

Serious Rules for Nuclear Power without Proliferation

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Background

From the beginning of the nuclear age at the end of World War II U.S. policymakers have searched for ways—by means of institutions and controls—to allow nuclear energy use worldwide without at the same time risking the spread of nuclear weapons. While the arrangements that were put into place in subsequent decades have not managed to wall off energy applications from possible diversion to weapons, the United States has nevertheless continually encouraged increased reliance on nuclear power plants around the world. The rationalization for an international nuclear energy policy that put a premium on short term economic and political gains has been that the United States was doing the best it could within the realities of world affairs to limit proliferation risks, and that “you have to play the game if you want to make the rules.” The underlying assumption, or perhaps hope, was that future international agreements would help to keep the burgeoning nuclear programs within reasonable bounds.

Each time the so-called nonproliferation regime encountered a reversal, “realists” argued that the United States had to deal with things as they are, and thus adopt a new, weaker position. Of course, these reversals were themselves, at least in part, the consequence of the “realistic” approach. We are skeptical that this short-term, ad hoc approach will continue to work for long, or that when it fails it will necessarily fail slowly. It seems equally plausible that at some point anti-proliferation controls would get overwhelmed rapidly by a large number of would-be nuclear weapons states.

The argument made against this happening is that such predictions in the past have proved alarmist. The usual reference is to President Kennedy’s 1962 statement that 15 to 25 countries could obtain nuclear weapons. But this was a warning, not a prediction, and a useful one that led to nonproliferation efforts that slowed the process. Since then we have had experience with countries claiming to be conducting “peaceful” nuclear programs and then using their facilities for illicit activities or conducting clandestine bomb activities—in India, Iran, Iraq, Israel, North Korea, Pakistan, South Africa, and Syria. In view of continued U.S. efforts to promote nuclear power worldwide in spite of this experience, it is time to heed proliferation warnings again.

The first step of an effective anti-proliferation policy has to be to get priorities straight: to put international security ahead of commercial or political gain. President Gerald Ford’s 1976

Statement on Nuclear Energy announced this would be U.S. policy, but since then it has been honored mainly in the breach.

We have hobbled ourselves by going along with a revisionist interpretation of the Nuclear Nonproliferation Treaty (NPT) that dilutes the Treaty's primary goal of nonproliferation. In this interpretation of the Treaty, nonproliferation is but one of three goals, on par with disarmament of the nuclear powers and respecting the "inalienable right" of all members to peaceful nuclear technology. The loose interpretation of the latter has been especially problematic. President Obama's comments on the foundations of the NPT, delivered on the Treaty's 40th anniversary in 2010, have not been helpful. The President described it as standing on "three pillars—disarmament, nonproliferation and peaceful uses." We need to get back to viewing the Treaty, whose full name is the Treaty on the Non-Proliferation of Nuclear Weapons, as indeed primarily about the nonproliferation of nuclear weapons.

To work effectively, such a nonproliferation policy has to gain international acceptance, and to do that it has to be based on a set of broadly applicable principles, ones that are reasonably consistent and fair to the countries to whom it applies. We propose such a set of principles.

In view of the near universality of the Nuclear Nonproliferation Treaty, it is natural to set down the principles in terms of the Treaty. That all nonnuclear weapons countries are members of the Treaty also means that should any of them decide to acquire bombs, the source of their nuclear explosives is likely to be their nuclear power program. That is why tighter rules on materials in nuclear power programs are essential to nonproliferation.

To provide context for their consideration, it is helpful to review the history of the main approaches to holding off the spread of nuclear weapons. That these initiatives came mainly from the United States says that U.S. leadership is critical if we are to improve on the present state of affairs.

The first initiative was described in the 1946 Acheson-Lilienthal Report, which proposed international ownership and development of nuclear energy. Its virtue was that it identified the problem clearly—that the large overlap between nuclear energy for electricity and for weapons made it extremely dangerous to allow worldwide use of nuclear energy under conditions of unlimited sovereignty. In other respects the 1946 proposal was naïve and had no hope of acceptance. An unfortunate aspect of the Report was that it introduced the mistaken notion—in fact, relied on the notion—that plutonium irradiated in power reactors was unusable for weapons and was thus safe in commercial channels. This error has led to confusions that have propagated to the present.

