment.org/pubs.



Contents

Foreword	v
Summary	1
The Nuclear Suppliers Group: Current Challenges in Context	5
The NSG's Last Decade	7
Specific Current and Future Challenges Facing the NSG	13
Discipline and Credibility: The NSG and China's Nuclear Trade With Pakistan	13
The NSG's Relationship With the NPT and the Question of Future Membership	17
NSG Decisionmaking	26
Revision of the Guidelines: Enrichment and Reprocessing	29
The NSG's Response to an Evolving Global Nuclear Trade Regime	31
The NSG and the Zangger Committee	37
The NSG and Other Export Control Arrangements	39
The NSG and the 1540 Committee	43
Enforcement and Effectiveness	45

Transparency and Outreach	47
Multilateral Nuclear Fuel Assurances	50
Conclusion: The NSG at the Crossroads of an Evolving Nuclear Trade Regime	53
Notes	57
About the Author	61
Carnegie Endowment for International Peace	62

Foreword

On May 9 and 10 this year, the Carnegie Endowment for International Peace hosted and conducted a workshop at Carnegie Europe headquarters in Brussels titled “The Nuclear Suppliers Group and the Future of Nuclear Trade.” Carnegie invited to this meeting all governments participating in the Nuclear Suppliers Group (NSG) and selected nuclear trade policy experts from academia, the European Union, the European Parliament and national legislative bodies, industry, international organizations, and nongovernmental organizations. About 75 invitees participated in the workshop, with about half of these from 30 NSG-participating governments.

Carnegie organized the workshop after the Ministry of Foreign Affairs of the Netherlands, which was scheduled to assume the rotating chairmanship of the NSG for one year beginning in June 2011, proposed this past November that we conduct an event to focus the attention of NSG-participating governments and others concerned with the management of international nuclear trade on issues that in recent years had come to the fore and that would be critical to the NSG’s future work.

Some of the topics on the workshop agenda had already drawn attention from the NSG and its working groups. Others, however—perhaps the most significant longer-term issues—have not been collectively addressed by the group, and many NSG-participating governments have likewise not systematically explored them.

Some of the topics we sought to raise appeared to escape concerted attention by the NSG, in part because its decisionmaking and routine activities are focused on more immediate problems and in part because the NSG’s consensus-based decisionmaking process has prevented some items from being put on its agenda. As workshop participants pointed out, an NSG chairman is in fact discouraged from generating momentum to address matters with a long trajectory because his term does not extend through the next annual plenary meeting, which is held one year after he assumes the rotating chairmanship.

The project was also intended to contribute to the policymaking process in real time. On the day after the Brussels workshop, the Ministry of Foreign Affairs of the Netherlands hosted an informal seminar of the NSG in The Hague. During that seminar, some of the findings of the Carnegie workshop were presented. One month later, at the NSG’s 2011 plenary meeting held in Noordwijk, the Netherlands formally assumed the chairmanship of the NSG for one year.

It was also agreed that Carnegie would publish an open report based on the proceedings of the workshop in the interest of informing the broader policy community about the discussion held during the meeting. A compendium of suggestions and recommendations emerging from the workshop is included in this report. The report, however, is broader in scope than the workshop, and it concerns itself with the history of the NSG from its inception as well as with events that transpired after the workshop was held. In writing the report, I incorporated the record of the workshop discussion into a broader presentation that interpreted the material and pointed to some general conclusions, which are my own.

In order to facilitate to the greatest extent possible an unencumbered discussion of sensitive nuclear trade policy issues, the workshop was held under the Chatham House Rule, which also governed how the material is presented in this report. This report covers all the topics on the agenda of the workshop. It refers to and cites participants' statements and interventions, but, as agreed at the outset, the identities of the authors of the statements and interventions have not been disclosed.

A final word about what this workshop was and what it was not.

In 1997 and 1999, the NSG itself organized two seminars on the NSG and its role in export controls and nuclear nonproliferation, the first one in Vienna and the second in New York.¹ These were open meetings and were intended to instruct a large audience about what the NSG is and how it functions.

Neither Carnegie nor the Ministry of Foreign Affairs of the Netherlands aspired to do this kind of outreach in holding the Brussels workshop. The prime intention was instead to discuss with NSG-participating states and a small number of nuclear trade specialists some current and future challenges facing the NSG, in the interest of the group's future effectiveness, cohesiveness, and credibility.

I wish to thank the experts who reviewed the draft text of this report, especially Dmitriy Nikonov of the Center for International Trade and Security at the University of Georgia, who provided much insight. I also wish to honor Ian Anthony, Christer Ahlstrom, and Vitaly Fedchenko of the Stockholm International Peace Research Institute for their path-breaking research on the NSG.

I wish to commend the Ministry of Foreign Affairs of the Netherlands for its present and past commitment to transparency in NSG affairs and thank Ambassador Piet de Klerk, the current NSG chairman, as well as his colleagues—in particular Ralf van de Beek, Josephine Frantzen, Nathalie Jaarsma, and Henk Cor van der Kwast—for their guidance and support in carrying out this project. The contents of this report, and the views expressed therein, however, are my responsibility. They do not represent any official position or view of the Netherlands government, the NSG, or its chair.

Mark Hibbs
Senior Associate
Nuclear Policy Program
Carnegie Endowment for International Peace

Summary

After the first Indian nuclear explosive test in 1974, seven nuclear supplier governments were convinced that the Nuclear Non-Proliferation Treaty (NPT) alone would not halt the spread of nuclear weapons—a view that developments in Iran, Iraq, North Korea, and elsewhere would later underscore. The seven governments formed the Nuclear Suppliers Group (NSG), and over the course of more than three decades, it has become the world’s leading multilateral nuclear export control arrangement, establishing guidelines that govern transfers of nuclear-related materials, equipment, and technology. Yet, as a voluntary and consensus-based organization of 46 participating governments, the NSG today faces a host of challenges ranging from questions about its credibility and future membership to its relationship to the NPT and other multilateral arrangements.

In light of major recent developments in globalized nuclear trade—complex proliferation transactions and networks that circumvent multilateral trade controls, the increasing role for nonstate actors in procurement and proliferation, opportunistic exporting policies of supplier states, and the rise of international equity issues in global nuclear governance and trade diplomacy—member states must address these pressing issues and reach out to non-NSG states. The group cannot function in isolation.

To encourage the NSG to consider issues that have a significant impact on its future credibility and effectiveness, the Carnegie Endowment held a workshop in Brussels, “The Nuclear Suppliers Group and the Future of Nuclear Trade,” from May 9 to 10, 2011. The workshop, supported by the Ministry of Foreign Affairs of the Netherlands, which assumed the NSG chair in June, was attended by 75 experts, including officials from 30 NSG-participating governments.

Participants made it clear that the NSG must decide how to manage its future relationship with states outside the group and how to define itself with respect to the NPT, whose 190 parties are committed to preventing the spread of nuclear weapons, and promoting disarmament and the peaceful use of nuclear technology. International nuclear commerce is rapidly evolving into a system of complex transactions involving destinations and actors that until now have been disconnected from the world of nuclear trade controls, be they governments that are members of budding regional customs unions or independent brokers, traders, and financiers such as those who have been affiliated with Pakistani scientist Abdul Qadeer Khan. As the world’s nuclear industry expands, engaging those countries outside the NSG framework will be far more critical than at any time in the NSG’s history.

India is one such country. As a state with undeclared nuclear activities outside the NPT, India was barred by the NSG and the NPT from most international nuclear commerce, but the group lifted nuclear trade sanctions against India in 2008 at the request of the United States, supported by other major nuclear exporting governments, including France and Russia. Workshop participants addressed the question of whether the India decision was a “singular exception” to principles set by the NPT parties and adopted by the NSG, as its main advocates claimed, or whether it marked a significant course correction by the NSG toward the goal of obtaining the adherence and participation of all nuclear supplier states, including those outside the NPT that enrich uranium, reprocess irradiated nuclear fuel, and have nuclear weapons. Attendees presented arguments for both cases but came to no consensus.

Now, three years after the India exception, China intends to export more power reactors to Pakistan, which is, like India, a state outside the NPT with nuclear arms. According to NSG guidelines, Pakistan would have to commit to full-scope International Atomic Energy Agency (IAEA) safeguards as a condition for the transaction. That will not happen, and workshop participants discussed whether China can be persuaded not to export the reactors or instead to seek a formal exception to NSG guidelines. China claims the exports are “grandfathered” by a long-standing agreement with Pakistan. Presently the NSG has not formulated a response to China’s challenge, but if Beijing does not come to some agreement with the NSG, the group’s credibility will be damaged, workshop attendees warned.

The NSG must be prepared to include new exporters, many of them developing countries previously outside the fabric of nuclear trade rule making. It will also have to address concerns that the organization is an exclusive club that undercuts states’ rights to nuclear commerce. The NSG incorporated China into the group in 2004 and should consider this experience in any future expansion. The United States has forced the pace of this discussion by advocating full NSG membership for India. Though workshop participants from India, Israel, and Pakistan presented arguments as to why these countries should be included in the arrangement, there was no consensus among the attendees that that should happen in the near future.

All of this will affect the rules by which the NSG operates. The NSG needs to consider how its voluntary participation and consensus-based decisionmaking will fare as more states join the group. Even at the NSG’s current size, some workshop participants said that the amount of complex negotiation that would be required to reach a consensus on criteria for an exception for Pakistan would not be worth the comparatively limited benefit of halting a small amount of Sino-Pakistani nuclear trade that is in violation of the guidelines. Voluntary commitments are difficult to enforce. But many workshop participants saw little upside to turning the NSG into a more formal organization.

The increasing volume of nuclear trade and the evolution of exporting states’ proliferation threat assessments have prompted a review by the NSG of its control lists—containing those items that members agree could be used to produce nuclear weapons and thus whose export should be restricted. Decisions made by the group in this area will profoundly impact the NSG’s future effectiveness. The ongoing list review should be carried out with

the cooperation of national governments' enforcement agencies to assure that practitioners responsible for controlling trade understand and can implement the group's decisions.

To further promote transparency and participation, the NSG should systematically investigate the possibilities for future collaboration with other multilateral export control arrangements, especially in the areas of good practices, efficiency, information management, threat assessments, guideline implementation, consensus formation, enforcement, and outreach. In particular, workshop participants urged, the NSG should intensify cooperation with the UN Security Council's Resolution 1540 Committee to establish and universalize a global standard for nuclear export controls, and to build capacity in national governments to have that standard applied and enforced.

In a globalized environment in which nuclear goods may be produced or transacted anywhere in the world, the NSG must remain an essential instrument for preventing nuclear material, equipment, and technology from getting into the hands of those who seek to develop nuclear arms. But it must reach out to industry, governments, and other nonproliferation stakeholders and adapt to new conditions.

The Nuclear Suppliers Group: Current Challenges in Context

There are two multilateral arrangements that establish guidelines for administering nuclear export controls: the Nuclear Suppliers Group (NSG) and the Zangger Committee, also known as the Exporters Committee of the Nuclear Non-Proliferation Treaty (NPT). Both arrangements emerged during the 1970s, and both evolved over time to supplement bilateral nuclear trade agreements, which, beginning in the years after World War II, have governed nearly all of the world's commerce in nuclear materials, equipment, and technology.

The Zangger Committee originated in 1971 when a group of fifteen nuclear supplier states began meeting to clarify how to interpret and implement Article III.2 of the NPT, which requires that state parties to the NPT apply International Atomic Energy Agency (IAEA) safeguards on their nuclear exports. The article states that NPT parties undertake not to provide “source or special fissionable material, or equipment or material especially designed or prepared [EDP] for the processing, use, or production of special fissionable material” to non-nuclear weapon states unless the source or fissionable material is under safeguards.

Export of EDP items would “trigger” certain conditions of supply, including IAEA safeguards in the recipient state if it were a party to the NPT, and assurances of peaceful use if the recipient state were not an NPT party.² EDP goods were not, however, defined by the NPT, and the informal Zangger Committee was formed to identify these items.

The NSG was established by a group of seven nuclear supplier states to further restrict nuclear commerce after India exploded a nuclear device in 1974 using equipment and material supplied by Canada and the United States under bilateral nuclear cooperation agreements committing India to peaceful use of the imported items. The NSG was expressly formed on the premise that the NPT and Article III.2 alone did not suffice to prevent nuclear items from being transferred to parties that aimed to develop nuclear weapons.

The Nuclear Suppliers Group was formed by states convinced that the NPT alone would not deter proliferators.

In its guidelines, the NSG adopted the Zangger Committee's list of goods that trigger safeguards on exports, but it went beyond the stipulations of Article III.2 in establishing other criteria that recipient states must meet to import nuclear goods from supplier states. Beginning in 1975, the NSG's members drafted guidelines that two years later were agreed upon by fifteen states. These guidelines were then published by the IAEA in 1978.³ In addition to the trigger list, they also included "Common Criteria for Technology Transfers" of sensitive items related to uranium enrichment and irradiated fuel reprocessing, a requirement for physical protection, a ban on nuclear explosive uses and on production of highly enriched uranium (HEU), conditions limiting recipient states' retransfers, and more restrictive "special controls" on items for uranium enrichment and spent fuel reprocessing.

Since 1974, the Zangger Committee's trigger list has been elaborated and expanded to reflect the evolution of nuclear technology, and also because proliferating states succeeded in exploiting loopholes in the guidelines. However, the Zangger Committee's mandate remains bound to implementation of NPT Article III.2.

The NSG, however, has continued to extend the scope of its rules for global nuclear trade beyond the mandate of the NPT.

After publishing its 1978 guidelines, the NSG did not meet again until 1991. During this period, several countries set up elaborate procurement organizations to support nuclear weapons development programs. They imported many items, especially dual-use goods, which were not subject to the controls of the two multilateral arrangements. More countries began generating nuclear power, more developed capacities to produce nuclear materials and equipment, and the number of NSG-participating governments increased from 15 to 27. When the scale of Iraq's clandestine procurement program was revealed in 1991 after the first Gulf War, the NSG met for the first time in thirteen years. It then updated the trigger list and compiled a new control list for dual-use items, which was published by the IAEA in 1992.⁴ The guidelines for dual-use trade encouraged suppliers to make a subjective judgment about the nonproliferation credentials of potential recipient states in the course of licensing exports. In 1993, the NSG exceeded the NPT mandate still further by requiring as a condition for the export of trigger list items, subject to new nuclear supply commitments, that any non-nuclear weapon state recipient's nuclear activities be subject to full-scope IAEA safeguards. In 1994, the NSG extended to trigger list items its stipulation in the NSG dual-use guidelines that supplier states consider recipients' nonproliferation credentials in licensing. In 2002, the NSG responded to the events of 9/11 by including in its guidelines the recommendation that greater efforts be made to prevent controlled items from being obtained by terrorists. In 2004, the NSG's participating states agreed to adopt a so-called catch-all mechanism to deter exports of unlisted items sought by foreign entities identified by supplier states as participating in nuclear weapons development programs.

Nearly a decade after the NSG began meeting regularly to steadily enlarge the scope of its controls, some NSG participants during outreach activities expressed cautious optimism that the multilateral export control regime would for an indefinite period succeed in stemming the spread of nuclear goods to proliferators. Declining oil and gas prices, unfavorable economics, and public acceptance problems led many countries to scale back

their nuclear power programs, implying that the world market for nuclear exports would decline. The Cold War was coming to an end, the number of potential nuclear proliferating states was falling, and most countries had determined that nuclear weapons were of no use to them, one participant in an NSG outreach conference asserted.⁵ But he added that, because the two multilateral export control arrangements had been spawned by alarming proliferation events, “it is regrettably reasonable to expect another crisis in nonproliferation within the next ten years or so.”

The NSG’s Last Decade

In fact, by the late 1990s, that crisis was already on the way, and during the next ten years until the present, the NSG would be challenged by these developments:

- complex proliferation transactions and networks circumventing multilateral trade controls
- an increasing role for nonstate actors in procurement and proliferation
- opportunistic exporting policies of supplier states
- globalization of the nuclear trade environment
- rise of international nuclear equity issues

Proliferation Outside Multilateral Controls

In 2003, it became known that Abdul Qadeer Khan, a Europe-trained metallurgist who headed Pakistan’s uranium enrichment program beginning in 1976 and who had set up an international procurement organization to support Pakistan’s nuclear and ballistic missile development effort, had sold Pakistan’s uranium enrichment technology—much of which he and others had stolen from the Netherlands and Germany—to Iran, Libya, and North Korea. Since 2003, NSG-participating governments have investigated the possibility that Khan also provided this know-how to others. It is widely believed that Khan provided enrichment technology to at least one more state client, and it is suspected—but has not been openly confirmed—that design information from Pakistan’s centrifuge enrichment program may now be in the possession of a handful of other countries.⁶

None of Khan’s three known clients were party to NSG understandings on nuclear trade guidelines. Iran in fact has asserted since 2003 that its quest for uranium enrichment capability has been driven in part by the NSG’s determination to prevent Iran from acquiring nuclear fuel and technology. Most of the other states suspected of having obtained Pakistan’s technology are likewise not participating in multilateral export control arrangements. Judicial and intelligence investigations in NSG-participating states have underscored the fact that, unlike nuclear materials and equipment, design information for uranium enrichment is fungible and can be transferred to proliferators on compact discs or via the Internet. When Libya announced in 2003 that it had abandoned its clandestine enrichment program based on assistance from Khan and then turned over

to foreign powers equipment it imported for that program, some investigators assumed it retained copies of sensitive gas centrifuge and enrichment plant design information.⁷

Participating governments in the two multilateral nuclear export control arrangements exposed the wave of nuclear smuggling that escalated during the late 1990s until Khan's arrest by Pakistani authorities in 2004. A small number of procurement agents, brokers, and project managers who had collaborated with Khan were subject to judicial investigations and, in a few cases, prosecution by national authorities. The uranium enrichment technology proliferated by these actors, however, remains at large, and an international and interlocking chain of procurement associations and contacts, according to officials from NSG-participating governments, also remains at large and active. Traders and brokers engaged in this business directly challenge the credibility and effectiveness of the NSG because they, and in some cases governments in countries where they are operating, are outside the multilateral export control arrangement.

