

# RECONSIDERING US NUCLEAR COOPERATION AGREEMENTS

BY RICHARD NEPHEW  
MARCH 2020

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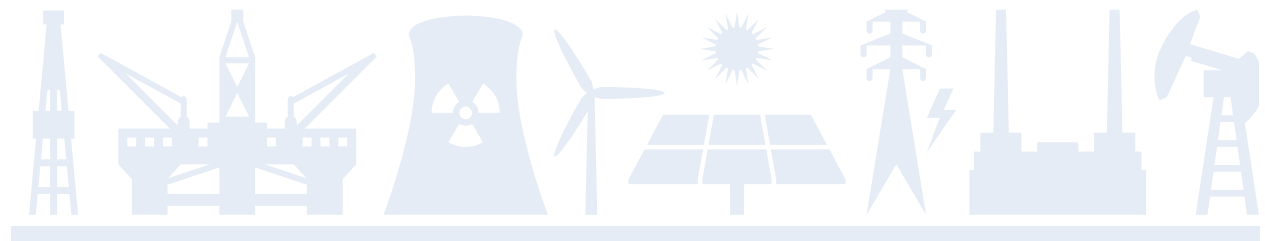
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## EXECUTIVE SUMMARY

Despite having played a central role in the creation of the international nuclear commercial sector, today the United States is increasingly on the outside looking in when it comes to civil nuclear projects. The United States now accounts for a relatively small number of new reactor builds, both at home and abroad. There are a few rays of sunshine for the US nuclear industry, especially when it comes to new technology. In fact, many of the new reactor builds that are underway do involve US technology and intellectual property, even if others are performing the construction. To take advantage of a similar dynamic, US innovators are looking to both new and forgotten designs as a way of managing the challenges of nuclear fuel manufacture, safety, waste management, security cost, and proliferation. But these new technologies face an uncertain future (and so consequently does the US role), even notwithstanding the advantages nuclear energy would bring to managing climate change and the edge the United States may have in their development.

Various factors account for the challenges facing the US nuclear industry, including the complex political, economic, scientific, and popular environment around nuclear technology and civil nuclear energy. Of the various problems potentially plaguing US nuclear energy policy, one remains both difficult to address and controversial: US requirements for nuclear cooperation, and in particular, the demand from many in Congress and the nonproliferation community that the United States insist on binding commitments from its cooperating partners to forswear developing enrichment and reprocessing technology. While this policy is not responsible for the decline of the US nuclear industry, it adds additional hindrance to US nuclear commerce abroad and may even be to the long-term detriment of US nonproliferation policy interests.

If so, then the questions that arise are whether this is in the US interest and, if not, how the US ought to respond. If the government believes that having a role in international nuclear commerce is advisable on both economic and strategic grounds, then it needs to decide whether to commit resources to incentivize foreign partners to overlook the problems its nonproliferation policies may cause these partners or seek modifications to those policies.

From a pure nonproliferation perspective, it would be preferable for the United States to invest in its nuclear industry to ensure it is competitive globally. But, this does not seem to be a likely course of action for the United States given the myriad political, legal, and budgetary complexities that would be involved. Consequently, this paper recommends several changes to how US nuclear cooperation agreements are negotiated as well as enhancements to overall US nuclear nonproliferation policies. In aggregate, they seek to rebalance and reformulate some aspects of US nuclear nonproliferation policy to make it more effective and efficient, particularly regarding engagement in civil nuclear commerce, but without compromising the core nonproliferation interests the current US diplomatic approach seeks to advance.



*With respect to nuclear cooperation agreements*, the paper recommends the following:

1. Relaxing the current US preference for a legally binding commitment to forswear all enrichment and reprocessing capabilities indefinitely for these agreements, while continuing traditional US policy to discourage these technologies development through various means.
2. Relying on enhanced inspector access and improved verification tools, technology, and practices to provide confidence on the nondiversion of civil nuclear cooperation rather than assurances regarding enrichment and reprocessing that, in any event, are potentially revocable.
3. Adopting a favorable view of “black box” transfers of nuclear power reactors and building this into policy as new, advanced reactor concepts are being explored, developed, and marketed.
4. Creating a new sanctions regime to cover countries that pursue enrichment and reprocessing capabilities after concluding a 123 agreement.

*With respect to nuclear nonproliferation policy more generally*, the paper recommends the following:

1. Developing an annual nonproliferation indicators publication to identify trends in proliferation, including the kinds of goods that proliferators are potentially seeking. This document would also include a list of countries where there are presently enhanced concerns regarding national nuclear programs *or* concerns about transshipment and export control risk. Its objective would not be to serve as a proxy for future sanctions designations decisions but rather to give a broad perspective of the challenges that exist with particular jurisdictions even—and perhaps especially—if there is no need or justification for sanctions at present.
2. Developing a warning system for sought-after goods. The United States should work with industry to develop a restricted database that identifies sensitive goods that are being sought. This database would be accessible to corporate compliance officers, who would be vetted for access to the information. Within it, the database could also include additional information about the sorts of tactics being employed by proliferators.
3. Making greater use of end use verification as a means of facilitating monitoring of the nonproliferation commitments of countries, particularly regarding dual use technology. This could also be built out to include greater collaboration with partner countries and companies.
4. Amending Executive Order 13382, which provides for sanctions against proliferators of weapons of mass destruction, to add a prong of “willful negligence.”





