

AMERICAN ACADEMY OF ARTS & SCIENCES

GLOBAL NUCLEAR FUTURE INITIATIVE

Nuclear Energy in the Middle East: Implications, Challenges, Opportunities

Report and Recommendations

Abu Dhabi, United Arab Emirates
December 13–15, 2009



ABOUT THE GLOBAL NUCLEAR FUTURE INITIATIVE

There is growing interest worldwide in civilian nuclear power based on the recognition of its potential for meeting increased energy demands. But the spread of nuclear technology, in the absence of rigorous safety regimes, presents unique security risks, including the potential proliferation of weapons capabilities to new states, sub-national, and terrorist groups.

The Academy's Global Nuclear Future Initiative is working to prevent this dangerous outcome by bringing together constituencies that historically have not communicated effectively—from government policymakers to heads of nongovernmental organizations, from nuclear engineers to industry leaders, from social scientists to nonproliferation experts—to establish an interdisciplinary and international network of experts working together to devise and implement nuclear policy for the twenty-first century. Our overriding goal is to identify and promote measures that will limit the security and proliferation risks raised by the apparent growing global appetite for nuclear energy.

To help reduce the risks that could result from the global expansion of nuclear energy, the Initiative addresses a number of key policy areas, including the international dimension of the nonproliferation regime, the entirety of the fuel cycle, the physical protection of nuclear facilities and materials, and the interaction of nuclear industry with the nonproliferation community. Each of these areas has specific challenges and opportunities, but informed and thoughtful policies for all of them are required for a comprehensive solution. We also recognize that “game changers,” developments that could have a tremendous impact but cannot be extrapolated from current trends, could influence the course of events and should be identified and included in our deliberations.

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As part of its initiative on the Global Nuclear Future (GNF), the American Academy of Arts and Sciences organized an international meeting in Abu Dhabi, capital of the United Arab Emirates. The meeting, held December 13 – 15, 2009, explored regional perspectives on nuclear trends, including the security and nonproliferation implications of the spread of nuclear power in the Middle East and elsewhere.

Highlights of Meeting Recommendations:

- For a country interested in developing nuclear power, the possibility of having its spent fuel removed through a “take-back” agreement would be invaluable. It would greatly increase the incentive for relying on the international market for enrichment services. However, the take-back of spent fuel to the country of origin is controversial.
- The diversification of the international market in enrichment services is overdue. Diversification could help allay concerns that existing suppliers are seeking to institutionalize a cartel.
- Shared responsibility, as a concept, will be most successful if there is agreement on the obligations it implies for both NWS (nuclear-weapons states) and NNWS (non-nuclear-weapons states). This agreement will be particularly important if the concept is to gain traction at the upcoming NPT (Nuclear Nonproliferation Treaty) Review Conference.
- The debate over Article VI of the NPT should not be seen as a NWS versus NNWS scenario. The NNWS have an interest in ensuring that their fellow NNWS are not trying to develop nuclear weapons. Moreover, some NNWS benefit from being under the nuclear umbrella of NWS.
- The Review Conference must undertake a serious discussion on the role of nuclear weapons in the defense doctrines of NWS. As long as nuclear weapons remain a critical part of national defense policies, the objectives of the NPT and its viability will be undermined.

Introduction—Bridging “the Gulf of Mistrust”

A major goal of the GNF initiative is to bring together key stakeholders who will shape the future of nuclear energy—leading experts from academia, government, nongovernmental organizations, and the nuclear industry—but who do not regularly

interact. The initiative is designed to be interdisciplinary and multinational and to build bridges to scholars and practitioners in the Muslim world. To that end, the meeting in Abu Dhabi included representatives from NWS and NNWS; individuals from developed and developing countries; and high-ranking officials from countries with existing nuclear power programs and from countries where such programs are only in the planning stage. Given this diversity, it is not surprising that opinions on a possible future nuclear order varied widely.

By the end of the meeting in Abu Dhabi it was clear that there is strong “buy-in” to the nuclear nonproliferation regime, in spite of a wider recognition that the regime is flawed. The themes of “shared responsibility” (on the part of both NWS and NNWS) and “common interests” were explored throughout the discussions, especially those discussions focusing on the NPT.

However, the U.S.-India deal, in particular, has created mistrust among many developing countries. They consider the original “bargain” of the NPT to have been undermined by the deal with India, a non-NPT state. India has received nuclear cooperation and trade benefits over and above those normally provided by the NPT to NNWS in exchange for their agreement not to seek or acquire nuclear weapons. India, it seems, has been rewarded for *not* joining the NPT.

A cautious optimism characterized much of the discussion. There is both excitement and trepidation surrounding the May 2010 NPT Review Conference and a shared sense that the nonproliferation regime can ill-afford another failure after the disaster of the Review Conference in 2005. In addition, enthusiasm over the new U.S. administration is tempered by concerns that, in spite of the welcome change in rhetoric, the old divisions will remain. The eagerly awaited U.S. Nuclear Posture Review—due for release in March 2010—is seen as one of the first litmus tests of how genuine the change in tone is, and whether that change in tone has translated to a change in behavior. It will have a significant effect on the atmosphere at the 2010 Review Conference.