It is important to underscore that, unlike previous cases in which national governments tightly managed clandestine procurement activities to develop nuclear weapons, the activities of the Khan network were apparently not steered by a national government but were carried out in parallel with Pakistan's nuclear weapons program and involved scores of nonstate actors—engineers, manufacturing companies, traders, brokers, and financiers—none of whom were acting on behalf of any national government authority.

“Opportunistic, State-Supported Nuclear Commerce”

During the past decade, the NSG's effectiveness and credibility was directly challenged by the willingness of established suppliers in the group to break or bend its guidelines in the service of their national security and economic interests.

Until the early 1990s, when the NSG established the condition of full-scope safeguards for trigger list exports and introduced controls on dual-use items—and as the number

of NSG members gradually increased—some supplier states resisted efforts to curtail their nuclear exports to countries with both declared and undeclared nuclear programs—in particular, Argentina, Brazil, India, Pakistan, and South Africa. None of the supplier states, though, overtly challenged or violated the NSG guidelines in exporting items to these destinations.

Since 1998, however, the NSG guidelines have been challenged by supplier states engaging in what one expert called “opportunistic, state-supported nuclear commerce.”⁸ Russia concluded a power reactor export deal with India, which it claimed did

not violate the NSG's full-scope safeguards condition because the transaction was “grandfathered” by a bilateral nuclear cooperation agreement concluded four years before the NSG established the full-scope safeguards requirement in 1992. During the 1998 NSG

During the past decade, the NSG's effectiveness and credibility was directly challenged by the willingness of established suppliers in the group to break or bend its guidelines in the service of their national security and economic interests.

plenary meeting, the United States objected to this argument and later requested that Russia provide documentation that its 1988 bilateral agreement with India specifically included supply of the power reactors to India. Russia did not provide any documentation, and the transaction went forward.⁹

In 2001, Russia exported nuclear fuel to India for two power reactors located at Tarapur and invoked a clause in the NSG guidelines that permits a supplier to export items to a recipient without full-scope safeguards “in exceptional cases when they are deemed essential for the safe operation of existing facilities.”¹⁰ Many NSG-participating governments objected that the planned export would violate the guidelines, and in 2004 Russia suspended fuel supply to the Indian reactors.¹¹ In 2006, when Russia again invoked the safety exception, there was little opposition from NSG-participating governments. Instead, there was an internal discussion about how the safety exception should be interpreted, with some parties, including Russia, arguing that the exception could be invoked if a decision not to supply the items in question would mean that the reactor would have to be shut down.¹² Russia supplied the fuel to India. In 2008, Russian nuclear fuel vendor TVEL signed a \$700 million contract with the Nuclear Power Corporation of India (Npcil) for continued supply of uranium for the reactors in Tarapur.¹³

Three years earlier, in 2005, the United States and India had announced that they would negotiate an agreement for peaceful nuclear cooperation that, to permit entry into force, would require the NSG to make an exception to the condition that export of trigger list items to all states except the NPT’s five nuclear weapon powers requires full-scope safeguards. When the U.S.-India bilateral agreement was first conceived, U.S. officials had considered presenting the NSG with a list of proposed criteria that might serve as the basis for awarding India an exception to the NSG requirement for full-scope safeguards. Two other states outside the NPT with nuclear arsenals, Israel and Pakistan, at that time pressed the United States to support their efforts to obtain a similar waiver from NSG trade restrictions on the basis of specific criteria.¹⁴

The United States, Russia, and France, all of which sought to export nuclear equipment to India, opposed providing exceptions for Israel and Pakistan. Instead, they argued that a unique exception should be made for India without reference to criteria. In September 2008, the NSG granted that exception for India by consensus, and India may now import controlled items from NSG supplier states.

A Changing Global Nuclear Trade Environment

The NSG has also been challenged during the last decade by a transformation in the conduct of international nuclear trade.

Since the genesis of both multilateral nuclear export control arrangements (the NSG and the Zangger Committee), the trigger list has been subject to considerable modification, enhancement, and enlargement. This was necessitated by the success of proliferators in exploiting loopholes in the guidelines. In some cases, countries imported partially manufactured items on the list, as well as materials and equipment that did not precisely conform to the technical specifications on the list but can nonetheless be used for nuclear

weapons development. They also imported dual-use equipment that could be used to produce the controlled items they sought.

In 2004, the NSG included in its guidelines a “catch-all” rule urging participating states “to provide a national legal basis to control the export of nuclear related items which are not on the control lists, when such items are or may be intended to be used for nuclear weapons programs.”¹⁵ Some NSG states had included catch-all provisions in their national export control laws since the mid-1990s. In a few cases the catch-all provisions permitted national authorities to halt specific exports to the Khan network during the late 1990s and as late as 2002, but in other cases they failed to halt transactions because determined exporters were prepared to violate national export control laws.¹⁶ Some officials participating in NSG deliberations have said that the catch-all mechanism was embraced by the NSG as a stop-gap measure in view of the large volume of unlisted equipment that procurement agents had supplied to nuclear programs in Libya, Iran, North Korea, and Pakistan during the decade prior to 2004.

When the NSG was founded, nearly all international nuclear trade involved point-to-point transactions in which sellers shipped items to specified end users. Since the 1980s, however, proliferators have increasingly transshipped goods to their final destinations via intermediate locations in countries with weak or nonexistent export control systems, and they have used trade brokers to organize complex transactions that are difficult for export control authorities to detect and interdict. These transactions are often organized to have multiple intermediary destinations called “turntables” and complex payment schemes.¹⁷ The Khan network frequently used the United Arab Emirates and Malaysia as turntables, but the records of national export control authorities cited in some EU states’ investigations of the Khan network suggest that trade relied on perhaps three dozen intermediary shipping points worldwide to move goods to their final destinations.¹⁸ In this way, for example, North Korea may have effectively disguised assistance to Syria related to construction of a clandestine plutonium production reactor between 1997 and 2006. Malaysia and South Africa, from about 1998 through 2003, served as manufacturing centers for uranium enrichment-related equipment ultimately destined for Libya and Iran.

Some of the most egregious proliferation transactions carried out by the Khan network did not involve equipment or nuclear materials but technology. National authorities investigating the Khan network discovered that design information incorporated into blueprints, originally stolen from established nuclear programs in supplier states, had been copied onto computer drives. Highly sensitive information has been transmitted in some cases via the Internet and stored on compact disks. In 2005, the author of this report obtained stolen design information for gas centrifuge uranium enrichment that had been photocopied and may have been electronically transmitted to unauthorized third parties.

Proliferators’ increasing reliance on complex transactions involving participants outside established supplier states is a greater challenge for the NSG than ever before because global expectations about the future of nuclear power are changing. After years of stagnant growth in capacity expansion, many countries that currently generate nuclear electricity now plan to significantly expand their nuclear infrastructure, and countries that so far have not developed nuclear technology assets are planning on deploying power reactors in

coming years. Many are developing countries that are not participating in NSG outreach activities.¹⁹ Some countries now investing in nuclear energy infrastructure, and in possession of a sufficient industrial base, will themselves become suppliers and exporters of nuclear material as well as trigger list and dual-use equipment.

China, a nuclear weapon state since 1964, set up a nuclear power infrastructure very gradually beginning in the 1980s through the end of the 1990s. Since then, China has dramatically accelerated its nuclear power development. China now operates fourteen nuclear power reactors and may have as many as 75 units online by 2020, and its nuclear buildup will involve perhaps several hundred enterprises participating in nuclear construction, equipment manufacture, and the engineering services sector, while Chinese oversight of commercial nuclear activities, including its export sector, may be comparatively weak.

India, freed from most NSG trade sanctions in 2008, now harbors similar ambitions. In late 2010, India began operating its twentieth power reactor, bringing its total installed generating capacity to about 5 GW²⁰; Indian industry aims to increase that capacity to as much as 63 GW by 2032. About two-thirds of this capacity expansion would be contributed by projects with foreign suppliers made possible by the NSG exception for India.²¹

Some countries now investing in nuclear energy infrastructure, and in possession of a sufficient industrial base, will themselves become suppliers and exporters of nuclear material as well as trigger list and dual-use equipment.

The Rise of International Nuclear Equity Issues

The NSG was founded by seven supplier states that were convinced that the NPT's safeguards provisions would not effectively prevent proliferators from obtaining materials and equipment for nuclear weapons programs. But the NSG imposed no additional trade restrictions between 1978 and 1992. After the first Gulf War revealed that for more than a decade Iraq had spent several billion U.S. dollars on a clandestine nuclear weapons program that had been hidden from the IAEA, the NSG began to ratchet up the scope of its trade controls, beginning with the dual-use list and additional trigger list items that had figured in Iraq's nuclear weapons quest.

Since its inception, the NSG, through its actions, has prompted accusations from developing countries that it is a cartel of technology holders aiming to prevent others from obtaining nuclear technology, skills, and infrastructure. These claims have strongly flavored NSG diplomacy in recent years. During the 1980s, they inhibited the NSG from further developing and expanding the scope of its trade controls.

Much of this criticism has been channeled into the NPT review conference process, during which some states have objected that the NSG's activities exceed what is called for under NPT Article III.2. During the 1995 NPT Review and Extension Conference, positive references to the work of the NSG were not admitted to the record of the conference, and the NSG was criticized for lack of transparency by some members of the Non-Aligned Movement (NAM). NAM critics, led by Iran, tried but failed to establish as a general principle that the IAEA alone should arbitrate compliance with NPT Article III.2.²²

During the 1997 NSG outreach seminar in Vienna, supplier states tried to convince others that the NSG was not meant to deny developing countries access to trade and that there are “no secret agreements” among NSG members to that effect, “and no secret list of bad guy countries.”²³ Some developing countries objected during the meeting that the NSG guidelines were arbitrarily interpreted by suppliers to deny exports. Supplier state officials offered the refrain that nearly all export license applications submitted to NSG-participating states are approved. Iran objected that “virtually all the denials are to states outside the NSG.”²⁴

Iran, supported by NAM states, increasingly objected to interference in its nuclear development beginning in 2003, when its safeguards compliance became subject to review by the IAEA board of governors, and NAM objections were magnified by the contribution of the United States and some other supplier states to the failure of the NPT Review Conference in 2005. One observer of that event said, “For the United States, the focus of nonproliferation [was at the time of the Review Conference] outside the [NPT]: It rests with the NSG, the Proliferation Security Initiative (PSI), UNSC Resolution 1540, the G8 Global Partnership, and its own military counterproliferation.”²⁵

U.S. President Barack Obama’s vows to recommit the United States to multilateral diplomacy beginning in 2009 contributed to the outcome that the 2010 NPT Review Conference did not run aground on North-South polarization. The consensus Action Plan resulting from that conference included Action 36, which encouraged state parties “to make use of multilaterally negotiated and agreed guidelines and understandings in developing their own national export controls.” Other actions on the list stressed that states’ rights to nuclear commerce were subject to Articles I–III as well as Article IV. Action 50, however, urged technology holders to “give preferential treatment” to NPT non–nuclear weapon states and developing countries.²⁶ As had been predicted, because many NPT non–nuclear weapon states were highly critical of the NSG’s exception decision for India in 2008, the NSG was not cited in Action 36 as a model reference for the development of national export controls.

Specific Current and Future Challenges Facing the NSG

Discipline and Credibility: The NSG and China's Nuclear Trade With Pakistan

Three years after the NSG lifted most trade sanctions against India, it appears that a new exception to this requirement is in the making, as China plans to export at least two power reactors to Pakistan, a state that, like India, is nuclear-armed and outside the NPT.

During its first three decades, the NSG had quadrupled its membership to embrace nearly all nuclear supplier states. Why it did this is exemplified by the case of China. For many years after China joined the ranks of the world's nuclear-armed states, it assisted both civil and military nuclear programs in Pakistan and provided assistance

to some other undeclared nuclear projects, notably in Algeria. During the 1990s, however, in parallel with its decision to expand its civilian nuclear cooperation with the United States and other supplier countries, China ceased official assistance to Pakistan's unsafeguarded nuclear program and joined the Zangger Committee. China did continue to export nuclear material and equipment to Pakistan's civil nuclear program on the basis that

individual exports comply with the safeguards requirements of the Zangger Committee trigger list. In 2004, China joined the NSG, which required under Paragraph 4 of its guidelines for trigger list items that any exports by China under new supply arrangements between China and non-nuclear weapon states be conditioned on full-scope safeguards in the recipient state.

Because of China's record of previous assistance to Pakistan's undeclared nuclear program, the prospect of China joining the NSG unsettled some nuclear trade experts. But advocates of Chinese participation argued that the inclusion of the last of the P-5 countries into the multilateral nuclear export control arrangements made it more likely that

During its first three decades, the NSG had quadrupled its membership to embrace nearly all nuclear supplier states.

the veto powers in the United Nations Security Council (UNSC) would thenceforth cooperate in stemming the spread of nuclear weapons, and that China would terminate all nuclear assistance to Pakistan.

China has assisted Pakistan's nuclear program from its inception in the 1970s. It concluded sales of two power reactors to Pakistan before China joined the NSG in 2004, and it may have been considering additional power reactor exports to Pakistan when the United States and India announced plans for bilateral civilian nuclear cooperation in 2005. If so, China did not make that decision known. In 2004, China spelled out to the NSG that it intended to continue civilian nuclear cooperation with Pakistan under the terms of a 1991 bilateral nuclear cooperation agreement. China informed the NSG that it planned to supply fuel and services for the Chashma-1 and -2 power reactors exported to Pakistan before 2004, but in outlining the scope of its anticipated future nuclear cooperation with Pakistan, China did not disclose that it planned to export any additional power reactors to that country.²⁷

In 2006, Pakistani and Western media began reporting that China and Pakistan were planning more Chinese power reactor exports to the Chashma site.²⁸ U.S. officials then vowed that the NSG would not provide an exception to guidelines for Pakistan permitting this to happen.²⁹

In November 2006, on occasion of an official state visit to Pakistan by Chinese President Hu Jintao, a senior Pakistani official told this author that Pakistan pressed China to agree to the sale of more reactors, but that Beijing was not inclined to do so until it was confident that both the United States and India would obtain required approval for the projected U.S.-India nuclear deal from lawmakers in Washington and New Delhi, and that both the IAEA board of governors and the NSG would likewise permit the U.S.-India deal to enter into force.³⁰ That explanation for Chinese official silence on the matter appears consistent with the contents of a leaked diplomatic cable from September 1, 2006, which states that China had not confirmed Pakistani media reports claiming that Beijing had agreed to export more reactors. According to the cable, Beijing spelled out that "China will strictly adhere to its international obligations as a member of the NSG."³¹

In early 2010, it was confirmed that China intended to export two new reactors to Pakistan as Chashma-3 and -4.³² NSG-participating governments at the June 2010 plenary meeting requested a clarification from China, and in November China issued a statement to the group indicating that it intended to export the two reactors, adding that the exports were grandfathered under Beijing's prior bilateral nuclear trade pact with Pakistan.³³ In parallel, China and Pakistan made arrangements for the IAEA to safeguard two more reactors in Pakistan under existing safeguards arrangements between Pakistan and the IAEA covering Chashma-1 and -2.³⁴ According to information given by Pakistani officials this past April, Pakistan had begun excavation work at the site, as well as pouring the concrete foundation for the first of the two reactors.³⁵

Since early 2010, there has been no unanimity among NSG-participating states about how to proceed in response to China's plans for new reactor exports to Pakistan.

