



Disarmament redux

The U.S. foreign policy establishment is beginning to consider progress toward “the d-word”—above and beyond deterrence—a global security imperative.

BY J. PETER SCOBLIC

SINCE THE UNITED STATES destroyed Hiroshima and Nagasaki in 1945, there have been Americans who have wanted to eliminate all nuclear weapons. Over the decades they have pushed for an emphasis on cooperation over conflict in U.S. foreign policy, a ban on atomic testing, and limits on atomic arsenals, and of course their ultimate goal: complete disarmament. But, while their efforts have had some effect, the complete denuclearization of the United States and its foes has long been a taboo subject within the foreign policy establishment. Liberals, advocacy groups, and some think tanks continue to agitate for a smaller role for atomic weapons—and, occasionally, even hawkish analysts point out that our relative military power would increase in a world limited to conventional armaments. Nevertheless, not only during the Cold War but even after, disarmament has rarely been a topic for polite Washington conversation—until recently.

On January 4, 2007, George P. Shultz, Henry Kissinger, William J. Perry, and Sam Nunn—that is, two former

secretaries of state, a former secretary of defense, and a former chairman of the Senate Armed Services Committee—published an op-ed in the *Wall Street Journal* calling for a world free of nuclear weapons. They followed it up with another *Journal* op-ed this past January further detailing their plans.

They were not the first elder statesmen to do so—a 92-year-old Paul Nitze, for example, advocated nuclear disarmament in his last op-ed, published in 1999—but whereas previous similar meditations had largely fallen on deaf ears, this article commanded a significant response. That response may not revive the disarmament movement, whose strength waned after the Soviet Union collapsed, but it could revive its ideals. With decades of foreign policy experience among them, Shultz, Kissinger, Perry, and Nunn are all éminences grises who garner respect from both Democrats and Republicans. But since the publication of their op-eds, they have become something considerably more: They are the four horsemen of the anti-apocalypse.

THE DISARMAMENT MOVEMENT HAS BROKEN on U.S. foreign policy in waves since the 1940s, washing in and then receding, sometimes changing the beach, but ultimately leaving the shoreline intact.

After the bombing of Japan made clear the horror of the atomic bomb, U.S. officials initially—and seriously—pursued proposals to control or eliminate nuclear weapons. In the spring of 1946, for example, the Truman administration announced a plan drafted by Undersecretary of State Dean Acheson and David Lilienthal, chair of the Tennessee Valley Authority, that would have internationalized control over all fissile material. Ultimately, statesman Bernard Baruch took a modified version of this plan to the United Nations.

The Soviets rejected the proposal, however, and the descent of the Iron Curtain dashed early post-war hopes that international laws and organizations would channel man's energy for conflict into more cooperative endeavors. Washington soon came to rely on its nuclear arsenal to deter Moscow's aggression, with President Dwight Eisenhower's policy of massive retaliation giving nuclear weapons a central role in U.S. defense policy. The very concept of “disarmament,” briefly shared among a wide circle of policy makers, soon became tainted by association with communist propaganda efforts, in which the weaker Soviet Union used calls for denuclearization to turn world opinion against the United States by focusing attention on its growing stockpile of nuclear weapons.

Public fear of nuclear weapons, however, only continued to grow—particularly as ever-larger aboveground tests spewed radiation into the atmosphere. In 1957, activists founded the National Committee for a Sane Nuclear Policy, or SANE, to educate the U.S. public about the dangers of nuclear weapons and advocate disarmament, and within a year, it had acquired 130 chapters and 25,000 members. The concerns of SANE and other like-minded organizations eventually filtered back to foreign-policy makers, encouraging restraints on the arms race. In 1963, President John F. Kennedy signed the Limited

Test Ban Treaty (LTBT), the first of many U.S.-Soviet nuclear accords.

