Steps for Rebuilding U.S.-Russian Nuclear Security Cooperation

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Abstract

Cooperation between U.S. and Russian nuclear scientists and engineers represents an important opportunity for rebuilding U.S.-Russian relations. The United States and Russia possess more than 90 percent of the world's nuclear weapons, the world's largest stocks of weapons-usable nuclear material, and the world's largest nuclear complexes, giving them a special responsibility for nuclear security and preventing nuclear terrorism. Unfortunately, in 2014, the Obama administration unwisely cut off U.S.-Russian cooperation on nuclear energy R&D and nuclear science after Russia's seizure of Crimea and military intervention in eastern Ukraine. Predictably, Russia responded by cutting off almost all cooperation on nuclear security (which it had long had concerns about for other reasons). Although the most urgent nuclear security upgrades had already been completed, there was still important joint work to do to ensure that sophisticated thieves could not steal nuclear material and provide it to terrorists. Indeed, nuclear security work is never "done," as nuclear security, like safety, must focus on continuous improvement in the face of evolving threats, changing technologies, and newly discovered vulnerabilities. Today, both President Trump and Russian President Vladimir Putin say they want a more cooperative U.S.-Russian relationship. Toward that end, they should direct their nuclear establishments to restart cooperative work on nuclear energy, nuclear security, nuclear science, nuclear safety – and, eventually, on topics such as developing new procedures and technologies for arms control verification as well. Such cooperation will not be like the Nunn-Lugar assistance of old, which is no longer appropriate or politically sustainable in either Washington or Moscow. Instead, it should be a partnership-based approach, based on principles of equality, mutual respect, and mutual benefit, with each party funding its own participation. Despite the deep disputes the two governments still have, such a partnership approach at the technical level is a realistic prospect. This paper focuses on one aspect of such renewed cooperation, providing an initial outline of cooperative initiatives that could be pursued on nuclear and radiological security.

Introduction

Today, both U.S. President Donald Trump and Russian President Vladimir Putin say they want a more cooperative U.S.-Russian relationship. As the United States and Russia possess more than 90 percent of the world's nuclear weapons, the world's largest stocks of weapons-usable nuclear material, the world's largest nuclear complexes, and the world's most extensive experience in nuclear security, they bear a special responsibility for nuclear security and preventing nuclear terrorism. Revitalizing U.S.-Russian cooperation to improve nuclear security has the potential to serve U.S., Russian, and world security interests.

Past U.S.-Russian nuclear security cooperation contributed to dramatic improvements in nuclear security in Russia. Today, both Russia and the United States have the expertise – and the resources, should they choose to use them – to provide effective nuclear security for their own stocks. But as both U.S. and Russian Presidents have acknowledged over the years, nuclear security must continuously evolve in the face of changing threats – and it is likely to be less effective when each country is going forward in isolation. Both countries can further reduce the risk of nuclear terrorism if Russian and U.S. experts work together to achieve excellence in nuclear security in their own countries, and to help other countries do the same. Recent incidents in both Russia and the

United States make clear that there is more nuclear security work to be done. Recent events around the world highlight the need for international cooperation to reduce the risk of catastrophic terrorism.

Unfortunately, controversies over Russian interference in the 2016 U.S. election and possible connections between Russia and Trump's campaign are constraining any major steps toward increased U.S.-Russian cooperation. Hence, the Trump administration should be looking for modest steps to cooperate with Russia that would begin to rebuild the relationship in key areas, would serve U.S. interests, and can be defended as not being concessions to Russia. Rebuilding cooperation between U.S. and Russian nuclear experts – particularly in nuclear security, but in other areas as well – should be high on the list.[1] This paper will outline the rationale for renewing U.S.-Russian nuclear security cooperation; propose particular types of cooperation to be pursued; and outline an approach for getting started.

Current Situation

Today, while commercial sales between U.S. and Russian nuclear firms continue, technical cooperation between U.S. and Russian government and laboratory experts is almost entirely at a standstill. The U.S. government cut off nuclear energy cooperation as part of the sanctions over Russia's seizure of Crimea and destabilization of eastern Ukraine in 2014, and Russia cut off almost all nuclear security cooperation – whose continued value the Russian government had already been viewing with considerable skepticism – later that year.[2] Later, Russia suspended its participation in the plutonium disposition agreement, terminated the U.S.-Russian agreement on converting research reactors, suspended its participation in the U.S.-Russian nuclear research and development agreement, and refused to participate in the 2016 nuclear security summit in Washington.[3] Congress, incorrectly viewing nuclear security cooperation as assistance to Russia's nuclear enterprise, has barred the Department of Energy (DOE) from spending any money "to enter into a contract with, or otherwise provide assistance to, the Russian Federation" unless the Secretaries of Energy, State, and Defense jointly certify that doing so is necessary to deal with a threat in Russia that "must be addressed urgently" and cannot be addressed by other means.[4]

