

## Nuclear Power and the NPT

### SUMMARY

- Given growing global energy demands and concerns about climate change, many analysts predict substantial growth in reliance on nuclear power, and in nuclear-power-plant construction.
- Many also expect that such an expansion would pose significant proliferation challenges.
- New reactor construction over the next decade will be concentrated in countries that already have nuclear-power programs, nearly all of which are members in good standing of the *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT). Eight states plan to build nuclear plants for the first time in the next decade. All are NPT members in good standing.
- Therefore, if the risk of state-level proliferation associated with an expansion in nuclear power cannot be discounted, it may not be as high as is frequently implied. The main proliferation risks (theft and illicit trade in nuclear materials) associated with a growth in nuclear power may be largely outside the purview of the NPT.
- Nonetheless, it will be essential to ensure that NPT commitments continue to be met in a verifiable fashion, and that the International Atomic Energy Agency (IAEA) has the resources and authority to carry out its mission. Key issues at the NPT Review Conference taking place in May 2010 include the adequacy of existing safeguards agreements; the terms and conditions of export-control regimes; and whether there can be any limits on the development of indigenous fuel-cycle capabilities.

### BACKGROUND: THE ANTICIPATED EXPANSION IN NUCLEAR POWER

The nuclear-power industry, and many governments, advocate and anticipate growth in nuclear power as a source of electricity production. They would like to see an increase in both the amount of nuclear power produced, and its relative proportion of electricity production. Proponents of greater reliance on nuclear power make several assertions, among them that climate change necessitates the development and widespread use of clean, noncarbon energy sources, including nuclear power; that economic growth, especially in

emerging and developing economies, requires substantial energy inputs, which cannot be met through reliance on existing carbon-based sources; that nuclear power can be cost-competitive; and that past concerns about the safety of nuclear power have been greatly ameliorated through improved technology and operating procedures.

These factors suggest a rising demand for nuclear-power production, which will clearly be the case in some countries. But the picture is mixed. Some analysts dispute the claims for climate mitigation, as well as the economic viability of nuclear power—especially in the next decade. In some countries, public opposition to nuclear-power-plant construction, or to waste-disposal plans, may also limit the industry's expansion. Other factors, such as limited sources of supply for important reactor components, may constrain the speed and breadth of any nuclear expansions. New reactor construction is taking longer in at least one closely watched case, and it has higher costs than promised. And of course, a major accident at a nuclear power plant—such as those at Three Mile Island and Chernobyl—could unexpectedly and quickly alter the prospects for nuclear power.

### PROJECTED GROWTH IN NUCLEAR POWER AND ITS IMPLICATION FOR PROLIFERATION

While the question of the actual extent of any nuclear renaissance remains open, it is nonetheless useful to look at existing projections and consider their proliferation implications. One way to gauge the future expansion of nuclear power is to look at the data about plans for new reactor construction.

According to the World Nuclear Association (WNA),<sup>6</sup> there are 439 operable (i.e., connected to the grid) nuclear reactors worldwide, located in thirty countries. Another fifty-two reactors are currently under construction.

Over the next eight to ten years, the WNA reports that construction of at least 143 additional reactors

<sup>6</sup> The World Nuclear Association is an industry group that provides information on various aspects of the nuclear-power industry. All figures in this discussion are from their frequently updated "World Nuclear Power Reactors and Uranium Requirement." See World Nuclear Association, "World Nuclear Power Reactors and Uranium Requirement," April 1, 2010, available at [www.world-nuclear.org/info/reactors.html](http://www.world-nuclear.org/info/reactors.html).

is planned. “Planned” in this sense refers to anticipated construction of units with “approvals, funding, or major commitment in place, mostly expected in operation within 8 years, or construction well advanced but suspended indefinitely.”<sup>7</sup> Although it is possible that some of the projects represented by these figures will fall through, nonetheless, they represent the firmest prediction available for new nuclear building in the next decade. If all became operable, and if construction were finished on those plants now being built, nearly 200 new reactors would be added over the coming decade. Although this may not mean a net increase of 200 reactors (since some older reactors would be decommissioned) it still suggests a substantial increase.