Ironically, though, as arms control efforts gained more momentum in the 1960s—first through the LTBT, then through the Nuclear Non-Proliferation Treaty (NPT), and finally through the Strategic Arms Limitation Talks—the anti-nuclear movement that had briefly bloomed faded, reassured by its successes and distracted by the daily horrors of the Vietnam War. As historian Lawrence Wittner has noted in his seminal trilogy on the disarmament movement, “[N]uclear weapons ceased to provide a subject of much concern to the mass media or to the general public. Between 1964 and 1970, magazines and newspapers in the United States sharply reduced their coverage of nuclear issues, while the number of books dealing with nuclear war declined substantially. . . . According to pollsters, between 1959 and 1965, the percentage of Americans viewing nuclear war as the nation’s most urgent problem fell from 64 to 16 percent.”¹

It was not until the early 1980s that the U.S. disarmament movement returned in force, after President Ronald Reagan embarked on an enormous military buildup of conventional and nuclear forces. In 1981, Reagan authorized development of the B-1 bomber and the neutron bomb; declared his intention to quickly field the MX missile; ordered the deployment of 3,000 nuclear cruise missiles aboard aircraft; and accelerated development of the Trident II missile, and the B-2 stealth bomber. At the same time, he obstructed arms control talks, while many of his top advisers spoke with concern about the prospect of “winning” a nuclear war.

The public reacted with horror to these developments: By the end of 1981, 76 percent of Americans believed a nuclear war would erupt within a few years, and many of them joined the Nuclear Freeze Movement, which demanded an immediate halt to the U.S. and Soviet arms buildup.² On June 12, 1982, nearly one million people protested the arms race in New York City. And that November, 9 states, 34 cities and counties, and the District of Columbia

approved a referendum calling for an immediate halt to weapons deployments.³

Reagan’s aides were dismissive of the Freeze movement, but the president himself was not immune to the movement’s arguments or fears. Despite his nuclear buildup and his long-standing dismissal of arms control, Reagan was at heart a nuclear abolitionist, viscerally frightened by the prospect of atomic holocaust. His early proposals to reduce the superpower stockpiles had been dismissed as insincere gambits, but once Mikhail Gorbachev took office, Reagan believed he had found someone with whom he could genuinely negotiate. And, in a remarkable moment of political theater at the 1986 Reykjavik summit, he proposed eliminating all nuclear weapons. Gorbachev agreed, but ultimately the suggestion foundered on his insistence that the United States then abandon the Strategic Defense Initiative—and Reagan’s unwillingness to do so.

The public was disappointed, but policy makers—foreign and domestic, liberal and conservative—were relieved, shocked that Reagan had nearly given up the U.S. nuclear deterrent. Among “serious people,” the thought was taboo. After all, the Red Army still had thousands upon thousands of troops on the doorstep of Western Europe; how were they to be deterred without nuclear weapons? The grassroots groaned as well. William Sloane Coffin Jr. of SANE/Freeze (which had merged) complained that the “Reagan-Gorbachev love-in” had deflated the movement’s urgency by demonstrating that the two superpowers were not about to nuke each other.⁴

If Reykjavik raised problems for the movement, the collapse of the Soviet Union ended it. With the dissolution of the Soviet Union, the possibility of all-out nuclear war became remote, and President George H. W. Bush’s signing of the Strategic Arms Reduction treaties suggested that the former rivals were well on their way to getting rid of nuclear weapons altogether. The Clinton administration seemed to pick up where Bush left off, negotiating the denuclearization of Ukraine, Belarus, and Kazakhstan, which had been left with Soviet-era weapons on their soil when the Soviet

Union broke up. It also secured the indefinite extension of the NPT in 1995, and in 2000, the administration committed to the “unequivocal undertaking . . . to accomplish the total elimination of their nuclear arsenals.”