The next grand U.S. scheme was the 1953 Atoms for Peace program. While the real motives behind it had to do with gaining political advantage from U.S. nuclear technology, the public rationale was that spreading "peaceful" technology would take attention away from military

uses, another naïve notion. The International Atomic Energy Agency was created to provide suitable auspices for distributing nuclear facilities and materials. IAEA inspections were supposed to assuage any concerns about diversions of nuclear exports to military uses. This arrangement was in fact exactly one that the earlier Acheson-Lilienthal Report said could not be relied upon for security and rejected.

The Kennedy administration initiated a more serious-minded approach to nonproliferation and started a process that, with the strong support of the subsequent Johnson Administration, culminated in the Nonproliferation Treaty. Still, in those days, nonproliferation was a sideshow to the main action in the Cold War. It was President Nixon who sent the NPT to the Senate for ratification in 1969. He did so not because he valued the Treaty, but because he was confident that it imposed no restrictions on the United States. The Treaty contains no enforcement mechanism for dealing with violations and has a 90-day withdrawal provision. Under Article VI the five countries with nuclear weapons promised to negotiate reductions and eventual elimination of their stocks. But this promise was weakened by its coupling with another: to negotiate a treaty on “general and complete disarmament,” a commitment no one took seriously. The long negotiations had also expanded the Treaty from its early drafts to include language that gave all Treaty members the “inalienable right” to “peaceful” nuclear technology. Their facilities would have to be subject to IAEA inspection, but in practice this didn’t amount to much as the early inspections were largely *pro forma* on the assumption that countries could be relied on to honor their “peaceful uses” pledges.

The 1974 Indian nuclear explosion jolted this assumption. India had not joined the NPT, but it had given “peaceful uses” pledges to both Canada and the United States on use of a Canadian-supplied research reactor. In spite of this, India used plutonium from this reactor for its bomb. It became clear that a country with access to plutonium (or highly enriched uranium) could, if it wanted to, rapidly assemble a bomb. The United States concluded that control of technologies that provided direct access to nuclear explosives was an essential component of nonproliferation. Adding to the need for urgent action in response to the Indian explosion was the sudden awareness of pending exports, from France and Germany to Asia and South America, of reprocessing technology to separate plutonium from spent fuel. At U.S. initiative, the major exporters created the Nuclear Suppliers Group to restrict what were called “sensitive” exports. On their face such restrictions conflicted with the “inalienable right” language of the NPT. Rather than confront and repair this inconsistency in the Treaty, and thus make clear that all its provisions had to be interpreted in light of its overriding purpose (“in conformity with Articles I and II of this Treaty”), the suppliers imposed restrictions more or less *sub rosa*, without challenging the “inalienable right” language.

Lax controls over U.S. nuclear exports became an issue in the 1976 U.S. presidential election, which led the Ford Administration to conduct an interagency study on nuclear energy and

nuclear proliferation. After receiving a report (which still reads well today), President Ford issued a statement that plutonium—then the main nuclear explosive of concern in relation to proliferation—was too dangerous for commercial use. In current terminology he proposed that nuclear energy throughout the world proceed on the basis of a “once-through” fuel cycle, that is, with no reprocessing. He thought this approach would both allow nuclear energy to develop and provide a reasonable safety margin for international inspection to safeguard the materials involved in nuclear commerce. The President announced that the United States would cancel domestic commercial reprocessing and thereby abide by the same standard it urged on others. After taking office, President Carter adopted this policy.

The halt to the expectation of future dependence on plutonium fuel did not sit well with the nuclear community. Both the nuclear industry and the government bureaucracies fought back with a series of arguments. The most interesting of these was that it was futile to control plutonium access by restricting commercial reprocessing in accordance with the Ford-Carter policy because most countries could easily build small clandestine reprocessing plants. To drive the point home that such small plants could quickly separate enough plutonium for many warheads, the Oak Ridge National Laboratory published a design for a simple reprocessing plant that could be built from off-the-shelf equipment. Although this disclosure was intended to undermine the assumptions underlying the Ford-Carter restrictions on commercial reprocessing, it actually undermined the Ford-Carter assumption that commercial nuclear power reactors by themselves—in the absence of commercial reprocessing—posed no proliferation concern.

In subsequent years a technological innovation—the development of practical uranium enrichment by means of gas centrifuges—raised new concerns about easy access to facilities to produce highly enriched uranium (HEU). Gas centrifuge technology lends itself to small-scale application and so raises the possibility of clandestine enrichment facilities, adding to the possibility of clandestine plutonium separation plants. Such clandestine HEU production is obviously a matter of concern today in both North Korea and Iran.