Beginning in early 2010 the United States expressed the position that, based on the information provided by China in 2004, China could not grandfather the transaction.³⁶ But officials from some NSG-participating governments instead considered that grandfathering of the export would be the most expedient solution to the dilemma, since numerous NSG-participating governments had been exposed to diplomatic pressure by the United States and India to approve the exception awarded to India in 2008; they did not want to repeat that experience with China.³⁷

The NSG and China's Nuclear Trade With Pakistan

Following discussions with participants at the Carnegie Brussels seminar, it would appear that the following options are available to the NSG in responding to China's resolve to export additional reactors to Pakistan:

- NSG-participating governments could tacitly permit China to export the reactors without any discussion or challenge.
- Absent documentary validation by China of the grandfathering of the export, NSG-participating governments could record objections that the export would violate the guidelines but take no further actions.
- They could explicitly agree that China may export the reactors without violating the guidelines on the basis that China's prior arrangements with Pakistan permit the transaction to be grandfathered.
- They could negotiate an agreement with China that permits the export (de facto grandfathering) but that commits China to delivering nonproliferation benefits, including a ban on future reactor exports.
- Suppliers could object to grandfathering and resolve that China must receive an exception to the guidelines to export the reactors.
- Suppliers could urge China to suspend its export to negotiate criteria that Pakistan must meet to qualify to receive new reactors from China.

There is currently no consensus in the NSG on how to proceed. A decision by the NSG should reflect a carefully considered assessment of the damage to the export control regime and the NSG's credibility for each option. The NSG chairman could commission an internal discussion paper to consider the available options; alternatively, one or more NSG-participating governments could independently study the matter and report the results to the chairman, after consultations with states outside the group.

Discipline-Related Issues

- The NSG should try to clarify among participating governments how grandfathering and safety exception provisions in the guidelines are to be interpreted and applied.
- The NSG should conduct a discussion on how to best encourage strict adherence of participating states and outreach countries to NSG guidelines.

At the NSG plenary meeting held in June 2011, the matter remained unresolved. As in 2010, NSG-participating governments requested additional information from China to explain its planned export to Pakistan and, in particular, to provide documentation that the transaction was called for under the 1991 Sino-Pakistani nuclear trade pact. According to officials from NSG-participating governments, the NSG had agreed by consensus in 2006, in response to Russia's challenge to the NSG guidelines over its fuel export to India, that any future claims by a participating government that specific exports should be grandfathered should be documented by evidence such as commercial contracts with agencies in the intended recipient state.³⁸ China so far has not provided any such documentation to validate its assertion that the export of the new reactors was called for by its previous arrangement with Pakistan. Without such documentation, according to NSG-participating government officials, the export of Chashma-3 and -4 by China must be considered a new supply arrangement requiring Pakistan to commit to full-scope safeguards as a condition for the transaction.

In mid-2011, China informed NSG-participating governments that it had, in 2004, told the IAEA of its intended future exports of power reactors to Pakistan when it provided an expanded declaration of its nuclear activities under the Additional Protocol.³⁹ Because the communications between the IAEA and member states concerning implementation of the Additional Protocol are confidential, Chinese statements about the content of its declarations to the IAEA under the Additional Protocol cannot be confirmed to third parties by the IAEA.

At the Carnegie workshop, some participants recalled that, so far, efforts by supplier states since 2010 to persuade China not to export the reactors to Pakistan had failed. These efforts included a proposal that the NSG agree to permit the exports to be grandfathered in exchange for China persuading its ally Pakistan to abandon its opposition to the negotiation of a Fissile Material Cut-Off Treaty at the Conference on Disarmament. A few workshop participants predicted that the resolve expressed by the United States beginning in 2010 to persuade China to seek a formal exception for Pakistan to the NSG full-scope safeguards condition in the guidelines would likewise not succeed. Some NSG-participating governments would not join such an initiative, they said, since these states anticipate that they would be subject to bilateral pressure from China to quickly agree to an exception for Pakistan. Some participants in the workshop also said that China believes that other suppliers in the NSG have no interest in pushing the issue to the brink in view of the group's clear understanding that adherence to the NSG guidelines is voluntary. Some participants said that the amount of complex negotiation that would be required to reach a consensus among the NSG's 46 suppliers on criteria for an exception for Pakistan would not be worth the comparatively limited benefit of halting a small amount of Sino-Pakistani nuclear trade in violation of the guidelines, particularly because Pakistan's deteriorating political and economic situation might prevent the Chinese export from materializing.

One Western government official said that China may be unwilling to agree to any incentives to defer nuclear commerce with Pakistan if there is a bilateral understanding between Pakistan and China that, in exchange for nuclear cooperation from China,

Pakistan will provide China strategic benefits deemed highly valuable by Beijing, such as freedom to develop and use port facilities on the Arabian Sea.⁴⁰

Many workshop participants queried or expressed a view on the matter, yet, acknowledged that if China goes through with the export of the two reactors to Pakistan without demonstrating that the trade is legitimately grandfathered, the NSG's credibility will be damaged.

The NSG's Relationship With the NPT and the Question of Future Membership

How the NSG responds to the Chinese challenge should be informed by its consideration of two broader issues that have come to the fore as a consequence of the decision by the NSG in 2008 to grant the exception to India: how to manage the NSG's relationship with states outside the arrangement—including those without comprehensive safeguards agreements—and how the NSG defines itself with respect to the NPT. The NSG's experience in incorporating China into the group should be considered in any future expansion of the NSG beyond the present participation of 46 governments.

Will the NPT in the future serve as a fundamental norm and point of reference for the NSG's trade rules? At the Carnegie workshop, no clear consensus was expressed on this question, but it was apparent to many participants that the India exception to the full-scope safeguards requirement had rendered a discussion of that issue by the NSG's participating governments timely and essential.

In September 2008, China joined the consensus decision of NSG-participating governments to grant India the exception from the full-scope safeguards requirement. In deliberations before that decision was made, China had urged the group to address India's request for the exception in a nondiscriminating manner, implying, in the view of some participating governments, that Israel and Pakistan should also be considered as possibly eligible to trade with NSG suppliers.

IAEA Director General Mohammed ElBaradei has openly endorsed the U.S.-India deal since 2006.⁴¹ In bilateral meetings with IAEA member states, ElBaradei also expressed the view that, in the somewhat longer term, in the interest of non-discrimination, both Israel and Pakistan should be included by the NSG as partners in the nuclear trade regime alongside India.⁴² ElBaradei also suggested in a 2006 published editorial that the nuclear supply regime be enlarged to include Pakistan and Israel, since "our traditional strategy of treating such states as outsiders is no longer a realistic method of bringing these last few countries into the fold."⁴³

But as several workshop participants underlined, from 1995, all NPT parties—which by then included all supplier states in the NSG—agreed that, as a condition for the

The NSG's experience in incorporating China into the group should be considered in any future expansion of the NSG beyond the present participation of 46 governments.

indefinite extension of the NPT, “New supply arrangements ... should require, as a necessary precondition, acceptance of IAEA full-scope safeguards and internationally legally binding commitments not to acquire nuclear weapons or other nuclear explosive devices.” That pledge was reaffirmed by the supplier states during NPT review conferences in 2000 and 2010. It was abrogated in 2008 when the NSG provided the exception for India.

In line with statements that Chinese representatives made during NSG deliberations in 2005 (when the United States informed NSG-participating governments of its intention to negotiate a nuclear cooperation agreement with India), U.S. officials had considered discussing in the NSG a criteria-based approach for an exception to the full-scope safeguards requirement in the guidelines that, in principle, could be applied to any state outside the NPT that desired access to nuclear trade. The U.S. decision to seek a “singular exception” for India instead was prompted by political expediency. The United States limited its support for an exception for India alone because it believed that leaving open the possibility that Israel and Pakistan would also be given exceptions would have provoked firm opposition from many countries. An exception for Israel especially would give rise to strong objections from Arab states. It would have been possible, officials said at the time, for the United States and other NSG-participating governments to draft criteria that India could meet but Pakistan could not; however, U.S. officials assumed that any criteria that India met could also be met by Israel.⁴⁴ The United States informed Israel at the highest level of government that it would not support a bid by Israel for an exception to NSG trade rules, after Israel had persistently lobbied on behalf of such an exception.⁴⁵

Three years after the NSG granted the India exception, Carnegie wanted to make a discussion possible during the Brussels workshop about whether the group is prepared to consider including other states outside the NPT that are capable of supplying nuclear materials and equipment. Carnegie invited workshop participants from India, Israel, and Pakistan to consider the arguments for and against permitting these countries to participate in the NSG in the future.

One participant said that, beginning around 2000, a bilateral U.S.-India process was launched to form a bilateral strategic partnership. This process began after India had demonstrated its commitment to controlling the spread of weapons of mass destruction and had strengthened its export control system. India, he said, is now committed to qualifying for membership in the NSG and other multilateral export control arrangements. India is also committed to a minimum credible deterrence strategic doctrine for its nuclear weapons and seeks access to uranium, nuclear equipment, and technology to build up its nuclear power generating infrastructure in the interest of economic development and climate change mitigation.

Another participant said that, unlike India, Israel is currently not prepared to embark on a nuclear power program that would rely on imports of controlled items from NSG-participating countries. Israel, however, has been applying the NSG guidelines since the 1990s, and in 2004 promulgated export control requirements for nuclear, biological, and chemical items. The participant said that current and future proliferation threats faced by NSG-participating countries bear no relation to whether the threats originated from NPT or non-NPT states.

Another participant also related that, both in the past and the present, the NSG faced proliferation challenges from a number of NPT states, including Iraq, Iran, Libya, and North Korea. In addition, he said, the Khan network operated on the territories and with help from individuals from about 30 NPT countries. Pakistan has been involved in the NSG's outreach program since 2002, he said, including a visit to Pakistan by the NSG in 2005. In 2004, Pakistan established a comprehensive export control system and, before that, a national command authority responsible for control of Pakistan's strategic assets. If the waiver for India were generalized on the basis of criteria, Pakistan could be exempted from the full-scope safeguards requirement and be incorporated into the NSG as a nuclear supplier state; Pakistan would be willing to negotiate the terms of such an exception.

Some participants in the workshop from NSG government delegations said after the discussion concerning the NSG's relationship with India, Israel, and Pakistan that they were not convinced that the NSG should expand its membership to include these countries. Others suggested during the meeting that, if, as anticipated, the NSG's 2011 plenary meeting one month later reached a consensus agreement on new guidelines for enrichment and reprocessing (ENR) transfers, the new conditions for this trade would require NPT membership by recipient states. That outcome, they said, would reflect a counterreaction or reflex by many NSG-participating governments in the aftermath of the U.S.-India deal and the NSG exception for India, taking into account criticism of those developments from non-nuclear weapon states in the NPT. According to this view, the requirement that a recipient non-nuclear weapon state must be an NPT party was meant to "reassure" non-nuclear weapon states in the NPT that the NPT would continue to be viewed by NSG-participating governments as an important international norm, and that, in the future, the NSG, as one workshop participant put it, "would not make the exception for India into a general rule for Israel and Pakistan." One export control practitioner at the workshop said that "an exception can become the norm very, very quickly. The NSG has to be very careful about the norms, and I don't think that it is being careful enough."

Another participant said that, when the NSG takes up possible future participation of non-NPT states, the group "is getting into very fundamental issues," since, if members take for granted that NPT membership is a criterion for NSG membership, that "would imply that non-NPT states would have to disarm as a condition for membership"—which is hardly a likely outcome.

But historically, participants pointed out, the NSG's relationship with the NPT has been ambivalent. The group was established by states that believed that the NPT did not suffice to prevent the spread of nuclear weapons, and its original membership included two countries that were not NPT parties. The NSG's members agreed to require full-scope safeguards as a supply condition in the same year that France and China—the only two NSG members outside the NPT—acceded to that treaty.

At the Brussels workshop, Carnegie distributed a discussion paper that outlined potential benefits and difficulties should the NSG pursue a criteria-based approach to eventually permit China to export power reactors to Pakistan, and discussed how China might be incentivized to agree to suspend its commerce with Pakistan for as long as it takes to negotiate appropriate criteria that would result in clear benefits in nuclear nonproliferation

and security. Separately, Carnegie later published an expanded version of this paper outlining such a possible approach.⁴⁶

During the workshop, some participants suggested a list of possible criteria for an exception to the full-scope safeguards requirement that might apply to any state without a comprehensive IAEA safeguards agreement. Among the proposed requirements mentioned were: an Information Circular (Infcirc)/66 safeguards agreement with the IAEA ensuring that IAEA safeguards would be applied in perpetuity on all safeguarded activities in the country; an Additional Protocol with the IAEA; ratification of the Comprehensive Nuclear-Test-Ban Treaty and, pending its entry into force, a moratorium on nuclear tests; adherence to the NSG guidelines and to the norms of other multilateral export control arrangements; robust export control legislation; ratification of the 2005 amended Convention on the Physical Protection of Nuclear Material (Infcirc/274/Rev.5) and the Convention for the Suppression of Acts of Nuclear Terrorism; and commitment to Step 3 of the 13 Steps agreed to by NPT parties in the final document of the 2000 NPT review conference, toward conclusion of a Fissile Material Cut-Off Treaty. For the case of Pakistan, the Carnegie papers suggested additional conditions for a future NSG exception, including counterterrorism, nuclear safety and security obligations, and steps Pakistan would have to take to de-escalate its nuclear relationship with India and prevent a regional nuclear arms buildup.

The Carnegie papers began with the premise that China, in the wake of the severe accident at three power reactors at Fukushima-Daiichi in Japan, currently might be prepared to reconsider its export to Pakistan, since as a consequence of the accident in Japan, China will likely in 2012 adjust its domestic reactor technology deployment strategy to build newer models and exclude the design represented by Chashma-3 and -4. Beijing could consider developing, together with other NSG-participating governments, criteria that could be set as a yardstick for future bilateral trade with states without comprehensive safeguards agreements. To encourage China to partake in such discussions, NSG supplier states could commit themselves to facilitate China's participation in international projects to export modern power reactors to markets outside Pakistan. Chinese participation is currently severely limited by intellectual property rights issues, since China is using foreign technology in most of the reactors it is building. Because the NSG from 1995 through 2010 has committed and recommitted itself to the full-scope safeguards supply condition, it was also advised that any NSG consideration departing from that understanding should be discussed with NPT non-nuclear weapon state parties.

The potential benefits of such an approach are:

- establishing a process for the long-term integration of non-NPT parties into the nuclear trade regime;
- providing a way to integrate China's nuclear commerce with Pakistan into an NSG framework acceptable to all NSG-participating governments;
- giving assurances that Pakistan's future nuclear development would take place under sustainable, safe, and secure conditions and would provide nuclear security and nonproliferation benefits; and

- incentivizing China to play a greater and constructive role in the shaping of the nuclear trade regime.

The potential drawbacks of such an approach include:

- possible aggravation of the relationship between nuclear supplier states and many non-nuclear weapon states in the NPT; and
- an unfavorable cost-benefit ratio, such that the main desired outcome driving the process—circumscribing Sino-Pakistani nuclear trade—may be not significant enough for NSG participants to invest in a complex and difficult negotiation over trade conditions with Pakistan.

Interventions by workshop participants suggested there is currently no consensus in the NSG about how it should approach the question of future relations with non-NPT parties.

A few participants drew parallels between the situation faced by the NSG today and that encountered by Cocom⁴⁷ beginning in 1992, shortly after collapse of the Soviet Union, and prior to Cocom's succession in 1996 by the Wassenaar Arrangement. Like Wassenaar, one participant said, the NSG “has no pretensions to universality.” Following the 2008 exception for India, he said, the NSG is “free to choose which road it should follow,” alignment with the NPT, or instead a path that in the future will generalize the “singular exception” provided to India to other non-NPT parties and consider them as future membership candidates. “An NPT commitment and the Indian exception are not compatible, so where does the NSG want to go?” he asked.

Not all participants favored the inclusion of both Pakistan and Israel into the arrangement. One European participant expressly advocated negotiating an eventual exception for Pakistan on the grounds that it might provide “tangible benefits” such as those postulated by the Carnegie paper. But he did not favor granting such an exception to Israel, in part because it would “cause a lot of unrest in the NAM.... Were Pakistan to be granted an [exception], I don't think there would be an uproar.” Another European participant underscored the possibility that, should steps be taken to move closer to accepting non-NPT states as members, not all of these would be treated equally. “The NSG is a political and diplomatic regime. Thus, it is about political consensus-building and what is possible and not necessarily what is logical.”

This participant said that the NSG “needs more than ever a consultative mechanism that opens the way for in-depth consultations with both aspiring NSG partners and countries outside the NSG. Indeed some of the leading countries in the NAM could fall within that category. The NSG could try to set up some sort of consultative format” similar to the North Atlantic Cooperation Council for countries that are not members of NATO. That body, he said, eventually “became a permanent mechanism for consultation between [NATO] and countries outside.” Were such a mechanism to be established for the NSG, he said, it would be up to the participating countries to decide how “close” to the NSG

There is currently no consensus in the NSG about how it should approach the question of future relations with non-NPT parties.

they wished the outsiders to be, but the mechanism would also “allow [a nonmember] to decide to become an aspiring member of the NSG.”

But, said another participant, no such mechanism in the NSG presently exists. Consideration by the NSG of new candidates for membership “doesn’t work like that.” What happens, he said, is that a country seeking membership in the NSG “presents an initiative” to the NSG-participating governments. “If the initiative is accepted, the country is considered. If not, we thank the country and tell it, this is not the time, we will come back to you at a good time. And that’s it.”