As a result, few communications are still continuing; the world's two largest nuclear establishments are virtually not talking to each other, and their approaches to nuclear security, nuclear safety, and nuclear energy are proceeding in isolation from each other. (In mid-2017 DOE experts were told not to attend an international conference on fast reactors that was held in Russia.[5]) Similarly, almost all military-to-military contact has been cut off. Whatever value ongoing U.S.-Russian cooperation had in strengthening nuclear security in Russia is no longer being provided. U.S. experts are no longer visiting Russian nuclear facilities (and vice versa); hence, with every month that goes by, the U.S. understanding of how nuclear security is evolving in Russia gets hazier. Personal relationships – so crucial for getting things done in Russia – are decaying. Russian laboratory experts (especially from defense laboratories) have told many of their U.S. counterparts that they cannot even continue to discuss issues over e-mail.

But there are hints of opportunities. There is little doubt that Russian and U.S. nuclear experts would very much like to be collaborating again – on nuclear security, nuclear energy, nuclear safety, nuclear science, and more. At a February 2016 meeting in Moscow, U.S. and Russian experts laid out a wide range of often overlapping proposals for collaboration in areas ranging from nuclear cleanup to nuclear security, and officials from both governments praised past cooperation and held out hope for future work.[6] Rosatom's official statement on the cutoff of nuclear security cooperation argued that nuclear energy was a "strategic area" where cooperation "should not depend on situational changes in the political environment," and indicated that "we will be ready to return to cooperation when the American side is ready for that."[7] Russian officials have allowed cooperation

on strengthening nuclear security regulation to continue, and have said (both to non-government and government experts) that they would like to see expanded cooperation at Russia's nuclear security training center at Obninsk; a small number of discussions have in fact occurred there.

Russia has made clear, however, that it sees U.S. willingness to cooperate on nuclear energy as a clear indicator of whether the United States is serious about a cooperative approach that serves both sides' interests. It is unlikely that it will be possible to revive nuclear security cooperation absent a broader package of cooperative efforts that includes cooperation in nuclear energy R&D as well. Fortunately, despite the intense commercial competition between U.S. and Russian nuclear firms, R&D collaboration that took advantage of the ideas, expertise, test facilities, and substantial R&D funding that Russia brings to the table would also serve U.S. interests.

Potential Approaches for Nuclear and Radiological Security Cooperation

U.S. President Donald Trump and Russian President Vladimir Putin should direct their nuclear establishments to restart cooperative work on nuclear energy, nuclear security, nuclear science, nuclear safety, and, eventually, on topics such as developing new procedures and technologies for arms control verification as well. Such cooperation should not be like the Nunn-Lugar assistance of old, which is no longer appropriate or politically sustainable in either Washington or Moscow. Instead, it should be a partnership-based approach, based on principles of equality, mutual respect, and mutual benefit, with each party funding its own participation. Despite the deep disputes the two governments still have, such a partnership approach at the technical level is a realistic prospect.

This paper focuses on one aspect of such renewed cooperation, providing an initial outline of cooperative initiatives that could be pursued on improving security and accounting for nuclear and radiological materials. Other U.S.-Russian cooperative steps that could help reduce the risk of nuclear terrorism, from efforts to share intelligence, cooperate to disrupt and destroy terrorist groups with potential nuclear ambitions, and interdict nuclear smuggling, are important, but are beyond the scope of this paper, as are other areas of nuclear cooperation.[8]

U.S.-Russian nuclear and radiological security cooperation can serve several related, but separable, goals:

- Improving nuclear and radiological security (and the sustainability of existing measures) in Russia;
- Improving U.S. and Russian understanding of the status of nuclear security in each country (to aid in national security planning and prioritization);
- Improving nuclear and radiological security in the United States (by making use of Russian ideas and approaches, where they are useful);
- Improving nuclear and radiological security in third countries, and the sustainability of existing measures (by making use of both U.S. and Russian expertise);
- Building and maintaining personal and institutional relationships (important for building foundations for achieving these and other goals over the long term).