Five Principles

The nonproliferation principles we propose are intended to establish a framework for dealing with the main deficiencies in the current NPT regime. These are: the notion that countries could amass the means for a weapons program under the NPT and then withdraw on 90-days’ notice; the idea that the Treaty gives members the “inalienable right” to conduct “peaceful” work with all nuclear materials, including nuclear explosives; that countries could limit the activities of IAEA inspectors; that enforcement of Treaty provisions is left up to members on an ad hoc basis; and that the several non-members are free of any restrictions. Fixing these deficiencies is in our view the minimum we need to do to reasonably control the proliferation risks associated with any expanded nuclear power use worldwide.

Our proposed principles are as follows:

1. *Locking down the NPT.* We need to make it much more difficult to exercise the NPT's withdrawal provision. First of all, a Treaty member should not be allowed to withdraw without squaring accounts, without clearing any existing violations. Beyond that, it is not consistent with the NPT's purpose for members to exercise the withdrawal provision after gaining any nuclear technology of relevance to weapons—whether by importing it or developing it domestically—as this was done under the assumption by other members that it was for peaceful uses. As a practical matter, this would mean membership in the Treaty was essentially permanent.

2. *Establishing a technological safety margin.* The Treaty cannot be a vehicle for legally coming overly close to a weapons capability. Nuclear power needs to develop in a way that does not provide easy access to nuclear explosives. There has to be an adequate technological safety margin between genuinely peaceful and potentially military applications. As a consequence, the “inalienable right” language in the Treaty has to be interpreted in terms of the Treaty's overriding objective, and thus there have to be restrictions on the kinds of technology that is acceptable for non-military use. Where to draw the line is now coming to a head in the context of Iran's nuclear program.

3. *Highly intrusive inspections.* Countries involved in nuclear energy must accept that the inherent international security dangers such involvement implies require them to relinquish a considerable degree of sovereignty to international security organizations, in practice the IAEA inspectorate. In view of the concerns about clandestine facilities, both with respect to enrichment and reprocessing, countries have to agree to essentially unlimited inspection rights for international inspectors if the circumstances warrant. The Additional Protocol is a good start toward expanding inspectors' right, but this unfortunately goes along with a reduction in the frequency of normal inspections.

4. *Predictable NPT enforcement.* The NPT needs an established enforcement mechanism to deal with Treaty violations in a predictable way. The foregoing rules for operating nuclear power plants in a manner that is consistent with international security are not self-enforcing. There has to be agreement among the Treaty parties concerning reasonably predictable responses to particular violations—and most particularly to any effort by a state to withdraw from the Treaty—to remove the notion that violators can escape with impunity.

5. *Weapons reductions for all.* All nuclear weapons states have to participate in weapons reductions. This is essential for gaining the cooperation of the other NPT members in restrictive measures. In the first instance this includes Britain, France, and China, which have up to now not participated in the reduction process that has involved the United States and Russia. But it has also to include India, Israel, Pakistan, and North Korea.

Why propose these principles? First, while it is unrealistic at this point to expect international agreement on specific application of these principles, most persons involved with nonproliferation policy, probably even in government, would agree at least with their general formulation. A clear and consistent set of principles provides a framework for policy, which is valuable even if the goals are not immediately attainable. Second, countries around the world may in time come to view the problem of proliferation more seriously than they do now. It is useful for all to be clear on what it takes to protect national use of nuclear technology for electric power from diversion to weapons.

If the impression is left that a serious application of these principles would restrict the expanded use of nuclear power, that is indeed correct. It comes down to a matter of priorities. If the United States and other countries shifted from the present emphasis on nuclear expansion to a security-first approach, the result is bound to restrain the worldwide development of nuclear energy. In fact it must be said that the dangers of proliferation are in every respect eased by a reduced use of nuclear energy for power around the world. There will inevitably remain a trade-off between energy and security objectives, even if we put security first. Realistically, we cannot sharply turn around other countries' long standing policies. But at a minimum, there should be no argument about whether it makes sense for the United State to encourage and subsidize the spread around the world of nuclear power plants that don't meet a market test when these same plants create security worries, either directly or indirectly.