Participants expressed an overarching confidence in the prospects and potentially valuable contribution of nuclear power to the global energy mix. Some participants supported multilateral solutions for proliferation-sensitive aspects of the nuclear fuel cycle; others were more skeptical, unsure whether a reliable nuclear fuel supply could be established. Still, the participants re-

peatedly emphasized the value and importance of the meeting in engendering a serious, much-needed dialogue across what one participant described as “the gulf of mistrust.”

Panel I. Managing the Spread of Nuclear Power¹

Summary. The speaker in this session discussed the history of the growth of nuclear power and the current prospects, and limitations, for the latest nuclear renaissance.

Overview. In the 1950s, during the early years of nuclear power, there were significant expectations for the role it would play in generating energy. However, in the late 1970s, the anticipated growth in nuclear power—particularly in North America and Western Europe—was derailed by the accident at Three Mile Island and by the return of affordable oil prices that followed the oil shocks earlier in that decade. In 1986, the meltdown of the Chernobyl reactor halted plans for nuclear power in many countries that had been considering harnessing nuclear energy.

The participants repeatedly emphasized the value and importance of the meeting in engendering a serious, much-needed dialogue across what one participant described as “the gulf of mistrust.”

Currently, nuclear energy supplies 15% to 16% of the global demand for electricity. There are 45 reactors under construction worldwide, 25 of which are in Asia. Uranium enrichment takes place in nine countries, six of which (France, Germany, The Netherlands, the Russian Federation, the United Kingdom, and the United States) are suppliers of enrichment services in the international market.

The decision to pursue a nuclear power program is based not simply on economics, but is also the product of politics, existing energy forecasts, and the desire for the prestige that accompanies technical accomplishment. Today, concerns regarding climate change, the environment, and energy security have provided additional incentives for pursuing nuclear power.

A major expansion in nuclear power is hampered by industrial limitations, namely the worldwide shortage of skilled labor. The downturn in nuclear power in the 1980s reduced interest in nuclear engineering and produced few graduates in this field. Moreover, constraints on nuclear power growth involve not only this

1. This report follows the agenda and main topics discussed at the meeting: managing the spread of nuclear power; managing the emerging nuclear order; managing the NPT regime; and setting priorities for the 2010 NPT Review Conference. Key recommendations, conclusions, and observations that emerged from the discussions follow at the end of each section.

“lost generation” of nuclear engineers, but a shortage of other skilled workers: welders, machinists, and experienced power plant operators.

In the Middle East, planning for nuclear power is in the earliest stages. It is considered by many in the region to be the only reliable means through which the Arab world can move away from oil and toward other sources of energy. Concerns about the lack of qualified personnel and infrastructure are particularly pronounced. In addition, public support for nuclear power has varied.

Discussions on managing the spread of nuclear power generated the following conclusions and recommendations:

- For a country interested in developing nuclear power, the possibility of having its spent fuel removed through a “take-back” agreement would be invaluable. It would greatly increase the incentive for relying on the international market for enrichment services. However, the take-back of spent fuel to the country of origin is controversial.
- The U.S.-India Civil Nuclear Agreement is an unfortunate precedent. Other countries that have signed the NPT have not received benefits similar to those India received. The Agreement risks undercutting the traditional motivation to join or remain party to the NPT as a NNWS. Other states may seek a similar deal with the United States or with other countries as they consider initiating or expanding their own nuclear power programs. This would be detrimental to the norms underlying the nonproliferation regime.
- Domestic support or criticism of a new nuclear program is not always predictable. In Turkey, for instance, opposition to nuclear power comes primarily from the public and grassroots organizations. In Egypt, opposition to nuclear power comes from the wealthier members of the public (or, in the words of one speaker, the “elites”) who are concerned with siting issues and the resulting possible impact on tourism revenue.
- An international conference to discuss a Middle East nuclear-weapon-free zone might be useful in moving forward on this issue. It could help allay international concerns regarding the growth of nuclear power in the Middle East. However, in order to be useful and credible, the conference would have to be open to participants from any country with an interest in the issue.

Panel II. Managing the Emerging Nuclear Order

Summary. The speakers in this session focused on the back-end of the fuel cycle and the prospects for finding multinational solutions to the problem of spent fuel. In addition, speakers explored the concept of “shared responsibility” with regard to the NPT obligations of both NWS and NNWS. The presentations also addressed the question of physical security, including problems with existing approaches to this issue.

Overview. The back-end of the nuclear fuel cycle. The discussion of how to manage the back-end of the fuel cycle focused on the storage and disposal of spent fuel and, to a lesser extent, on plutonium reprocessing. In the 1970s, the back-end of the fuel cycle received a great deal of thought and attention. In recent years, however, the enrichment of uranium, and the possible spread of enrichment facilities, has been a major source of concern to many countries. Spent fuel has received less attention by the experts, although it has not been ignored by the public. Ten thousand tons of spent fuel are produced every year, with a 1,000 MW nuclear power plant yielding approximately 12,500 kilograms of (unseparated) plutonium over fifty years. As nuclear power expands around the globe, the question of how to manage the increase in the amount of spent fuel is returning to the forefront of discussions.