Nevertheless, talk of actually denuclearizing remained a third rail of defense policy. For example, in April 1997, Secretary of Defense William Cohen proposed that Russia scholar Rose Gottemoeller fill the post of assistant secretary for international security policy—but soon rescinded the offer. Gottemoeller had recently participated in a bipartisan study by the National Academy of Sciences that called for deep reductions in nuclear weapons and said that, under certain circumstances, the prohibition of nuclear weapons could “on balance . . . enhance the security of the United States and the rest of the world.”⁵ That aroused the anger of some on the right, notably conservative activist Frank Gaffney who lobbied against her appointment on the grounds that the NAS study advocated “steps that, taken together, could have the result effectively of unilaterally disarming the United States.”⁶ Cohen maintained that he had simply decided to eliminate the post as part of an administrative consolidation, but other officials disagreed, insisting that Cohen feared Gottemoeller’s brush with denuclearization threatened a contentious Senate confirmation.⁷ Gottemoeller was later successfully appointed assistant secretary of energy for nonproliferation and national security. [Gottemoeller serves on the Bulletin Board of Directors.]

If the Clinton administration was skittish about denuclearization, the George W. Bush administration has been simply dismissive of it. For one thing, Bush officials dispute the common interpretation of the NPT’s Article VI—that it calls on the nuclear powers to work toward disarmament—and argue that it calls for denuclearization only in the context of “general and complete disarmament.”⁸ For another, although it claims to have decreased the role of nuclear weapons in U.S. strategic policy—and is reducing nuclear deployments via the 2002 Moscow Treaty—its nuclear posture

review, submitted to Congress in December 2001, says that, while the United States needs fewer weapons, it needs them for more missions: "Greater flexibility is needed with respect to nuclear forces and planning than was the case during the Cold War. . . . [A]lthough the number of weapons needed to hold those assets [valued by adversaries] at risk has declined, U.S. nuclear forces still require the capability to hold at risk a wide range of target types." The review's chief architect was Keith Payne, who in 1999 had written of the dangers posed by the "anti-nuclear lobby." In effect, then, Bush's posture review was explicitly an anti-disarmament tract.

What's more, the Bush administration has called for the development of new low-yield nuclear weapons that would reduce the collateral damage from a strike and therefore not "self-deter" the president from ordering their use. It called for a new Robust Nuclear Earth Penetrator that would enable it to target deeply buried enemy bunkers. And it called for the revitalization of the nuclear weapons complex and the development of the reliable replacement warhead (RRW). Combined with its dismissal of the Comprehensive Test Ban Treaty (CTBT), its rejection of a verifiable fissile-material cutoff treaty, its withdrawal from the Anti-Ballistic Missile Treaty—indeed, its dismissal of arms control generally as a "Cold War relic"—the Bush administration is arguably less committed to a world free of nuclear weapons than any administration since the start of the nuclear age.

GEORGE P. SHULTZ, REAGAN'S SECRETARY OF STATE, today works out of a cozy corner office in a modernist building at Stanford University. Just down the hall, in sparser quarters, is his friend Sidney Drell, a physicist who spends much of his time at the nearby Stanford Linear Accelerator Center, but remains involved in national security affairs. In 2005, Drell and retired diplomat James Goodby had coauthored a report for the Arms Control Association titled "What Are Nuclear Weapons For?," and toward the end of that year, he was becoming

increasingly concerned with the crises in Iran and North Korea. Tehran was once again enriching uranium after talks with Britain, France, and Germany had failed to make progress, and Pyongyang had walked away from the Six-Party Talks with the United States, Russia,

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China, South Korea, and Japan after the Treasury Department sanctioned Banco Delta Asia, a Macao-based bank, for laundering the regime's drug-running and counterfeiting profits.