Finally, a word about the role of nongovernmental organizations (NGOs) in the field of nonproliferation: The most valuable contribution outsiders can make to government policy makers is to provide an intellectual structure for understanding problems and events. That usefulness is undermined if the outsiders try too hard to act like insiders—to be “relevant”—by anticipating the immediate bureaucratic imperatives to gain a more favorable reception for their message. Speaking clearly on what it takes to restrain proliferation as it relates to nuclear energy use is therefore especially important for NGOs.

Practical Implications

What practical implications would flow from the proposed principles? First, their articulation and adoption by senior officials should help shape day-to-day policy and the handling of specific nonproliferation issues in a way that would put security ahead of convenience or commerce. Second, each of these principles inescapably encourages the consideration of more consistent, effective measures for promoting nuclear nonproliferation. What follows is a discussion of specific measures to help promote each of the principles listed. Many authors in and out of government have discussed one or another of these measures. There is, after all, hardly anything on the subject that has not been discussed in the past decades. Our contribution is to combine the best of these measures into a coherent package that tracks a set of sound principles.

1. Locking down the NPT

The first practical implication of the principle that a member cannot leave the NPT while in violation of it and escape its obligations is that North Korea's 2003 announcement of "withdrawal" while in noncompliance of IAEA inspection requirements left that country in a state of Treaty violation. Of course, North Korea is already subject to sanctions, but these sanctions are not related to its legal obligations under the NPT. It is a question of legitimacy, a concept that, however intangible, has weight in international affairs, and to which we know North Korea is acutely sensitive. More importantly, it would help mobilize international support for sanctions against a Treaty withdrawal if the country in question is seen as a Treaty violator. It was especially unfortunate that when North Korea threatened to withdraw, and after it announced its withdrawal, while everyone deplored this, no one pointed to the *illegality* of such action in view of the North's state of noncompliance.

The argument for the even stricter stance we propose—that once a Treaty member has entered upon nuclear development of relevance to nuclear weapons it should be precluded from withdrawing—is that a Treaty member that acquired nuclear facilities and equipment did so with the acquiescence and forbearance of the international community on the assumption that these facilities and equipment were to be used for peaceful purposes. A move to leave the Treaty with these nuclear resources raises questions about a country's good faith in originally acquiring them. It should be made clear that any country possessing nuclear facilities usable for weapons production that announces a withdrawal in the future will be regarded by Treaty members as a Treaty violator and cut off internationally in every meaningful way until it returned to compliance.

We discuss the broader issue of Treaty enforcement in the fourth point, "Predictable NPT enforcement."

2. Establishing a technological safety margin

A continued spread of fuel cycle facilities is dangerous because it would bring more countries within a technological stone's throw of nuclear weapons. The two fuel cycle processes of most concern are, of course, enrichment, with the potential to produce highly enriched uranium, and reprocessing, which produces plutonium. There is no longer any economic justification for commercial reprocessing, so this activity should be discontinued. The original reason for separating plutonium was to fuel a new generation of plutonium-burning fast reactors. With the abundance of uranium and fewer than expected nuclear installations, the shift to such reactors has receded beyond the horizon. It never made any economic sense to use plutonium fuel (MOX) in current generation light water reactors, and the argument that reprocessing simplifies waste disposal is simply wrong.

This restriction on reprocessing should apply in nuclear weapons countries, as well. If nuclear weapons countries set a separate standard for themselves, it will exacerbate the difficulty in gaining international consent for stricter rules, and perhaps make it impossible. The NPT division between weapons countries and non-weapons countries is burden enough.

Enrichment poses a more difficult problem because almost all of the world's power reactors use enriched uranium fuel. Power reactors nowadays do not use *highly* enriched uranium fuel. There is also no need for research reactors to continue to use such fuel, as lower enrichment alternatives are available. Unfortunately, some institutions with research reactors, including some in the United States, are dragging their feet about conversion to lower enrichment fuel. If we could eliminate entirely the use of HEU and plutonium, we would have at least eliminated the materials that can be put to weapons use so fast that international inspection would be helpless to thwart the action.

There remains the problem of how to deal with enrichment facilities that produce the low enriched uranium fuel used by power reactors and a relatively small amount of somewhat higher enrichment fuel, but still under 20 percent, used in some research reactors. Strictly speaking the issue is not enrichment per se, but enrichment technologies that lend themselves to small-scale application. The earlier gaseous diffusion enrichment technology, now considered obsolete, requires many enrichment stages, lots of electric power, and is an intrinsically large-scale affair. By contrast, centrifuge plants use little power, have small footprints, and the manufacturing know-how is relatively widespread. Ultimately, if we are to use nuclear power we need to find a way to limit the number of enrichment facilities to a small number.