The WNA also presents data on new reactors “proposed,” i.e., “specific program or site proposals, expected operation within 15 years.”<sup>8</sup> A total of 344 additional reactors are “proposed” using these terms. Were most of these reactors actually constructed, this would represent a very substantial increase in the number of operational reactors, but there is great variability among these projections in terms of the scope and the firmness of states’ intentions. Some seem quite ambitious, for example, a proposal to build ten new reactors in a country that currently has no operable reactors and none under construction or in the planning stage. Others, however, are more conservative; and it is difficult to draw conclusions about the likelihood that all these programs will develop.

To sum up: a large number of new reactors are planned and proposed over the next decade, although it is hard to know how much of this new construction will actually occur. Advocates of nonproliferation, who are concerned about the potential proliferation risks associated with an expansion of nuclear power, will therefore face considerable uncertainty about the scale of any nuclear expansion.

However, it is possible, using this data, to establish at least a starting point for thinking about the proliferation implications of existing construction and plans for new projects. We can do this by looking at the geographic distribution of current

and planned new construction.

**Reactors currently under construction.** Fifty-one of the fifty-two reactors under construction are in countries that already have nuclear-power programs in operation. Iran is the one country that does not currently have operable reactors. Over half of these fifty-two reactors under construction are in four countries: China (twenty); India (four); Russia (eight); and South Korea (six).

Nearly all of these fifty-two reactors are being built in states that are NPT members in good standing, with required safeguards agreements in place. India and Pakistan—both of which are building new reactors—are not NPT members. Iran is an NPT member, but faces outstanding claims of NPT noncompliance.

Thus, among those states with reactors under construction, there are no newly added states that may be considered “of proliferation concern” or outside the NPT.

**Reactors planned.** Of the 143 planned new reactors, over 70 percent are located in six countries that already have operating nuclear-power programs: China (thirty-seven), India (twenty), Russia (sixteen), Japan (thirteen), the United States (nine), and South Korea (six). Of these, five are NPT parties in good standing; India is not an NPT member.

Other countries that have existing nuclear power programs, and expect to add from one to four reactors are Argentina, Armenia, Brazil, Bulgaria, Canada, France, Pakistan, Romania, South Africa, Ukraine, and the UK. All but Pakistan are in the NPT. All that are in the NPT are in compliance with NPT obligations.

There are eight countries that have relatively firm plans to build nuclear reactors, but which do not currently have operating reactors. These are Egypt (one); Indonesia (two); Belarus (two); Kazakhstan (two)<sup>9</sup>; Thailand (two); Turkey (two); the United Arab Emirates (four); and Vietnam (two). All are NPT members in good standing.

Thus again, the majority of planned construction would take place in NPT member states in good standing—most of which already have functioning

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Kazakhstan had one operating reactor that was shut down in 1999.

nuclear-power programs and have therefore made and kept safeguards agreements with the IAEA.

**Reactors proposed.** Although the figures for proposed construction are uncertain at best, it is worth noting also that in the WNA information presented, in only one case (Bangladesh) would proposed construction be new, i.e., take place in a country with no previous experience in nuclear-reactor construction.

Clearly, an existing nuclear-power program and NPT status do not guarantee that a state will never use its civilian nuclear program to develop a military program. Yet there is no a priori reason to assume that states will do so. Moreover, when we look at the total set of existing, planned, and proposed new construction, no new states are added to the list of existing proliferation worries.

Does this mean that proliferation will not occur? No, and effective verification of nuclear activities by the IAEA will remain essential to confirm in each case their peaceful purposes. But it does suggest that the proliferation risks posed by an expansion in nuclear power may not derive principally from state behavior that is proscribed by the NPT. Theft of and illicit trade in nuclear materials is a major concern, including within numerous NPT member states. But those risks are affected by a state's willingness and ability to control access to nuclear material—and these are not issues that are directly within the NPT's purview.

## NUCLEAR POWER AND THE NPT REVIEW CONFERENCE

In a sense, then, for the NPT, the main proliferation implication of a growth in nuclear power is to assure that states continue to adhere to their NPT commitments, and that the IAEA continues to have the resources and authority to do its job. Given the large projected increase over the coming years in the number of nuclear installations and in the dissemination of nuclear know-how, this will be a major challenge. The agency will need increased human and financial resources as well as proper

technical and legal tools to keep up with its verification tasks.

In the context of the NPT review process, this puts several issues on the agenda. These include the adequacy of existing safeguards agreements; the terms and conditions of export-control regimes; and whether there can be any limits on the development of indigenous fuel-cycle capabilities.