One day, as Drell tells it, he and Shultz were commiserating over these dangers, when they became nostalgic for the drama of the 1986 Reykjavik summit. Shultz had been in the room when Reagan proposed eliminating all nuclear weapons, saying, "Let's do it," according to a memorandum of the conversation. Shultz and Drell realized that the twentieth anniversary of that remarkable moment was approaching, and they decided to hold a conference to explore whether it was possible to rekindle Reagan's vision. The following October, about two dozen scholars and statesmen converged on Stanford's Palo Alto campus for two days of discussion on the legacy of Reykjavik. During the conference, Max M. Kampelman, a Reagan arms control negotiator from 1985 to 1989, gave a stirring speech in which he encapsulated the conference's *raison d'être* by describing the relationship between what he called the "is" and the "ought." The "is" may be a practical and accurate assessment of the status quo, he said, but unless we establish an "ought," we can never hope to change

the status quo—just as the Declaration of Independence laid out a standard of equality even though the existence of slavery gave the lie to its contemporary implementation.

In some ways, Kampelman was an odd spokesman for nuclear disarmament,

having served in the late 1970s on the hawkish Committee on the Present Danger, which disparaged the concept of mutual assured destruction and advocated the buildup of the U.S. atomic arsenal so that the United States would not "lose" a nuclear war with the Soviet Union. But Kampelman also had a history of pacifism, having been a conscientious objector during World War II, and now, he explained, he found himself fearful for the safety of his children and grandchildren. It was time, he thought, to resurrect Reagan's vision. "The elimination of all nuclear arms is an 'ought' that must be proclaimed and energetically pursued," Kampelman said. "It is time for us to get behind that essential 'ought' and shape it into a realistic 'is.'"

Over the next three months, the conference participants attempted to do just that, circulating a draft of an article that would become the *Wall Street Journal* op-ed. (Kissinger and Nunn had not attended the conference but they contributed to the article.) Although the men agreed on the essential substance of the article, some careful phrasing was needed, especially when it came to support for the Comprehensive Test Ban Treaty. (Kissinger, for one, had opposed its ratification in 1999.) The final version appeared on January 4, 2007, and with its

high-powered, bipartisan byline, quickly became a hot topic in foreign policy circles around the globe.

The article began with a common enough observation: The United States was poised on the edge of a new nuclear era in which mutual assured destruction would no longer provide the protection it once had. States such as North Korea and Iran introduced new uncertainties to the once relatively stable nuclear balance, and the possibility of a terrorist armed with a nuclear weapon was terrifying. But the authors then switched to a more provocative gear, arguing that Reagan's abolitionism had been prescient. They reminded readers that the United States had long ago legally committed itself to nuclear disarmament when it signed the NPT. They wrote that we must establish a "goal of a world free of nuclear weapons" and take incremental steps toward that goal, ratifying the CTBT, negotiating a verifiable fissile-material cutoff treaty, and establishing greater international control of the nuclear fuel cycle.

The article soon received dozens of mentions in the popular press, and in the professional literature, it was mentioned so often that it quickly became something of a cliché. Big names associated themselves with its recommendations. Gorbachev himself penned a companion op-ed for the *Journal* reinforcing the points Shultz and his coauthors had made. Joseph Biden, chairman of the Senate Foreign Relations Committee, said, "The *WSJ* op-ed is a vitally important statement. It defines a new center in American politics, where realist conservative Republicans and tough-minded Democrats find common ground." And Hans Blix, the former weapons inspector much maligned by the right wing, said, "I don't know how it was received in the Bush administration, but these guys are not doves. If they can write [that] way, perhaps the idea is not too strange among the policy-conscious foreign policy set in the United States. That gives me a lot of hope."¹⁰

That June, Nunn and Kampelman kicked off the Carnegie Endowment for International Peace's Nonproliferation Conference, the preeminent gathering

for nonproliferation scholars and arms control advocates. Jessica Mathews, Carnegie's president, introduced the pair by saying the op-ed represented a "paradigm shift": "[O]n a Nixon-goes-to-China scale of 1 to 100, I think this article rated about a 98." The two-day event included a luncheon keynote address by Margaret Beckett, then Britain's foreign minister, which began this way: "I expect that many—perhaps all—of you here today read an article which appeared in the *Wall Street Journal* at the very start of this year." To the surprise of many in attendance, Beckett then proceeded to lay out a vision of a world free of nuclear weapons, along with incremental steps to make that vision a reality.