# INTRODUCTION

Despite having played a central role in the creation of the international nuclear commercial sector and possessing the world's largest commercial reactor fleet operating today, the United States is increasingly on the outside looking in when it comes to civil nuclear projects. Domestically, only two reactors are under construction at the time of this writing; two additional reactors halted construction during the time taken to write this paper and have since been scrapped altogether.<sup>1</sup> Another dozen or so are in various stages of authorization and planning but with uncertain timetables and even futures. Internationally, the bankruptcy of Westinghouse and struggles of other big US firms in developing new markets have been well documented. The United States now accounts for a relatively small number of new reactor builds internationally.<sup>2</sup> Nevertheless, there are a few rays of sunshine for the US nuclear industry. In fact, many of the new reactor builds that are underway do involve US technology and intellectual property, even if others are performing the construction. To take advantage of a similar dynamic, US innovators are looking both to new and forgotten designs as a way of managing challenges of nuclear fuel production, safety, waste management, security cost, and proliferation. But these new technologies face an uncertain future, notwithstanding the advantages nuclear energy would bring to managing climate change and the edge that US industry may have in this field (as other countries have researchers exploring the same possibilities as well).

Various factors account for the challenges facing the US nuclear industry, including the complex political, economic, scientific, and popular environment around nuclear technology and reliance on nuclear power. Other papers—including those published by the Center on Global Energy Policy<sup>3</sup>—address potential solutions to these challenges. But of the problems potentially plaguing US nuclear energy policy, one remains both difficult to address and controversial: the role of US nonproliferation policy and especially the way the United States negotiates nuclear cooperation agreements.

For some, the US insistence on high nonproliferation standards has been the Achilles' heel of the sector, hamstringing US nuclear commerce by creating barriers to US exports that countries such as Russia and China do not have to face. From this argument flows the contention that, for the United States to compete in the global nuclear game, it needs to ratchet back its emphasis on nonproliferation. A complementary argument is that simply by being part of the global nuclear commercial sector, the United States positively affects the behavior of other states and participants. Put another way, the best US nonproliferation policy is to let exporters export, with the strength of our comparative advantage in technology driving better nonproliferation choices.

There are counterarguments. Some have noted that previous, more lax US nonproliferation policy has not prevented US nuclear cooperation from being diverted to weapons use and that tough, legally-binding standards are needed. Others have taken issue with the automatic assumption that Russia and China are inclined to support proliferation. They note that Russia, for example, helped to negotiate the Treaty on the Nonproliferation of Nuclear Weapons



(NPT) as the Soviet Union and has been an active member of the Nuclear Suppliers Group (NSG) and other export control organizations. Even as challenges persist, China has also improved its nonproliferation performance in the last 20 years, at least as relates to transfers of nuclear technology to states in noncompliance with their NPT obligations (such as Iran) and responsiveness to US requests for cooperation to address some illicit transfers. As such, it would be a misnomer to argue that Russia and China have materially softer approaches and that, where there are deficiencies, the United States ought to encourage them to make improvements. Still others argue that US nonproliferation policy is largely irrelevant when compared to the financial incentives that other exporters are prepared to offer.

This paper begins with an assumption that while US nonproliferation policy has not been responsible for the decline in US nuclear exports, it adds additional hindrance to US nuclear commerce abroad and may even be to the long-term detriment of US nonproliferation policy interests. It begins with a historical overview of how the United States has handled nuclear cooperation since 1945, particularly in light of the negotiation and implementation of the NPT. It then outlines current problems in this approach. It concludes with suggestions for how to adapt current US nonproliferation policy, and particularly how nuclear cooperation agreements are negotiated, to address the current climate.

This paper does not advocate dispensing with nonproliferation priorities, such as minimizing the proliferation of enrichment and reprocessing technology, nor does it advocate for a “compete at all costs” approach with Russia and China. Instead, as with previous restrictions on computing technology, it asks the question of whether nonproliferation policies forged in the 1970s and reinforced in the 1980s and 1990s are constructive today. It posits that there are changes to how the United States approaches nuclear nonproliferation in general that might have positive ramifications for US nuclear cooperation arrangements and US nuclear exports without adversely affecting US nonproliferation interests. It underscores the value of nonproliferation but also recognizes that nonproliferation requirements, mechanics, and opportunities may be changing alongside economic, technological, and political realities. It is written out of a firm belief in the necessity of strong but pragmatic nonproliferation policies that advance the sum total of US national interests.



# HISTORICAL CONTEXT

The US approach to nuclear cooperation since 1945 can best be described as falling into three periods of time: total secrecy, “Atoms for Peace,” and seeking a middle ground.

## Total Secrecy

Perhaps not surprisingly, the US approach to all forms of nuclear technology exchange in the immediate aftermath of World War II was to maintain its total secrecy and prohibition to the extent possible. The 1946 Atomic Energy Act (AEA) banned the transfer of all nuclear material, equipment, and technology to other countries.

The logic of the approach was simple and direct: the United States was, at the time, the only known and declared nuclear power. There was some hope that, in the event that the United States was able to control dissemination of nuclear information, the United States would be able to prevent its diffusion to potentially hostile powers. This viewpoint even led the United States to limit access to nuclear information by the United Kingdom, which was a key participant in the Manhattan Project. But by 1953, the Soviets were in possession of nuclear weapons and facilities, as were the British, and it seemed unlikely that further domestic restrictions would prevent the diffusion of nuclear knowledge or nuclear weapons.