The so-called "Gold Standard" for civilian nuclear cooperation between the United States and other countries points in the right direction. This is the standard established in the 2009 agreement with the United Arab Emirates that permits reactor sales but rules out nuclear fuel activities. Unfortunately, the Obama administration has been ambiguous about whether it will apply this standard to all such agreements. An American commitment to it is a prerequisite for the standard to gain international acceptance.

The spread of research and commercial fuel cycle facilities threatens to overwhelm in a number of ways the usefulness of international inspections as a means of protection. There is, first of all, the sheer magnitude of the effort required to track effectively, and on a timely basis, nuclear material flows. The existence of even small enrichment and related facilities in a country puts a high premium on keeping very close tabs on all its uranium fuel. This includes fabricated low enriched fuel at reactor sites, of which large power reactors require a ready reserve of many tons. If a country used such low enrichment uranium as the starting point for producing HEU, it could reduce the necessary amount of enrichment, or the time required to reach high enrichment, by as much as a factor of five. The same power reactors also annually produce in their uranium fuel rods amounts of weapons-usable plutonium that, if diverted and chemically separated, are

sufficient to make militarily significant numbers of nuclear warheads.¹ If a country has nuclear explosives readily at hand, the possibility of effective detection and response in time to thwart bomb making is essentially nil. Another complication is that the presence of commercial enrichment or reprocessing plants, even small ones, masks emissions from any clandestine plants, making them much more difficult to detect.

To restrict fuel cycle activities to a small number of countries would mean not only that states that have not yet gotten into these activities would forego doing so, but also that some states already involved in such activities would have to give them up. Giving up reprocessing facilities would not involve economic penalties, as reprocessing is uneconomic, and broadly understood to be so.² Enrichment is a more difficult proposition, as enrichment is a necessary part of the nuclear fuel cycle.

A number of countries operate small enrichment programs to which they are strongly attached, even though they may be uneconomic compared with available services elsewhere. Just to mention the idea of Brazil, Argentina, and South Africa giving up enrichment, not to speak of Iran, is to grasp the difficulty in effecting the change that is required. But that is what it would take to restrict enrichment activities to a small number of countries in order for nuclear power to operate with a reasonable safety margin from the point of view of proliferation. It will not be sufficient to adopt the standard political course in similar situations, which is to limit restrictions to yet-to-be-built facilities and grandfathering the existing ones. That is a recipe for a creeping retreat to an increasingly unstable state of affairs in which many countries are a short step from nuclear weapons, one they could likely take before their neighbors could react.

There may be other creative solutions to the problem of restricting enrichment activities. One is that the IAEA set a much higher safeguards standard in approving facility attachments. Another, in view of the very high cost even small enrichment facilities impose on the safeguards system, is that countries be assessed a substantial fee in the form of a safeguards surcharge that realistically covers the cost of inspection and surveillance. Perhaps in the end we will return to the central wisdom of the Acheson-Lilienthal plan and find some way to internationalize enrichment activities. It remains an open issue.

A final note on reprocessing: the Fukushima accident has so reshuffled the politics of nuclear power in Japan that it is conceivable that the country will abandon its large new Rokkasho reprocessing plant. Japan's nuclear retrenchment has made clear that the plant is a white elephant. If Japan abandoned it, this would have tremendous symbolic significance for other countries' decisions, as of course would an opposite decision to operate it.

3. Highly intrusive inspections

One thing is clear about nuclear energy—its widespread use is too dangerous for it to take place under conditions of unlimited sovereignty. Yet from the beginning of international inspection the

international community has tried to limit its intrusions on sovereignty to a minimum. In his 1953 Atoms for Peace speech, President Eisenhower spoke of the “great virtue” of starting with small projects because these could avoid “the irritations and mutual suspicions incident to any attempt to set up a completely acceptable system of world-wide inspection and control.” But these small projects were, as the British say, the thin end of a nasty wedge. The IAEA’s inspections, when first instituted, were infrequent and specifically limited to listed facilities, and the inspectors were instructed to ignore anything outside their limited purview. Later, in the negotiations over the NPT, the Germans and Japanese insisted on and obtained Treaty language limiting IAEA inspections to “strategic points.” In time the inadequacies of this approach became evident and the inspection process was upgraded, most particularly after the 1991 Gulf War when it came to light that the IAEA had missed Iraq’s nuclear weapons program. But each inspection upgrade revealed that the system was still insufficient to provide reasonable protection against diversion from listed facilities and even more so from clandestine ones.