The conventional argument favoring a strong alignment between the NSG and NPT is that the NSG’s supplier states—all of them now NPT parties—are committed to a “grand bargain” according to which they must provide non-nuclear weapon states access to trade and technology in exchange for their continued renunciation of nuclear weapons. One Asia-Pacific participant suggested that a criteria-based approach to non-NPT states might result in the NPT’s non-nuclear weapon states leaving the treaty. “If you allow [non-NPT states] in without them giving up their nuclear weapons programs ... there will be a temptation for countries to first go nuclear and then join the export control regimes. So North Korea will follow India and Pakistan ... and this could seriously undermine the NSG regime.” Another participant from the same region asked the same question, albeit framed by Iran. “We sit in the IAEA board of governors [meetings] and often hear Iran saying that [NPT membership] comes with a whole load of obligations and not much benefit. Wouldn’t changing the NSG membership criteria feed Iran’s argument?”

But one participant voiced what he called a “heretical thesis” that the assumption that the NSG’s extending nuclear trade privileges to India and other states outside the NPT would lead to greater proliferation and defections from the NPT is “an unproven one.” Libya, Iraq, Iran, and North Korea did not move forward with clandestine nuclear programs because the NSG was discriminating against them in favor of non-NPT states, he said.

In 1997, as part of its outreach program, the NSG published a document titled “The Nuclear Suppliers Group: Its Origins, Role, and Activities” as *Infcirc/539*.⁴⁸ The original version included a rubric called “membership.” The most recent version, *Infcirc/539/Rev.4*, calls this “participation” instead. One workshop participant involved in drafting that document said that the recent language was meant to discourage countries outside the NSG from concluding that the suppliers group was a “club” or a cartel. In the future, “participation” might also imply, unlike “membership,” that countries might embrace the aspirations and adhere to the guidelines of the NSG without taking active part in its decisionmaking. In all consecutive versions of *Infcirc/539* since 1997, the document explains that there are “factors”—not criteria—that are “taken into account” for membership/participation. These “include ... adherence to one or more treaties, such as the NPT, the Treaties of Tlatelolco, Rarotonga, Pelindaba, Bangkok, or an equivalent international nuclear non-proliferation agreement [and] full compliance with the obligations of such agreement(s).”

“We have to remember that [*Infcirc/539*] states that membership in the NPT is one of the crucial factors in deciding membership [in the NSG], and if [other criteria] are now to be considered, we have to consider why NPT membership was set as a factor in the

first place,” one workshop participant said. Another participant, however, challenged the assumption that the NSG must indefinitely use the NPT as a benchmark for membership. “In the beginning, there was no direct link between the NSG and the NPT because the suppliers organized themselves to constrain France to accept some rules regarding exports.” NSG participants should therefore “question why the NSG has been so preoccupied with one particular condition of supply—membership in the NPT—especially since the [NSG] originally never formally referred to the NPT. Why didn’t [the NSG] spend more time defining other conditions of supply?”

Shortly after the workshop and before the 2011 NSG plenary meeting held one month later, the United States circulated to NSG-participating governments a paper titled “Food for Thought”⁴⁹ concerning the issue of membership. The paper was drafted after President Obama announced this past November that the United States supported the inclusion of India as a full member in the NSG.⁵⁰ Accordingly, the paper did not propose that the NPT should be set forth as a criterion for future NSG membership.

U.S. advocacy of Indian membership in the NSG beginning in late 2010 prompted some other NSG-participating governments to object to the United States that full membership would permit India to block consensus decisionmaking in the group in the future because, as one participant in the workshop said, “there is a concern, even a suspicion, that India’s agenda is to reverse the trend of the NSG since the 1990s” toward the tightening of nuclear export controls.

During preparation of the membership paper, U.S. officials informed foreign NSG counterparts that the United States might approach the issue of Indian membership by considering India a “like-minded” state that shared the NSG’s overall aspirations and norms. Some participants in the workshop, however, voiced reservations about this approach, since the definition of “like-minded” would necessarily be subjective, and a decision by NSG-participating governments as to whether India was “like-minded” would be determined according to the national interest of each participating government. During the negotiation of new guidelines for enrichment and reprocessing, consensus was not possible until a number of proposed subjective conditions were deleted from the text.

“We are prepared to continue to discuss [prospects for Indian membership], but we won’t go further unless India presents a very convincing argument,” one workshop participant said. Membership for Israel and Pakistan were currently not on the agenda of the group at the time the workshop was held.

One of the “factors” considered for participation in the NSG under *Infcirc/539* is “the ability to supply items (including items in transit) covered by the annexes of Parts 1 and 2 of the NSG guidelines.” As one participant told the NSG seminar in 1997, “Any country which has a machine tool shop could be the supplier of especially designed or prepared components from the trigger list.”⁵¹ One participant in the Brussels workshop said his government has estimated that about 110 countries can supply nuclear dual-use equipment, and, based on what was revealed about the activities of the Khan network, “virtually any of these could be set up to manufacture at least some trigger list items.” The NPT, therefore, “can’t be the ultimate yardstick for NSG membership in the future if our goal is to capture all suppliers of nuclear items.”

During the 1997 and 1999 NSG outreach seminars, some participants warned that increasing the size of the group would render it nearly impossible to reach consensus on future issues, including on the most important subjects, such as the content of control lists and the conditions for trade in the guidelines. A few participants in those meetings proposed that the NSG establish a “two-tier” membership with one group of countries adhering to the guidelines and a second group active in NSG decisionmaking. But other participants then offered the view that new supplier countries would not agree to uphold the guidelines if they were not permitted to fully take part in decisionmaking. Twice in the past ten years, the NSG held a discussion on “categories of membership,” one Carnegie workshop participant said. This “was discussed in very general terms,” but no actions were taken as a consequence.

Aside from the danger that expanding the membership will make it less likely that states will reach consensus, participants in the Brussels workshop related that, as membership has expanded, there have been greater concerns about internal data security, which will increase further as the NSG focuses more attention addressing threats from nonstate actors.

How, one workshop participant asked, could the NSG justify excluding, on subjective political grounds, countries that had demonstrated that they were suppliers of trigger list items, or even entire nuclear facilities, when the group had included a number of European countries that don’t have a track record of supplying any nuclear material or equipment? More generally, as one participant elsewhere had written in an unpublished paper:

Adding new states with divergent interests may make it more difficult to maintain effective nuclear export standards or to upgrade those standards when circumstances dictate. On the other hand, excluding any state that has the potential to cause damage to the nonproliferation regime may mean that such a state will not adhere to responsible export policies. Such states have little incentive to adhere to the guidelines if they are not permitted to participate in the decisions of the group.

One participant suggested that the automatic admission of all European Union members to the NSG raised further questions about the equity and sustainability of the NSG’s

present course on dealing with potential new participants. All 27 members of the European Union are full participants in the NSG, but “only half of these have any serious nuclear infrastructure, and only a few of these are genuine nuclear suppliers or transshipping states for nuclear items,” a workshop participant from industry said. All EU members are admitted as NSG participants because they are members of a customs union where many listed goods are routinely shipped across national bound-

In the future, the emergence of new customs unions in Africa, the Asia-Pacific, the Middle East, and Central and South America will challenge the NSG.

aries without controls.⁵² In the future, the emergence of new customs unions in Africa, the Asia-Pacific, the Middle East, and Central and South America will challenge the NSG, several participants warned. One such group in formation is the Cooperation Council for the Arab States of the Gulf (GCC). One GCC member, the United Arab Emirates (UAE), is constructing a nuclear power plant, is considering future participation in the

NSG, and is a major transit destination for large amounts of dual-use goods, as the investigation of the Khan network's activities underscored. Should the UAE join the NSG, establishment of a customs union in the GCC would imply that Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and perhaps Jordan and Morocco would become NSG participants.

In another case, the Eurasian Economic Community, one participant explained, five countries are setting up a customs union, and, in the process, for about eight years they have also been establishing a common system of export controls. Two member of this group, Russia and Kazakhstan, are already participating in the NSG. Three more—Belarus, Kyrgyzstan, and Tajikistan—so far are not. Some supplier states had previously objected to the admission into the Zangger Committee of one of these, Belarus, on grounds that it was not “like-minded,” since Belarus had been cited by these suppliers as being in violation of international norms for conventional weapons trade covered by the Wassenaar Arrangement.

As one participant summarized:

The NSG has begun a process to include the non-NPT states which are nuclear suppliers. The matter must be approached carefully in order not to undermine the objectives of the non-proliferation regime. India's intention to apply for NSG membership will test how the NSG responds to adapting to a new international security environment.... This is something that is coming, it's in the air, and will have to be dealt with by future NSG chairs.

Some participants advised that, if the NSG moves further in this direction, the chair should advocate a more active outreach role for the group in communicating its intentions to civil society and nonparticipating countries by providing briefings and background materials. Prior to the NSG's decision in 2008 to grant the exception to India, the NSG did not extensively brief outsiders, including working groups preparing for the 2010 NPT Review Conference, on its proceedings.

Some workshop participants expressed caution about defining criteria for future NSG participation because absence of criteria affords the group political flexibility. “Right now the NSG doesn't have hard and fast criteria” and for a “very good reason,” one said. “There are ‘factors’—not criteria—to be taken into account, and there is merit in this approach. The factors are quite clear, but they're not firm criteria; there's leeway, and in politics it's always good to have some leeway.” But other participants pointed out that flexibility comes at the price of legitimacy, since without firm criteria, decisions about future participation by other states could be determined on a subjective basis—including potential cases in which the NSG defined itself as a group of “like-minded states.” Subjective judgments prevailed when the NSG granted India an exception, many participants suggested.

As one participant summarized near the end of the workshop:

Right now there are no requests from any country to become a member of the NSG, but there might be requests in the future. Such requests need to be considered very carefully. We certainly need a discussion about criteria, and the discussion about potential criteria [in the Carnegie paper circulated at the workshop] was an important part of this seminar. It was a surprise that there emerged some agreement here about what sensible criteria might be ... but this will be a discussion that takes a lot of time.... The workshop spelled out that the NSG started from a paradigm that was completely different from that of today.

In 1974, “a big country, India, had crossed the threshold of possession of nuclear weapons” by violating peaceful-use commitments made to supplier states. Another supplier, France, was preparing to export reprocessing technology to Pakistan and South Korea. Yet another, Germany, had concluded an ambitious nuclear plant and enrichment technology export deal with an important country, Brazil, which harbored nuclear weapon ambitions. “Today’s paradigm is very different, and that’s the reason why we face the question of possible non-NPT states becoming NSG members in the future.”

NSG Membership and the NPT

The NPT is a treaty that is close to universal, but it cannot be adapted. The NSG was founded on the basis that the NPT would not suffice to halt nuclear proliferation, and two of its original seven members were not NPT parties. Unlike the NPT, the NSG does not aspire to be universal, but currently all its participants are NPT parties, and for the last fifteen years NSG-participating states have committed themselves to upholding the full-scope safeguards condition (although in 2008 they abrogated that commitment). However, there remain other nuclear suppliers—which also possess enrichment and reprocessing technology and have nuclear weapons—outside the NPT.

- The NSG should conduct a thorough and systematic discussion of future membership, including a consideration of the U.S. thought paper, which does not include NPT membership as a criterion.
- Any discussion of criteria should include establishment of benchmarks for such criteria and possible metrics to determine compliance with the criteria.
- It should discuss whether coexistence of “adherence” to guidelines and “participation” as separate categories is sustainable and feasible.
- The NSG should consider establishment of a more formal process to consult with nonparticipating states, manage the group’s relationship with these countries, and prepare them for membership as distinct from waiting on and reacting to unsolicited initiatives of individual states.
- The NSG should discuss with NATO its organization for cooperation with nonmember countries and apply any lessons learned.
- The NSG should consider rotating membership in the Consultative Group as a possible partial answer to the challenge of greater adherence and participation.
- The NSG should carry out a systematic investigation of all sources of listed goods worldwide to help prioritize future expansion of participation.

NSG Decisionmaking

The NSG, which in 1978 agreed on a complete set of international export control guidelines within the three years following its first constitutive meeting, began as a small group of states that had much in common. All were developed countries with advanced nuclear

R&D and fuel processing infrastructure, all generated electricity with reactors, and all could produce trigger list equipment.

The current 46 participating governments represent a far more diverse group of states from every continent, including five states with nuclear weapons, most of the world's nuclear power generators, some states that are opposed to nuclear power and have modest or no supplier capabilities, and some developing countries.

Since 2001, membership in the NSG has increased from 39 to 46 by adding China, Croatia, Estonia, Iceland, Kazakhstan, Lithuania, and Malta. During this period, the NSG has also taken actions to prepare to accommodate more countries as participants, in particular by expanding outreach efforts to states that may emerge as new nuclear suppliers in coming years. The outreach program included bilateral engagements, including technical exchanges, with India, Israel, and Pakistan, and interactions and visits to key transiting states such as the United Arab Emirates, Malaysia, and Singapore. The NSG's overriding aim behind these activities is to universalize the application of its guidelines.

From the outset, all decisions about the content of guidelines and other matters have been made by consensus. The consensus rule was retained and reiterated as the NSG's membership steadily increased, most recently in the 2009 revision of *Infcirc/539*.

During the workshop, however, participants related that, as the membership has grown, consensus formation on important decisions has become increasingly difficult. After the United States in 2004 called for a rethink on rules governing the export of enrichment and reprocessing items in response to the Khan network and 9/11, it took the NSG seven years to agree to new language in two paragraphs of the guidelines.

A few participants questioned whether the consensus rule would or should continue to be applied in the future. They pointed out that, even within the European Union—a comparatively homogenous group of states in terms of their overall political, economic, and technological development—significant differences have emerged in decisionmaking on important NSG matters.

Participants warned, however, that abandoning the consensus rule for decisionmaking would imply that voluntary guidelines that are not accepted by all participating states would be less viable because some states might not be willing to adhere to guidelines they do not agree with. That, they said, was especially the case for efforts by the group to agree that the Additional Protocol should be a condition for all nuclear trade. If this were decided without a consensus, that could lead some states to develop sensitive capabilities indigenously or with the assistance of suppliers not abiding by NSG guidelines.

Ultimately, however, some participants in the workshop said, it would be highly unlikely that the NSG would abandon its consensus rule for decisionmaking, because doing so would require all participating governments in the group to agree to take that step by consensus.

One participant said that during the last decade the NSG's internal procedures have been rationalized by a working group on internal reform, in part to address the challenge of increasing participation. Until 2001, he said, the NSG had a plenary and three other bodies—working groups on transparency, dual-use commerce, and information sharing—running in parallel. On the basis of recommendations from the reform working

group, he said, the mandate of these three bodies was transferred to a new Consultative Group. “Current work is carried out by the plenary, by the Consultative Group and its Information Exchange Meeting. In addition the NSG can flexibly convene working groups or hold dedicated meetings to deal with specific issues, all of them reporting to the Consultative Group.”

Until now, the NSG has operated on the basis of voluntary commitments of participating governments and without a secretariat. In light of the above-referenced decisions by major supplier states since 1998 not to rigorously apply the guidelines, a few participants in the workshop advanced the idea of moving the NSG toward becoming a more formal organization in which member states would belong to a body having a permanent secretariat and make legally binding commitments to implement the guidelines. An enforcement process might also be established, which could expel states that do not abide by the guidelines.

Interventions by participants suggested that these ideas will likely not be taken up by the group. One participant expressed the view that moving toward becoming a more formal organization reflecting the formal responsibilities, duties, and rights of members would encourage the formation of “sub-constituencies” in the NSG, and in the future perhaps even the formation of a NAM chapter in the NSG. “Do we want alignments in the NSG?” he asked. “This could be a disaster. If we replicate the UN ethos inside the NSG, it’s over.” According to another participant, the danger of interest-group “blocs” emerging inside the NSG had been pointed out by some participating governments and then discussed internally by representatives over the past several years, in step with negotiations held by the NSG for enrichment and reprocessing export guidelines. During that negotiation, another workshop participant said that “there was a possibility that if the discussion got out of control, we would have a few countries agreeing to support a common position against the rest.” Because the negotiation was concerned with countries’ sovereign rights to make decisions concerning their economic development, he said, there was the potential that the negotiation could have been deadlocked along the global North-South divide.

One participant said during the workshop that retaining a loose organization without binding commitments would best ensure that decisionmaking would take place on the basis of compromise between “common goals and legitimate national, technological, and commercial interests” of individual NSG-participating governments. Increasingly lengthy negotiations on the content of guidelines, he said, may be a relatively small price the NSG must pay to preserve the group’s political flexibility.

Likewise, numerous participants in the workshop advised that no advantages would derive from the establishment of a permanent secretariat. Until now, secretarial and administrative duties have largely been carried out by a so-called “Point of Contact,” currently at Japan’s Permanent Mission to the International Organizations in Vienna. Some participants suggested that the Japanese Mission’s resources for NSG work—staff allotment and funding—would have to increase, should outreach and the scope of NSG activities be further enlarged.