OF COURSE, PRIME MINISTER TONY Blair's government had recently re-committed itself to deploying three nuclear-armed Trident submarines, underscoring the difference between Britain's "ought" and its "is" and raising the question: Could the op-ed really make a difference, or had it simply provided useful rhetorical fodder? Certainly the Bush administration has not changed its policy on the CTBT, the fissile-material cutoff treaty, or any of the op-ed's other points since last January.

But the op-ed does seem to have given Capitol Hill a shot of adrenaline. In May 2007, the House Armed Services strategic forces subcommittee voted to establish a bipartisan commission to review the U.S. nuclear posture—and to fund it by cutting \$20 million from the Bush administration's request for the RRW. Democratic Cong. Ellen Tauscher of California cited the *Journal* op-ed in explaining her push for the study, saying, "There are a growing number of voices that have credibility that are saying we have a disjointed set of programs that don't lead to a cogent nuclear policy for the 21st century."¹¹ Then, in August, Democratic Sen. Dianne Feinstein, also of California, introduced legislation calling on the president to conduct a nuclear policy review and on the Pentagon to conduct a nuclear posture review, and cutting all funding for the RRW until

those things are done. She, too, referenced the *Journal* op-ed, saying, "I believe that bipartisan policy is beginning to emerge."¹² In December 2007, Congress cut all funding for the RRW. And, interestingly, the Defense Authorization Bill for 2008 contains language remarkably similar to that of the *Journal* article, maintaining, among other things, that the United States should reaffirm its commitment to Article VI of the NPT.¹³

In the current presidential race, Democratic candidates have said they support a world free of nuclear weapons—and have said so, in no small part, because of the *Journal* op-ed. During a question-and-answer session following a speech he gave at the Council on Foreign Relations in May, former North Carolina Sen. John Edwards said, "Well, let me say first, I think I would want to associate myself with the concepts that are conveyed by Kissinger, Sam Nunn, and others in the op-ed piece. I thought it was very thoughtful. And I think essentially what they said . . . was that we should aspire to a nuclear-free world. I agree with that." According to Derek Chollet, a longtime foreign policy adviser to Edwards, the op-ed made a big difference in the senator's willingness to discuss disarmament as a potential goal: "The piece was a game-changer. While the issue had always been something to consider, the four tenors op-ed gave the zero-option a significant degree of seriousness, credibility, and bipartisan support that it had previously lacked."

Similarly, in October, Illinois Sen. Barack Obama told a Chicago crowd, "Here's what I'll say as president: America seeks a world in which there are no nuclear weapons. We will not pursue unilateral disarmament. As long as nuclear weapons exist, we'll retain a strong nuclear deterrent. But we'll keep our commitment under the Nuclear Non-Proliferation Treaty on the long road toward eliminating nuclear weapons." The speech reflected both the themes and the specific recommendations that Shultz, Perry, Kissinger, and Nunn had articulated. Obama also cosponsored, with Republican Sen. Chuck Hagel of Nebraska, legislation supporting ratifi-

cation of the CTBT and negotiation of a fissile material cutoff treaty.¹⁴

But Obama would probably need to capture the White House to enact his vision. The impetus for dramatic change in nuclear policy has traditionally not come from Congress, and whatever the merits of the disarmament movement—indeed, whatever its past successes—it seems unlikely to force a dramatic change of course in the near future. Although arms control advocates point to surveys showing that most Americans support nuclear disarmament—for example, a recent University of Maryland poll showed 73 percent support the verifiable elimination of nuclear weapons—the subject does not, by and large, move them to political action.¹⁵ Social psychologists have found that those Americans deeply committed to nuclear issues do not form a cohesive or easily identifiable bloc.¹⁶ They share few traits or values in the same way that, say, opponents of abortion or immigration often do.

