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Perspectives

Confronting the nuclear paradox

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ABSTRACT

From the dawn of the atomic age, the meaning of nuclear energy has been contested in language and in substance. The tension between the hope expressed by "atoms for peace" and the fear symbolized by a mushroom cloud remains at the heart of contemporary political debates regarding the future of nuclear energy. This tension results in countervailing rhetorical and social fault-lines that undermine the political consensus necessary to generate meaningful action to address arguably the two most significant threats facing the international community today: climate change and nuclear security, including nuclear proliferation and nuclear terrorism.

Since 1947, the Bulletin of Atomic Scientists has maintained a "Doomsday Clock." The aim of this clock is to convey "how close we are to destroying our civilization with dangerous technologies of our own making," including nuclear weapons and climate changing technologies.[1] According to the website, "The decision to move the minute hand is made by the Bulletin's Board of Directors in consultation with its Board of Sponsors, which includes 18 Nobel Laureates."[2] In 2015, the Board moved the clock to three minutes to midnight, the closest it has been to "doomsday" since the height of the Cold War. Their rationale is summed up by a quote by U.S. President Kennedy: "our progress in the use of science is great, but our progress in ordering our relations small."[3]

Atomic energy confronts us with a well-known paradox: the development and use of nuclear power has the potential both to enhance and to threaten national and global security. This paradox is reflected in policy debates surrounding nuclear security and climate change. While some see nuclear power as an important source of energy and energy diversity option, others see a world fraught with nuclear peril, including weapons proliferation and an increased possibility of nuclear terrorism.[4] While some see nuclear energy as a 'green' solution to climate change, others see it as posing excessive environmental risk.[5] The politics of energy security is therefore driven by struggles over the perceptions of citizens over where the balance lies in terms of further use of atomic energy by international society.

This essay is not a research article, but instead a "think piece" intended to raise questions about the extent to which the politicization of the nuclear paradox erodes the social consensus required to take meaningful and simultaneous action in two critical areas: nuclear security (broadly conceived) and climate change. Indeed, political heavyweights such as the "Gang of Four" Cold Warriors and Bill Gates have campaigned for the total elimination of nuclear weapons and carbon emissions, respectively.[6] But these two issue areas have more in common than the aspirational goal of zero. Both are seen as posing potentially existential threats to humanity, capable of causing crises of cataclysmic proportions.[7] Both mitigating climate change and forging a pathway toward nuclear disarmament require a major public and private investment, thus posing tough policy choices. And both fields are highly technical, requiring a considerable degree of translation to make accessible to policy makers and general public.

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[1] Bulletin of the Atomic Scientists, *Overview*, http://thebulletin.org/overview.
[2] Bulletin of the Atomic Scientists, *About Us*, http://thebulletin.org/about-us.
[3] Bulletin of the Atomic Scientists, *Overview*, http://thebulletin.org/overview.
[4] For an overview of the debate on the spread of nuclear weapons, see Sagan and Waltz [30]. On the stabilizing value of nuclear weapons, see e.g. Waltz [39] and Joffe and Davis [44]. On the prospect of nuclear terrorism, see e.g. Allison [1].
[5] Nathan Myhrvold, *New York Times, Nov. 15 2013* The documentary "Pandora's Promise," for example, makes the positive case. For a critique, see http://www.beyondnuclear.org/pandoras-false-promises/.
[6] George P. Shultz, William J. Perry, Henry A. Kissinger and Sam Nunn, "A World Free of Nuclear Weapons," The Wall Street Journal, Jan. 4, 2007; Page A15; http://www.ted.com/talks/bill_gates.
[7] See, for example, the Bulletin of Atomic Scientists Doomsday Clock at http://thebulletin.org/timeline.

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Of course, reaching zero in either context is not feasible in the short- or even-medium term. Activists evoke the Martin Luther King language of mountaintops and emphasize the importance of aspiration in pushing for political change, though few can even imagine what such a mountaintop might look like at present.[8] Progress toward zero carbon emissions or zero nuclear weapons will no doubt have to proceed incrementally. Yet taking incremental steps that will matter more than at the margins will require some degree of political will, thus raising the larger question of whether it is *politically* possible to make sufficient progress toward these two goals before it is too late?

Holding all else constant, one can certainly envision ways in which these twin goals are compatible. The mainstream view appears to be that a "nuclear renaissance" can provide a reliable civilian nuclear energy grid that can aid international efforts to arrest climate change and take steps toward a nuclear weapon free world.[9] However, the contestation over the value and meaning of nuclear energy in the 21st century that drives a fundamentally political process complicates and, in important ways, undermines the political will necessary to take sufficient action on either front. Consequently, political opponents in the United States and the international community more generally are likely to grind it out over short-term exigencies while neglecting to devise a more robust, long-term cooperative strategy necessary to promote a secure, environmentally sustainable world. Meaningful and simultaneous progress toward zero nuclear weapons and zero carbon emissions is unlikely, thus increasing the prospects for a "doomsday" scenario.

To think about political complications posed by the nuclear paradox, this essay first considers two questions that reside at the heart of the contemporary discourse over the future of atomic energy. It then concludes with a preliminary discussion of ways in which these complications might begin to be addressed in an effort to address climate change and nuclear security in tandem.