Revision of the Guidelines: Enrichment and Reprocessing

In response to the proliferation challenges described above, by the middle of the last decade the NSG had embarked upon a major effort to revisit its rules for nuclear trade.

The chairman of the Consultative Group in 2009 described the task facing the NSG as follows:

The first question the NSG must address is whether the current guidelines and interpretations have impacted the ability of proliferants [*sic*] to achieve their nuclear ambitions: either by slowing it down or making it more difficult to acquire nuclear goods and technology. Second, the NSG must consider how to strengthen its guidelines and what changes should be made to the control lists. Finally, the group must consider next steps, most notably in terms of some very revolutionary ideas being put forth to ensure that enrichment and reprocessing technologies are not misused for non-civilian purposes.⁵³

The NSG began revising its guidelines for enrichment and reprocessing (ENR) in 2004. A long negotiation of new terms of trade for ENR was concluded one month after the Brussels seminar was held. Over the next few years, the NSG will carry out a systematic review of its control lists, and, as was the case for ENR trade, it may also make changes in the conditions for trigger list and dual-use transfers.

The guidelines for ENR are found in paragraphs 6 and 7 of Infcirc/254 Part I. The revision of these guidelines was inspired by revelations of the Khan network's activities in spreading centrifuge enrichment know-how from Pakistan to Iran, Libya, North Korea, and possible other destinations beginning in the 1980s and through 2003. Until now, the guidelines urged ENR technology holders to "exercise restraint" in decisions about exports. The new guidelines establish in addition a number of specific conditions that a recipient state must meet to be eligible for ENR. These are:

- being party to, and in full compliance with, the NPT;
- not being subject to decisions by the IAEA board of governors to redress safeguards compliance or safeguards implementation deficiencies;
- reporting to the UN Security Council under UNSC Resolution 1540 that the recipient state is implementing effective export controls;
- committing to IAEA safety standards and international nuclear safety conventions; and
- provision of agreement between the recipient and supplier state assuring no explosive use, supplier's retransfer consent rights, and effective safeguards in perpetuity.

The new guidelines also call on suppliers, inter alia:

- to have a legally binding agreement with recipients to limit any uranium enrichment to 20 percent U-235;

- not to transfer any enabling design or manufacturing technology; and
- to exclude replication by the recipient state of any supplied ENR technology or equipment.

In particular, the new guidelines call upon suppliers to require a comprehensive safeguards agreement and an Additional Protocol with the IAEA. This requirement for the Additional Protocol is not absolute, however, since the language of the guidelines would permit a supplier to transfer ENR to a recipient without an Additional Protocol if that state 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.” There are only two such regional arrangements: Euratom, for the countries of the European Union; and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC). All EU states have an Additional Protocol. Brazil and Argentina do not, and Brazil, especially, is opposed to the Additional Protocol. Numerous participants in the workshop said that Argentina and Brazil will interpret the guidelines to mean that they do not need to have an Additional Protocol to be eligible for ENR. Neither Brazil nor Argentina made a formal commitment to have an Additional Protocol when it agreed to the new ENR guidelines, and some participants expressed the view that the language did not imply that either Argentina or Brazil had made a commitment to take part in a process that intended to result in an Additional Protocol. The language is weak, but NSG-participating governments agreed to it in order to resolve objections raised by Brazil in the interest of getting agreement on the other conditions that are now required for ENR transfers. It is theoretically possible that two or more states without an Additional Protocol could conclude an agreement to form a regional safeguards agreement similar to ABACC, but it is uncertain that the IAEA board of governors would approve it.

Beginning in 2003, the IAEA and some NSG-participating governments have urged that future uranium enrichment projects be organized as multilateral nuclear fuel cycle enterprises whereby sensitive technology is not transferred to new parties. During the negotiation of the ENR guidelines, a number of states objected to proposed language that they believed would prohibit them from obtaining rights to ENR by compelling them to set up future projects on the basis of a “black box” arrangement, according to which the state deploying the enrichment technology would not own but would lease the technology for use from an established technology holder. The final text of the new guidelines does not require “black boxing” of ENR technology in new projects, but it strongly encourages technology holders not to share ENR with new partners and provides for a five-year review of the ENR guidelines concerning uranium enrichment to accommodate commercial and technology developments, especially any trends that might prompt a state to intend to develop an enrichment capability on the basis of technology it sought to acquire and not lease.

Since obtaining the exception from the full-scope safeguards condition in 2008, India encouraged NSG-participating governments not to adopt the requirement that recipients

of ENR must be NPT parties. Some participants at the workshop suggested that, after the exception was awarded to India—and after it became apparent that China aimed to export nuclear power reactors to Pakistan—some NSG-participating governments were more inclined to favor NPT membership as a requirement for ENR, in part to demonstrate that the exception the NSG provided for India in 2008 was a singular one.

The NSG's Response to an Evolving Global Nuclear Trade Regime

Separately from the discussion of the ENR guidelines, the NSG is now embarking on a review of the content of its control lists for nuclear and dual-use items. According to one participant in the workshop, the NSG foresees a three-year timeline for reviewing the lists.

This will not be the first time that the lists have been subject to review and alteration, but it will be the first time that a comprehensive review of the lists will be undertaken. In the past, nonproliferation failures—such as the one which in 1974 led to the creation of the NSG in the first place—prompted the NSG to amend its lists to include and to make more precise controls on specific items. Until IAEA inspections in Iraq, beginning in 1991, revealed the extent to which Iraq had tapped foreign sources for dual-use goods to further its clandestine nuclear program, most countries, including nearly all NSG participants, had no nuclear dual-use control lists. The NSG created such a list in 1992, published as Infcirc 254/Rev.1/Part II. It originally contained 65 items but has been substantially expanded and elaborated in detail. The most recent of eight successive versions was completed and published in 2010.

In parallel with the creation of the dual-use list, the NSG, also during the 1990s, undertook a revision and update of the trigger list to bring the NSG list into line with the Zangger Committee trigger list, which had been revised during the previous two decades to include new items and define existing items more precisely. The additions made by the Zangger Committee included heavy water plants (in 1977, in response to the NSG having included this item on its trigger list), followed by clarifications for gas centrifuge and gaseous diffusion uranium enrichment, reprocessing, heavy water production, primary cooling pumps in reactors, uranium exports, and uranium and plutonium conversion equipment.

While in the past the Zangger Committee had carried out the updating of the trigger list, since about 2000, one participant said, the NSG has become responsible for updating both the trigger and dual-use lists, leaving to the Zangger Committee the task of harmonizing its trigger list with the one updated by the NSG. Until now, he said, “there were minor modifications of the NSG list, though it was never comprehensively updated.” At the 2010 NSG plenary meeting, it was agreed by participating governments that the NSG lists would be comprehensively reviewed. The Zangger Committee will harmonize its list with the updated NSG list.

The NSG list review is being coordinated by a Dedicated Meeting of Technical Experts (DMTE), chaired by an official from the Netherlands, which will report its

results to the Consultative Group. The DMTE has decided to address both the Part I and Part II guidelines as a whole and has set up seven thematic groups, each of which will have a coordinator:

- reactor technology
- isotope separation technology
- reprocessing technology
- weaponization technology
- fuel fabrication technology
- industrial equipment
- miscellaneous/other

This thematic approach, one participant said, implies that the result of the review could be substantial, including the possibility of a single control list, which would identify specific items that would trigger IAEA safeguards.

The compilation of a single NSG list would permit nuclear suppliers to require full-scope safeguards for a subgroup of goods that are identified as sensitive and relevant for proliferators' nuclear weapons programs. That would include items used in a nuclear weapon—for example, items for production of the lithium-6 isotope or tritium—that would not be included on the Zangger Committee's trigger list because they are not EDP items and therefore not subject to control under NPT Article III.2. Such items would also include specific technologies—for example, vortex technology normally used for production of silicon isotopes—likewise not considered EDP items but still sensitive because they can be applied to enrich uranium.

Some participants suggested that, as the NSG's review of the lists gets under way, the group would likely in effect abandon the EDP category as a yardstick altogether. Doing that, they said, would make a discussion among NSG-participating governments and the members of the Zangger Committee concerning the future role of the Zangger Committee more necessary, since under NPT Article III.2(b) the EDP condition expressly triggers safeguards and because the Zangger Committee was expressly established to identify the EDP items.

Some participants in the workshop expressed the view that, over and above the question of how the NSG reorganizes the Part I and Part II lists, of far greater significance is a more basic decision the NSG must make about whether to aspire to comprehensive listing of goods or instead focus on effective implementation of a shorter list, at the same time relying increasingly upon participating governments' export control legislation and enforcement measures to fill in the gaps. Said one participant, if the NSG follows the latter course, it would increasingly rely on effective implementation of the catch-all rule to prevent nonlisted items from being procured by proliferators.

Independent of efforts by the NSG to revise its control lists, some workshop participants suggested that the NSG should coordinate and sponsor an effort to make

the catch-all provisions of its participating governments more rigorous. In particular, one participant proposed a “deepening” of the NSG’s catch-all provisions by adopting more elaborate and comprehensive catch-all provisions in EU export control guidelines. This participant also advised that it would be more efficient and faster for the NSG to strengthen its catch-all mechanism than to significantly amend the lists, since considerable time may be needed for participating governments to agree on new guidelines and then to pass them into national law.

Some countries in the group in recent years have carried out a review of their catch-all arrangements and found deficits, and among NSG-participating governments there is a need for harmonization of the arrangements and, some participants said, for an NSG agreement for sharing denial information among national authorities.

A focus on enhancement of the catch-all provision was favored by some workshop participants because, as one said, in the future, proliferators will increasingly concentrate on obtaining items that are nonlisted. This participant said:

Should the NSG in the future spend its resources by keeping its lists up to date and comprehensive, or should it create a mechanism to more quickly and effectively react? The only way to do this is to have a better catch-all provision unless you have some kind of reactive mechanism in the guidelines that updates lists very fast. But in one case a single item could have a very high proliferation profile while in another case it may not. Sometimes it is not always useful to list all the items because there is a potential risk that, in certain situations, an item might be thereby identified and used by proliferators.

Therefore if the NSG catch-all provision were to be elaborated and increasingly relied upon, the group “needs to discuss whether consultations should be required” concerning how and when the catch-all provision is implemented in specific cases.

But another participant strongly disagreed with this assessment. “There is a place in the NSG for a catch-all clause but it is a very limited place,” he said. “The lists are there to create a level playing field and the catch-all clause is not part of that level playing field.” Instead, he said, the catch-all provision is an instrument at the disposal of national governments, and how and when it is invoked will depend on a sovereign state’s judgment on the basis of a threat assessment. This participant said he did not favor expanding the catch-all provision.

Workshop participants also discussed the challenge faced by the NSG in dealing with the evolution of global nuclear trade. Specifically, asked one, how much effort should the NSG apply to address trade brokering and transshipment issues? The fact that the volume of trade is constantly growing is another reason, one participant said, to probe “whether our lists should be permitted to get longer and more detailed.” Another participant agreed: “We know that [customs authorities] are able to physically control less than 2 percent of what is going through. It’s not that they are inefficient; it’s a question of the amount of trade.”

Industry participants at the workshop said that, in addition to the number of nuclear suppliers increasing in the future, the number of licensable transactions will also increase, because the nuclear industry “may be subject to more types of globalization than what we

Because nuclear projects are getting more and more expensive and entail great political and economic risk, in the future there will be more and more complex international ownership and outsourcing of participation in projects.

have seen in other industries,” as one participant said. Because nuclear projects are getting more and more expensive and entail great political and economic risk, in the future there

will be more and more complex international ownership and outsourcing of participation in projects. “The increase in the volume of licensable transactions and also the change in the internationalization of the industry would be a serious challenge for export control just through the volume of work that needs to be done,” one vendor executive said. The number of staff at his firm assigned to export license processing, he said, has doubled during the past ten years.

Participants said that, apart from the anticipated growth in volume in nuclear trade and the increasing complexity of project outsourcing, the two most important challenges related to the evolving nature of nuclear trade are transit and brokering, and intangible technology transfer.

Until now, most global nuclear commerce has flowed along predictable trade routes. One participant explained:

What matters is shipping density, and the vast majority of this trade is by sea. Not surprisingly, the countries of concern are actually located very close to the shipping and transshipment hubs and also supplier countries. There is a geographical correlation between the countries having and wanting nuclear power, on the one hand, and the international shipping lanes, on the other. So the supply of those goods, the movements of those goods, the ability to source those goods, to divert them, also coincides with all the transit and transshipment hubs, hence our obsession with those places over the last few years.

The challenge of coping with brokering and transiting are formidable, one participant warned. Until just before the UN Security Council imposed trade restrictions on Iran, he said,

We would see a vessel leased by an Iranian shipping line from a Greek agent that was mortgaged to a German bank and flagged in the Isle of Man, and the vessel is transporting weapons of mass destruction goods from North Korea to Iran. What can you do? Who is responsible? What authorities do you have? In such a case it’s nearly impossible.

He gave another example of how the world of international nuclear trade has evolved:

How is international trade changing the threat we face? From about 2015 onwards a WMD program will source unlisted material from your country to a friendly country; there’s either no need for a license, or a license will be given very easily. It will then go to another country, to a procurement organization; it will then fabricate something that probably would be controlled, but in that state they don’t have the controls so it doesn’t matter, and then it goes to the end user of concern. It will be happening all the time, every day... How can Iran launch satellites and have the nuclear program it has? Because of the lack of controls worldwide. This is a globalized economy; what you can buy in the UK you can buy in Malaysia or Indonesia or Hong Kong or China, no problem.

The extension of nuclear trade activities into scores of countries which themselves are not participating in the NSG and in most cases have no true nuclear industries or even experience with controlling exports was illuminated by the revelations of the global reach of the Khan network. Those revelations in 2004 prompted the UN Security Council to pass a resolution under Chapter VII of the UN Charter compelling all 192 countries in the UN system to modify their national legislation and administrations to put into place and enforce legal measures to prevent proliferation of weapons of mass destruction. UNSC Resolution 1540 established an ad hoc committee comprising all fifteen members of the UN Security Council to monitor the implementation of the resolution.

Workshop participants said that data accumulated by the 1540 Committee, based on national government reports on their export control systems and practices, highlighted the significant differences between the state of nuclear export controls in NSG-participating countries and conditions in most of the 146 states in the UN system which are not participating in the NSG. NSG-participating governments had, they said, taken many measures to comply with Resolution 1540, but many other governments had not.

Said one participant, the 1540 Committee “sees that NSG members actually do have controls in place, including catch-all and on intangible transfers. But when you leave the NSG world, unfortunately, you see a totally different picture. Not only do a large number of states have no export controls, but there’s a still smaller number of countries that actually have control lists” in their regulations and laws. Moreover, these countries “might have some sort of export controls but no way of identifying what commodity they’re supposed to be looking for.”

So far, participants said, the NSG has done little as a group to address issues raised by the growth of transshipment and trade brokering in the nuclear sector. One participant said: “We approved in 2009 a mandate to start to deal with brokering and transit, but the work is at a very early stage of debate. Some documents are being presented, but we’re not there yet.”

A second major challenge to the group—intangible technology transfer (ITT)—was also underscored by revelations from the Khan network, as we have seen above.

According to one workshop participant, the NSG was the first multilateral export control arrangement to address the issues of technology (as distinct from equipment or material) transfer. But as is the case for brokering, he said, the NSG “has not taken up the challenge thrown down by the Khan network in electronically replicating and transferring sensitive design information, and the definition of technology in both [Part I and Part II] guidelines is out of date.”

How big a threat ITT is to the nonproliferation regime, another participant said, is difficult to assess because it is extremely difficult to detect:

The reality of ITT is that you will discover this either because the entities are seeking to comply or because they [after a transaction is concluded] found themselves that they made a mistake and so they come to you and say, look, we’ve done this, very sorry, so now we’ve put in place controls on it to ensure it doesn’t happen again.

The NSG, he said, needs to decide “how far to go in including ITT in its mandate, because while most of the NSG’s work has been in the area of commodity lists, at the moment it is the technology that is probably in need of the greatest control.”

But if the NSG moves in this direction, another participant said, it will have to strengthen its cooperation and information exchange with enforcement agencies and industry, “because the only way you can control ITT is through those entities that have it, they have to have internal compliance processes to ensure the technology is secured and that they don’t breach controls, and that whoever has the responsibility for enforcement—sometimes it is a licensing authority and sometimes customs—does regular audits.” More attention needs to be devoted to how companies record and monitor technology transfers, especially internally. “So you have a scenario where the company does not keep records because legally they don’t have to, and if they don’t keep records, what can an auditor do? An auditor doesn’t know what he can’t know.”

NSG outreach to technology holders in its participating countries would be beneficial, another workshop participant said. “Very seldom do you have regulators or auditors who really know what they are looking for in terms of items which are on control lists, let alone intangible transfers.” Said one industry representative, “For ITT, prevention is the best enforcement, and on ITT controls making the companies aware is the key to preventing ITT because you can’t really control the transfers themselves, or at least it’s very hard to do.” If NSG-participating governments “do outreach in this area, they have to tell the companies that it is in their interest to go through the proper channels, because if they don’t then their government cannot guarantee and protect their intellectual property rights in case the technology is transferred. That is something that makes the companies see the rationale and their commercial interest in compliance.”