The IAEA’s Additional Protocol, which gives the IAEA authority for wider inspections, is a step in the right direction. It acknowledges the danger of clandestine nuclear facilities and allows IAEA inspectors to look for them outside the specific facilities designated in the country agreements with the Agency. However, the Additional Protocol still does not allow the Agency to perform the true snap inspections—at any place and any time—that the IAEA inspectorate wants most. There is provision in the IAEA agreements for “special inspections” outside the facilities normally inspected, but the IAEA has so far been timid about using this authority. There is another problem with the Additional Protocol: To make the arrangement more acceptable to the countries inspected, and to reduce the resource requirements, the Additional Protocol reduces the frequency of routine IAEA on-site inspections of listed facilities. For example, after adoption of the Additional Protocol, stocks of spent fuel would be inspected once a year instead of every three months. It is possible that remote monitoring could help compensate for the lengthier on-site inspection intervals but, again, the direction of inspections should be to increase their frequency and coverage rather than to reduce them.

It needs to be remembered that at this point the whole Additional Protocol arrangement is voluntary. Almost all countries have signed it, but in a number of cases the Additional Protocol has not entered into force, including in Algeria, Belarus, India, Iran, Iraq, and Serbia (as of April 2012). Argentina, Brazil, Egypt, North Korea, and Syria have not signed.

As for funding more intrusive inspections, it would make sense for the IAEA to impose safeguard fees. These fees should reflect the number of declared nuclear facilities subject to inspection and the number of man-years required to properly inspect them.

Finally, a problem that is not immediate but is bound to arise in the future concerns the NPT safeguards exclusion for materials used in “non-prohibited military applications,” which principally means naval reactor fuel. This is a potentially large loophole in the NPT that at a

minimum needs to be narrowed, and perhaps eliminated altogether, just as use of “peaceful nuclear explosives” was in effect eliminated from the Treaty.

4. Predictable NPT enforcement

As Fred Iklé pointed out in a 1961 Foreign Affairs article, for a control agreement like the NPT to be effective the penalties for violating it need, in the eyes of the countries subject to it, to outweigh any advantages that flow from a violation. It is an obvious point, but one often overlooked. It means that for restrictive agreements to work there has to be a sufficiently high probability of both the timely detection of the violation *and* subsequent adverse consequences for the violator. The NPT contains the first element, at least in principle, but not the second. There is a Treaty mechanism for detection of violations by means of IAEA inspections, augmented by national intelligence, and if it is not overstressed by too many facilities it could adequately perform the detection role. But there is no mechanism for enforcement other than referring the matter to the Security Council. Nor is there a permanent secretariat attached to the Treaty to take up such matters. It is a gap in the Treaty that in any particular circumstances of a serious violation is left to be filled, or not, by members on an ad hoc basis. As a practical matter, Treaty enforcement depends on the reaction of the United States, whose involvement has proved critical to any international response.

Historically, just as we have tried to keep international inspections to a minimum, we have also tried to avoid the political burdens associated with gaining agreement on explicit and predictable enforcement. At least that has been so since Bernard Baruch’s addition of what he called “swift and condign punishment” to the original Acheson-Lilienthal plan finished off that proposal for international control of nuclear energy. Since then, the United States has preferred a more flexible, ad hoc approach, preferably one that operated out of the public eye. During the Cold War there was an implicit assumption that each of the two blocks would police its client states. The United State did that, for example, when in the mid-1970s it forced Taiwan and South Korea to dismantle their clandestine nuclear weapons efforts.

The record of ad hoc enforcement is, however, decidedly mixed. Political considerations sometimes intervened to deflect U.S. interest in pursuing enforcement of nuclear agreements, and even to pretend there was no violation at all, as was the case in the mid-1960s when it appeared that Israel had stolen highly enriched uranium from a U.S. facility in Pennsylvania, or when India used U.S. heavy water covered by a “peaceful uses” agreement to produce plutonium for its 1974 bomb, or in 1979 when Israel conducted a bomb test in the ocean off South Africa in violation of the Limited Test Ban Treaty of which it was a charter signatory. These cases were not *NPT* violations, as India and Israel were not Treaty members, but they did involve major violation of agreements and U.S. law, and so the lack of responses is significant for our discussion.

