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Controlling the Further Spread of Nuclear Weapons

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INTRODUCTION

The replacement for the Strategic Arms Reductions Treaty (START), which presidents Barack Obama and Dmitry Medvedev signed in April 2010, marks the first legally binding arms control agreement to be reached in nearly twenty years. At the Nuclear Nonproliferation Treaty (NPT) review conference in May 2010, where the topic of nuclear disarmament will be discussed, the elimination of nuclear weapons will be viewed as a practical possibility. While this prospect can be easily dismissed as an optimistic or fleeting trend, it should instead be harnessed as a means to bolster international security, or at least not to make matters worse. This requires both sound insights into what is and is not possible, and in Washington, sensitivity to an increasing number of contentious political views regarding nuclear controls.

A significant stumbling block to securing tighter limits on dual-use nuclear activities and to further reducing nuclear weapons is how heavily the Obama administration nuclear agenda depends on the successful negotiation and ratification of legally binding bilateral and international control agreements. These formal agreements include arms reduction treaties to follow New START, the Comprehensive Test Ban Treaty (CTBT), a fissile material cutoff treaty (FMCT) banning further military nuclear production, and a variety of multilateral and international nonproliferation and nuclear fuel supply arrangements. These formal legal devices are, at best, an awkward way to secure the support of administration critics in Congress, who are skeptical of traditional nuclear control. Nor are any of these treaty-based agreements—some of which require ratification by North Korea, Iran, Pakistan, India, Egypt, and China—likely to fully come into effect any time soon.

This suggests that it would be useful to develop a more practical set of control measures that are not at odds with the current agenda, but are more likely to secure bipartisan support and can begin to be implemented without the legal consent of other states. Fleshing out this agenda requires clarifying the character of the long-term nuclear threats the United States and its friends are likely to face, and identifying which ones are most tractable.

WASHINGTON'S CURRENT AGENDA

After the replacement agreement for START (New START), Obama administration officials hope to reach additional nuclear weapon reduction agreements not only between the United States and Russia, but with the other nuclear weapon states as well. The expectation is that these agreements will then persuade nonnuclear weapon states to steer clear of dangerous civilian nuclear fuel activities and open their facilities to more rigorous international inspections.

Such nuclear hopes, however, are unlikely to be fully realized. Barring regime change in North Korea or Iran, neither Pyongyang's nuclear disarmament nor Tehran's cessation of nuclear weapons–related activities are probable. As for further reductions in existing nuclear arsenals, some further ones may be possible, but capturing Russia's much larger number of tactical nuclear weapons will not come easily or quickly. The odds of China, India, Pakistan, North Korea, and Israel agreeing to nuclear warhead reductions in the near future are even more remote.

Assuming current nuclear trends continue, international security could be easily tested in the next two decades as it has never been before. Prior to 2020, the United Kingdom could find its nuclear forces eclipsed by those of Pakistan, Israel, and India; soon thereafter, France could share the same

fate. China, which already has enough separated plutonium and highly enriched uranium to triple its current stockpile of roughly three hundred nuclear warheads, could also expand its nuclear arsenal. Meanwhile, Japan, which has the equivalent of two thousand bombs of separated plutonium on its territory, will soon operate a reprocessing plant that could add to it the equivalent of 250 nuclear bombs of plutonium each year.[1] U.S. and Russian weapons-usable fissile material stocks—still large enough to be converted back to many tens of thousands of weapons—will experience only marginal declines, while similar stocks in the other nuclear weapon states and Japan could easily double.[2] Compounding these developments, over thirty states have expressed their desire to build large reactors of their own. If fully realized, this is almost certain to increase the spread of nuclear weapons–related related materials and expertise to an even larger number of states.[3]

None of these trends in arsenals, fissile material stocks, or nuclear power is likely to bolster the cause of eliminating nuclear weapons. Even success with the current battery of U.S.-backed arms control measures—including ratification of major U.S.-Russia arms reductions treaties (New START and possibly others), CTBT, FMCT, and agreements that establish international civilian nuclear fuel banks and enhanced international inspections of civilian nuclear programs—is unlikely to be sufficient to avoid these troubling trends. Moreover, these arms control measures, if executed too hastily, could conceivably make matters worse in several ways.

- Congressional critics of bilateral strategic arms reductions with Moscow warn that if New START is superseded by reductions to one thousand or fewer strategic nuclear warheads, it might undermine the credibility of U.S. nuclear security guarantees to key allies. As a result, states like South Korea, Japan, and Turkey might be tempted to develop nuclear arsenals of their own.[4]
- Too hasty a push for CTBT ratification might also backfire. Several of India's top nuclear scientists recently had a contentious public debate over whether India needed to resume nuclear testing. One central argument for resumption is to preempt what some in India fear is an approaching deadline. Meanwhile, American test ban opponents have urged the U.S. Senate to tie the treaty's testing limits to what other states, namely Russia, believe is allowed. Some Russian officials have argued that extremely low-yield nuclear tests are permissible under the treaty. If so, pegging the treaty's prohibitions to such a standard could risk authorizing limited nuclear tests.[5]
- Securing a nondiscriminatory global ban against the "military" production of separated plutonium and enriched uranium for nuclear weapons could also be problematic. The proposed treaty only bans the production of fissile material for military purposes. Civil production is allowed. Yet the odds of inspectors catching military diversions from such "peaceful" fuel activities are quite low.[6] The hope is that most nuclear weapon states might lack incentives to cheat since the treaty would allow them to retain their military holdings. But if the treaty came into effect, it is difficult to see how its nuclear members would be able to deflect demands from nonnuclear weapon states for equal treatment—to be allowed to make nuclear fuel and have their nuclear production plants be inspected no more carefully than those of weapons states. One proposal to address this problem is to afford nonnuclear weapon states access to international civilian nuclear fuel services. Unless these states are in violation of existing nuclear rules, though, they already have access to such services from a variety of providers.
- With the growing popularity of civilian nuclear energy, nuclear supplier states claim that exporting new power reactors will not increase proliferation since these products will be coupled with the application of "enhanced" nuclear inspections. Yet, in the most worrisome cases—Syria, Iran, Al-