True, several public interest groups are lobbying against programs such as the RRW, and in June 2005, an anti-nuclear protest outside the NPT review conference drew several thousand people. But there is little indication that the Bush administration's revitalization of the nuclear weapons infrastructure is about to spark a return of the Freeze movement. The threat of nuclear holocaust may have motivated large numbers of people during the Cold War, but its absence motivates far fewer. The threat of nuclear terrorism may be very real, but arguing that reducing that threat requires enforcement of the nonproliferation regime, and linking that enforcement to cuts in the U.S. nuclear arsenal is a tortuous process not easily distilled to bumper-sticker pith. What's more, Americans who would like to see the United States constructively engaged in international laws and institutions, like those that make up the nonproliferation regime, generally have more salient concerns—chief among them the Iraq War, whose bloody immediacy has distracted them from nuclear issues, as the Vietnam War did their predecessors.

This suggests that any move toward nuclear disarmament will require presidential leadership, and none of the major Republican presidential candidates have embraced the tenets of the op-ed—or seem likely to do so. Many see a large role for nuclear weapons in the future—

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including to preemptively strike Iran's nuclear facilities—and when Obama endorsed the *Wall Street Journal* op-ed, a spokesman from the Republican National Committee said he was playing to the “fringe elements of his party.”¹⁷ Further, any president who moved toward denuclearization would undoubtedly face opposition not only from conservatives, but from hawkish moderates. In November, Harold Brown, President Jimmy Carter's secretary of defense, and John Deutch, Clinton's CIA director, took to the *Wall Street Journal's* op-ed page to rebut Shultz et al., arguing that nuclear weapons are essential for deterrence—that they “cannot be eliminated.”¹⁸

Of course, in a world in which the United States spends more on its conventional military than the next several nations combined, it is difficult to see what our nuclear weapons deter besides other nuclear weapons, meaning that, if one could simply wave a magic wand and be instantaneously and verifiably done with the process, disarmament would pose little danger to our national security; the asymmetric power of nuclear weapons means that we are more likely to be deterred by rogue-state nuclear weapons than the other way around. Alas, there are no magic wands, and the deeper one cuts into nu-

clear arsenals, the harder it becomes to cut any more. A process of denuclearization, even if it moved forward, might well progress asymptotically, approaching but never reaching zero. Still, writing that “hope is not a policy,” as Brown and Deutch do, is a less substantive ar-

gument than baseless condescension. Hope is an essential component of any vision—that is, any policy that is not purely reactive—and, regardless, there are many constructive steps that can be taken toward reducing the salience of nuclear weapons before the question of disarmament is broached.

That is precisely the point that Shultz, Drell, and their colleagues made, and they are continuing to push ahead. This past October, they held another conference at which they discussed papers they had commissioned on each of the specific recommendations outlined in their op-ed. And their January 2008 op-ed detailed their progress and gave the nuclear community its next set of marching orders—or certainly discussion points. Says Shultz of the future: “I think there will be a nuclear posture review that will not just be a Defense Department-type exercise. There'll be a congressional effort. So this subject will be an open subject to talk about. And what we have proposed will be—must be—one of the things to talk about.” ■

FOR NOTES, PLEASE SEE P. 57.

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“Mechanism, Regulation, and Ecological Role of Bacterial Cyanide Biosynthesis,” *Archives of Microbiology*, vol. 173, no. 3, pp. 170–177.

27. Eckard Wimmer of the State University of New York at Stony Brook has argued that viruses are more akin to nonliving chemicals than to living organisms and proved the point by synthesizing infectious poliovirus in the laboratory from off-the-shelf chemicals. In principle, it would be possible to include synthetic viruses under the General Purpose Criterion of the CWC. At the same time, it would be politically and practically unrealistic to incorporate synthetic viruses into the treaty’s routine verification regime.