Perhaps even more significant was the way the United States responded to the DPRK's 1992 direct violation of the Treaty's inspection provisions by refusing to permit essential IAEA inspectors to check on suspected illicit reprocessing. The U.S. reaction in that clear case was blunted in part out of concern that North Korea might exercise the NPT's withdrawal provision and thereby undermine the then-upcoming 1995 NPT Review Conference. Extension of the Treaty took precedence over enforcing it. Subsequently the United States arrived at a very generous agreement with North Korea—the so-called Agreed Framework—that in effect shielded the country from compliance with the NPT. That agreement fell apart in 2002 and Pyongyang announced its departure from the Treaty anyway (on one day's notice, on the tenuous argument that the North had already given 89 days' notice in advance of the Agreed Framework agreement).

The formidable sanctions regime led by the United States against Iran, principally out of concern that its enrichment activities are a prelude to bomb making, is perhaps a counterexample, as it reflects a tough response. But the issues over Iran's nuclear program have not been framed in terms of the NPT but rather in terms of U.S. and, principally, Israeli security. The sanctions have been accompanied by a clandestine sabotage and assassination campaign and extensive discussion regarding the possible bombing of Iranian nuclear facilities by Israel, the United States, or both. The impression left around the world is that the United States is very selective in its anti-proliferation efforts. Would, say, Saudi Arabia be dissuaded by the example of Iran?

What is needed—as Pierre Goldschmidt, a former IAEA Deputy Director General for Safeguards, recommends—is a country-neutral, reasonably predicable, more-or-less automatic sanction regime that puts all countries on notice in advance of a possible announcement of withdrawal from the Treaty, or a violation, including major violations of IAEA safeguards agreements. Improving the ability to detect possible violations will hardly deter violators if they know that little or nothing will be done quickly enough to stop their bomb making, or ever. As Fred Iklé also wrote, “a nation contemplating a violation will not be deterred if it thinks it can discourage, circumvent, or absorb our reaction.”

5. Weapons reductions for all

As everyone knows the NPT requires the nuclear weapons state parties to negotiate reductions in nuclear arms. Up to now, all of the nuclear arms control reduction agreements have been between the United States and Russia, both of which have made substantial reductions. That process now has to extend to the other NPT weapons states—China, France, and the UK—who are also bound by the Treaty. For one thing, as the number of U.S. and Russian deployed nuclear weapons declines, the relative importance of the other nuclear weapons states' arsenals increases. It is natural for them to insist that the United States and Russia need to come down to the Chinese-French-British level before they will engage, but that likely isn't going to work. If there

is to be a continuation of the nuclear weapons reduction process there will have to be some form of proportional reductions.

The thorniest problem for the Treaty concerns the three nuclear weapons states outside the NPT—India, Israel, and Pakistan. It is obviously unacceptable that NPT parties should disarm while these states, in effect NPT outlaws, should not. A way of approaching the issue is to start by declaring the Treaty as universal and applying to all states whether they adopted it or not. After all, a treaty that is adhered to by 190 countries comes as close to meriting that status as any ever will. What this would mean as a practical matter is that the members of the Treaty would announce that they will treat the non-signers as states out of compliance with the Treaty. But—to take a positive approach—they could then offer these holdouts a path toward compliance. If these three states would join in the nuclear arms reduction process (Israel would of course have to acknowledge its weapons status), and otherwise comply with NPT provisions on their nuclear facilities, they could be regarded as states out of compliance with the Treaty but on their way toward compliance.

A first step here would be for all weapons states to announce their inventories of weapons and weapons materials. Verification of these declarations would eventually have to follow.

Conclusion

In presenting what needs to be done to make it possible to generate nuclear energy without spreading the bomb, we do not play down how difficult—and perhaps impossible—it would be to obtain broad agreement on these points. The alternative is to continue to try to muddle through, trying as best we can to retard proliferation by relying on the existing measures and patching things up where we can. The challenge would depend on the extent to which nuclear power use expanded worldwide. Without much of an increase in installed nuclear capacity, or even a decrease if new construction does not compensate for the decommissioning of old plants, it is easier to imagine that present means might hold the line. The extent to which the opposite happens—a large increase in nuclear energy use, or perhaps more significantly, a large increase in the number of countries relying on it—depends mainly on the economics of nuclear power. But adverse economics are not necessarily decisive, for as we know, governments provide substantial subsidies to nuclear power projects, and exporters are eager to provide whatever financing they can to promote sales.