> geria, Egypt, Saudi Arabia, and Myanmar—even enhanced inspections may be too unreliable to effectively deter or prevent significant military diversions. At present, international nuclear inspections are failing to maintain continuity of inspections over most of the world's spent or fresh fuel—materials that can be used to accelerate the production of weapons-usable fissile material at enrichment and reprocessing plants. These nuclear fuel facilities, moreover, can be hidden from inspectors and, even when declared, be used to make weapons-usable fuel without nuclear inspectors detecting such activity in a timely fashion. For all of these reasons, it must be clear that any recipient of a large reactor—even a reputed "proliferation-resistant" light-water reactor—is entirely out of the nuclear bomb–making business and is likely to stay out of it.[7]

Several of these points are beginning to receive attention in the United States, but the debate needs to be broadened. Even if the favorite nuclear control initiatives in Washington and Europe—New START, CTBT, FMCT, civilian nuclear fuel banks, and intrusive nuclear inspections—are all adopted and implemented in ways that avoid the aforementioned risks, the United States and its allies would still face a series of additional, major nuclear proliferation threats. Some of these threats are more probable than others, but all likely enough to require that U.S. decision-makers attend to them now.

NUCLEAR REDUCTIONS AND THE NEXT ARMS RACE

Perhaps the least explored risk for potential proliferation is that as the United States and Russia incrementally reduce their nuclear weapons deployments, China, India, Pakistan, and Israel may continue to increase theirs. At the outset of New START negotiations last year, President Barack Obama is reported to have originally sought to reduce the number of operationally deployed strategic warheads to one thousand each. Although New START limits the United States and Russia to roughly 1,550 warheads, leading arms control experts are already calling for the two countries to reduce their deployments to one thousand by 2020.[8] Assuming Obama achieves this objective in subsequent negotiations, it would open up the possibility that sometime after 2020, the difference in operational weapon levels separating the United States and Russia from other nuclear weapon states would be measured in the hundreds rather than thousands.

In such a world, relatively small changes in any state's nuclear weapons capabilities could have a much larger impact on the perceived balance of power than it does today. Compounding the increased volatility that this set of trends might produce are the large and growing stockpiles of weapons-usable fissile materials—separated plutonium and highly enriched uranium—held in several states. In the United States and Russia, these stockpiles already exceed the equivalent of the material in tens of thousands of crude bombs, and they are projected to grow in Pakistan, India, China, Israel, and Japan. This will enable all of these states to increase their current nuclear deployments more quickly and dramatically than any of the superpowers could during the worrisome early years of the Cold War.

Twenty years from now there could be more "threshold" nuclear weapon states—countries that could acquire nuclear weapons in a matter of months, like Japan and Iran. If the projected thirty states all realize their dreams of bringing their first power reactors online by 2030, it would double the approximately thirty states that currently have such programs, most of which are in Europe.

If even a portion of this civilian nuclear expansion is realized, it could have major military implications. Every current weapon state brought a large reactor online prior to acquiring its first bomb. The United Kingdom, France, Russia, India, and the United States made a significant portion of their nuclear weapons plutonium and tritium from reactors that also provided power to their electrical grids.[9] The United States still uses a "proliferation resistant" light water power reactor operated by the Tennessee Valley Authority to make all of the weapons-grade tritium for its nuclear arsenal.[10]

In addition to large power reactors, other facilities would be needed to chemically separate the plutonium in reactor fuel or enrich the uranium used to power such machines. Yet as the recent cases of Algeria, Libya, Iran, Syria, Iraq, and North Korea demonstrate, large nuclear facilities can be built in ways that are difficult to detect. Both experience and analysis suggest that they could even be operated in ways to make timely detection of illicit production unlikely.[11] If the planned civilian nuclear power programs for the Middle and Far East get completed, the world in 2030 would be a far less stable place. Instead of eight confirmed nuclear weapon states, most of which the United States now claims to recognize as allies, there could be several additional nuclear weapons–capable states—Algeria, Turkey, Saudi Arabia, Syria, and Egypt—able to acquire nuclear weapons in as little as twelve to thirty-six months. Security-challenged states like Taiwan, South Korea, Iran, and Japan are already to this point.[12]

In such a world the United States and its allies might know who their friends and potential adversaries might be, but they would have difficulty knowing what countries might do in a crisis—close ranks, develop their own weapons options, or follow the lead of some other nuclear weapons–capable nation. As for possible adversaries, it would be difficult to determine just how lethal their military forces might be.