## “Atoms for Peace”

In 1953, President Eisenhower took the US approach to nuclear technology and flipped it on its head. Rather than seek to contain all forms of nuclear knowledge to the extent possible, the Eisenhower administration recognized that the policy of denial was unlikely to work and might have undermined the US ability to manage the growth of nuclear energy worldwide. Speaking at the United Nations General Assembly in December 1953, Eisenhower made the “Atoms for Peace” speech, in which he advocated for broad international nuclear information exchange but with an eye toward ensuring that nuclear development internationally was restricted to “peaceful uses.” Among other things, he called for the creation of an Atomic Energy Agency that would be

- “made responsible for the impounding, storage and protection” of a global stockpile of nuclear material;
- tasked with applying “atomic energy to the needs of agriculture, medicine and other peaceful activities”; and
- given the purpose of providing “abundant electrical energy in the power-starved areas of the world.”<sup>4</sup>

After three years of negotiations, the International Atomic Energy Agency (IAEA) was created, following US ratification of the IAEA’s statute. Its mission, per its statute, would be to:

- “accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world”; and



- “ensure, so far as it is able, that assistance provided to it or at its request or under its supervision or control is not used in such a way as to further any military purpose.”<sup>5</sup>

This purpose would come to be identified as “nuclear safeguards,” whereby nuclear materials would be declared to the IAEA and subject to a variety of transparency and monitoring provisions.

Simultaneously, the United States undertook changes to its own domestic law that would facilitate the transfer of nuclear technology around the world. In 1954, the US Congress passed a revised version of the 1946 AEA that permitted “nuclear technology and material exports if the recipient countries committed not to use them to develop nuclear weapons.”<sup>6</sup> The combination of the changes to the AEA as well as the creation of the IAEA led to a profusion of nuclear programs around the world, particularly the construction of research reactors and other associated facilities.

The terms of the agreements that covered those initial collaborative projects are particularly salient for purposes of this paper. The 1954 AEA set forth the terms of bilateral agreements for cooperation in Section 123. This section laid out the terms whereby US entities may be permitted to cooperate on nuclear matters with foreign countries that involve the transfer of nuclear materials, equipment, and technology as specified in the statute. In 1954, the criteria specified that the (then) Atomic Energy Commission would submit an agreement to Congress that included

1. the terms, conditions, duration, nature, and scope of the cooperation;
2. a guaranty by the cooperating party that security safeguards and standards as set forth in the agreement for cooperation will be maintained;
3. a guaranty by the cooperating party that any material to be transferred pursuant to such agreement will not be used for atomic weapons or for research on or development of atomic weapons or for any other military purpose; and
4. a guaranty by the cooperating party that any material or restricted data to be transferred to the cooperating party will not be retransferred, except as specified in the agreement.

The original approach to a Section 123 agreement involved congressional scrutiny, but only for 30 days while Congress was in session and an affirmative vote of approval by Congress was not required. The effect was to remove the prohibitions on US nuclear cooperation internationally but set forth a number of nonproliferation controls as a condition of US nuclear cooperation with other countries.

## Seeking a Middle Ground

By 2019, the terms of a Section 123 agreement changed considerably. The main principles of the original Section 123 show through (e.g., restrictions on retransfer, prohibitions on military use, and the need for security and safeguards), but significant additional requirements were added in the Nuclear Nonproliferation Act of 1978, partly in reaction to India’s 1974 detonation



of a nuclear device. As amended, Section 123 requires that an agreement for nuclear cooperation\* must include

1. a guaranty by the cooperating party that safeguards will be maintained on any nuclear material and equipment subject to the agreement (which could include nuclear material produced via the equipment or materials transferred);
2. a commitment by the cooperating party that it will maintain IAEA safeguards on all nuclear material under its jurisdiction or control (i.e., “full-scope safeguards” or “comprehensive safeguards”);
3. a commitment not to use any items subject to the agreement in furtherance of nuclear explosives or any other military purpose;
4. a commitment that the United States would have the right to demand the return of any nuclear material or equipment subject to the agreement if the recipient state terminates or abrogates IAEA safeguards or detonates a nuclear explosive device;
5. a guaranty not to retransfer restricted data or nuclear material and equipment subject to the agreement to another country without US consent;
6. a guaranty to maintain adequate physical security for any nuclear material and equipment subject to the agreement;
7. a guaranty that the United States would have prior consent rights if the cooperating party wishes to reprocess, enrich, or otherwise alter in form or content nuclear material subject to the agreement;
8. a guaranty that the United States would have prior approval of facilities in which specified sensitive nuclear materials subject to the agreement would be stored; and
9. a guaranty that all of the above requirements would apply to any special nuclear material or use of production facility resulting from the transfer of “sensitive nuclear technology” transferred pursuant to the agreement.<sup>†7</sup>

Under the AEA as amended, AEC’s agreements are negotiated by the secretary of state with the technical assistance of the secretary of energy. The Department of Defense provides its views to the State Department in this process, while the Nuclear Regulatory Commission provides its independent view directly to the president. To demonstrate that the terms

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\* 123 Agreements are not required for all forms of nuclear cooperation. For example, the AEA also includes an authorization for “limited forms of nuclear cooperation ... if that activity has been authorized by the Secretary of Energy following a determination that it ‘will not be inimical to the interest of the United States.’” Such authorizations take place under Section 57b of the AEA and Part 810 of the Code of Federal Regulations and are therefore known as “Part 810 authorizations.” By and large, Part 810s cover “unclassified nuclear technology transfer and services, such as nuclear reactor designs, nuclear facility operational information and training, and nuclear fuel fabrication.” Put another way, Part 810s usually cover “knowledge,” while 123 Agreements focus on materials and equipment.