In planning cooperative activities, it is important to assess carefully how much contribution they would make to each of these goals. Working together on nuclear security in other countries, for example, could contribute to improving nuclear security in those countries (though the scale of the benefit compared to the United States simply working directly with those countries, or doing so with

other partners, would have to be assessed) and to building and maintaining personal relationships among the experts participating, but might not have much impact on the other goals.

Joint working groups and good practice exchanges

Among the most important initiatives would be to ensure that experts working on similar technological and organizational challenges are in regular contact and sharing ideas on the best approaches to solving them. This could be accomplished by forming joint U.S.-Russian working groups in particular areas, with both countries funding their own experts' participation. Exchanges of good practices in particular areas, coupled with discussions of remaining challenges to be addressed, could be a key element of such an approach. Each country could choose how best to implement the ideas exchanged or developed in the working groups; in some cases, the working groups might develop joint technical guides, or launch joint R&D projects to improve particular technologies (see below for more discussion of joint R&D).

Areas for joint working groups might include:[9]

- Material accounting and control for bulk-processing facilities
- Tamper-indicating devices
- Vulnerability assessment
- Performance testing (including force-on-force exercises)
- Insider threat protection
- Security culture
- Transport security
- Regulation and inspection

Cyber security is an increasingly important area of nuclear security that was not fully addressed in past U.S.-Russian cooperation. But given the intense suspicions and tensions between the United States and Russia in the cyber arena – including suspicions on both sides that the other is targeting its nuclear facilities with cyber weapons – it may or may not be possible to have productive discussions of approaches to protecting nuclear facilities from cyber intrusions in the initial stages of cooperation.

Joint R&D on improved nuclear security and accounting technologies

Cooperation is likely to be especially attractive and sustainable if it brings commercial benefits. Both U.S. and Russian firms are regularly developing new hardware and software products for nuclear security applications. There may be opportunities for the U.S. and Russian governments to fund joint nuclear security R&D, and arrange for mutual benefit from marketing the resulting products. One approach might be, for example, for the Russian participating firm to retain all rights for marketing the resulting items within Russia, the U.S. participating firm for marketing them within the United States, and for a negotiated sharing of rights for marketing them elsewhere.[10] Under such an effort, the U.S. and Russian governments could establish a joint nuclear security R&D program with a pool of funding that a committee of Russian and U.S. experts would allocate to the most promising projects.

Areas for joint R&D might include:

- Improved computer tools for vulnerability assessment (including for assessing vulnerabilities to insider threats, and for integrated cyber/physical vulnerability assessment);
- Improved technologies for nuclear materials and explosives detection, at short range and at distance (including in the face of shielding);
- Improved technologies and approaches for measuring the plutonium and uranium content of spent nuclear fuel, of scrap, and of radioactive wastes;
- Improved material accounting systems for plutonium reprocessing, plutonium and HEU fuel and component fabrication, and other bulk processing facilities;
- New approaches to integrating the use of drones and other new technologies into nuclear security systems.

Joint development of nuclear security principles

The United States and Russia, with their extensive experience in nuclear security, have clear ideas of what kind of security is needed for nuclear weapons, or for Category I quantities of highly enriched uranium (HEU) or separated plutonium. Moreover, in past cooperative threat reduction efforts, they reached broad agreement on what nuclear security goals the systems being developed and installed should be designed to reach.

Another promising area of cooperation, therefore, would be to work together to develop clear principles and guidance for the kinds of nuclear security measures that should be in place, wherever these items exist. The two sides could draw from their real experience in implementing cooperative nuclear security upgrades to outline what measures they believed were needed and how they could be implemented.[11] This might be particularly important for nuclear weapons and materials for defense purposes, which are not effectively covered by IAEA recommendations. Ultimately, U.S. and Russian experts could take the lead in developing principles that all states with military materials might commit to implementing. Principles might include such items as providing protection against the full set of adversary capabilities and tactics that are judged to be plausible at that location; having well-armed, well-trained, and well-motivated on-site armed guard forces sufficient to defeat adversary threats (or to delay them until supplemented by off-site forces); having regular programs of inspection and testing to ensure that systems are performing as intended; having comprehensive programs to protect against insider threats; and having regular efforts to assess and strengthen security culture in operating organizations.[12]

Cooperation to strengthen nuclear security in other countries

Russian and U.S. experts can also cooperate in improving nuclear security in third countries. Already, U.S.-Russian cooperation has helped many countries convert their HEU-fueled research reactors to LEU and ship their HEU back to Russia (work that has continued, despite current tensions). U.S. and Russian experts could cooperate in providing training, assistance in designing and installing appropriate security systems, regulatory support, and more. In the past, there have been a number of cases in which experts from two or more countries cooperated to improve security and accounting in another country – such as U.S., Australian, U.K., and Swedish assistance to upgrade physical protection and material control and accounting at the Institute for Nuclear Physics in Uzbekistan, to take one example. Such cooperation can be quite efficient, as long as the parties agree on who will undertake which tasks.