Finally, these nuclear trends would surely aggravate prospects for nuclear terrorism. Not only would there be more opportunities to seize nuclear weapons and related materials, there would be more military and civilian nuclear facilities to sabotage. In addition, the potential for miscalculation and nuclear war could rise to a point where even nonnuclear acts of terror could ignite larger conflicts that could turn nuclear.

This sort of international volatility could easily mimic that which preceded the First and Second World Wars, periods in which overly ambitious arms control agreements were sought while states raced to complete significant covert and overt military programs. Ultimately, the latter only heightened tensions and subsequently resulted in unrestricted warfare. But if such wars break out in the future, a major difference would be that the ammunition in these conflicts might not just be highly explosive, but nuclear.

PRINCIPLES FOR THE FUTURE

The United States and like-minded countries can avoid or mitigate these trends, but only if they adhere more closely to several basic principles.

Maintaining Stability in a World With Fewer Nuclear Weapons

As nuclear deployments decline, greater care must be taken to ensure military reductions or additions actually decrease chances for war. If U.S. nuclear security guarantees are to continue to neutralize the desires of important allies from developing their own nuclear weapons, then Washington must avoid

undermining the correlation of forces it currently enjoys against U.S. nuclear competitors. In addition to reducing to roughly equal nuclear numbers with Russia, in the near to mid-term the United States and the North Atlantic Treaty Organization (NATO) will have to keep nuclear-armed states such as China from trying to catch up with the United States or Russia, and—in the case of India and China, Pakistan and India, and Japan and China—from catching up with each other.

This means that agreements on additional nuclear restraints, either in the form of nuclear weapons reductions or further limits on the production or stockpiling of weapons-usable fuels, will need to be reached not only with Russia, but with China, India, and Pakistan. As a practical matter, other undeclared nuclear states, like Israel, and producers of civilian nuclear weapons–usable fuels, like Japan, must be asked to curtail or end their production, or to dispose of some portion of what they currently have.

To maintain the relative parity of competing nuclear-armed states through nonnuclear military assistance or build ups, conventional arms must be substituted for nuclear ones in a manner that avoids increasing the incentive for one or both sides acquiring more nuclear weapons. Unfortunately, simply deploying more advanced nonnuclear systems to compensate for forgone nuclear platforms will not necessarily assure this.

Consider the possibilities if more long-range precision strike and advanced command control and intelligence systems are introduced in either India or Pakistan. Islamabad believes it must threaten to use its nuclear weapons to deter New Delhi's superior conventional forces. The Pakistani military, however, is already worried that with the continued acquisition of advanced precision strike systems, India could conceivably use them to knockout Pakistan's nuclear weapons force. As a result, several analysts have voiced concerns that arming India with such weapons without attending to Pakistan's defense requirements would only encourage Pakistan to go on higher nuclear alert and to acquire and disperse more nuclear weapons to keep Indian officials from thinking that they could even knock them out. Exporting the wrong kinds of advanced nonnuclear weapons systems to India or helping New Delhi build them in disproportionate numbers, they argue, could adversely influence Pakistan's nuclear weapons plans.[13]

Ballistic missile defenses could also be problematic. Under the right circumstances these weapons could afford a nonnuclear form of deterrence that might facilitate nuclear weapons reduction. Instead of "neutralizing" a possible opponent's missiles by targeting them with nuclear or nonnuclear offensive weapons, active missile defenses might be used to counter them after launch. They could also be useful as a form of insurance against cheating on any future nuclear-capable ballistic missile reduction agreements. To secure these benefits, though, more than mere deployment may be necessary.

Consider again the case of India and Pakistan. While Pakistan insists it must use its nuclear weapons first in any major war against India, New Delhi would hope to use its conventional forces to capture enough of Pakistan from a "cold start" and get Islamabad to quickly sue for peace. India has also begun to develop missile defense systems of its own to counter both Pakistani and Chinese offensive missile threats.

Under these circumstances, sharing equal amounts of missile defenses with India and Pakistan would only give India yet another nonnuclear military edge against Islamabad. In turn, this risks encouraging Pakistan to beef up its offensive nuclear missile forces even more. The only way to secure the benefits of missile defense for both countries is to address the underlying conventional asymmetry between them.

Regional security experts have long favored the creation of low, medium, and high conventional deployment zones on both sides of the Indo-Pakistani border to equalize the ability of each country to launch quick conventional attacks against the other. The elimination on both sides of existing short-range ballistic missiles constitutes a central element of these proposals, since their use could prompt nuclear reactions. If such military confidence-building measures were implemented, they might be effective enough to attenuate the perceived stability risks of deploying more advanced and discriminate nonnuclear military systems.[14]

Other measures might be required elsewhere. As China increases its nuclear and nonnuclear missile superiority over Taiwan and its capability to target U.S. carrier groups with advanced conventional ballistic missiles, the United States and its Pacific allies must worry that Beijing may be able to overwhelm the missile defenses on which they are now working.[15] Meanwhile, China is developing ballistic missile defenses of its own to counter possible U.S. nuclear and precise conventional intercontinental ballistic missile attacks. Countering offensive Russian ballistic missiles may also be a Chinese concern. These missile concerns suggest that diplomatic efforts should focus on reaching offensive ballistic missile limits in Asia, to assure that whatever missile defenses are deployed, they will not immediately be overwhelmed. Several precedents exist:

- the Strategic Arms Reduction Treaty, which limited U.S. and Russian strategic ballistic missile delivery systems
- the Intermediate Nuclear Forces (INF) Treaty, which covers Russian and NATO missiles with ranges between 500 and 5,500 kilometers
- the Missile Technology Control Regime (MTCR), which limits commerce in missiles capable of lifting 500 kilogram payloads more than 300 kilometers

New ballistic missile limits must be aggressive enough to include the ballistic missiles that matter, so as to reduce the need or desire to deploy more nuclear warheads without creating new categories of permissible missiles. It makes little sense to eliminate the class of ballistic missiles with ranges beyond five hundred kilometers only to end up legitimizing slightly lower-range missile systems that are above the limits restricted by the MTCR.