Multinational ownership of a facility would also have advantages for the nonproliferation regime as a whole, adding transparency to a state's nuclear activities and making undetected diversion of nuclear material more difficult.

New nuclear programs will require access to state-of-the-art storage and disposal facilities in order to ease proliferation concerns and to meet safety and security requirements. These facilities would also improve the economics of nuclear power, particularly from the viewpoint of new entrants, who might not have to build such facilities in their own territories. Countries that wish to sell their reactors and that offer to assist buyers in the eventual disposal of fuel, or even its return to the country of origin (the take-back option), would add a major sales incentive.

The construction of multinational spent fuel repositories and the issue of spent fuel take-back have been debated for many years. Early versions of the United States' Global Nuclear Energy Partnership (GNEP) incorporated an element of spent fuel take-back, but this aspect of the partnership never came to fruition. A working group established for a potential European Repository Development Organisation (ERDO) includes representatives from 14 countries and is currently working to create a blueprint for shared, regional European geological repositories. Because there are 27 states in the European Union—and 20 have nuclear power plants—a multinational spent fuel repository could be far preferable to a repository in each state.²

The benefits of a multilateral approach to reprocessing are less obvious than the need for regional spent fuel repositories. Ways to assure fuel supply for nuclear reactors have focused lately on

2. Members of the American Academy's Global Nuclear Future working group have contributed directly to these efforts.

the front-end of the fuel cycle. In particular, much attention has been paid to the enrichment of uranium because, from a proliferation perspective, it is easier to obtain fissile material through the enrichment of uranium than by reprocessing.

Although the supply of enrichment services currently meets market demand, additional suppliers are needed. Ideally, NNWS should serve as the new suppliers; otherwise, NNWS are likely to grow more concerned that NWS are monopolizing certain technologies and denying others access to the potential benefits of the full nuclear fuel cycle. Alternatively, enrichment services could be internationalized.

Many countries also fear that relying on the international market for enrichment services makes them vulnerable to fuel-supply disruptions for political reasons. However, multilateral approaches to the nuclear fuel cycle—including the back-end of the cycle—provide a potential economic benefit to new nuclear powers: if they can rely on the international market, they would not need to engage in the extremely costly and labor-intensive work of developing an indigenous fuel cycle. Multinational ownership of a facility would also have advantages for the nonproliferation regime as a whole, adding transparency to a state's nuclear activities and making undetected diversion of nuclear material more difficult.

Shared Responsibilities. Although the discourse that surrounds the NPT notes the connection between nuclear nonproliferation and nuclear disarmament, obligations related to each area have been unnecessarily—and unhelpfully—split between NWS and NNWS. It is generally accepted that NWS are solely responsible for the implementation of Article VI and the obligation to work in good faith toward nuclear disarmament (and toward general and complete disarmament). The text of the NPT, however, makes no such delineation. Rather, Article VI requires *all* states-parties to the Treaty to work toward nuclear disarmament. In addition, Article IV (which, in part, reaffirms “the inalienable right of all Parties to the Treaty to develop research, production, and use of nuclear energy for peaceful purposes”³) is predicated on states-parties acting in conformity with Articles I and II.⁴

Rather than viewing certain articles of the NPT as the responsibility of NWS and others as the responsibility of NNWS, the Treaty and its goals would be best served if all states-parties believe in their “shared responsibility.” The NWS will not go beyond certain levels of reduction in nuclear arsenals if they have serious concerns regarding nuclear proliferation by new states. Thus, NNWS must assess their own obligations, under Article VI, to pursue negotiations in good faith toward nuclear disarmament, for instance by working toward the internationalization of proliferation-sensitive parts of the nuclear fuel cycle

3. Treaty on the Non-Proliferation of Nuclear Weapons (1968), Article IV.1.

4. For NNWS, Article II obligates them not to manufacture or otherwise acquire nuclear weapons or nuclear explosive devices, while NWS are obliged under Article I not to transfer nuclear weapons (or other nuclear explosive devices) or control over those weapons or devices to NNWS, or to provide NNWS with assistance in obtaining such weapons.

(enrichment and reprocessing). NWS, on the other hand, must work to reduce the role of nuclear weapons in their own defense doctrines. This includes reassessing the conditions under which nuclear weapons might be used as part of a policy of extended deterrence (for example, as part of the “nuclear umbrella” provided to allies).

Physical Security. Effective nuclear security applies not only to the security of nuclear weapons stockpiles against theft and terrorism, but to the security of nuclear facilities and any other location where nuclear material is stored. The renaissance in nuclear power raises the number of nuclear sites that may be targeted for sabotage or some other form of attack.