Outside the NSG, according to UN Security Council data, one participant said, 130 states have no controls on intangible technology transfer. As for controls on brokering, trade financing, and transport services for trade, controls are also largely missing in these countries.

Adjusting to an Evolving Nuclear Trade Regime

- The NSG should strongly consider extending to all nuclear trade specific conditions that were added to the guidelines for ENR commerce as approved by the NSG in June.
- The NSG should require as conditions for any retransfer of items by recipient states to a third party the same conditions that apply in the original bilateral supply agreement between the supplier and the recipient state.
- The NSG should consider establishing common nonproliferation and export control standards for participating supplier states that would permit expeditious export licensing of exporters with a record of cooperation and compliance.

- The NSG should establish an internal working group or forum during the updating of the lists to coordinate a response to pressure from participating countries' industries to remove specific items from control lists.
- The NSG should hold a formal discussion among participating governments on establishing the desired balance between reliance on amended control lists and reliance on national governments' implementation of the catch-all provision.
- The NSG should hold a catch-all workshop with participating governments' customs and export control authorities. This should document that, compared to the administration of NSG control lists, the implementation of the catch-all is comparatively difficult, and subject to uncertainties. The NSG should ensure that feedback from this discussion is provided to DMTE for use in revising control lists.
- The NSG should conduct a rigorous comparative examination of the catch-all provisions in all member states with the goal of harmonizing and maximizing the effectiveness of that provision, taking advantage of catch-all reviews carried out by participating states.
- The NSG should consider drafting and adopting a Code of Conduct for suppliers to reinforce nonproliferation norms. This document should also reaffirm participating governments' commitment to states' rights to engage in international nuclear commerce as expressed in both NPT Article IV and in the IAEA Statute.
- The NSG should consult with other multilateral export control arrangements and enforcement practitioners to render new guidelines more effective and user-friendly.
- The NSG should establish a forum or mechanism in the NSG to coordinate and harmonize the introduction of the new guidelines into national law in participating states to prevent "guideline shopping" by proliferators.
- The NSG should expedite the internal discussion of formulating and then implementing the NSG's response to the challenges of trade-brokering and ITT.

The NSG and the Zangger Committee

The very existence of the NSG raised questions about the future role of the Zangger Committee as early as 1977, when the Zangger Committee adopted into its trigger list an item that had previously been included on the NSG's own new list. Especially beginning in 1992, when the NSG was resuscitated after the Gulf War, officials responsible for both groups have considered whether, why, and how the two multilateral nuclear export control arrangements would continue to exist in parallel. During the 1990s, the long-serving Zangger Committee chairman, Fritz Schmidt of Austria, argued that the NSG should focus on dual-use export controls, leaving to the Zangger Committee, on behalf of the IAEA, the job of continuing to review the trigger list. Schmidt also argued that the IAEA's role in multilateral export controls would be increased if all states would adhere to the Additional Protocol.⁵⁴

It didn't turn out that way. What Schmidt had anticipated or hoped for has not transpired. Instead, as a participant at the Brussels seminar explained, the fact that the NSG will now undertake a "holistic approach" in its guidelines review—considering as one both the dual-use and trigger lists—"necessitates that the Zangger Committee take a subordinate role to the NSG."

Another participant added that DMTE, the working group carrying out the control list review, may add to the NSG's control lists sensitive equipment and installations that don't conform to the Zangger Committee's mandate in NPT Article III.2, which is limited to "especially designed or prepared equipment or material for the processing, use, or production of special fissionable material." Currently, the NSG and the Zangger Committee have similar memberships, this participant said, and the members of both groups "are unlikely to have significantly divergent views on issues like sensitive nuclear trade or the Additional Protocol."

But what will the role of the Zangger Committee be in the future? From the beginning, and after the creation of the NSG, the Zangger Committee was intended to define which exported items triggered safeguards for NPT parties. The Zangger Committee "remains different from the NSG in its relationship to the NPT and possibilities for outreach," this participant said. Added another, "The Zangger Committee is still alive, and through it [nuclear supplier states] have a direct link with the NPT. We don't have that link with the NSG" because it was created by nuclear supplier states to control trade beyond the NPT's scope.

The NSG and the Zangger Committee

The revision of the NSG guidelines and control lists may result in a further departure by the NSG from the terms of reference of NPT export controls. The NSG is considering combining the Part I and Part II control lists and compiling a single control list that would identify more items and technologies requiring safeguards and other conditions for export than the Zangger Committee trigger list. The future of the Zangger Committee could be profoundly affected, should, as some participating governments anticipate, the ongoing review of NSG control lists in effect abandon the EDP condition as a yardstick or reference.

- The NSG should explore options for future collaboration with the Zangger Committee, which will continue as an interpretive arrangement for NPT safeguards so long as adherence to the NSG guidelines by all NPT parties is not universal.
- The NSG in its deliberations should consider that NSG decisionmaking and policies may significantly challenge the continued existence of the Zangger Committee.
- The NSG and the Zangger Committee could organize joint assistance to UN member states to comply with UNSC Resolution 1540, mutual guideline consultations, and common outreach to industry.
- The Zangger Committee may be consulted by the NSG in its work related to maintaining the lists, but it will no longer have lead responsibility for the trigger list.

The NSG and Other Export Control Arrangements

The NSG is now the most comprehensive multilateral nuclear export control arrangement, but it coexists with other arrangements for other technologies relevant to the spread of weapons of mass destruction and conventional weapons. Of particular relevance, one workshop participant explained, are three multilateral export control regimes:

- the Australia Group, for chemical and biological materials and technologies (parties are also parties to Biological and Chemical Weapons Conventions);
- the Missile Technology Control Regime (MTCR), for missile systems and potential WMD delivery vehicles; and
- the Wassenaar Arrangement, for dual-use goods and technologies and munitions.

These arrangements share certain features of the NSG. All but Wassenaar have no secretariat but instead like the NSG have an informal point of contact to facilitate discussions and the exchange of documents. Wassenaar's formal structure was called for because it is not an arrangement governing terms for specific transfers but is intended to prevent destabilizing accumulations of conventional weapons through a consultation and information-sharing process best facilitated by a formal secretariat.

Similar to the NSG, Wassenaar has a list of membership criteria—one of which is adherence to the guidelines of the other arrangements, including the NSG and the Zangger Committee—and its members share basic principles. In 2010, the Wassenaar plenary meeting mandated an update of its control list. Of interest to the NSG, there is also an ongoing effort of Wassenaar participants to make the control list less technical so it can be understood by enforcement personnel—in particular, customs and licensing officials who may have little experience with the weapons subject to controls on the list. Wassenaar also has a well-developed outreach program aimed at promoting the goals, mission, and accomplishments of the arrangement, including post-plenary briefings of nonparticipants and industry outreach.

The Wassenaar arrangement is also active in adopting new measures, guidelines, and best practices for specific controlled technologies and adjusting to new security threats. Recently, the group promulgated new documents on export controls for air-launched weapons, best-practice guidelines for the export of small arms and light weapons, a Statement of Understanding on Implementation of End-Use Controls for Dual-Use Items, a document on best practices for ITT, and another on brokering, transit, and transshipments.

All three of these arrangements share with the NSG closed memberships and the goal of supplementing existing nonproliferation treaties and agreements that expressed general principles but few technical specifications and that presented loopholes proliferators could exploit. Like the NSG, most other multilateral arrangements have no enforcement or multilateral sanctions mechanisms, and in all cases enforcement, as well as the licensing of exports, is the responsibility of participating governments.

Like the NSG, these three arrangements make decisions by consensus because, as one participant said, “the consensus principle allows for a unified approach to a specifically defined threat.” Some participants said that, for the NSG as for the other arrangements, the more specific and unique the threat, the more likely there will be consensus about how to respond. Like the NSG, the other arrangements are also challenged by the difficulties of achieving consensus among a large number of participants, although, unlike the NSG, the membership in these arrangements appears to have currently reached a saturation point, with little future growth anticipated.

As is the case for the NSG, the other arrangements are potentially challenged by the sovereign prerogative of participating governments to freely interpret the guidelines as they please, and MTCR and the Australia Group have experienced difficulties, in part because of the groups’ informal structures, in determining what constitutes noncompliance with guidelines and principles.

Likewise for the NSG, the closed membership of the other three arrangements has led to challenges to their legitimacy and to criticism that the arrangements are in fact cartels meant to shelter established technology holders and exporters. All three have encountered criticism from developing countries and especially from the NAM; all have initiated transparency programs in response; all have introduced catch-all principles into their guidelines; and all have been updating their guidelines to accommodate new developments in international trade such as brokering, trade financing, and ITT.

There is a high positive correlation between a state’s participating in one or more of these three arrangements and its participating in the NSG. This led one participant to comment that “there is a lot to learn from other memberships and a high benefit potential—especially given that, for many smaller countries, the same government officials responsible for representing their governments in the NSG are also participating in the other arrangements.” “Only in large countries, with large bureaucracies, can governments afford to send different officials to different meetings at the same time,” one participant said. Since the bigger countries in the NSG tend to be those that take most initiatives in the group, stovepiping in these countries’ nonproliferation and export control bureaucracies can discourage the NSG from drawing on the experience of the other multilateral arrangements.

After 9/11, one workshop participant said, a series of conferences were held that were designed to bring together representatives from the different arrangements. But historically, he said, these groups have expressed little need for collaboration. Individual chairmen have tried to encourage collaboration but at the group level there has been little or no common activity or interaction.

During the NSG outreach conferences held in the late 1990s, some participants urged that NSG-participating governments consider starting afresh and negotiating a global arms control treaty within the United Nations framework. In recent years, and especially following the revelations that some proliferators have been spreading conventional weapons and missile-related items, as well as nuclear wares, some experts have presented cogent arguments suggesting that the export control arrangements might be unified through the establishment of an international export control treaty that would be binding on its members and have a sanctions and enforcement mechanism.⁵⁵ In 2004, ElBaradei likewise

proposed that an international export control treaty be considered, and the negotiation of such a treaty is currently advocated by some nuclear nonproliferation experts.⁵⁶

This subject was indirectly raised by several participants during the workshop; however, a number of participants who are involved in official NSG deliberations made interventions which argued that such an approach would not be currently feasible or desirable, and that most participating governments in the NSG were not inclined to initiate a process that would lead to an amalgamation of the multilateral export control regimes into something which would be more formal and empowered.

A few participants advised caution concerning the NSG's forging links to or comparing notes with the other multilateral export control arrangements. One said that, for each arrangement, the operating threat assessment underpinning its activities may be significantly different. One participant said that UN Security Council sanctions resolutions on Iran and North Korea, for example, refer to the NSG and to the MTCR but not to Wassenaar. During Wassenaar information exchanges, he said, "we occasionally deal with issues of threatening accumulation of conventional weapons in African countries, where there is no problem whatsoever with regard to nuclear or ballistic missile proliferation.... The specific control regimes are there because they each pursue very specific objectives." For national governments to take action based on Wassenaar deliberations, the governments require flexibility, which can be afforded only by a specific threat assessment governing that export control arrangement. "At the end of the day, [NSG-participating governments] in a number of cases need to go to our national parliaments and tell parliamentarians why we did or did not grant a specific export license to that country for that type of item. So the NSG and the other [multilateral export control] regimes have their specificities which we need to respect."

Most participants commenting on this issue stated that they did not advocate merging any of the arrangements or their threat assessments, but, as one participant expressed, they did advocate closer cooperation and interchange "to try and see whether the way the regimes are operated and are functioning can mutually inform each other and make the overall system more effective."

At the same time, some participants warned that the NSG should concentrate on what it does best. "The NSG needs to focus on where it adds value, not try to do things other regimes are doing better," one said. Bureaucratic pressure toward "mission creep," however, is not uncommon in the international export control field. One participant related, for example, that a participating country in the Proliferation Security Initiative (PSI) has repeatedly advocated expanding the initiative's mandate into the area of proliferation financing, notwithstanding the fact that the Financial Action Task Force (FATF), a consulting group established by the G-7 in 1989 originally to combat money laundering, had in recent years successfully assumed a leading role in combating proliferation financing on behalf of the 1540 Committee.⁵⁷

In the words of another participant, "There needs to be more institutional coordination among all the multilateral export control arrangements. There should be more cooperation. We shouldn't try to replicate or, in some cases, compete. I have experienced these arrangements competing." Cooperation is in the NSG's best interest, another said. "Left

to its own devices, the NSG can go off and become a wonderful, cutting-edge organization which, however, struggles because the other multilateral arrangements haven't kept up with it. There needs to be wider evolution and reform."

Several participants encouraged the NSG, but also other multilateral arrangements, to consider adopting a more regional approach to outreach and internal management in the future, in part because the European Union has been very successful in setting up an export control normative architecture for itself and because other regional customs unions are now in the making and in the future will likely be established. Particularly in the area of dual-use controls, said one participant, the European Union "should serve as a model for the GCC, ASEAN, and others." So far, another said, the NSG and other multilateral export control rule makers "have not been interacting" with the officials and agencies that are now or are about to "decide on common customs rules for their communities." One participant suggested that the NSG consider consulting with regional nuclear weapons-free zone arrangements pursuant to carrying out regional outreach.

Some participants suggested that the NSG should further develop best practices and then share best practices with the other export control arrangements. "No best practice will be best for any two specific countries," one participant cautioned, "because the nature of trade, their size, and their goods-producing economies will not be identical." Another said that the NSG has a law enforcement guidebook for its participant governments, but that it was "extremely basic" and would not contribute to improving the effectiveness of NSG guideline implementation; it should be improved and updated in collaboration with experts in other multilateral arrangements.

More generally, some participants suggested that the working group experts in the NSG who are responsible for maintaining and updating the control lists should discuss that work with counterparts from the other arrangements.

The NSG and Other Multilateral Arrangements

- Most generally, the NSG should systematically investigate the possibilities for future collaboration and cooperation with Wassenaar, the MTCR, the Australia Group, PSI, and other multilateral export control arrangements and then make approaches to these arrangements as appropriate.
- The NSG chairman should take the lead in approaching other arrangements and consider the value of routine meetings of the chairmen of the arrangements.
- Areas for potential collaboration that would be of mutual benefit include: efficiency and reduction of redundancies; information management, including data security; comparative threat assessments; good practices; comparative implementation of catch-all provisions; definition of noncompliance; consensus formation; national interpretations of guidelines; enforcement deficiencies; and trust deficits encountered during outreach.
- The NSG should consider setting up a permanent working group among all the arrangements to collaborate in responding to challenges (including those listed above) that are common to all the arrangements.

- The NSG should especially confer with other arrangements to look for commonalities in outreach and ways to address criticism from nonparticipants that they are discriminatory.
- The NSG should hold a discussion with the Australia Group concerning its transparency exercises with NAM states.
- The NSG should hold a discussion with the Wassenaar Arrangement concerning its effort to make its guidelines and control list easier to use by export control authorities.
- The NSG should hold a discussion with the Wassenaar Arrangement concerning its effort to conduct peer reviews and external audits to identify weaknesses.

The NSG and the 1540 Committee

Numerous participants made references to the work of the 1540 Committee and the potential for collaboration between it and the NSG. Since Resolution 1540's mandate specifically encourages international cooperation as a means of achieving its goals, one participant suggested that there would be "a lot of overlaps" with outreach work carried out by the NSG and other multilateral arrangements, especially "because the 1540 work is targeted toward the building of national capacity in implementing [the resolution], whereas the work of the [export control arrangements] is geared toward finding the best practices and common guidelines and a common harmonized approach toward achieving a compatible result."

On April 20, three weeks before the Carnegie workshop, the UN Security Council passed Resolution 1977, which extended for ten years the mandate of the UNSC 1540 Committee in assisting the implementation of Resolution 1540. Resolution 1977, participants suggested, was directly relevant to the NSG because it mandated that the 1540 Committee intensify its activities with a number of international bodies including the NSG in order to promote full implementation of the UNSC resolution. Participants said that several elements of Resolution 1977 may be of interest to nuclear suppliers:

- the resolution's recognition of the contribution of the Nuclear Security Summit process;
- its call on states to "work together urgently to prevent and suppress acts of nuclear terrorism including through increased cooperation and full implementation of the relevant international conventions, and through appropriate measures to reinforce the existing legal framework"; and
- its increased emphasis on identifying and sharing effective practices.

One participant said that the 1540 Committee is keen to "hear from states and from bodies like the NSG and the Zangger Committee where they identify effective best practices which the [1540] Committee can point [UN member states] to," especially since the committee has not developed any standards or yardsticks for nuclear export controls on its own.

Some participants said that during the past six years, contact between the NSG and the 1540 Committee has not always been effective, regardless of exchanges of letters and a few briefings provided by the NSG to the committee.