Yet another related concern in limiting offensive ballistic missiles while making room for the deployment of missile defense systems that rely on ballistic missile interceptors is to ensure that the proliferation of missile defense systems does not result in the further spread of large ballistic missiles or related technologies. A good start would be prohibiting the export of ballistic missile-based defensive systems that employ rockets in excess of the Category One missile limits in MTCR on missiles capable of lifting five hundred kilograms payloads more than three hundred kilometers. Alternatively, agreements might be reached to encourage states to move away from missile defense systems that rely on large ballistic missile systems and toward alternatives like small boost-phase missile interceptors on drones and directed energy systems. In either case, the same goal would remain—assuring efforts to reduce the nuclear threat do not end up aggravating it.

Strengthening the Link Between Arms Reductions and Nonproliferation

If the United States is to diminish the nuclear threat, the reduction of existing nuclear weapons and nuclear-capable delivery systems needs to be related more closely to preventing their further spread.

Currently the connection between reducing nuclear arms and preventing their spread is mostly symbolic. As the United States and Russia reduce their operationally deployed strategic weapons, conventional wisdom suggests other nuclear armed states will follow. This, in turn, should persuade nonnuclear weapon states to submit to much more intrusive inspections of their civilian nuclear activities.[16] Putting aside the hard cases of Iran and North Korea, this line of reasoning ignores important technical developments and relies on questionable political assumptions.

After the International Atomic Energy Agency (IAEA) failed to detect covert nuclear programs in Iraq, Iran, Syria, Libya, and North Korea, it remains questionable if even "enhanced" international nuclear inspections would be able to reliably detect future illicit nuclear activities. This is especially true if large civilian nuclear programs spread in regions, like the Middle East, where a number of IAEA members—Algeria, Egypt, Syria, Iraq, Libya and Iran—have either been uncooperative with IAEA inspectors or have been found to have been in noncompliance well after a violation.

The United States, as well as Israel, Japan, NATO, India, Russia, and China, all plan to deploy ballistic missile defense systems, albeit each for different reasons. However, the approaches to controlling nuclear strategic threats taken by the United States and its allies do not yet clearly specify whether these defense programs should be promoted or restricted and, if so, how. Outside of strategic reduction talks with Russia, there exists little discussion of whether or how other states' development of ballistic missiles—both nuclear and nonnuclear—should be approached.

The success of U.S. and allied nuclear arms control and nonproliferation policies also depends on

- the likelihood that Russia will agree to strategic reductions beyond those detailed in New START;
- whether Russia will agree to limit its nonstrategic nuclear weapons;
- what requests Moscow will make in return for such reductions;
- whether Russia will demand the United States and NATO eliminate conventional and missile defense plans;
- when, if ever, such agreements might be reached; and
- whether the United States and Russia could reduce their nuclear weapons arsenals sufficiently to pressure or attract other states, namely China, to join in subsequent arms reductions talks.

The above issues raise questions about enforcement, namely the likelihood that states without nuclear-capable missiles or weapons will refrain from attempts to acquire them in the absence of new penalties or risks. Certainly, the greater Middle East is watching what, if anything, the United States and its allies will do to penalize Iran for its nuclear misbehavior. Many states in the region—including Turkey, Egypt, Jordan, Saudi Arabia, and the United Arab Emirates—are already hedging their nuclear bets by announcing plans to acquire "peaceful" nuclear programs of their own. Meanwhile, South Korea and Japan share similar apprehension in relation to North Korea's repeated violation of its nuclear nonproliferation pledges. Both are developing missile defenses, long-range strike options, and nuclear fuel–making capabilities. Beyond the lack of strong penalties for nuclear activities in Iran and North Korea, there is a general concern that current enforcement of nuclear nonproliferation limits lacks teeth and over what, if anything, will be done to prevent future nonproliferation violations by these or other states.

These questions all suggest the need for an additional set of arms control and nonproliferation measures to complement those the United States and the European Union are currently pushing. These efforts may or may not succeed, leaving room for more immediate, incremental limits to complement them. A number of possibilities exist.

Controlling Fissile Material

To date, the United States has given only basic guidance on how it intends to reduce the production of weapons-usable fissile material (highly enriched uranium and separated plutonium). President Barack Obama has called for the negotiation of a fissile material cutoff treaty. But most versions of this agreement explicitly allow civilian nuclear fuel production, which is nearly identical to military production. Also, after decades of fruitless talks in Geneva, it is unclear if such an agreement could ever be negotiated, much less brought into force.