† Other parts of the AEA lay out the process for licensing nuclear exports pursuant to an agreement for nuclear cooperation as well as the terms for “subsequent arrangements” that might involve, for instance, enrichment or reprocessing of nuclear materials.



of Section 123 of the AEA are followed, Congress also established a process whereby the executive branch would be required to submit the text of the agreement along with a Nuclear Proliferation Assessment Statement for congressional review for a period of 90 days of continuous session before its entry into force.†

The AEA still does not require congressional approval of an agreement that satisfies all the terms of Section 123, but it does lay out the terms for rejection of the agreement as well as a requirement for congressional approval of any proposed agreement that does not satisfy all the terms of Section 123. Section 123 also includes a general requirement that “the President shall keep the Committee on Foreign Affairs of the House of Representatives and the Committee on Foreign Relations of the Senate fully and currently informed of any initiative or negotiations relating to a new or amended agreement for peaceful nuclear cooperation pursuant to this section.”<sup>8</sup>

The United States currently has 23 such agreements for nuclear cooperation with 48 countries, including the IAEA and the authorities on Taiwan. The first agreements were with Canada and Taiwan in 1955.<sup>9</sup> The agreements that predated the Nuclear Nonproliferation Act of 1978 were systematically renegotiated to reflect the more robust provisions of the amended Section 123.

The changes to the requirements of 123 agreements are substantial and underscore the profound shifts in nonproliferation-related thinking that emerged in the mid-1970s. Three specific factors can be identified in the more aggressive approach taken to support nonproliferation: changes in technology; changes in proliferator behavior; and changes in the threat perception from terrorists and other groups.

## Technology Change

Simply put, the changes wrought by nuclear technology’s own development and improvement created real problems for nuclear nonproliferation. By the 1970s, much had been learned about nuclear materials science and the engineering problems that a nuclear program had to solve. Likewise, though the Manhattan Project required a vast expenditure of resources (\$35.7 billion in 2019 dollars, roughly one-seventh of the total cost of all bombs, mines, grenades, small arms, tanks, and artillery used in World War II<sup>10</sup>), the costs of nuclear proliferation had been going down. Glenn Seaborg, former chairman of the US Atomic Energy Commission, in his book *Stemming the Tide*, estimated the cost of producing one to two nuclear weapons was no more than \$100 million in 1966;<sup>11</sup> in 2019 dollars, that is just over \$806 million.<sup>12</sup> Seaborg further noted that a United Nations expert panel projected that the cost of producing 100 20-kiloton plutonium bombs would be \$188 million by 1977 (or less than \$825 million in 2019 dollars).<sup>13</sup> Much of this cost cutting would come from the larger supplies of available nuclear material as well as the greater sophistication in the machinery and processes needed to manufacture the material.

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† Taking into account congressional recesses, the 90 days of continuous session can often take as long as six months to complete.



From a purely commercial and scientific perspective, the advancement of the overall state of nuclear technology was a good thing. It meant greater efficiency, less waste, and the prospect of nuclear power's great promise of cheap, reliable electricity being achieved. But from a nonproliferation perspective, the reduced costs associated with nuclear technology were decidedly negative. It lowered the barriers for similar investments by a wider range of countries and, consequently, the possibility of illicit activity.

This was especially the case given that the technology itself was becoming easier to use and easier to hide. Still, at the time, plutonium was seen as the nuclear weapons material of choice. For example, Seaborg draws attention to the ubiquity of spent nuclear fuel containing plutonium as a source of tremendous proliferation concern. He also notes that “the chemical processing and fabrication of plutonium is a very formidable, hazardous, high-technology task.”<sup>14</sup> He does note that people were aware that “some breakthrough in technology might occur that would bring nuclear weapons more easily within the reach of additional nations.”<sup>15</sup> He particularly highlighted uranium centrifuges, underscoring that their potential for use in an efficient nuclear weapons program was a reason the United States barred private companies from working on the technology in the late 1960s.

But Seaborg fails to point to the problems that the proliferation of centrifuges would create, especially in the context of uranium's relatively simpler management problems due to its lesser radioactivity and toxicity compared to plutonium. By comparison with gaseous diffusion enrichment technology, centrifuges required less energy and were smaller and less observable; their lack of attention in the US nuclear program stemmed largely from their relative smaller output and more finicky construction when compared to the massive, well-established gaseous diffusion plants. Of course, by the 1990s and later, it was well established that proliferators could and would seek to use technology that was more discreet and easier to hide. The examples of Pakistan, North Korea, and Iran (and Iraq until 1991 and Libya until 2003–2004) demonstrated that uranium enrichment—especially via centrifuge—was not just a way for states to acquire nuclear weapons but potentially the most attractive means for those seeking to do so quietly.

The point is less that Seaborg—and others—did not fully foresee how nuclear technology would change but rather, to underscore Seaborg's more fundamental statement, that change was inevitable and that it is necessary to configure nonproliferation policies to manage proliferation in expectation of such change.

### **More Proliferators, More Problems**

This revelation also dovetails with shifting notions of who would seek to proliferate and how they would treat their obligations to not do so.

Simply put, the 1954 version of the AEA was built with a certain understanding of what it would take to be a proliferator. The approaches taken by the Chinese, French, Indian, Israeli, and other nuclear weapons programs challenged this understanding almost immediately. The oft-quoted Kennedy admonition that, left unchecked, the 1960s could end with dozens of nuclear weapons states accurately reflected the circumstances of the time, but so, too, did the fact that the countries pursuing nuclear weapons used a variety of means and methods to advance their programs. India, for example, diverted nuclear-related material and equipment



from the United States and Canada to detonate what it called a “peaceful nuclear explosive device.”<sup>16</sup> Avner Cohen’s book *Israel and the Bomb* similarly recounts Israel’s decision to divert spent fuel for reprocessing and acquisition of weapons-grade plutonium from the French-supplied Dimona research reactor.<sup>17</sup> These activities were coincident with reports that many other countries—from South Korea to West Germany to Sweden—were likewise interested in taking advantage of their nuclear capacities for military deterrence. Given this, there was a natural and desirable interest on the part of the US government to guard against US complicity as well as, more generally, to find ways of preventing proliferation where possible.