Participants noted several possible common interests and fields of endeavor for both the NSG and the 1540 Committee, in which the committee is active:

- ongoing and future work of the committee on proliferation trade financing;
- the committee's compilation of disaggregated data on export control systems for 179 countries, based on country reports submitted by national governments as mandated by Resolution 1540;
- findings of the committee based on national implementation reports indicating some Resolution 1540 compliance deficits in some NSG-participating countries;
- findings of the committee concerning deficits in perhaps as many as two dozen states with some kind of nuclear infrastructure but which are outside the NSG;
- the mutual interest of the NSG and the 1540 Committee in identifying and providing states with effective export control practices to comply with Resolution 1540; and
- the committee's ambition to serve as a clearing house for assistance to national governments in capacity building.

Some participants said that a closer relationship between the NSG and the 1540 Committee would be facilitated by the fact that the NSG is a multilateral body and that the five permanent members of the UN Security Council are important NSG participants. The absence of some P-5 countries from a few other multilateral export control arrangements, they said, makes it more difficult for the 1540 Committee to recognize the contributions of those arrangements.

As a body of the UN Security Council, the activities of the 1540 Committee are closely watched by UN member states to make sure they do not transgress states' sovereign rights, participants said. For that reason, the committee is most comfortable in dealing with national governments and international organizations like the IAEA in facilitating the implementation of Resolution 1540. Participants said that, for that reason, the easiest way for the NSG and the 1540 Committee to cooperate on any joint exercises or activities having an outreach character, especially those involving participation from civil society or industry, would be for the NSG to take the initiative, since such an initiative coming from the committee might prompt concerns or objections from UN member states. Should the NSG or its participating governments want to provide capacity-building assistance to states in the 1540 process, it would be possible for the NSG chairman to approach the 1540 Committee separately from any bilateral approach to the committee undertaken by any individual NSG-participating government.

During internal NSG discussions concerning new guidelines for ENR, it was agreed by participating governments to add as a criterion for a recipient state that is reporting to the 1540 Committee that the state is "implementing effective export controls as identified

by Resolution 1540.” One participant suggested that, should the committee’s work during the next ten years result in more effective export controls in all states, this would facilitate the NSG’s focusing on its guidelines and their implementation.

The NSG and UNSC Resolution 1540

It is important that the NSG understand that the 1540 Committee is a mechanism that can help the group universalize effective application of its guidelines and to establish robust export control systems in nonparticipating states to qualify them to participate in the NSG process. In consideration of the lack of political will and difficulties that would pertain to any negotiation of a global export control treaty, and for the deficits of the NPT, which does not include all nuclear supplier states and does not mandate safeguards for all nuclear weapons–critical items, Resolution 1540 and the work of its committee are important instruments that should be used to achieve the goals of universal application of common nuclear export control standards:

- The NSG should work with the 1540 Committee to create a standard for legally based export controls in all UN member states. (The same applies to the other multilateral export control arrangements.)
- The NSG should use data on national export control systems compiled by the 1540 Committee in preparing its outreach programs.
- The NSG should determine that compliance with Resolution 1540 is a condition for all nuclear trade expressed in the revised NSG guidelines.
- The NSG should be willing to take the lead in cooperation with the 1540 Committee, given concerns of UN member states about the limitations of the UN Security Council mandate.
- The NSG chairman should hold discussions with the 1540 Committee to address and overcome political sensitivities inhibiting information-sharing by the NSG with UN member states that need help in building national export control capacity.
- The NSG should provide the 1540 Committee information on good practices obtained from future peer reviews and other exercises and investigations.

Enforcement and Effectiveness

Independent of encouragement from workshop participants that the NSG strengthen its relationships with other multilateral export control arrangements, some participants warned that the NSG should not be distracted by these interactions. “We should put our effort into ensuring that existing guidelines are properly enforced, and if we [do that] we will discover where there are gaps and where there should be additional guidelines.” In many cases, another participant said, the guidelines are “produced by officials in foreign affairs ministries who have never had to enforce or control a frontier.” With that in mind, he said, the NSG should consult with enforcement agencies in participating governments during its ongoing review of the control lists to ensure that the final result is a “control

list that is as user-friendly as possible.” The control list review should be focused on its outcome for export control practitioners, particularly for dual-use items. “The assumption of everybody along the chain of responsibility for controlling dual-use goods has been that customs could stop all of these things at the frontier very easily, that they have perfect information, that the timeframes are such, the windows of opportunity are such, that they can actually stop these goods. It’s not the case.”

During the workshop discussion several participants underlined that the historical record shows that individual countries react very defensively to allegations that they are not controlling their exports. “Believe me, over 25 years I have heard all of them. It doesn’t matter if it is Germany or Pakistan; they all say ‘export controls are not a problem in our country,’ but in point of fact there has been very little demonstration that national controls in any single state are effective.” For that reason, he said,

The NSG and its participating governments should think hard about what they could do in this area and talk to their colleagues in the other [multilateral export control] arrangements. There may be some pushback from people concerned about bureaucratic amalgamation of the export control regimes, but there’s certainly room for a discussion. There’s no reason why the chairman of each of the arrangements couldn’t periodically meet and discuss these issues informally.

One participant who has taken part in many NSG deliberations said that, to effectively implement export controls, the NSG must track its own effectiveness; however, the NSG is currently not doing this. Added another participant, “There is an obligation to abide by the guidelines, and you report what you do, but there is no mechanism to track what specific countries are doing in certain areas.... The tracking is a very complex matter.... You are politically bound to deliver, but you are not legally bound.”

In the past, he said, the NSG-participating governments have considered peer reviews of national export control systems “a very prickly issue. It’s considered by a lot of people in the NSG realm to be politically taboo, difficult to implement, but someone in the NSG should be thinking hard about a creative way to implement a peer review process in the group.” Suggestions for conducting peer reviews have been made by experts from at least two organizations: the Center for International Trade and Security (CITS) at the University of Georgia, and the Stockholm International Peace Research Institute (SIPRI). CITS has developed a methodology for performing reviews and has carried out reviews in more than 80 countries. Another participant suggested that the NSG could initiate a peer review process without requiring a consensus agreement by all of its participating governments. “There’s no reason why three or four NSG members cannot independently undertake between them a peer review, looking at the NSG guidelines and their implementation and their enforcement in each of those three or four countries, and then share that information with the plenary and then invite other plenary members to go through a similar process.” In other arrangements, peer reviews have been conducted, experts learned from the outcomes, and “we have found this to be very effective. There’s no need for a consensus; there will always be states in the [multilateral arrangements] which will always block a peer review, no question. But if you get 40 percent or 60 percent of the members of the NSG undertaking peer reviews, perhaps it will become a norm.”

Added one participant, setting up a peer review process now would help the NSG to ensure that its reviews of the control lists “don’t result in more elaborate lists if in fact the NSG is not effectively implementing the lists it already has.”

Effectiveness and Enforcement

- Especially because increased use of the catch-all provision will increase the requirement for real-time information-sharing, the NSG might create a working group to investigate how to expedite data-sharing among participating governments and to collaborate to profit from the experience of PSI participants and EU export control authorities in this area.
- The NSG should encourage three or four participating states to volunteer to conduct a peer review of national implementation of the NSG guidelines in their respective countries. It should present the results at a plenary meeting in a way that facilitates showing how lessons learned from the review could be generalized. This process could be broadened so that, inside a decade, peer reviews could become a norm.
- The NSG should encourage several participating governments, and then all of them, to carry out an analysis of 5 percent of their NSG-listed goods to determine where export controls were effective and where they were not effective.
- The NSG should identify good practices during peer reviews and share them with other multilateral arrangements and the 1540 Committee.
- The NSG should consult with export control enforcement personnel in NSG-participating governments during the review of the control lists.

Transparency and Outreach

The NSG conducted outreach seminars in 1997 and 1999 in response to Principle 17 of the Package of Decisions concluded when the NPT was indefinitely extended in 1995, which stated: “Transparency in nuclear-related export controls should be promoted within the framework of dialogue and cooperation among all interested states party to the [NPT].” Some participants suggested during the Carnegie workshop that the NSG reaffirm that commitment by taking concrete steps to broaden its outreach to industry, civil society, and non-participating governments.

Participants also said that there is a need for greater transparency inside the group corresponding to varying degrees of commitment to information-sharing of individual participating governments. Just as there will be NSG-participating governments that will balk at participating in a peer review process, there are those states that are reluctant to share information at a significant or deep level. China (the only NSG-participating state from the greater Asia-Pacific region that did not attend the workshop) was mentioned by several workshop participants in this regard. One participant said that he had attended numerous NSG information-sharing meetings and noted that “it is the same five or six

countries giving presentations and the same countries providing case studies every single time. Some countries at these events never even speak.” Some participants regretted the lack of a mechanism to compel or encourage reluctant NSG-participating governments to more fully participate but ascribed that state of affairs to the voluntary nature of the arrangement. “For some participating governments, participation is a one-way street,” one said. “They attend NSG meetings solely to find things out, not to disclose.”

In the interest of greater transparency, some participants said that the NSG should take a systematic look at its denial-sharing process to try to create a consensus toward a greater sharing of denial information.

When the NSG crafted its approach to the dual-use challenge in 1992, it ordained that no member should take advantage of the denial of an export by another member to permit its industry to export the same item to the recipient subject to a denial. To make that policy effective, NSG participants routinely exchange denial data via a Joint Information Exchange, which meets once or more per year. Because denial information can be useful to proliferators, however, the NSG has been reluctant to share denial data with states that are not members but are subject to outreach, including India, Israel, and Pakistan. There is also no systematic denial-sharing approach in the NSG related to implementation of the catch-all provision. The NSG also does not share denial information with the IAEA.

Several participants suggested that the NSG share its denial information with the IAEA Department of Safeguards, since that information would assist the IAEA in implementing the Additional Protocol in member states and thereby contribute to a more comprehensive threat assessment, which would in turn be valuable to the NSG and its participating governments in making decisions about specific nuclear transfers. But some participating governments may not support providing information to the IAEA, since they have little confidence that the IAEA would prevent such information from being leaked to any of its 150 member states. Participants also pointed out that, because of the IAEA’s safeguards confidentiality provisions, information-sharing with the NSG could easily not be reciprocal—that is, the IAEA could not provide the NSG information from its database on country profiles, which would directly assist the NSG in its proliferation threat assessments. Participants said, however, that, were the IAEA given the denial data, the IAEA could encourage states whose end-users are subject to NSG denials to provide greater information about their activities and then provide that data to the NSG. Especially in cases in which entities subject to denials are not proliferators, states implementing an Additional Protocol should be willing to cooperate with the IAEA, and the results of cooperation would benefit the importer, its state authorities, the IAEA, and the NSG.

Some participants in the workshop complained that there is no operational definition of what constitutes a denial, permitting some states that are reluctant to share data with other NSG-participating governments not to inform them of denied transactions on the grounds that the state, using authority not formally incorporated into the export licensing process, intervened with the exporter and persuaded or forced it not to export the item in question.

Finally, in the interest of transparency, some workshop participants suggested that the NSG website be upgraded and frequently maintained and updated. Some of the information

on the website is currently out of date. The site could be transformed into a useful resource for export control information, including open source information from participating governments whose authorities are linked to the NSG website, and the site could serve as an interactive sounding board for providing requested information on how the NSG functions, with updated information from participating governments, the Consultative Group, working groups on information exchange and transparency issues, and the NSG chairman.

Transparency and Outreach

- The NSG should establish contact with, and provide briefings and background information to, the working groups preparing for the 2015 NPT Review Conference and future review conferences.
- The NSG should intensify cooperation with nonparticipating transshipping states, including exchanging information to identify and deter activities by proliferating end-users.
- An NSG working group should facilitate participating states efforts to harmonize national rules for sharing information, including privacy and legal disclosure guidelines.
- The NSG should sponsor and facilitate ongoing discussion by participating governments toward a common application of the NSG's 1994 "nonproliferation principle" in the guidelines, and it should draft common criteria for this provision for use by national government licensing authorities.
- The NSG should communicate those draft criteria to civil society, to the NAM, to other NPT constituents, and to the 1540 Committee for its work in assisting capacity building.
- Likewise, the NSG should develop a methodology to render denials more objective under the NSG guidelines. This could be delegated to a working group.
- The NSG should conduct outreach to industry to provide nonproliferation background illustrating how proliferators work and why export controls are important to global security.
- The NSG should share denial and export information—in a manner that does not violate commercial confidentiality and distort open trading practices—with the IAEA for its use in implementing the Additional Protocol.
- The NSG should hold a discussion to conclude what constitutes a denial and get a consensus agreement on the application of that definition; in parallel, it should secure agreement from all participating governments to share information on seizures of goods by national authorities.
- The NSG chairman should begin a discussion to encourage participating governments to make updated information about their national export control process available to others in the NSG, with the goal of making this practice a norm.
- The NSG should hire a consultant to improve, upgrade, and maximize the effectiveness of the NSG website as a transparency and communications medium.

Multilateral Nuclear Fuel Assurances

In December 2010, the IAEA board of governors approved the creation of a nuclear fuel bank that would serve as a stopgap supply of low-enriched uranium (LEU) fuel for an IAEA member state, should supply of fuel to that state from other sources be interrupted for non-commercial reasons. Kazakhstan has volunteered to host the fuel bank. The LEU would be owned by the IAEA.

The establishment of the fuel bank may necessitate some adjustments or clarifications in NSG guidelines, said one participating government official during the workshop. “It must be determined whether the LEU reserve and subsequent transfers of fuel to the IAEA and then thereafter to recipient states are compatible with the NSG guidelines,” he said. He also said that the NSG guidelines should be amended to spell out the NSG’s mission or position on assurance of supply. Another participant, more generally, urged the NSG to make a formal statement in the guidelines and “adopt new language which refers to NPT Article IV rights and registers NSG’s commitment to promote international cooperation and really reaffirm the inalienable right of all NPT parties to the peaceful uses of nuclear energy, as long as the recipients are conforming with their NPT obligations. Similar declarations are found in statements of the UN General Assembly, UNSC Resolution 1887, and in the documents of the NPT Review Conferences.”

According to one participant, there are also issues for the NSG to resolve concerning the end-user certificates for transfer of nuclear material in the fuel bank. “End-user certificates are mentioned in the guidelines for the transfer of [nuclear] material... But the procedure for end-user certificates is not clearly defined, nor does it have a regulatory framework for using and applying end-user certificates in practice. There exists an uncertainty and the NSG guidelines do not adequately address the rules for issuing end-user certificates.” He also said that there is ambiguity concerning some end-user-related issues, including which authority in the importing country has the responsibility to issue end-user certificates and what happens in cases in which verification of an end-user certificate is deemed necessary.

There may be cases, another participant said, where the end-user certificate would be issued by an agency which would not be compatible with the export control law in an NSG supplier state. There are also questions about the right of the recipient to re-export the fuel. In cases in which the fuel was to be re-exported without consent, who would be held accountable? The IAEA, or the state that supplied the uranium? This participant advised that “an exchange of views” about end-user certificates should take place within the Consultative Group, and that one or more participating governments should prepare a document outlining a best practice for end-user certificates.

In NSG deliberations so far, another participant said, some participating governments have taken the position that export control issues related to multilateral nuclear fuel cycle mechanisms can be addressed without their inclusion in the NSG guidelines.

According to other participants, in cases in which a state requests LEU from the fuel bank, the IAEA would provide the necessary documentation for the transfer according to the export control requirements of the country hosting the fuel bank. The proposal

for the fuel bank mechanism, which was approved by the IAEA board of governors, sets conditions that would have to be met by a recipient state. These include a peaceful-use commitment, IAEA safeguards, and limitation of the use of the uranium as fuel for electric power generation in a specific reactor as identified in the original agreement between the fuel supplier and the recipient. According to participants, these conditions are not identical with the conditions of supply of uranium fuel expressed in the NSG guidelines; the differences must be rectified.

The NSG and Multilateral Fuel Assurances

The NSG should request from Kazakhstan, and perhaps a few other states, discussion papers on good practices for multilateral fuel banks and especially end-use statement and obligations (“flag”) management.

More generally, the NSG should consider how nuclear export controls, until now administered by national governments, would be implemented under a multilateral fuel assurance scheme.

Conclusion: The NSG at the Crossroads of an Evolving Nuclear Trade Regime

Over the course of more than three decades, the NSG, for compelling reasons, has become the leading multilateral nuclear export control arrangement. During the past decade, the dramatic evolution of international nuclear trade, as well as of the nuclear proliferation threats accompanying that trade, has demonstrated that in the future the NSG must remain an essential instrument to prevent nuclear material, equipment, and technology from getting into the hands of those who seek to develop nuclear arms.

The workshop held by the Carnegie Endowment in Brussels in May explored a number of issues that will confront the NSG now and in coming years. Some of these—for example, how the group deals with China’s nuclear trade with Pakistan—will require answers very soon. Other issues—such as how the NSG approaches future membership and how it adapts its trade rules—have a somewhat longer trajectory, but they must be addressed if the NSG is to be effective and credible.