Some officials, including those advising Secretary of State Hillary Clinton, have suggested a complementary approach known as the Fissile Material Control Initiative. Instead of a binding treaty, both weapon and nonweapon states under the Nuclear Nonproliferation Treaty (NPT) would simply identify what portion of their separated plutonium and highly enriched uranium stocks were in excess of either their military or civilian requirements, and then secure or dispose of them.[17] Accessing the surpluses that states declare could be made more difficult by requiring the prior consent of parties participating in the initiative.[18]

Another practical idea would be to ensure that the U.S.-India civilian nuclear cooperation agreement does nothing to help New Delhi make more nuclear weapons–usable fuels than it was producing when the deal was finalized, in late 2008. Under the NPT, the states that had nuclear weapons in 1967—the United States, Russia, France, the United Kingdom, and China—committed to refraining from direct or indirect actions that would help another state acquire these weapons. Meanwhile, under the Hyde Act, which authorized the U.S.-India civilian nuclear deal, the White House is routinely required to report to Congress on how much uranium fuel India is importing, how much it is using to run its civilian reactors, how much uranium it is producing domestically, and the extent to which the operation of its unsafeguarded reactors is expanding its stockpiles of plutonium with either the direct or indirect help of NPT nuclear weapon states.[19]

If India's unsafeguarded plutonium stockpiles grow faster per year than was the case prior to the finalization agreement, and it could be shown to be related to Indian uranium imports from one or more of the NPT weapons states, the latter would be in violation of Article I of the NPT. To prevent such a situation or limit the harm it might do, the United States should alert all other nuclear supplying states and ask them to suspend civilian nuclear assistance until India's unsafeguarded weapons-usable fissile material production declines. The logical place to make this request would be the Nuclear Suppliers Group (NSG). Such vigilance should also be matched with efforts to keep Pakistan from expanding its nuclear weapons capabilities.

Finally, the United States, China, Japan, and South Korea could reconsider the merits of expanding "civilian" recycling of plutonium-based fuels. As has already been noted, Japan is about to open a commercial plutonium reprocessing plant in Rokkasho. Projected to cost over $100 billion over its lifetime, the plant is designed to produce roughly 250 Nagasaki-sized bombs worth of plutonium each year. Although it was intended to produce plutonium-based fuels for a large breeder reactor

program, the Japanese breeder effort has fallen many years behind schedule. As a result, the many tons of plutonium that will be produced at Rokkasho are likely only to add to what Japan already has stored on the site, enough plutonium to make about two thousand bombs. Technical difficulties have already delayed the plant's opening several times, but Japanese officials hope to bring it online later this October.

South Korea, meanwhile, sees Japan's plutonium recycling effort as a model. Seoul, which the United States has previously caught trying to use its civilian nuclear program to make plutonium weapons, now wants to revise the civilian nuclear cooperative agreement with Washington to allow it to recycle plutonium. China is not far behind. Last year Beijing announced that it had contracted with the French firm Areva to build a plutonium reprocessing plant nearly identical to one the French built for Japan at Rokkasho. Some in the U.S. Department of Energy and Congress believe federal funding of a U.S. commercial reprocessing program ought to be considered.[20]

Nuclear experts have repeatedly determined that none of these plutonium recycling programs are as economical as simply burning fresh uranium fuel and storing the waste above ground. All of them run proliferation and physical security risks. That is why the bipartisan Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism called on the legislative and executive branches of the U.S. government to maintain the moratorium Presidents Gerald Ford and Jimmy Carter imposed on U.S. commercial reprocessing in the 1970s.[21] Discussing the merits of expanding such a moratorium with China, Japan, and South Korea might make sense. In exchange for Japan, the United States, and South Korea refraining from reprocessing, it might be possible to persuade China to do so as well. It may even be possible to get Chinese officials to announce publicly what they have told U.S. experts privately: China has not made highly enriched uranium or plutonium for weapons for many years. If China were to do this, it would make it easier for the United States to exert pressure on India, which sees itself in military competition with China, and Pakistan, which is a close security ally of China, to do the same.

Curbing Nuclear Tests and NPT Violations

Getting the U.S. Senate to ratify the CTBT will not be easy, and it may be many years before this agreement is ever brought into force. It was reported recently that North Korea might test a third nuclear weapon. Last year nuclear scientists in India seriously debated whether and when New Delhi might have to resume nuclear testing to perfect a thermonuclear device. If India tests, then Pakistan would almost certainly follow suit.[22] It may not be possible to rein Pyongyang in, but India, Pakistan, China, Russia, the United States, France, and the United Kingdom have all gone on record previously announcing their policy not to test. Rather than wait for yet another nuclear explosion, all these states should recommit themselves to the moratorium they previously supported. If the United States cannot get them to recommit, the prospects for the United States in bringing the CTBT into force would become even more remote.

Enforcing the moratorium is a separate matter. It would make sense, in this case, to exploit the implicit legal ban in the NPT against testing by nonnuclear weapon states. Since the NPT has been in force, civilian nuclear supplier states have tried through the NSG to bolster the treaty by imposing common sense restrictions on civilian nuclear exports. One recommendation is to secure agreement among NSG members to block further civilian nuclear trade with any NPT nonweapon state that conducts a nuclear test. Given Tehran's dependence on Russian civilian nuclear assistance, this would

be immediately relevant, as Iran is a state that could well be tempted to test its nuclear prowess soon.[23]

Seeking agreement to cut off supplies of nuclear capable missile technology under the Missile Technology Control Regime (MTCR) could complement any NSG agreement. Violators of the NPT and IAEA safeguards, and states that withdraw from the NPT while still in violation, are not prohibited at present from receiving nuclear-capable missile technology and assistance from states that supply missile technology. This loophole could be eliminated by the adoption of an automatic cutoff of MTCR-controlled goods to nuclear violators.