28. OPCW, Conference of the States Parties, First Review Conference, “Note by the Director-General: Report of the Scientific Advisory Board on Developments in Science and Technology,” RC-1/DG.2, April 23, 2003, p. 4.

29. Neil Davison, “‘Off the Rocker’ and ‘On the Floor’: The Continued Development of Biochemical Incapacitating Weapons,” Bradford Science and Technology Report No. 8 (Bradford Disarmament Research Center, University of Bradford, United Kingdom, August 2007), p. 24.

30. See “The Danger of ‘Nonlethal’ Weapons,” sidebar in Wheelis, “Will the New Biology Lead to New Weapons?” pp. 8–9.

31. Julian Perry Robinson, “Categories of Challenge Now Facing the Chemical Weapons Convention,” discussion paper, 52nd Pugwash CBW Workshop, Noordwijk, The Netherlands, 17–18 March 2007, p. 18.

32. Alan Pearson, “Incapacitating Biochemical Weapons: Science, Technology and Policy for the Twenty-First Century,” *Nonproliferation Review*, vol. 13, no. 2, p. 170.

33. Kerry Boyd, “Rumsfeld Wants to Use Riot Control Agents in Combat,” *Arms Control Today*, vol. 33, no. 2, p. 32; Kerry Boyd, “U.S. Grapples with Use of Nonlethal Agents,” *Arms Control Today*, vol. 33, no. 3, p. 44.

34. For a discussion of possible oversight mechanisms for dual-use research in the life sciences, see National Science Advisory Board for Biosecurity, “Proposed Framework for the Oversight of Dual Use Life Sciences Research: Strategies for Minimizing the Potential Misuse of Research Information,” available at www.biosecurityboard.gov/FrameWork%20for%20transmittal%200807_Septo7.pdf.

Making nuclear energy work

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1. I would like to thank my colleagues at Argonne for tutoring me in the intricacies of the nuclear power industry; these include Yoon Chang, Phillip Finck, Steve Goldberg, Bob Hill, Hussein Khalil, Walt Kirchner, Pino Palmiotti, Mark Peters, and Andrew Siegel. I would like particularly to thank Steve Goldberg and Walt Kirchner for their critical readings of this paper.

2. Charles D. Ferguson, “Nuclear Energy: Balancing Benefits and Risks,” Council on Foreign

Relations Special Report, CSR No. 28, April 2007, p. 9. Note, however, that this estimate is very conservative, as the study assumed no efforts at life extension. A better assumption might be that by 2050, the majority of the existing 104 reactors in the United States will have to be replaced, which still leads to a construction schedule of one to two new reactors per year through this period.

3. This informal conclusion is supported by recent detailed studies, including “Poland Becoming a Member of the Global Nuclear Energy Partnership,” pp. 1, 18–19, ANL-0710 vol. 1, V. Koritarov, March 2007; and “TRUST, an Innovative Nuclear Fuel Leasing Arrangement,” J. Malone, Exelon Corporation, presentation to the NEI-WNA International Fuel Cycle Conference, April 2007. The studies were conducted in collaboration with the University of Chicago, Northwestern University, and staff from Exelon Corporation. Results from the Poland study indicate that a trans-Baltic solution—that is, a regional nuclear energy facility—would be economically attractive, as would a robust fuel supplier system and take-back regime. In the second study, we developed an innovative fuel-leasing strategy that meets the objectives of the International Atomic Energy Agency and other entities, is market-based, facilitates additional nonproliferation agreements, and is compatible with various back-end strategies.

4. Moray Dewhurst, FPL Group, presentation to the 3rd Annual Platt’s Nuclear Energy Conference, February 8–9, 2007.

5. See, for example, Committee on Bridging Design and Manufacturing, National Research Council, *Retooling Manufacturing: Bridging Design, Materials, and Production* (Washington, D.C.: National Academies Press, 2004).