### Safeguards

The NPT rests on the assumption that its parties' compliance with treaty terms can be verified by the IAEA. The obligation of states party to the treaty to conclude verifiable safeguards agreements with the IAEA is outlined in Article III of the NPT.<sup>10</sup>

In the early 1990s, in the wake of revelations about Iraq's nuclear-weapons program, and the difficulty of verifying the nuclear activities of the DPRK, the IAEA secretariat began a process of strengthening the implementation of existing safeguards, and considering additional authority for the conduct of inspections activities. Later in the decade the agency's board of governors adopted a *Model Additional Protocol for Safeguards Agreements*, which, if adopted by a state party, would give the agency greater power to seek information about undeclared nuclear materials and activity. For example, with an Additional Protocol in place, the IAEA could have information about, and access to, all parts of the nuclear fuel cycle within the country; short-notice access to all buildings on a nuclear site, even if those buildings had not been declared; and the right to take environmental samples "at locations beyond declared locations when deemed necessary by the Agency."<sup>11</sup>

As of April 2010, twenty-one states in the NPT had not concluded a comprehensive safeguards agreement; forty-four did not have an Additional Protocol in place. The IAEA secretariat has said that comprehensive safeguards agreements together with the Additional Protocol should become the "universal standard" to verify nonproliferation.<sup>12</sup>

<sup>10</sup>In its first paragraph, Article III states that "Each Non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for the exclusive purpose of verification of the fulfilment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices." See *Treaty on the Non-Proliferation of Nuclear Weapons*, March 5, 1970, Article III. The full text of the treaty is Annex I of this report.

<sup>11</sup>IAEA, *IAEA Safeguards Overview: Comprehensive Safeguards Agreements and Additional Protocols*. Available at [www.iaea.org/Publications/Factsheets/English/sg\\_overview.html](http://www.iaea.org/Publications/Factsheets/English/sg_overview.html).

<sup>12</sup>IAEA, Statement by Director-General ElBaradei, *Nuclear Energy: The Need for a New Framework*, Berlin, April 17, 2008.

Although many states share this view, the question of universalizing the Additional Protocol remains contentious, with some states arguing that the protocol represents a further restriction on the rights of non-nuclear-weapon states, and should be voluntary only.

### Export Controls

After the NPT entered into force in the early 1970s, states that supplied nuclear-related materials created two voluntary groups to advise and/or develop guidelines for export. The Zangger Committee refers specifically to the second paragraph of Article III of the NPT, which prohibits the provision of nuclear-related material to any non-nuclear-weapon state, unless the material will be safeguarded by the IAEA. The Nuclear Suppliers Group (NSG) develops guidelines for exports of nuclear and nuclear-related material.

Export-control organizations have also been controversial throughout the history of the NPT. Some states see these agreements among nuclear suppliers as nontransparent and limiting the choices, in a potentially discriminatory way, of states seeking peaceful nuclear technology. Others see them as a means to guide the practical implementation of requirements that the NPT places on states that have the potential to export nuclear-related materials.

### Article IV Rights and Obligations

Article IV of the NPT says that nothing in the treaty can be taken to affect the “inalienable right of all Parties to the Treaty to develop, research, production and use of nuclear energy for peaceful

purposes without discrimination and in conformity with articles I and II...” It also says that all parties will “facilitate and have the right to participate in the fullest possible” development of peaceful nuclear energy.

The discussion of this Article piques both general and more specific concerns. At a general level, there is ongoing debate about whether or not the Article IV reference to an “inalienable right” means that all states party to the NPT are allowed to develop and hold full fuel-cycle capabilities, if they so choose. The debate takes various forms, questioning what is meant by “inalienable” and whether it applies to states parties that are found in noncompliance of their safeguards agreements (and by extension, at what point in the IAEA process does noncompliance exist?). Another dimension is whether the article obligates states parties to assist non-nuclear-weapon states, and whether they must do so equally.

At a more specific level, recent discussion has focused on the question of whether any conditions can be placed on the right of states to develop full fuel-cycle capabilities. This question has been raised particularly in relation to the IAEA’s exploration of the possibility of creating a guaranteed supply of nuclear fuel. The idea of a multilaterally controlled nuclear-fuel supply has existed since the inception of nuclear power. It gained new momentum earlier this decade, when then Director-General Mohamed ElBaradei called attention to the difficulties of conducting oversight of civilian nuclear-energy activities, in the context of an increase in reliance on nuclear power and