Global nuclear security institutions and standards remain insufficient because of complacency and because of the sensitivity of information, both of which impede international cooperation. In addition, the security recommendations made by the International Atomic Energy Agency’s (IAEA) Office of Nuclear Security are not binding, and the existing design-basis threat methodology needs to be reassessed.

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International cooperation to reduce the threat of nuclear terrorism needs to be pursued, and a multilayered system—one with the flexibility to recognize changing types and sources of threats—is required. All plutonium and high-enriched uranium (HEU) stocks should be protected. In addition, existing counterterrorism measures must be strengthened, along with increased emphasis on international cooperation in intelligence. Given limited resources, sites and transport routes that comprise the greatest risk must be prioritized.

In the discussions that followed, participants offered these key observations and recommendations:

- The diversification of the international market in enrichment services is overdue. Diversification could help allay concerns that existing suppliers are seeking to institutionalize a cartel.
- In order not to encourage the spread of enrichment facilities, it would be best if only those countries that currently have domestic enrichment capabilities (for example, Argentina, Brazil, and Japan) were to consider entering the international

market. Some participants felt that any new entrant into the international market in enrichment services should reflect one of the many approaches that have been suggested to multinationalize the nuclear fuel cycle.

- There is widespread belief that assurances of fuel supply would not be immune to cutoff for political reasons and therefore that assurances cannot be guaranteed. Reliance upon an internationalized fuel cycle is seen by some countries as a distant goal, even a pipe-dream.
- The concept of “shared responsibility” is both valid and timely. As part of their shared responsibilities under the NPT, NNWS might consider putting more pressure on NWS to make progress in the UN’s Conference on Disarmament; putting ideas forward on disarmament without waiting for NWS to move first; and sharing more of the financial costs of implementing IAEA safeguards.
- Shared responsibility, as a concept, will be most successful if there is agreement on the obligations it implies for both NWS and NNWS. This agreement will be particularly important if the concept is to gain traction at the upcoming NPT Review Conference.
- The overlap between nuclear security activities and nuclear safety activities can be unclear. Although often synergistic, steps taken in the interest of nuclear safety are sometimes detrimental to nuclear security and vice versa. How to balance these two imperatives still remains to be resolved.

Panel III. Managing the NPT Regime

Summary. The presenters discussed the difficulties in assessing compliance with Article II of the NPT, and the limitations of the IAEA’s safeguards mandate under the Treaty. The potential problems resulting from Article X of the Treaty, and the question of how and whether to amend states’ right to withdraw, were considered as one possible way by which to address the Treaty’s perceived loopholes. Speakers pointed to compliance with Article VI as an ongoing source of conflict among states-parties, as well as the controversy over whether the inalienable right to develop nuclear energy for peaceful purposes should be abridged.

Overview. Article II of the NPT. Compliance with Article II of the Treaty is more complicated than with Article III. In Article III, the IAEA is given a clear mandate to implement safeguards designed to prevent the diversion of nuclear energy from peaceful purposes. The IAEA then makes the determination of whether a state is in compliance with its safeguards agreement. The Treaty’s specification that the IAEA should prevent the diversion of nuclear energy as opposed to declared nuclear material is an important distinction; it indicates that IAEA safeguards should go beyond a simple accounting exercise.

However, the IAEA is not the secretariat of the NPT, which lacks its own institutional infrastructure. The IAEA's prescribed role under the Treaty is limited to the implementation of Article III. As a result, the equally important question of how to judge compliance with Article II (which obliges each NNWS not to seek or acquire nuclear weapons or other nuclear explosive devices) does not have a clear answer; the criteria were never defined or established. Although noncompliance with IAEA safeguards under Article III would *imply* noncompliance with Article II, this may not necessarily hold true in all cases.

Article IV. During the initial negotiation of the NPT in the 1960s, there were fears that the Treaty would block access to nuclear energy. Therefore, the language of Article IV, which refers to the “inalienable rights” of states in this regard, was included to ensure the success of the negotiations. Without this language, the NPT likely would not have been ratified. Article IV also requires that NNWS be in compliance with their Article II obligation not to seek or obtain nuclear weapons or other nuclear explosive devices. Nonetheless, some have argued that Article IV constitutes a major loophole in the NPT, allowing NNWS to develop a full fuel cycle and come to the brink of a nuclear-weapons capability, before withdrawing from the Treaty under Article X.

The overlap between nuclear security activities and nuclear safety activities can be unclear. Although often synergistic, steps taken in the interest of nuclear safety are sometimes detrimental to nuclear security and vice versa. How to balance these two imperatives still remains to be resolved.

In practice, this loophole has proved more of a political problem than a legal one, although the concern has led to calls for restricted access to proliferation-sensitive parts of the nuclear fuel cycle (enrichment and reprocessing). It has also been proposed—most notably by President Bush in 2004—that the Nuclear Suppliers Group (NSG) should deny access to enrichment and reprocessing technology to any state that does not already possess it. These proposals have been greeted with hostility from many NNWS, which see them as an attempt to limit their rights under Article IV and fundamentally alter the NPT bargain.