The NSG was formed by a group of nuclear supplier states that were convinced after the first Indian nuclear explosive test that the NPT alone would not halt the spread of nuclear weapons. That assessment proved to be correct. A number of NPT parties beginning in the late 1970s—North Korea, Egypt, Iraq, Iran, Libya, the Republic of Korea, Syria, and perhaps Myanmar—engaged in undeclared or clandestine nuclear activities. The decisions of governments to challenge the NPT by engaging in these activities did not stem from their concern that a “cartel” of nuclear suppliers was blocking their access to peaceful nuclear development. The undeclared activities in these countries likewise were not terminated or declared to the IAEA as a result of concessions on nuclear trade made to these countries by NSG-participating governments.

The NSG must remain an essential instrument to prevent nuclear material, equipment, and technology from getting into the hands of those who seek to develop nuclear arms.

From its inception, the NSG exceeded the terms of NPT Article III.2 when it set additional conditions for nuclear commerce in 1978. The distance between the aspirations of the NSG and the mandate of Article III.2 has become even greater over time, especially as supplier states' threat assessments evolved. From this point of view, the decision in principle by the group in 2008 to lift nuclear trade sanctions against India was not an illogical development.

But that decision three years ago had to raise the question of whether that step was truly a “singular exception” to principles set by 190 NPT parties, as its main advocates claimed, or whether it instead marked a significant course correction by the NSG toward the goal of obtaining the adherence and participation of all nuclear supplier states, including those outside the NPT that have uranium enrichment, reprocessing, and nuclear weapons.

In a globalized environment in which nuclear goods may be produced or transacted anywhere in the world, the NSG must reach out.

Carnegie therefore aimed to put the NSG's relationship to the NPT to the test during this workshop. Participants from India, Israel, and Pakistan presented arguments as to why these countries

should be included in the arrangement. There was no consensus among the participants in the workshop that that should happen in the near future.

Indeed, some participants said that the NSG's recent affirmation that only NPT parties may obtain ENR signified that supplier states are for now reluctant to go farther down the road in divorcing the group from a global treaty binding 185 states not to acquire nuclear arms. But some participants also said that the NSG would not ultimately succeed in the future unless all nuclear-supplier and nuclear-armed states adhere to its guidelines, effectively share information, and cooperate with the arrangement.

In the meantime, the NSG can do more to universalize adherence to its guidelines. Participants suggested that many or perhaps even most of the UN's 193 member states would not participate in a global export control treaty. But since 2004, all these states have been committed to controlling their exports under UNSC Resolution 1540, and the NSG should work closely with the 1540 Committee to establish and universalize a global standard for nuclear export controls, and to build capacity in national governments to have that standard applied and enforced.

As part of that process, the NSG can take other steps that will demonstrate transparency to nonparticipants and inspire confidence in them that the arrangement is committed to nuclear trade equity. Engaging with those countries now and in the future will be far more critical than at any time in the NSG's history, because international nuclear commerce is rapidly evolving away from point-to-point transfers and into a system of complex transactions involving destinations and actors that have until now been disconnected from the world of nuclear trade controls.

Moreover, the volume of nuclear trade and the number of entities taking part in it is rapidly increasing. During the coming two decades, the number of power reactors in the world—a number which has been stable during the last twenty years—may double.

To effectively control a bigger trade volume, the NSG must rigorously challenge its own habits and those of its participating governments; it must work more closely with enforcers, compare notes with other multilateral export control arrangements, and—during the next three years—make watershed decisions about what goods it should control in the future and how it should control them.

During the workshop, a few participants suggested that some governments will resist efforts to forge relationships between the NSG and others that share the responsibility of preventing the spread of weapons of mass destruction, as well as those whose trust will be essential if the NSG is to be credible. But more now than ever before, the NSG cannot function in isolation, and it cannot be a club. In a globalized environment in which nuclear goods may be produced or transacted anywhere in the world, the NSG must reach out.

Notes

- 1 International Seminar on the Role of Export Controls in Nuclear Nonproliferation, Vienna, October 7–8, 1997, www.nuclearsuppliersgroup.org/Leng/PDF/SeminarControl1.pdf; Second NSG International Seminar on the Role of Export Controls in Nuclear Nonproliferation, United Nations Headquarters, New York, April 8–9, 1999, www.nuclearsuppliersgroup.org/Leng/PDF/SeminarControl2.pdf.
- 2 The Zangger Committee’s “trigger list” was first published by the IAEA in 1974, www.iaea.org/Publications/Documents/Infcircs/Others/inf209.shtml.
- 3 Communication Received from Certain Member States Regarding Guidelines for the Export of Nuclear Material, Equipment or Technology, International Atomic Energy Agency, February 1978, www.vertic.org/media/assets/nim_docs/NSG%20and%20ZC/INFCIRC-254.pdf.
- 4 Communication Received from Certain Member States Regarding Guidelines for the Export of Nuclear Material, Equipment or Technology, International Atomic Energy Agency, July 1992, www.iaea.org/Publications/Documents/Infcircs/Others/infcirc254r1p2.pdf.
- 5 Alec Baer, “Nuclear Suppliers Group and its Time,” Second NSG International Seminar on the Role of Export Controls in Nuclear Nonproliferation, April 8–9, 1999, United Nations Headquarters, New York, Conference Report, www.nuclearsuppliersgroup.org/Leng/PDF/SeminarControl2.pdf, 9.
- 6 Rumors abound that Pakistan’s enrichment know-how is in the hands of Algeria, Egypt, India, Iraq, Israel, Myanmar, Saudi Arabia, Syria, Sudan, and Turkey, among others. None of these rumors has been confirmed, and in some cases governments have denied them. In recent years, press reports have speculated that Khan served a “fourth customer” in addition to Iran, Libya, and North Korea. See Jeffrey Lewis, “The Fourth Customer,” *Arms Control Wonk*, April 22, 2005, <http://lewis.armscontrolwonk.com/archive/558/the-fourth-customer>; and Douglas Frantz, Interview with Tavis Smiley, *Tavis Smiley*, PBS, January 21, 2011, www.pbs.org/wnet/tavissmiley/interviews/author-douglas-frantz.
- 7 Private communications from NSG-participating government officials.
- 8 Michael Krepon, “Is the US-India Nuclear Cooperation Agreement Good or Bad for Proliferation?” Stimson Center, August 31, 2005, www.stimson.org/essays/is-the-us-india-nuclear-cooperation-agreement-good-or-bad-for-proliferation.
- 9 “Russia: Nuclear Exports to India,” Nuclear Threat Initiative, Center for Nonproliferation Studies, 2010, www.nti.org/db/nisprofs/russia/exports/rusind/nuclovr.htm.
- 10 Paragraph 4.(b) of Infcirc/254/Part 1.
- 11 “Russian Fuel for Tarapur Ruled Out,” *Hindu*, December 6, 2004.

- 12 Quentin Michel, “Emerging International Standards: If a Dream Could Come True,” University of Liège, May 27, 2009, http://local.droit.ulg.ac.be/sa/uee/admin/file/publi/20091003075140_EsardaQM.pdf.
- 13 “Russia and India ready to trade,” *World Nuclear Trade*, December 5, 2008, www.world-nuclear-news.org/newsarticle.aspx?id=23994&terms=india
- 14 Glenn Kessler, “Israel Submits Nuclear Trade Plan,” *Washington Post*, September 30, 2007.
- 15 NSG Plenary Meeting, Strengthening the Nuclear Non-Proliferation Regime, Gothenburg, Sweden, May 27–28, 2004, www.nuclearsuppliersgroup.org/Leng/PRESS/2004-05-goteborg.pdf.
- 16 Mark Hibbs, “The Unmaking of a Nuclear Smuggler,” *Bulletin of the Atomic Scientists*, vol. 62, no. 6, 35–41.
- 17 David Albright, Paul Brannan and Andrew Scheel Stricker, “Detecting and Disrupting Illicit Nuclear Trade after A. Q. Khan,” *Washington Quarterly*, vol. 33, no. 2, 85–106.
- 18 Private communication from an EU export control official.
- 19 That group includes Algeria, Bangladesh, Chile, Egypt, Ecuador, Ghana, Jordan, Libya, Morocco, Oman, Qatar, Nigeria, Philippines, Saudi Arabia, Thailand, Tunisia, Venezuela, and Vietnam.
- 20 “India’s 20th nuclear power plant goes critical,” *Hindustan Times*, November 27, 2010.
- 21 “India eyeing 63,000 MW nuclear power capacity by 2032: NPCIL,” *Economic Times*, October 11, 2010.
- 22 Savita Pande, “NPT, Export Controls, and Nuclear Trade,” Institute for Defence Studies and Analyses, www.idsa-india.org/an-sep-4.html.
- 23 Intervention by Carlton Thorne, U.S. Department of State, on Tuesday, October 7, 1997 [author’s notes from the meeting].
- 24 Intervention by Ambassador M. S. Ayatollahi, on Tuesday, October 7, 1997 [author’s notes from the meeting].
- 25 Harald Mueller, “The 2005 NPT Review Conference: Reasons and Consequences of Failure and Options for Repair,” www.blixassociates.com/wp-content/uploads/2011/03/No31.pdf.
- 26 2010 NPT Review Conference Action Plan from the Final Document adopted by 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, www.reachingcriticalwill.org/legal/npt/revcon2010/2010NPTActionPlan.pdf.
- 27 Private communications to the author from participants at NSG plenary meeting in Gothenburg, Sweden, May 27–28, 2004.
- 28 “Pakistan in Talks to Buy Chinese Reactors,” *Financial Times*, January 2, 2006; Shahid-ur-Rehman, “Pakistan’s nuclear building plan gets China’s continued support,” *Nucleonics Week*, vol. 47, no. 1, January 5, 2006, 6; Shahid-ur-Rehman, “PAEC says Pakistan taking steps toward new reactor construction,” *Nucleonics Week*, vol. 47, no. 2, January 12, 2006, 3.
- 29 Mark Hibbs, “Pakistan, China planning two 1,000-MW PWRs,” *Nucleonics Week*, vol. 47, no. 40, October 5, 2006, 1.
- 30 Private communication to the author, November 2006.
- 31 “Islamabad, Beijing had differing views on Sino-Pak nuclear cooperation,” *Dawn*, September 1, 2006.

- 32 Mark Hibbs, “Pakistan Deal Signals China’s Growing Nuclear Assertiveness,” *Carnegie Nuclear Energy Brief*, April 27, 2010, www.carnegieendowment.org/2010/04/27/pakistan-deal-signals-china-s-growing-nuclear-assertiveness/4su.
- 33 “Maßnahmen zur Stärkung der Non-Proliferation und nuklearen Exportkontrolle” (Measures for strengthening nonproliferation nuclear export controls), German Bundestag, June 14, 2011, 17/5978, <http://dipbt.bundestag.de/dip21/btd/17/062/1706224.pdf>.
- 34 Siddharth Varadarajan, “IAEA approves safeguards for new Pakistani reactors,” *Hindu*, March 9, 2011.
- 35 Private communication to author, Islamabad, May 2011.
- 36 “Transshipment and Diversion: Are U.S. Trading Partners Doing Enough to Prevent the Spread of Dangerous Technologies?” Hearing Before the Subcommittee on Terrorism, Nonproliferation and Trade, Committee on Foreign Affairs, House of Representatives, 111th Congress, 2nd session, July 22, 2010, Serial No. 111-122, www.gpo.gov/fdsys/pkg/CHRG-111hrg57609/html/CHRG-111hrg57609.htm.
- 37 Private communications to author, June and September 2010.
- 38 Private communication to author, July 2011.
- 39 Private communication of NSG-participating government official to author, October 2011.
- 40 Private communication, October 2011.
- 41 “IAEA Director General Welcomes U.S. and India Nuclear Deal,” IAEA Press Release, March 2, 2006, www.iaea.org/newscenter/pressreleases/2006/prn200605.html.
- 42 Private communications to the author from IAEA member state and IAEA secretariat officials.
- 43 Mohamed ElBaradei, “Rethinking Nuclear Safeguards,” *Washington Post*, June 14, 2006.
- 44 In particular, the Bush administration excluded any consideration of a similar exception for its ally Israel because it feared that opposition from Arab states might prove fatal to the planned exception for India [private communications from Israeli and U.S. officials in 2008].
- 45 Mark Hibbs, “US rebuffed Israeli request for exception from NSG trade rule,” *Nuclear Fuel*, vol. 32, no. 1, January 1, 2007, 1.
- 46 Toby Dalton, Mark Hibbs, and George Perkovich, “A Criteria-Based Approach to Nuclear Cooperation With Pakistan,” Policy Outlook, Carnegie Endowment for International Peace, June 2011, www.carnegieendowment.org/2011/06/22/criteria-based-approach-to-nuclear-cooperation-with-pakistan/24l.
- 47 Coordinating Committee for Multilateral Export Controls, established by western states during the Cold War to enforce a trade embargo against Warsaw Pact countries. Cocom was terminated in 1994 and was succeeded in 1996 by the Wassenaar Arrangement, which comprises 40 countries, including former Warsaw Pact countries.
- 48 International Atomic Energy Agency Information Circular, “Communication Received from the Permanent Mission of Australia on Behalf of the Member States of the Nuclear Suppliers Group,” INFCIRC/539, September 16, 1997, www.iaea.org/Publications/Documents/Infcircs/1997/inf539.shtml.
- 49 Nuclear Suppliers Group Point of Contact Note, United States Communication—“Food for Thought” Paper on Indian NSG Membership, May 23, 2011, www.armscontrol.org/system/files/nsg1130.pdf.

- 50 “US to support India’s full membership in NSG,” *Times of India*, November 6, 2010.
- 51 C. Thorne, “Multilateral Nuclear Export Controls: Past, Present, and Future,” 34.
- 52 One workshop participant explained that transfer within the EU of items listed in the EU Annex IV (including category 0 trigger list items) require an authorization from a supplier country, but what form the authorization takes is not specified. EU dual-use regulation does not regulate or stipulate an authorization requirement for countries where goods are transited. There are some safeguards-related (safe transport, public health) requirements that might also take the form of an authorization, but these are not specifically export-control-related.
- 53 Richard Goorevich, “Development of the NSG and the Philosophy of Export Controls,” NSG, October 15, 2009, www.nuclearsuppliersgroup.org/Leng/PDF/2009-Development_of_the_NS-Export_Controls-R_Goorevich.pdf.
- 54 Fritz W. Schmidt, “The Zangger Committee: Its History and Future Role,” James Martin Center for Nonproliferation Studies (CNS), *Nonproliferation Review*, Fall 1994, <http://cns.miis.edu/npr/pdfs/schmid21.pdf>.
- 55 In particular Ian Anthony, Christer Ahlstrom, Vitaly Fedchenko, “Reforming Nuclear Export Controls: The Future of the Nuclear Suppliers Group,” Sipri Research Report no. 22, Stockholm International Peace Research Institute, 2007. See also D. Albright and C. Hinderstein, “Unraveling the A. Q. Khan and future proliferation networks,” *Washington Quarterly*, vol. 28, no. 2, 2005.
- 56 M. ElBaradei, “Saving Ourselves from Destruction,” *New York Times*, February 12, 2004.
- 57 “Combating Proliferation Financing: A Status Report on Policy Development and Consultation,” Financial Action Task Force, February 2010, www.fatf-gafi.org/dataoecd/32/40/45049911.pdf.

About the Author

MARK HIBBS is a senior associate in the Carnegie Endowment's Nuclear Policy Program. Before joining Carnegie, he was an editor and correspondent for over twenty years for nuclear energy publications, including *Nucleonics Week* and *Nuclear Fuel*, published by the Platts division of the McGraw-Hill Companies.

From the late 1980s until the mid-1990s, he covered nuclear developments in the Soviet bloc, including research on the USSR's nuclear fuel cycle facilities and its nuclear materials inventories. Since the mid-1990s, his work has focused on emerging nuclear programs in Asia, including China and India.

Throughout the last two decades, many of his more than 3,000 articles investigated nuclear-proliferation-related developments in Argentina, Brazil, China, India, Iran, Iraq, Israel, Japan, Libya, North and South Korea, Pakistan, South Africa, Syria, and Taiwan.

Since 2003, he has made many detailed findings about clandestine procurement in Europe related to gas centrifuge uranium enrichment programs in Iran, Libya, North Korea, and Pakistan.

Carnegie Endowment for International Peace

The **Carnegie Endowment for International Peace** is a private, nonprofit organization dedicated to advancing cooperation between nations and promoting active international engagement by the United States. Founded in 1910, its work is nonpartisan and dedicated to achieving practical results.

As it celebrates its Centennial, the Carnegie Endowment is pioneering the first global think tank, with flourishing offices now in Washington, Moscow, Beijing, Beirut, and Brussels. These five locations include the centers of world governance and the places whose political evolution and international policies will most determine the near-term possibilities for international peace and economic advance.

The Carnegie **Nuclear Policy Program** is an internationally acclaimed source of expertise and policy thinking on nuclear industry, nonproliferation, security, and disarmament. Its multinational staff stays at the forefront of nuclear policy issues in the United States, Russia, China, Northeast Asia, South Asia, and the Middle East.



THE GLOBAL THINK TANK™

WASHINGTON DC ■ MOSCOW ■ BEIJING ■ BEIRUT ■ BRUSSELS