Finally, as missile defense capabilities grow and spread around the world, the treatment of serious NPT control violations should be linked not only to the accessibility of NSG and MTCR goods, but also to the freedom of states to test fly nuclear-capable missiles outside their borders. Under current international law, it is legal for countries that flaunt the nuclear rules, such as North Korea, to fire nuclear capable missiles over Japan toward the United States. Yet such missiles are indistinguishable from those designed to carry nuclear warheads, and their development and testing are inherently destabilizing. If a state is found by the IAEA or the United Nations Security Council to be in violation of its NPT obligations, it should be subject to an international norm against testing nuclear-capable missiles outside of its borders, just as there are international norms against acts of piracy, drug running, and slave trading. States with the technical ability to do so could be given the authority to shoot down such "outlaw" objects once they enter international air space. Similarly, if progress is made on creating additional limits on ballistic missile deployments via a global treaty or understanding, violators should also be banned from receiving controlled missile and nuclear goods and be subject to similar missile testing restrictions until the appropriate authorities have determined that they had resumed full compliance.

Clarifying What Can Be Safeguarded

The presumption inherent in the last recommendation is that organizations such as the IAEA are fully effective in making such determinations at all times when, in fact, they are not. International nuclear inspectors should be encouraged to distinguish between the nuclear activities and materials that they can reliably safeguard against military diversion and those that they cannot. The NPT is clear that all peaceful nuclear activities and materials must be safeguarded—that is, inspected in a manner that can reliably prevent them from being diverted to make nuclear weapons. Most NPT states assume that if they merely declare their nuclear holdings and allow international inspections, they have satisfied this requirement.

In light of these points, the IAEA should concede that it cannot safeguard all of the materials and facilities under its inspections jurisdiction against possible military diversions. This would raise questions about the advisability of producing or stockpiling plutonium and highly enriched uranium to fuel reactors, and beliefs that these materials and activities can be safeguarded. At the least it would suggest that nonnuclear weapon states should not acquire such materials or facilities beyond what they already have. These points are important enough to raise before, during, and after the NPT Review Conference in May 2010.

In this regard the United States and other like-minded countries might independently assess whether the IAEA can meet its own inspection goals, under what circumstances—if any—these goals can be met, and whether they are set high enough. Last year the U.S. House of Representatives ap-

proved legislation requiring the executive branch to routinely make such assessments and report their findings. Similar legislation has been proposed in the Senate.[24]

Encouraging Economic Competition Among All Energy Options

To assure safe and economically competitive forms of clean energy, greater attention should be paid to comparing costs and discouraging the use of government financial incentives for commercial energy projects, especially nuclear power**.** Supporters of nuclear power insist that expansion is critical to prevent global warming, yet they generally downplay or ignore the nuclear weapons proliferation risks associated with this technology's further spread. That said, it may be impossible to prevent the spread of nuclear power if it turns out to be the cheapest, quickest way to provide low- or no-carbon energy. Given the security premium associated with the further spread of nuclear power technologies, though, no government should pay extra to promote it.

Creating additional government financial incentives to build more commercial nuclear plants will only increase the difficulty of accurately comparing them to nonnuclear alternatives. Not only do such subsidies mask the true costs of nuclear power, but they tilt the market against less-subsidized, potentially sounder alternatives.[25] This is troubling since nuclear power continues to enjoy massive government support and the most dangerous practices in civilian nuclear energy—nuclear fuel cycle activities in nonnuclear weapon states and large power reactor projects in politically unstable regions like the Middle East—are poor investments compared to other, safer alternatives.[26]

Governments should open all large civilian energy projects in their countries to competitive, international bidding that includes all energy types. Currently, states that want to build large civilian nuclear reactors limit their consideration to nuclear bids only, rather than opening the competition up to any energy option that can meet a given set of environmental and economic criteria. This practice flies in the face of the Energy Charter Treaty, which the European Union has ratified and Washington supports. This agreement calls on states to encourage open international bidding on large energy projects or transactions. Meanwhile, the Global Energy Charter for Sustainable Development, which the United States and many other countries also support, calls on states to internalize as many external costs—namely those associated with government subsidies and quantifiable environmental costs such as the probable prices on carbon—in determining the costs of large-scale energy projects.

Although these agreements have not yet played a significant role in reducing carbon emissions, they should. The surest way to achieve the quickest and least expensive carbon reductions is to

– include all the relevant government subsidies when pricing various energy options;
– assign a range of probable carbon prices to each option;
– use these figures to determine what the lowest-cost energy source or technology might be in relation to a specific time period; and
– rank each option on the basis of both price and time.