Put another way, the NPT lessened but did not eliminate the proliferation threat, as some states remain outside the regime (e.g., India, Pakistan, and Israel) and others violate their obligations under the treaty (e.g., Iraq, Iran, Libya, North Korea, and Syria). For this reason, the United States began to explore other complementary approaches to prevent future diversion as well as to more generally restrict the availability of US assistance for foreign nuclear programs that might be perceived as being on the bubble for proliferation. In 2004, President George W. Bush took this approach to a logical conclusion, announcing that the United States would seek to amend the guidelines of the (then) 40-member NSG to prevent the provision of uranium enrichment and reprocessing technology to countries not already possessing it, as well as seek a prohibition against nuclear cooperation of any sort with countries that had not accepted enhanced IAEA safeguards (via a mechanism known as the “Additional Protocol”).<sup>18</sup> The Bush administration followed up on this effort by modifying its negotiating approach with respect to 123 agreements, seeking that they include a clear renunciation of enrichment and reprocessing technology for those countries not already in possession of it. This approach was applied in the US-United Arab Emirates (UAE) 123 agreement in 2009 and became known as the “gold standard” for 123 agreements.<sup>9</sup> In many ways, this was an apt description in that the UAE agreement became the standard by which agreements would be judged—by Congress and some in the public at the very least—and also due to the rarity of similar such agreements, as will be discussed in the next section.

### Greater Concerns around Theft and Misuse

Also at this time, there emerged a sense that nuclear material was vulnerable to theft and misuse. Nuclear security was an established concept long before the 1970s, but there was less of an expectation that nonstate actors (like terrorists and criminal organizations) were aware of or interested in nuclear items. Rather, security was focused on more state-based threats, like espionage or sabotage. In the 1970s, nuclear security began to be taken more seriously as a challenge presented by nonstate groups, driven in part by the “many incidents of airline hijacking worldwide, as well as terrorist attacks against various targets.”<sup>19</sup> In response, the nuclear community began to assess the potential effects of “unauthorized removal of nuclear material” and their use.<sup>20</sup> In 1972, an advisory group to the IAEA issued a set of international guidelines for physical protection of nuclear materials, which, over time, have been modified and enhanced to deal with developments in technology as well as in the nuclear threat profile.

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§ Notably, however, the UAE agreement was based on the premise that the “terms and conditions ... shall be no less favorable in scope and effect” than other deals in the Middle East. The UAE reserved the right to withdraw from the agreement should this premise be violated.





Modifications to the US 123 agreement framework and negotiating process matched these developments, prioritizing physical protection and other security mechanisms. This was identified as renewed particular importance after the collapse of the Soviet Union—which raised the concern that organized criminal groups could seek to profit from pilfering the Soviet nuclear arsenal or employing underpaid nuclear experts—and the events of 9/11, which crystalized the fears that terrorist groups would be prepared to engage in mass casualty events.<sup>21</sup>

## Finding a Balance

The threat and international complexity presented by nuclear proliferation over the past 30 years underscores the importance of shaping nuclear cooperation with a healthy sense of what might go wrong, especially as one looks at the implications of nuclear weapons programs in South Asia and the persistent risk of war, the threat of conflict in Northeast Asia and the Middle East, and the increasingly tenuous nature of arms control between the United States and Russia.

But this does not mean the balance between nuclear cooperation and nonproliferation is necessarily well set, nor does it follow that changes to this balance would invariably result in more proliferation (or, for that matter, more cooperation). Instead, we must first look to see what the effect of present nonproliferation policy has been on nuclear cooperation and commercial activity and, second, evaluate whether there are changes that might be made to US nonproliferation policies that would improve commercial and cooperative ventures without imperiling nonproliferation.



## CURRENT ISSUES

US nonproliferation policy can affect the US commercial nuclear sector if US extensive nonproliferation controls drive foreign countries to turn to other suppliers that do not impose such restrictions. But determining precisely how much nonproliferation policy drags on industry is far more complicated.

Much has been written about the difficulty of making nuclear projects work in the United States over the last few decades, including by Tim Frazier for the Center on Global Energy Policy in 2017.<sup>22</sup> In his paper, Frazier notes that large-scale research and development (R&D) projects had been put on hold or terminated, in part due to inconsistent budgetary support. He further notes that while six nuclear power reactors had been shut down over the preceding four years, only four new reactors were under construction; since then, that number has dropped to two, with the company constructing those two reactors—Southern Company—already expressing reservations about attempting such a project again for the next two decades due to cost overruns and delays.<sup>23</sup> Frazier further suggested that the absence of a viable domestic nuclear fuel cycle (particularly an indigenous, US enrichment capability) has contributed to uncertainties about nuclear power in the United States as well as cost and complexity. Frazier also notes that some of the difficulties experienced by the nuclear industry have been purely economic. Lower costs of natural gas, lower demand for electricity growth due to slow economic growth, and the effects of the 2008 recession have also dampened interest in nuclear power, made worse—in his view—by the presence of federal production tax credits for renewable energy sources that do not benefit the nuclear industry. In Frazier's view, all of these factors have contributed to placing the US domestic nuclear industry in a weakened state, most dramatically demonstrated by Westinghouse Electric Company's declaration of bankruptcy in 2017.