Article VI. The part of the NPT dealing with nuclear disarmament has, along with Article IV, been the source of great debate and varying political interpretations over the years. In particular, there

are different understandings of how to assess whether Article VI is being fulfilled by NWS—that is, whether those states are pursuing negotiations in good faith toward nuclear disarmament. The current negotiations between the United States and Russia toward a Strategic Arms Reduction Treaty (START) qualify as one effort, as would a formal reduction of the role of nuclear weapons in the defense doctrines of the NWS. The upcoming U.S. Nuclear Posture Review provides the first opportunity to outline such a reduction.

Some of the accomplishments made in the context of Article VI—such as the Thirteen Practical Steps toward disarmament agreed on at the NPT Review Conference of 2000—were rejected only a few years later by the Bush administration. In addition, it is unclear how disarmament by a NWS could be verified to the satisfaction of the international community. The IAEA has some experience in overseeing the dismantlement of a clandestine nuclear program, but it is formally tasked only with implementing safeguards. Neither it nor any other agency currently has a mandate to verify disarmament.

Other states have also behaved in ways contrary to their NPT obligations. Russia continues to deploy nuclear weapons in 48 locations. China is believed to be upgrading and increasing the numbers of weapons in its arsenal, as are the non-NPT states India and Pakistan. Concerns about these non-NPT states (as well as Israel), and the benefits that were made available to India through the U.S.-India agreement, have shown that compliance with Article VI of the NPT is only one part of a broader disarmament effort.

Article X of the NPT. The option for a state-party to the NPT to give three-months notice to withdraw (should “extraordinary events jeopardize its supreme interests”) is considered by some to be a grave loophole in the Treaty. A state could acquire significant nuclear technology and expertise as a NNWS in good standing, and then exercise its right of withdrawal and go on to develop nuclear weapons. This is the so-called breakout scenario.⁵

A major drawback of Article X is the fact that the “extraordinary events” a state must cite in its withdrawal are undefined and left to the judgment of the withdrawing state. The U.S.-India Civil Nuclear Agreement may have made the breakout scenario more appealing, as India has been accepted by the United States and by all members of the NSG as a *de facto* NWS. This precedent may increase the temptation for a state to build up its civilian capacity, withdraw from the NPT, endure whatever sanctions or other punishments accompany withdrawal, and then later seek out the same benefits as India. However, the parallel with India is imperfect: India was never a state-party to the NPT and therefore never violated any Treaty obligations.

5. The Democratic People's Republic of Korea (DPRK) is often cited in such discussions of Article X. Having joined the NPT as a NNWS following long-standing concerns about its nuclear program, the DPRK exercised its Article X rights and withdrew from the Treaty even as it was under increasing suspicion of possessing nuclear weapons and undeclared uranium enrichment activities. The DPRK has remained outside the NPT since 2003.

There are several ways Article X might be amended. States-parties to the Treaty could formally renounce their right of withdrawal. Alternatively, all NPT states-parties could discourage the exercise of Article X rights in order to create a strong normative prohibition against it. States could also increase the withdrawal notification period from three months to one year. Three months gives the international community insufficient time to address the questions raised by withdrawal notification or to assess the validity of the “extraordinary events” cited by the withdrawing state. Since Article X requires that the UN Security Council also be notified by the withdrawing state, the Security Council needs sufficient time to decide if the withdrawal constitutes a threat to peace and security.

The current negotiations between the United States and Russia toward a Strategic Arms Reduction Treaty (START) qualify as one effort [toward nuclear disarmament], as would a formal reduction of the role of nuclear weapons in the defense doctrines of the NWS. The upcoming U.S. Nuclear Posture Review provides the first opportunity to outline such a reduction.

Work to amend Article X could move in tandem with progress on Article VI. If NNWS show themselves amenable to the modification of the terms of Article X, NWS might undertake their Article VI obligations more easily. Likewise, if NWS moved on Article VI, NNWS might be inclined to curtail their existing rights under Article X.

Some suggested that no amendment is required and that it would, in fact, damage the NPT. While a state-party withdrawing from the Treaty is indeed problematic, it would be better to establish a process of dialogue and negotiation to eliminate the reasons behind the withdrawal notification. The question of whether a withdrawing state would be obliged to return any equipment or technology, received as a result of NPT membership, to the state of origin might be better addressed outside the NPT framework. It might, for instance, be introduced as a clause in the guidelines adhered to by the NSG, or in a bilateral agreement.