Enforcing total adherence to these principles will be challenging. However, the downsides of not trying far exceed the risks even of partial failure. To this end, Washington should suggest a modest action plan for the Group of Twenty (G20) as a follow-on to the December 2009 Copenhagen Climate Conference. It would include establishing common means of accounting for energy project

costs and consistent international bidding rules. Beyond this, the G20 should give the IAEA notice of any state decisions they believe violate these principles by favoring nuclear power over cheaper alternatives. The aim would be to encourage the IAEA to ascertain the true purpose of such nuclear projects.[27]

As a complementary effort, the world's advanced states could also work with developing countries to create nonnuclear alternatives to address their energy and environmental needs. In the case of the United States this would entail implementing existing law. Title V of the Nuclear Nonproliferation Act of 1978 requires the executive branch to cooperate with developing nations in performing analyses of their energy needs and identifying how they might be fulfilled with energy sources that do not include nuclear fuels. Title V also calls on the executive branch to create an alternative energy cadre of experts to help developing nations explore these options. To date, no president has chosen to implement this law. Congress has indicated that it would like to require country energy analyses—and outside, nongovernmental assessments of them—to be done under Title V as a precondition for any additional U.S. nuclear cooperation agreements.[28] Meanwhile, the United Nations has a nonnuclear renewable energy initiative of its own—the International Renewable Energy Agency (IRENA)[29]—aimed at assisting developing states. As with most of the suggestions already made, the United States and others can emphasize these initiatives without waiting for additional international treaty agreements.

POLITICAL ANALYSIS

The current U.S. arms control and nonproliferation agenda is ambitious. After the recently signed New START agreement, there is little chance any of the other treaties President Obama highlighted in his April 5, 2009, speech in Prague—additional nuclear reduction treaties with Russia or other states, the CTBT, and the FMCT—can be brought into force before the end of his first term, or even before the 2016 presidential elections.

However, the United States can make progress toward achieving the goals of these agreements even if these agreements fail to be finalized if it would take more modest, incremental steps such as implementing existing U.S. law, such as the Hyde Act on India and the Nuclear Nonproliferation Act of 1978 on alternative energy cooperation, conduct energy assessments, and make sure U.S. nuclear cooperation is safeguarded in a manner that affords timely warning of possible military diversions. None of these more modest recommendations require negotiating or ratifying formal bilateral or international treaties. In addition, most of the sanctions recommendations that have been made involve little more than modifying current Nuclear Supplier Group and Missile Technology Control Regime guidelines, something that is done on a routine basis. Assessments of what the IAEA can and cannot safeguard can be done with or without other states' cooperation.

Other suggestions can also be implemented without waiting for consensus or the consent of other countries. The Fissile Material Control Initiative and recommitment to existing nuclear test moratoriums can make it easier to negotiate formal international treaties by setting practical examples. Promoting a moratorium on the further expansion of commercial plutonium reprocessing in the United States and Asia and encouraging the Group of Twenty (G20) to make large energy projects competitive and adopt sound energy accounting rules could save many billions of dollars.

Seasoned U.S. political experts would still rightly be skeptical that either Democrats or Republicans would seize on these ideas until after the elections in November 2010. Until then, few, if any, in

the Democratic Party would have the time or inclination to suggest that their leadership do something different than what is already on the foreign affairs agenda. Meanwhile, Republicans running for office are unlikely to be drawn to anything other than criticizing the Obama administration. Such an environment hardly leaves room for incremental innovation.

However, November 2010 is not far off. After those elections the glow of negotiating New START will have largely worn off and the prospect of not bringing any new treaty agreements into force for many years will replace it. In this environment, Democratic supporters of President Obama may actually seek new ways to demonstrate their support of his nuclear control goals: reducing stocks and production of nuclear weapons and weapons-usable fissile material, nuclear testing, the spread of nuclear weapons–related capabilities, and the risks of nuclear use and theft.

Republicans, on the other hand, are likely to be focused on defeating President Obama in 2012. Assuming that he does not defeat himself, this will force the Republican Party to explain not just what it opposes, but what it supports. Republicans may find fault with the formal treaties President Obama is trying to negotiate and bring into force. The question will be not whether the Republicans support the president's nuclear controls, but rather in what alternative ways they might try to achieve these ends. For different reasons then, Democrats and Republicans could both have an interest in developing an additional list of nuclear controls to those currently in play.