That said, this picture is probably too dire given the complete picture of nuclear power in the United States. For one, the United States remains the world's largest producer of nuclear power, with reactors producing 807 billion kilowatt-hours in 2018.<sup>24</sup> Much of this production has come from older reactors, some of which are receiving extensions on their licenses as well as approvals to increase their power output, but the effect is the same: nuclear energy is hardly dead inside the United States. The challenges of climate change have also led to new looks at the regulatory environment around nuclear energy, with states such as New York, New Jersey, Wisconsin, Minnesota, and Illinois in various states of implementation of plans that would focus on carbon-neutral energy production that would embrace nuclear as an option. Furthermore, cutting-edge nuclear R&D is still being performed in the United States and, in many ways, in areas that address the weaknesses and deficiencies of the current industry. For example, work in advanced reactors that are intended to have fewer proliferation, safety, and security risks is ongoing at a variety of public and private institutions throughout the country (as another paper written for the center by Andy Kadak outlines in detail<sup>25</sup>). It very well may be that large-scale R&D projects are no longer being undertaken along historical lines, but some of the ongoing work on advanced reactors may eventually lead to solutions to commercial, regulatory, and political problems that have plagued nuclear



power projects since the 1980s (after the scares of Three Mile Island and Chernobyl, and more recently, the events around the Fukushima crisis).

## US Foreign Nuclear Cooperation Efforts

In fact, it is the quality of US R&D and technology that continues to keep the United States in the nuclear game internationally, particularly with respect to countries that might otherwise be reluctant to negotiate over the terms of nuclear cooperation agreements. Emirati officials, for example, made clear during the negotiations of the US-UAE 123 agreement that access to top-of-the-line US technology was one of the reasons they were prepared to move forward with the gold standard agreement requested by US negotiators. These same officials also noted, after the US concluded the Joint Comprehensive Plan of Action (JCPOA) with Iran and other partners, that the possible loss of access to this technology that would come from an Emirati decision to renounce the 123 agreement and start up its own enrichment or reprocessing activities was sufficiently disadvantageous to deter its consideration as a strategy.<sup>26</sup>

But while access to US technology and goods has been an inducement to some countries, it has manifestly not been in other places. Saudi Arabia, for example, has been exploring a 123 agreement with the United States since at least 2007, when the Gulf Cooperation Council states announced their intention to develop nuclear programs. A key stumbling block has been the US insistence that the Saudis accept a UAE-level commitment not to pursue enrichment and reprocessing technology. The Saudis have maintained that they will not relinquish this right, no matter how caveated. The Saudis remain interested in US nuclear technology, but to date, they have not shifted on this position in their negotiations with the United States. A similar issue exists with respect to Jordan. Likewise, the Obama administration attempted to secure a similar commitment from Vietnam in the development of its 123 agreement with the United States. Ultimately, the United States settled for a far less substantial statement of Vietnamese intent.<sup>27</sup> An agreement with Mexico submitted by the Trump administration to Congress in 2018 also does not contain the gold standard language but rather appears to revert to the Vietnam standard of an expression of intent to use the nuclear fuel cycle market rather than domestic facilities.<sup>28</sup>

Some of the justification for this difference in treatment was explained by the US government in 2013 as based on the neighborhoods in which Saudi Arabia and Vietnam are located. A State Department official said on December 10, 2013, that “a country’s ‘regional context’ could ‘weigh heavily’ in the analysis” involved in negotiating and concluding a 123 agreement.<sup>29</sup> What this meant in effect was that states living in regions where there is a high risk of nuclear proliferation—such as the Middle East, due to Iran’s nuclear program and regional competition that exists—would be treated differently than states living in regions without such a risk. But the United States was able to secure gold standard provisions in the Taiwan agreement reached in 2013,<sup>30</sup> suggesting that the core difference is that the United States was unable to get Vietnam or Saudi Arabia to accept terms that the UAE and Taiwan (which depends on the United States for its security and nuclear program) did. The Obama administration effectively admitted this in 2013, when it noted in a letter to then Senate Foreign Relations Committee chairman Bob Corker that the administration would adhere to an approach that “allows for flexibility in structuring legal and political commitments, while meeting the requirements of



US law and maintaining our principled stance' on enrichment and reprocessing activities.”<sup>31</sup>

Two problems with this position, however, have complicated US negotiations with other potential partners: first, countries tend to see themselves less in their regional context and more as independent partners of value (as surely is the case with the Saudis), and second, some members of Congress has very different ideas.

On the first, it is hard to tell countries that you are treating them differently than others due to the presence of problematic neighbors, especially if the countries in question are otherwise treated as partners and allies. This was the case before the JCPOA with Iran because it suggested a lack of confidence in partners and allies. But after the conclusion of the JCPOA (which permits continued Iranian uranium enrichment), Saudi Arabia and Jordan have deftly argued that the JCPOA underscores the unequal nature of the enrichment-related provisions that they are being asked to accept. Other issues have similarly clouded the picture, as India—which possesses nuclear weapons but is not a member of the NPT—was able to conclude a 123 agreement with the United States in 2007 without accepting comprehensive safeguards as a condition of supply. The result is a policy that looks less an attempt to accommodate regional differences and more, from the perspective of Arab countries in particular, discriminatory.

Some members of Congress have sought more restrictive terms for 123 agreements and greater congressional oversight of such agreements. Since at least 2011, members have explored options for modifying the terms of the AEA to exercise greater control over the process. Some of these options have included fast-track approval for agreements, which includes both commitments on enrichment and reprocessing and implementation of the Additional Protocol with the IAEA, and far more intensive scrutiny for agreements that fail to include such provisions (as well as easier rules for rejecting such agreements).<sup>32</sup> The result has been real pressure on the executive branch—regardless of party affiliation—to avoid submitting 123 agreements that would encounter real problems in congressional review. Arguably, the 123 agreement process has gotten more complicated under the Trump administration, at least with respect to Saudi Arabia, due to its tepid response to the murder of Jamal Khashoggi in Istanbul in October 2018 and reports that the Department of Energy had provided Part 810 authorizations for business activities in Saudi Arabia without disclosing them to Congress.<sup>33</sup> Though the regulations at 10 CFR Part 810 have long provided applicants with the right to request that DOE not make it specific authorization public, the lack of notifications around the Saudi Part 810s was perceived by some members of Congress as an abuse of the statutory authorities that permit such transfers. They argued that this is inappropriate and, as a result, the decision to extend the Part 810s without notification has contributed to resistance to grant any degree of flexibility or discretion to the Trump administration in considering future nuclear commerce with the Saudis.