The discussions that followed produced these conclusions and recommendations:

- IAEA safeguards cannot assess a state’s intentions. The result is a rise in “gray area” cases (Iran, the DPRK, Syria) that NPT states-parties have difficulty in addressing. States might consider putting forward a draft resolution at the 2010 Review Conference on how to address these kinds of cases within the context of the Treaty.
- Although a NNWS that obtains nuclear weapons is clearly in violation of the NPT, it is unclear at what point that state is officially in violation of its Article II obligations.
- When some NPT states-parties engage in behavior that is technically legal but politically objectionable, other states tend to refer to that behavior as “not in keeping with the spirit of the NPT.” This tendency contributes to mistrust between states-parties.
- The debate over Article VI should not be seen as a NWS versus NNWS scenario. The NNWS have an interest in ensuring that their fellow NNWS are not trying to develop nuclear weapons. Moreover, some NNWS benefit from being under the nuclear umbrella of NWS.
- Fulfilling Article VI will require the NWS to be more transparent with regard to the numbers and makeup of their nuclear weapons stockpiles. However, it is important for NNWS to be realistic about how much can be revealed and how quickly.
- It would be counterproductive and damaging to the Review Conference process if efforts were made to amend or otherwise restrict states’ right under Article X to withdraw from the NPT at this point.
- It should not be assumed that a state exercising its right of withdrawal under Article X is seeking nuclear weapons. Article X also serves as the most forceful way for a NNWS to express its dissatisfaction with the NPT process, providing the opportunity to withdraw in protest.

Panel IV. Setting Priorities for the 2010 NPT Review Conference

Summary. The speakers in this session expressed concern that, although there is optimism regarding the 2010 NPT Review Conference, it will be difficult to overcome the deep mistrust that has built up. Many old divisions remain, and most states-parties are waiting to see whether the shift in rhetoric from the United States will result in tangible change. A successful Review Conference will depend on the ability of states to strike a better balance between nonproliferation and disarmament objectives.

Overview. Although the main NPT bargain has always been understood to be between the NWS and NNWS, it is important that the NNWS not be thought of as a single group with identical

interests. There are differences within that group: between regions, between developed and developing countries, and between those countries that are protected by a nuclear umbrella and those that are not.

Over the last eight years, pressure on NNWS to sign new safeguards agreements and to accept restrictions on their access to certain technologies has increased their skepticism about the value of NPT membership. This sentiment has been underscored by the nuclear trade and cooperation benefits that were extended to India. There has also been a tendency to restrict certain fuel cycle technologies (enrichment and reprocessing) in NNWS, with the technologies allowed in some states and met with suspicion in others. A lack of trust has resulted, and the atmosphere of the 2005 Review Conference reflected that mistrust.

Overriding the various concerns and skepticism, however, was a sense that the nonproliferation regime, despite its flaws, is worth preserving and enhancing. Just as important, participants agreed that these efforts need not come at the expense of the growth of nuclear power worldwide.

The new U.S. administration has raised the hope that this toxic atmosphere may be dissipating, due in great part to President Obama's April 2009 speech in Prague and the apparent Russian acceptance of some of those ideas. However, many of the points of contention that existed at the last Review Conference remain today. Although there are declarations of intent to make tangible progress, words have yet to be translated into action. Reverting to the entrenched positions that characterized the 2005 Conference will doom the 2010 Review Conference as well.

The key division to overcome is the balance between nonproliferation and disarmament objectives. Nuclear disarmament is often presented as a long-term, distant objective, rather than an immediate goal. Yet to meet this long-term objective, NNWS are expected to accept further restrictions immediately. This trade-off is not impossible for NNWS to accept, but it has become very difficult as a result of the mistrust that has built up.

The question of transparency will also be an important issue at the 2010 Conference. At the 2000 NPT Review Conference, NWS circulated regular official reports on their efforts to fulfill their Article VI obligations. Since that time, the reports have been

circulated only on an ad hoc basis. The prospects for a successful 2010 Review Conference would greatly increase if NWS were to circulate official reports and increase transparency regarding the numbers of weapons they possess.

The fate of the 2010 Review Conference is difficult to predict and is dependent on events between now and then. The success of the U.S.-Russian START negotiations will have an effect, as will the contents of the forthcoming U.S. Nuclear Posture Review. The progress, or not, toward the implementation of the Comprehensive Test-Ban Treaty (CTBT) and a fissile material cutoff treaty (FMCT) will also set the stage for the Conference, as will developments in the nuclear programs of Iran and the DPRK.

The discussion that followed produced these observations and conclusions:

- Recent positive signs should be welcomed but not overstated. It is still unclear whether tangible change will result.
- The Review Conference must undertake a serious discussion on the role of nuclear weapons in the defense doctrines of NWS. As long as nuclear weapons remain a critical part of national defense policies, the objectives of the NPT and its viability will be undermined.
- Even if not used, nuclear weapons function as a threat to others, simply by existing. An important step would be the adoption by all NWS of negative security assurances (that is, a pledge of non-use of nuclear weapons)—without preconditions and offered to all NNWS.
- In order to give increased political significance to the NPT review process, states-parties might consider devoting their first few days to high-level meetings.

Conclusion

The two-day meeting in Abu Dhabi covered a wide range of topics, from the beginnings of nuclear power to the current state of the NPT. Concerns and hopes regarding the future nuclear order, and the attributes it should possess, guided the presentations and discussions. Several themes consistently reemerged during the meetings:

1. A nuclear renaissance is now well under way.
2. Nuclear power is seen as a realistic goal for many states that either had not considered it or had ended their nuclear power programs in the past.
3. There will be more nuclear technology, nuclear material, and nuclear expertise spread across more states than ever before.
4. The configuration and interests of players in the nuclear nonproliferation regime are undergoing change against the backdrop of a nonproliferation regime that is itself confronting serious challenges to its legitimacy.