The United States remains committed to increasing the world's dependence on nuclear power. In his 26 March 2012 speech at South Korea's Hankuk University, President Obama called for "a renewed commitment to harnessing the power of the atom not for war, but for peaceful purposes." He predicted, "With rising oil prices and a warming climate nuclear energy will only become more important." But do we want to realize that prediction without first nailing down the means for making sure peaceful nuclear activities stay that way?

The principal argument advanced for a commitment to a nuclear future, and for providing the necessary subsidies, is that nuclear power is the answer to a “warming climate,” or at least an important part of the solution.³ But to gain that advantage—to make a serious dent in the global warming problem—would take a great number of nuclear plants, over a thousand and perhaps thousands. There is not much gain on this score, and essentially none in the vicinity of the plants themselves, from building a *small* number of nuclear plants. That only makes sense if the initial small number of nuclear plants is the vanguard for a great many more.

The question we have to ask ourselves, therefore, in evaluating U.S. policy that supports increased worldwide use of nuclear power to combat global warming, is not only whether we can cope with the proliferation side effects of current and planned nuclear plants, but whether we can do so with a much larger number. The latter is a much chancier gamble on the future because we don’t yet have a universal system in place to maintain a suitable safety margin between power applications and possible weapons programs.

There is another consideration. Interest in nuclear weapons may be waning in the United States, but in many countries their allure is increasing. The spread of nuclear power facilities and materials and skills would bring many countries much closer to a weapons capability.

In his Hankuk University speech the President spoke of his goal of “a world without nuclear weapons.” How long would such a world last if the lack of a proliferation safety margin allows dozens of countries to come within easy reach of a bomb?

If the “realists” are right that we are not able to mobilize support for a strong nonproliferation regime, why are we promoting policies that will further stress the weak one we have? In 1976 President Ford said countries should postpone plutonium use until “the world community can effectively overcome the associated risks of proliferation.” That thought could be usefully extended to nuclear power itself.

Endnotes

1. For a technical discussion of the security risks associated with even the most proliferation-resistant reactors, see: Victor Gilinsky, Marvin Miller, and Harmon Hubbard, “A Fresh Examination of the Proliferation Dangers of Light Water Reactors,” *Nonproliferation Policy Education Center*, October 22, 2004, [http://www.npolicy.org/article.php?aid=172&rt=&key=fresh%20examination%20of%20lwr&sec=article&author=.](http://www.npolicy.org/article.php?aid=172&rt=&key=fresh%20examination%20of%20lwr&sec=article&author=)

2. President Obama muddied the waters in a March 26, 2012 speech in South Korea by saying “*We need an international commitment to unlocking the fuel cycle of the future.*” To the nuclear community these words mean “closing the fuel cycle” by reprocessing spent fuel and recycling plutonium. Now of course in serving up the fuel cycle of the future the Energy Department and its laboratories claim they are putting high priority on proliferation resistance and are developing exotic forms of reprocessing that will make it impossible for anyone to illicitly access separated plutonium, which is presumably why the President endorsed the idea in his speech. In practice, the proposition is quite different. A few years ago one of us (VG) served on a National Academies committee review of this subject (published in Review of DOE’s Nuclear Energy Research and Development Program, National

Academies, 2008.) It was clear that DOE didn't have the technology for proliferation-proof plutonium recycle, and that if they came up with something the cost would be astronomical. Despite this DOE wanted to start a crash program to build full-scale reprocessing plants. The reason the nuclear R&D people want reprocessing is that it is the key to essentially all the advanced reactor designs that they want to work on. But if we are serious about nonproliferation we shouldn't be supporting any of this.

3. Those making this argument assume that nuclear power is the easiest, quickest way to reduce carbon. This, however, is unclear. For more, see Doug Koplow, "Nuclear Power as Taxpayer Patronage: A Case Study of Subsidies to Calvert Cliffs Unit 3," *Nonproliferation Policy Education Center*, July 9, 2009, <http://npolicy.org/article.php?aid=179&rt=&key=koplow&sec=article&author=>; and John W. Rowe, "Energy Policy: Above All Do No Harm," presentation at the American Enterprise Institute, May 8, 2011, Washington, DC, http://www.exeloncorp.com/assets/newsroom/speeches/docs/spch_Rowe_AEI2011.pdf.