The result has been a pronounced reluctance to move forward with negotiations on agreements where prospects for approval are slim or more complicated than comparatively simpler agreements, such as with Switzerland or Australia. Even US allies like South Korea have had their 123 agreements subjected to intense scrutiny due to differences in technical opinion concerning the nature of some South Korean R&D activities that have been planned (namely, whether “pyroprocessing” is a form of spent fuel reprocessing). Such issues have



been manageable to date due to the slow nature of Saudi and Jordanian consideration of nuclear programs and the relatively straightforward negotiations involved in the Mexican and Vietnamese agreements. But, shortly, older agreements with countries—Egypt, Turkey, and South Africa—will be up for renewal, and negotiating extensions to these agreements will likely be very complicated. Identifying a viable path forward for how to treat 123 agreements generally and for these countries in particular would be invaluable.<sup>34</sup>

## How Other Countries Manage Their Nuclear Cooperation

This is especially important because lamentably, few other countries pursuing civil nuclear commerce have the high standards of nonproliferation demanded by the United States of its civil nuclear industry. Countries such as Russia, China, and South Korea all adhere to the terms of the NPT, the NSG, and IAEA safeguards, which establish a solid nonproliferation benchmark. However, as noted, these requirements are not as demanding as those sought by the United States. Despite a concerted effort to secure more intensive nonproliferation commitments on the part of suppliers after Bush’s 2004 speech, the United States was unsuccessful in persuading suppliers to adopt much more stringent standards, much less the Additional Protocol as a condition of supply or binding commitments on enrichment and reprocessing technology.

The difficulty of doing business with the United States might explain, at least in part, the number of international nuclear projects currently underway that involve countries other than the United States as suppliers. Some of these projects involve countries in the former Soviet Union, where the United States would be at a competitive disadvantage in any event. But countries as diverse as Bangladesh, Belarus, China, Egypt, India, Slovakia, and Turkey have chosen to seek Russian reactors for their new projects (despite the historical problems with Russian nuclear technology and safety culture).<sup>35</sup> By contrast, the United States has a direct commercial stake in very few international projects—limited to South Korea, Japan, the UAE, and a few reactors in China using US technology<sup>36</sup>—and they are largely through joint venture agreements with South Korean or Japanese firms involving the use of US intellectual property and technology. The United States is reportedly still negotiating a reactor deal with India, which is somewhat shocking given the extraordinary effort in the last years of the George W. Bush administration to obtain Indian access to global civil nuclear commerce, including through exceptions to global rules.<sup>37</sup>

China, for its part, has ongoing projects in Pakistan and Romania, with projects planned in Argentina, the United Kingdom, and a handful of other countries.<sup>38</sup> Memoranda of understanding have been signed in Kazakhstan, Kenya, Thailand, and Uganda, with others possible now that China “has made it clear that its policy is to expand overseas nuclear plant deals by building on the technology of Russia, France, and other countries that have been at the forefront of nuclear plant development.”<sup>39</sup> As Robert Ichord of the Atlantic Council reported in March 2018, China’s approach has been to pursue three types of markets:

1. Investment and contracting for the construction of existing reactor designs
2. Marketing and construction of its indigenous design



3. Collaboration with foreign companies in the design and construction of new plants (especially the Canada's CANDU reactor design)<sup>40</sup>

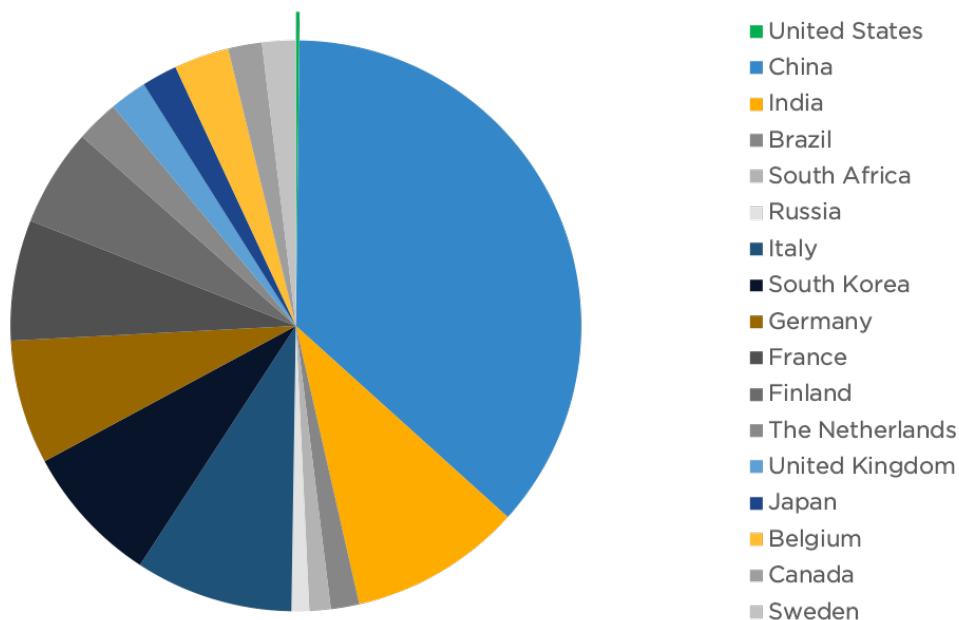
This three-pronged strategy has given China flexibility in pursuing projects that it previously could not as well as an edge on its competitors given the general desire of most economies for greater Chinese access and participation.