6. We must recognize that experiment, theory, and simulation do not compete, and that none is without its pros and cons. The “cons” are clear: *Experiment* is expensive, sometimes dangerous, and very difficult to get precise answers with; *theory* is limited to very idealized cases and does not work well for highly nonlinear phenomena, detailed geometries, etc.; *simulation* relies heavily on competently executed (but often neglected) validation and verification, and has a very limited application domain extent when relying solely on a first-principles (“direct”) simulation approach. However, when applied in concert, these three research modalities have shown repeatedly that highly complex systems can be designed and built efficiently and operated effectively and safely—recall again the commercial aeronautics industry.

7. “TRUST, an Innovative Nuclear Fuel Leasing Arrangement,” J. Malone, Exelon Corporation.

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1. Lawrence Wittner, *Resisting the Bomb* (Stanford: Stanford University Press, 1997), p. 447.

2. Daryl G. Kimball, “Looking Back: The Nuclear Arms Control Legacy of Ronald Reagan,” *Arms Control Today*, July/August 2004.

3. Lawrence Wittner, *Toward Nuclear Abolition*

(Stanford: Stanford University Press, 2003), p. 167.

4. *Ibid.*, p. 406.

5. Committee on International Security and Arms Control, National Academy of Sciences, *The Future of U.S. Nuclear Weapons Policy* (Washington, D.C.: National Academy Press, 1997). The study was chaired by retired Maj. Gen. William Burns, who served as the director of the Arms Control and Disarmament Agency during the Reagan administration.

6. Gaffney’s comment on Gottemoeller’s nomination to the Energy Department appears at www.centerforsecuritypolicy.org/modules/newsmanager/ShowSectionNews.aspx?CategoryID=66&SubCategoryID=189&NewsID=1451. It cites his earlier opposition to her Defense Department appointment.

7. R. Jeffrey Smith, “Aides Question Elimination of Pentagon Job; Arms Control at Issue for Would-Be Appointee,” *Washington Post*, September 23, 1997, p. A1. Interview with Clinton administration official.

8. See Stephen Rademaker, “Blame America First,” *Wall Street Journal*, May 7, 2007.

9. Keith B. Payne, “Nuclear Weapons: Theirs and Ours,” National Institute for Public Policy, May 7, 1999.

10. “Epiphanies: Hans Blix,” *Foreign Policy*, March/April 2007.

11. Walter Pincus, “Bush Urged to Develop Overall Nuclear Arms Policy,” *Washington Post*, March 18, 2007, p. A5; Walter Pincus, “Bipartisan Panel Will Review Nuclear Posture,” *Washington Post*, May 3, 2007, p. A3.

12. Statement by Sen. Dianne Feinstein introducing S. 1914, August 1, 2007.

13. U.S. Congress, “National Defense Authorization Act for Fiscal year 2008,” S. 1547, Sec. 3122.

14. U.S. Congress, “Nuclear Weapons Threat Reduction Act of 2007,” S. 1977.

15. Center for International Security Studies and WorldPublicOpinion.org, “Americans and Russians on the Future of Disarmament,” November 9, 2007.

16. American Envionics, “American Values Survey for the Peace & Security Community,” Summer 2007.

17. Christopher Wills, “Obama Urges Eliminating Nuclear Weapons,” Associated Press, October 2, 2007.

18. Harold Brown and John Deutch, “The Nuclear Disarmament Fantasy,” *Wall Street Journal*, November 19, 2007, p. A19.

The bureaucracy of deterrence

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1. See Janne E. Nolan, *Guardians of the Arsenal* (New York: Basic Books, 1989).

2. Max Weber, *Economy and Society: An Outline of Interpretive Sociology*, Guenther Roth and Claus Wittich, eds., translated by Ephraim Fischoff and others (New York: Bedminster Press, 1968), pp. 215–223, 961–962, 973, 987–993.

3. National Defense Panel, *Transforming Defense: National Security in the 21st Century* (Washington,

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