1. Could the expansion of nuclear power heighten perceived security risks and therefore undermine intermediate nonproliferation goals that could pave the way toward disarmament?

Ronald Reagan is often credited with two legacies. His "trust but verify" dictum underscored the primacy of verification in arms control and his call for nuclear disarmament in Reykjavik recognized the fallibility of a security paradigm premised on mutually assured destruction. Yet reconciling these two legacies poses a major challenge, as the expansion of nuclear power could heighten uncertainty and pose additional security risks in ways that could have the unintended consequence of undermining the respective goals of reducing the spread of nuclear weapons, improving nuclear security, and taking steps toward nuclear disarmament.

In this regard, Miller and Sagan raise several questions about the relationship between nuclear power and nuclear proliferation.[10] Will the growing number of nuclear states required to meet global energy needs exhibit the "good governance" characteristics necessary to prevent the military diversion of nuclear technology and know-how? Should we be concerned that many emerging nuclear states are likely to be non-democratic and that historical record suggests non-democratic members of the NPT account for every material violation of Article II (i.e. the commitment not to acquire or develop nuclear weapons)? Will states face increased threats of nuclear terrorism or theft? The 9/11 Commission report stated that one of the original plans involved hijacking 10 planes and flying them into nuclear reactors and the IAEA has a total of 2331 incidents of nuclear and other radioactive material out of regulatory control from 1993 to 2012.[11] Concerns are increasing about the ability of cyber-terrorists to hack into a nuclear power plant's computer system and release radiation.[12] And while nuclear weaponization is difficult, longstanding concerns about "brain drain" have been validated by the revelation of proliferation networks.[13]

Some contend that these security concerns related to the expansion of nuclear energy are either overstated or can be addressed.[14] Proposals already exist to mulitlateralize the nuclear fuel cycle (and have since the Acheson-Lilienthal report almost seven decades ago).[15] However, barring an unforeseen development in nuclear technology that renders a new source of energy that cannot be redirected to military purposes in any way, it remains difficult to foresee political circumstances in which disarmament can occur while the world continues to rely on civilian nuclear power, even as incremental progress is made promoting the 13 intermediate steps toward disarmament laid forth in the Final Document of the 2000 NPT Review Conference.[16] Critics of arms control are skeptical of the ability of multilateral institutions to safeguard national security interests and verify compliance with international legal norms.

For example, although the United States has long been a leader in global nuclear nonproliferation efforts, its domestic political dynamics complicate matters. To convince Congress to ratify the new START Treaty, in which the U.S. and Russia agreed to reduce further their nuclear warhead stockpiles, the Obama administration had to agree to spend millions of dollars of additional investment in the Stockpile Stewardship Program and nuclear modernization. The Comprehensive Nuclear Test Ban Treaty (CTBT), a critically important incremental step in multilateral nuclear nonproliferation efforts, remains moribund after the U.S. Senate's historic rejection in 1999. The United States continues to invest millions into its nuclear deterrent and seems to accept the validity of nuclear weapons for states like Israel and India that remain outside of the Nuclear Nonproliferation Treaty (NPT).[17]

Much of the U.S. domestic opposition to nuclear arms control and disarmament is rooted in mistrust and the belief that nuclear weapons hedge against uncertainty because of their deterrent value. Former Senator John Kyl, who led efforts to reject the CTBT, attributes one of his favorite quotes to Reagan as well: "we don't mistrust each other because we're armed; we're armed because

[8] Daalder and Lodal [5] "Logic of Zero." For more discussion of global nuclear disarmament, see Hynek and Smetana [14] and Perkovich and Acton [24].

[9] For a general overview of the politics of nuclear energy, see Squassoni [34].

[10] Miller and Sagan [22], Fuhrmann [10], Fuhrmann [11] explains why states provide peaceful energy technology and, argues that doing so contributes to nuclear weapons proliferation. See also Kroenig [19].

[11] IAEA [15] Incident and Trafficking Database, International Atomic Energy Agency, Dec. 9, 2014 (http://www-ns.iaea.org/security/itdb.asp). See also Holt and Andrews [45].

[12] http://www.nytimes.com/aponline/2016/12/15/world/ap-un-united-nations-extremists-and-deadly-weapons.html?_r=0.

[13] On illicit proliferation networks, see Braun and Chyba [3] and Montgomery [23].

[14] See several contributions to Stulberg and Furhmann [36] For a discussion of "nuclear myths" in the security realm, see Gavin [12].

[15] Socolow and Glaser [31] write that a nuclear-weapons free world would be more stable and more secure without nuclear energy. But a new framework for the nuclear fuel cycle could make nuclear energy compatible with a nuclear-weapons free world. For a recent analysis of the internationalization of the fuel cycle, see e.g. Stulberg's chapter in Stulberg and Fuhrmann [36]. On proliferation risks of fusion systems, see Glaser and Goldston [13].

[16] http://www.un.org/disarmament/WMD/Nuclear/pdf/finaldocs/2000%20-%20NY%20-%20NPT%20Review%20Conference%20%20Final%20Document%20Parts%20I%20and%20II.pdf. See also Ferguson [7].

[17] On the different logics of nuclear acquisition and restraint, see Solingen [32]. On why states acquire civilian nuclear technology, see [10,11].