Endnotes

1. The U.S. Department of Energy conservatively defines the amount of material necessary to make a nuclear bomb with a yield equivalent to that dropped on Hiroshima as 4 kilograms of plutonium. Japan currently stores 17,400 kilograms of separated (and thus potentially weapons-usable) plutonium on its territory. For a more detailed analysis of how much less material is required to produce Hiroshima-like yields, see Thomas B. Cochran, "The Amount of Plutonium and Highly Enriched Uranium Needed for Pure Fission Weapons," Natural Resource Defense Council, 1995, http://www.nrdc.org/nuclear/fissionw/fissionweapons.pdf.
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3. World Nuclear Association, "Emerging Nuclear Energy Countries," April 13, 2010.
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8. Tim Reid, "President Obama Seeks Russia Deal to Slash Nuclear Weapons" *The Times*, February 2, 2009; Steven Pifer, Joseph Cirincione, and Clifford Gaddy, "Resetting U.S.-Russian Leadership on Nuclear Arms Reductions and Non-Proliferation," *Brookings Arms Control Series* (The Brookings Institution, January 2010); remarks of Ambassador Thomas Pickering detailed in "China's Nuclear Posture Important for Disarmament," *China Daily*, April 9, 2010.
9. Within the oldest and most significant nuclear states, dual-use reactors run by the government have long been connected to electrical grids to produce nuclear weapons fuels and electricity. In the United States this includes the now-defunct Richland dual-purpose reactor in the state of Washington and the Tennessee Valley Authority's tritium-producing light water reactors. It also includes Russia's RMBK reactors, which made plutonium for Russia's arsenal; France's gas cooled natural uranium and breeder reactors, which did the same for France through the 1980s; India's unsafeguarded heavy water reactors and planned breeder reactors, which currently provide tritium and plutonium for India's nuclear weapons program; and Britain's Magnox power plants, which provided a significant portion of the plutonium for the United Kingdom's nuclear arsenal. Energy Northwest, *50 Years of Public Power* (Energy Northwest, 2007), http://www.energy-northwest.com/downloads/EN_Annual_Report_2007_small.pdf; Global Secuirty.org, "RBMK Reactor," http://www.globalsecurity.org/wmd/world/russia/rbmk.htm; The U.S. Central Intelligence Agency, "The French Nuclear Reactor Fuel Reprocessing Program: An Intelligence Assessment," September 1984, approved for release July 1992, available at http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB184/FR30.pdf; Paul Brown, "First Nuclear Power Plant to Close, *The Guardian*, March 21, 2010; The Nuclear Weapon Archive, "British Nuclear Facilities," http://nuclearweaponarchive.org/Uk/UKFacility.html; and Zia Mian, A.H. Nayyar, R. Rajaraman and M.V. Ramana, "Fissile Materials in South Asia and the Implications of the US-India Nuclear Deal," International Panel on Fissile Materials Research Report, September 2006, available at http://www.fissilematerials.org/ipfm/site_down/ipfmresearchreport01.pdf.
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15. Mark Stokes, China's Evolving Conventional Strategic Strike Capability: The Anti-ship Ballistic Missile Challenge to U.S. Maritime Operations in the Western Pacific and Beyond (Project 2049, September 14, 2009), available at http://www. project2049.net/documents/chinese_anti_ship_ballistic_missile_asbm.pdf.

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21. Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, *The World at Risk* (Vintage Books, Random House, 2008), p. 51.

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23. Although the Nuclear Nonproliferation Treaty does not legally prohibit nuclear weapon states from further testing, if sufficient support existed, an additional agreement might also be sought to expand such trade restrictions to nuclear weapon states as well.

24. Section 416 of the House State Authorization Act of 2010 and 2011, "Implementation of Recommendations of Commission on the Prevention of WMD Proliferation and Terrorism," available at http://www.govtrack.us/congress/billtext.xpd?bill=h111-2410.

25. Doug Koplow, "Nuclear Power as Taxpayer Patronage: A Case Study of Subsidies to Calvert Cliffs Unit 3," July 7, 2009, http://www.npec-web.org/Frameset.asp?PageType=Single&PDFFile=Koplow%20-%20CalvertCliffs3&PDFFolder=Essays.

26. Some Middle Eastern states—such as Algeria, Libya, and states bordering the Persian Gulf have—significant proven reserves of relatively clean burning natural gas, which can be used to produce power and industrial heat for a fraction of the costs of any nuclear system. New methods of drilling for gas are opening up new finds in the region, for example off the coast of Israel. In addition the few states in the region that lack their own natural gas resources are still major pipeline transit points and thus have ready access to this resource at low prices. The fundamental challenge to maintaining these cheaper energy supplies is assuring that the natural gas is not being given away through excessive state subsidies. Meanwhile the growing availability of natural gas in the United States, Europe, and Asia has already reduced demand for liquefied natural gas and could conceivably reduce demand for this fuel from the Middle East. On these points and how uneconomical nuclear fuel making can be for small numbers of nuclear power plants, see, "An Unconventional Glut," *The Economist,* March 11, 2010, pp. 72-74; Peter Tynan and John Stephenson, "Nuclear Power in Saudi Arabia, Egypt, and Turkey – How Cost Effective?" (Nonproliferation Policy Education Center, February 9, 2009), http://www.npec-web.org/Frameset.asp?PageType=Single&PDFFile=Dalberg-Middle%20East-carbon&PDFFolder=Essays; "Frank von Hippel, "Why Reprocessing Persists in Some Countries and Not in Others: The Costs and Benefits of Reprocessing," (Nonproliferation Policy Education Center, April 9, 2009), http://www.npec-web.org/Frameset.asp?PageType=Single&PDFFile=vonhippel%20%20TheCostsandBenefits&PDFFolder=Essays.

27. Henry Sokolski, "Market Fortified Non-proliferation," in Jeffrey Laurenti and Carl Robichaud (eds.), *Breaking the Nuclear Impasse* (The Century Foundation, 2007), pp. 81-143; for more on the current membership and investment and trade principles of the Energy Charter Treaty and the Global Energy Charter for Sustainable Development, http://www.encharter.org and http://www.cmdc.net/echarter.html.

28. See Letter from Congressmen Brad Sherman, Edward Markey and Ileana Ros-Lehtinen to Secretary of State Hillary Clinton, April 6, 2009, http://bradsherman.house.gov/pdf/NuclearCooperationPresObama040609.pdf.

29. The International Renewable Energy Agency (IREA) was created in 2009. For more on its mandate, http://www.irena.org/.

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