In particular, it would be important to work together (and with the IAEA) to establish effective nuclear security approaches from the outset in newcomer states, including effective nuclear security regulation, to ensure that new nuclear reactors in these countries are well protected from sabotage and terrorist attack. Both the United States and Russia should be willing to work together to ensure security for new nuclear programs, regardless of what country has the contract to build the first reactors. Cooperation to better protect dangerous radiological sources around the world could also be beneficial (see discussion of radiological source security below).[13]

Cooperation to minimize sites requiring high security

Both Russia and the United States have worked to consolidate their own stockpiles of nuclear weapons and materials in fewer locations (since it is possible to achieve higher security at lower cost by protecting fewer sites), to help convert HEU-fueled research reactors they supplied to LEU, and to take back the HEU that is no longer needed.

There is more to do on minimizing the number of sites both internationally and within the United States and Russia. Russia, in particular, continues to maintain the world's largest number of nuclear weapon storage facilities and the world's largest number of buildings with separated plutonium or HEU. Russia maintains a fleet of HEU-fueled research reactors far larger than any other country in the world, and far larger than is plausibly needed (including, for example, two-thirds of the world's remaining HEU-fueled pulse reactors and critical assemblies, two types that pose particular dangers because of the large stocks of high-quality HEU they typically use); it could achieve its ongoing civilian and military requirements more effectively at lower cost by shutting many of these facilities and concentrating resources on the remainder.[14] Yet Russia tightly limited U.S.-Russian cooperation on conversion of HEU-fueled research reactors within Russia, has now terminated that agreement, and has no plan for reducing its fleet of HEU-fueled reactors.[15] Russia, to serve its own national interests, should move to greatly reduce the number of HEU-fueled research reactors it operates, closing those whose benefits no longer outweigh their costs and risks, and converting others to LEU.

Renewed U.S.-Russian cooperation could facilitate such efforts. For example, both Russia and the United States are working to develop new, high-density fuels to convert high-performance HEU-fueled research reactors, as are international partners in Europe and East Asia; re-engaging Russia on cooperation in this area could potentially strengthen and accelerate these efforts. Similarly, Russia and the United States should work together to establish reliable production of medical isotopes without HEU.[16] Russian and U.S. experts could also work together to assess the potential for using accelerators as alternatives to research reactors for some applications, ranging from neutron research to isotope production.[17] The United States has several aging high-performance research reactors that cannot be converted to LEU with existing fuels. Neither country has a long-term plan for their research reactor fleets. As a new initiative, each country should develop a plan for achieving the science, training, and isotope production they need at minimum cost and risk, with minimum use of HEU or plutonium – plans for "Neutrons for America" and "Neutrons for Russia." In the civilian domain, these plans should include sharing of facilities where appropriate, as the scientific objectives such reactors can pursue are largely common. Discussions of the development of these plans, and of opportunities for conversion or consolidation of existing HEU-fueled reactors, could be the subject of another joint U.S.-Russian working group.

As part of such an effort, it would make sense to cooperate on converting propulsion reactors – both icebreakers and naval reactors – to LEU fuel over time. If these reactors continue to use large quantities of HEU indefinitely, the huge stocks of HEU Russia and the United States would likely

retain to fuel them would pose problems for both nuclear security and the stability of deep reductions in nuclear arms.

Reciprocal technical exchange visits

To really understand how a site implements particular aspects of nuclear security, there is no real substitute for going there, seeing it in action, and discussing it with experts at the site. Both U.S. and Russian experts would benefit from a regular program of visits to selected nuclear sites. Sites would also benefit from the independent perspective offered by outside experts. And both the U.S. and Russian governments would have increased confidence in how nuclear security was being implemented in both countries.

In the past, as part of assistance efforts, there were more U.S. experts visiting Russian sites than Russian experts visiting U.S. sites – but Russian experts visited the key facilities of the U.S. nuclear weapons complex, including all of the U.S. nuclear weapons labs, the U.S. nuclear weapons assembly and disassembly facility, and the U.S. sites for managing plutonium and HEU. In a future approach, visits would be reciprocal: a Russian team would visit a U.S. site for a technical exchange on particular agreed topics, and then a U.S. team would visit a comparable Russian site for a similar technical exchange. There should be open discussion in advance of visits about concerns and sensitivities regarding these sites and how to address these concerns.