Nuclear Energy in the Middle East

During the discussions that followed each presentation, the differences in perception, opinion, and priorities among the participants were laid out with candor and in a constructive atmosphere. Participants reiterated their desire for a successful 2010 NPT Review Conference, even as they expressed concerns about whether positive rhetoric would yield concrete results. Overriding the various concerns and skepticism, however, was a sense that the nonproliferation regime, despite its flaws, is worth preserving and enhancing. Just as important, participants agreed that these efforts need not come at the expense of the growth of nuclear power worldwide. ■

List of Acronyms

CTBT:	Comprehensive Test-Ban Treaty
DPRK:	Democratic People's Republic of Korea
ERDO:	European Repository Development Organization
FMCT:	Fissile Material Cutoff Treaty
GNEP:	Global Nuclear Energy Partnership
GNF:	The Global Nuclear Future initiative of the American Academy of Arts and Sciences
HEU:	High-enriched uranium
IAEA:	International Atomic Energy Agency
MW:	Megawatt
NNWS:	Non-Nuclear-Weapons States (all those not accounted for under NPT Article IX.4)
NSG:	Nuclear Suppliers Group
NWS:	Nuclear-Weapons States, as defined under the NPT (Article IX.4)
NPT:	Treaty on the Non-Proliferation of Nuclear Weapons (Nuclear Non-Proliferation Treaty)
NPR:	Nuclear Posture Review (the review of U.S. Nuclear Forces undertaken by the U.S. Department of Defense)
START:	Strategic Arms Reduction Treaty
UN:	United Nations

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ATTENDEE LIST

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Project Leaders

Thomas Isaacs serves as the Director for the Office of Planning and Special Studies at Lawrence Livermore National Laboratory and is a consulting professor at the Center for International Security and Cooperation at Stanford University. Isaacs's career spans more than two decades with the Department of Energy, including managing policies and programs on the advancement of nuclear power and issues associated with security, waste management, and public trust. He is a member of the National Academy of Sciences Board on Nuclear and Radiation Studies. Isaacs serves as the Research Coordinator for the Academy's Global Nuclear Future Initiative.

Richard Meserve is the President of the Carnegie Institution for Science. He is former Chairman of the U.S. Nuclear Regulatory Commission. He was a partner in the Washington, D.C., law firm Covington & Burling LLP and now serves as Senior of Counsel. Earlier in his career, he served as law clerk to Supreme Court Justice Harry A. Blackmun and as legal counsel to the President's Science Adviser. He has served on and chaired numerous legal and scientific committees, including many convened by the National Academy of Sciences and the National Academy of Engineering. Among other activities, he is a member of the Board of Overseers of Harvard University. He was elected a Fellow of the American Academy of Arts and Sciences in 1994 and serves as a member of the Academy's Council and Trust. He also serves on the advisory committee of the Academy's Global Nuclear Future Initiative.

Steven Miller is Director of the International Security Program at the Belfer Center for Science and International Affairs at the Harvard Kennedy School. He is Editor-in-Chief of the quarterly journal *International Security* and Coeditor of the International Security Program's book series, *BCSIA Studies in International Security* (MIT Press). He was Senior Research Fellow at the Stockholm International Peace Research Institute and taught defense and arms control studies in the Department of Political Science at MIT. He is also Cochair of the U.S. Pugwash Committee, a member of the Council of International Pugwash, a member of the Advisory Committee of the Stockholm International Peace Research Institute, a member of the Scientific Committee of the Landau Network Centro Volta (Italy), and formerly a member of the Council of the International Institute for Strategic Studies. He was elected a Fellow of the American Academy of Arts and Sciences in 2006. He serves as a member of the Academy's Committee on International Security Studies and Coleader of the Academy's project on The Global Nuclear Future.

Robert Rosner is William E. Wrather Distinguished Service Professor in the Departments of Physics, Astronomy and Astrophysics at the University of Chicago. He is former President of UChicago Argonne, LLC and former Director of Argonne National Laboratory. Previously, he served as Argonne's Chief Scientist, Chairman of the Department of Astronomy and Astrophysics at the University of Chicago, and Director of the Center for Astrophysical Thermonuclear Flashes at Chicago. He was Rothschild Visiting Professor at the Newton Institute for Mathematical Sciences at Cambridge University in 2004. He is a Fellow of the American Physical Society and a Foreign Member of the Norwegian Academy of Science and Letters. He was elected a Fellow of the American Academy of Arts and Sciences in 2001. He is Senior Advisor to the Academy's Global Nuclear Future Initiative.