Cooperation to remove radiological sources and adopt replacement technologies

Russia and the United States have successfully cooperated on a large number of removals of radiological sources. This cooperation continued after the cutoff of most nuclear security cooperation, and recently included the removal of radio-thermoelectric generators (RTGs) from Antarctica.[18] Russia and the United States should continue to cooperate to consolidate unused sources and, where practical, develop and deploy alternative technologies that pose fewer dangers than large radiological sources.[19]

Cooperation to strengthen radiological source security

In addition to removals, Russia and the United States have had many successes in cooperating to improve security for radiological sources, both in Russia and in other countries. This cooperation, too, should continue. Here, too, Russian and U.S. experts, working with other countries and with the IAEA, can jointly develop key principles and approaches that should be applied to security for all of the most dangerous radiological sources, and work to help countries apply them at particular sites and transport routes with especially dangerous radiological materials.

Steps to Get Started

In rebuilding U.S.-Russian nuclear security cooperation, it will be essential to proceed step-by-step – and to make clear that whatever cooperation goes forward will not be just a return to old Nunn-Lugar approaches, but a new approach based on equality.

Small early steps might be done quietly, "under the radar" – such as small-group workshops on particular topic at the Russian training centers at Obninsk (or elsewhere, such as in Vienna). With each side paying for its own participation, there would be no contract or assistance to Russia requiring DOE to waive congressional restrictions.

But given the sensitivity of the topic, it is not likely that more substantial cooperation would remain under the radar for long; high-level approval and direction is likely to be needed. A brief summit-level statement highlighting the importance of cooperation on civil nuclear energy and on preventing nuclear proliferation and terrorism, and establishing a joint working group to oversee such cooperation, could provide political cover for experts on both sides to pursue such cooperative

activities. As a first step, such an initiative would not need to be as specific as Bush-Putin Bratislava initiative, which set particular deadlines and designated particular officials to be responsible for overseeing work on meeting them; a more general endorsement of cooperation and creation of a structure for overseeing the work would be sufficient.[20] While cooperation on nuclear energy R&D – likely to be essential to getting agreement to restart significant nuclear security cooperation – would mean rolling back one small piece of the sanctions imposed after Russia's seizure of Crimea, it would have no significant impact on Russia's economy, would leave the rest of the sanctions structure intact, and would significantly benefit the United States' own nuclear R&D efforts.

Past experience suggests that each area of cooperation may require a legal framework under which it proceeds. The two sides could revive the U.S.-Russian nuclear R&D agreement, which would provide an appropriate, equal basis for a wide range of projects, from exchanges of best practices to joint R&D. If there are areas of cooperation both sides wish to pursue that do not fit well into the R&D agreement or other existing agreements, it may be possible to negotiate new accords. For example, before the conflict in Ukraine, the two sides were discussing a new agreement on cooperation in nuclear emergency response.

Much of the work that might be done to improve nuclear security in other countries might be done working through the IAEA, as the leading international organization that includes nuclear security in its mandate. The returns of Russian-supplied HEU to Russia, for example, have included a central IAEA role. Both Russia and the United States have contributed funds and experts to strengthen the IAEA's nuclear security abilities, and U.S. and Russian experts could work together on a wide range of topics in an IAEA context – or could jointly develop ideas to be presented in IAEA discussions.

The United States and Russia should also consider leading the creation of a nuclear security working group in the Global Initiative to Combat Nuclear Terrorism. In that format, Russia is a co-leader with the United States (as co-chair of the Global Initiative) rather than a follower in a U.S.-led enterprise, as they were in the nuclear security summit process from which Russia ultimately withdrew.

Past experience also suggests that having a joint coordinating committee for overseeing the work and discussing and agreeing on next steps can be very helpful. A renewed working group covering all agreed areas of nuclear cooperation – going well beyond the nuclear security focus of this paper – could be established to work out next steps in nuclear cooperation.

The Path Forward

Both Russian and U.S. national interests would be served by a well-designed program of U.S.-Russian cooperation on nuclear security, based on a partnership approach, and part of a larger package of renewed nuclear cooperation. Together, experts from Russia and the United States, working in their own countries and with other states, could substantially reduce the danger of nuclear terrorism, promote a safe and secure future for nuclear energy, and keep open a dialogue that can help build mutual confidence and understanding.

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