Scott Sagan is Caroline S.G. Munro Professor of Political Science and Codirector of the Center for International Security and Cooperation at Stanford University. Before joining the Stanford faculty, he was a lecturer in the Department of Government at Harvard University and served as a special assistant to the director of the Organization of the Joint Chiefs of Staff in the Pentagon. He has also served as a consultant to the office of the Secretary of Defense and at the Sandia National Laboratory and the Los Alamos National Laboratory. He is the author of *Moving Targets: Nuclear Strategy and National Security* (Princeton University Press, 1989), *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (Princeton University Press, 1993), and with coauthor Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate Renewed* (W.W. Norton, 2002). He is the coeditor of *Planning the Unthinkable*, with Peter R. Lavoy and James L. Wirtz (Cornell University Press, 2000) and the editor of *Inside Nuclear South Asia* (Stanford University Press, 2009). His most recent publications include "The Case for No First Use," *Survival* (June 2009) and "Good Faith and Nuclear Disarmament Negotiations" in George Perkovich and James A. Acton, eds., *Abolishing Nuclear Weapons: A Debate* (Carnegie Endowment, 2009). He was elected a Fellow of the American Academy of Arts and Sciences in 2008 and serves as Coleader of the Academy's project on The Global Nuclear Future.

Global Nuclear Future Publications

Dædalus, Fall 2009

The Global Nuclear Future, Volume 1

Steven E. Miller & Scott D. Sagan, “Nuclear power without nuclear proliferation?”

Richard K. Lester & Robert Rosner, “The growth of nuclear power: drivers & constraints”

Robert H. Socolow & Alexander Glaser, “Nuclear energy & climate change”

Paul L. Joskow & John E. Parsons, “The economic future of nuclear power”

Harold A. Feiveson, “A skeptic’s view of nuclear energy”

José Goldemberg, “Nuclear energy in developing countries”

John W. Rowe, “Nuclear power in a carbon-constrained world”

Anne Lauvergeon, “The nuclear renaissance: an opportunity to enhance the culture of nonproliferation”

Richard A. Meserve, “The global nuclear safety regime”

Matthew Bunn, “Reducing the greatest risks of nuclear theft & terrorism”

Thomas C. Schelling, “A world without nuclear weapons?”

Paul Doty, “The minimum deterrent & beyond”

Sverre Lodgaard, “Toward a nuclear-weapons-free world”

Sam Nunn, “A world free of nuclear weapons”

Scott D. Sagan, “Shared responsibilities for nuclear disarmament”

Dædalus, Winter 2010

The Global Nuclear Future, Volume 2

Pierre Goldschmidt, “Multilateral nuclear fuel supply guarantees & spent fuel management: what are the priorities?”

George Perkovich, “Global implications of the U.S.-India deal”

Charles McCombie & Thomas Isaacs, “The key role of the back-end in the nuclear fuel cycle”

Siegfried S. Hecker, “Lessons learned from the North Korean nuclear crises”

Jayantha Dhanapala, “The management of NPT diplomacy”

William C. Potter, “The NPT & the sources of nuclear restraint”

Atsuyuki Suzuki, “Toward a robust nuclear management system”

Mohamed I. Shaker, “Nuclear power in the Arab world & the regionalization of the nuclear fuel cycle: an Egyptian perspective”

Abbas Maleki, “Iran’s nuclear file: recommendations for the future”

Anatoly S. Diyakov, “The nuclear ‘renaissance’ & preventing the spread of enrichment & reprocessing technologies: a Russian view”

Steven E. Miller & Scott D. Sagan, “Alternative nuclear futures”

Global Nuclear Future Publications

Occasional Paper

Shared Responsibilities for Nuclear Disarmament: A Global Debate (April 2010)

Introduction

Scott D. Sagan, “Shared Responsibilities for Nuclear Disarmament”

James M. Acton, “U.S. Allies and the Politics of Abolishing Nuclear Weapons”

Jayantha Dhanapala, “Common Responsibilities in the NPT—Shared or Asymmetrical?”

Mustafa Kibaroglu, “Turkey and Shared Responsibilities”

Harald Müller, “The Common Project of Nuclear Abolition”

Yukio Satoh, “On Rethinking Extended Deterrence”

Mohamed I. Shaker, “Shared, But Not Equal Responsibilities”

Achilles Zaluar, “Shared Responsibilities, Shared Rights”

Occasional Paper

Multinational Approaches to the Nuclear Fuel Cycle (April 2010)

Introduction

Charles McCombie and Thomas Isaacs, “The Key Role of the Back-End in the Nuclear Fuel Cycle”

Noramly Bin Muslim, “Possible International Fuel-Cycle Arrangements Attractive to States during the Nuclear Power Renaissance”

Tariq Rauf, “New Approaches to the Nuclear Fuel Cycle”

Atsuyuki Suzuki, “Not Second but First Place for the United States”

Frank von Hippel, “Spent-Fuel Management: The Cases of Japan, South Korea, and Russia”

Ellen Tauscher, “Addressing the Nuclear Fuel Cycle: Internationalizing Enrichment Services and Solving the Problem of Spent-Fuel Storage”

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