Several observers have pointed to one crucial element to explain the difference in Russian and Chinese success with foreign audiences vis-à-vis the United States: the ability of Russia and China to provide the financial support to make nuclear projects attractive. Russia has provided direct loans to support its nuclear projects abroad, “using resources from both the Russian budget and the Russia Wealth Fund.”<sup>41</sup> For example, the Russians agreed to provide Egypt a \$25 billion loan—to be paid back over 30 years—to finance the \$30 billion in reactor construction and related projects.<sup>42</sup> It is possible that Egypt would not have been able to even contemplate moving forward with the project absent this financing. Turkey is a clear case in point in this regard, as its project for a nuclear power plant (costing \$20 billion) has been stalled precisely because Rosatom has been unable to find a Turkish partner willing to absorb the 49 percent of the costs required pursuant to its agreement with the Turkish government.<sup>43</sup> The Russians have also provided complete packages, from construction to fuel supply to operation to spent fuel repatriation, all of which simplifies the process of countries considering whether and how to pursue nuclear power plants. China has likewise made great use of its export-import financing mechanisms to make projects more affordable in the near term (though questions continue to build up about whether China is leading countries into debt traps in the process).

The United States government does not have a financing mechanism to compete with China and Russia. There are many factors that have complicated doing so in any event, starting with the fact that US nuclear companies are not state-backed organizations while most of their competitors abroad are. Advocacy groups such as the Nuclear Energy Institute pointed out that “the US Export-Import Bank’s board of directors [was] without a quorum and as a result cannot consider medium- and long-term transactions exceeding \$10 million.”<sup>44</sup> Given the high cost of nuclear projects, this effectively put the Export-Import Bank of the United States’ financing out of reach. The bank only dropped below a quorum in 2015, however, and had three confirmed members in 2019, a span of time that is far shorter than explains fully the lack of interest in project support.<sup>45</sup> More important than the voting capacity of the board has been the funding of the mechanism: only \$135 billion was authorized by Congress for fiscal year (FY) 2015–2019, well below the amounts authorized and used by other countries, as figure 1 demonstrates using countries identified by the Congressional Research Service.<sup>46</sup>



**Figure 1:** Export Financing by Selected Export Credit Agencies in 2017



Source: Congressional Research Service

Of course, not all the financing approved by these other countries covers nuclear projects, nor should the Export-Import Bank be expected to do the same. But within the scope and scale of export credit authorizations more generally, the absence of a concerted export financing strategy is apparent. Put another way: the entirety of the US authorization for a five-year period, if evenly split across the five years, would be only slightly more than what the Russians committed to Egypt for one reactor project.

An argument could logically run, then, that the key variable for US nuclear project support is financing and the financial backing of the government. If the United States were to commit to extra trade support for nuclear reactor projects, then, presumably, there would be no asymmetry in its nuclear export business.

But this conclusion fails in an assessment of the broader policy currents that influence reactor sales and cooperation agreements. For some countries, longstanding relationships probably influenced reactor purchasing decisions. Belarus (for Russia) and Pakistan (for China) are cases in point, as both countries have been supported by their respective nuclear patrons for decades. Pakistan in particular relies on China to help address its somewhat unique status as a non-NPT adherent that is trying to secure external support with its nuclear program without the exceptions to the rules that India secured. Belarus, for its part, has long been an ally of Russia, with the government of President Lukashenko largely deferential to and dependent on Russia (at least until the beginning of 2019).<sup>47</sup>



For other countries, other policy views may be seen as more significant, especially regarding nonproliferation. Egypt is a useful case in point. While it is certainly true that the Egyptians are interested in receiving financial support, they are also very much attracted to the “no strings attached” nonproliferation requirements the Russian government has presented. Egypt has opposed for decades taking on any additional nonproliferation obligations while Israel remains outside the NPT. An exception to this was Egypt’s decision in 1995 to endorse the indefinite extension of the NPT, which was to lapse that year after 25 years in force. In fact, some Egyptian officials said in private in 2016 that they “regret the indefinite extension of the NPT in 1995” because it reduced the momentum that they perceived existed toward creation of a nuclear weapon free zone in the Middle East.<sup>48</sup> For this reason, the US demands for greater restrictions on enrichment and reprocessing are probably nonnegotiable factors for Egypt in any event, and no amount of export financing could make up for this basic policy impasse. Turkey—another of Russia’s nuclear customers—may have made similar calculations, given its similar perspective on the rights of NPT adherents to possess their own enrichment and reprocessing capabilities, even if they choose not to act upon them.

Saudi Arabia is arguably in the same category as Egypt and Turkey. Its objections to a nuclear cooperation agreement with the United States are most fundamentally about the policy differences it holds with respect to the nonproliferation commitments that it would be required to make. What may be more interesting is the degree to which Saudi Arabia has *declined* to pursue other options for reactor supply in any serious fashion in the absence of progress with the United States, though conversations are reportedly ongoing with other suppliers (such as South Korea, which only requires the Saudis to obtain South Korean approval for enriching South Korean supplied or derived uranium above 20 percent). It is possible that the absence of a financial motive has been helpful. The Saudis also lack a technological community that could be upset at the failure to reserve the right for the country’s scientists to make their own advances. In 2016, in an interview conducted at the Saudi nuclear authority, an official informed the author that the Saudis had “only 40 to 50 people” involved in nuclear science, most of which was concentrated in the use of radioactive sources for civil uses.<sup>49</sup> Rather than serving as a control lever for Saudi nuclear policy, it is possible that Saudi interest in the broader strategic dimensions of its relationship with the United States—in the absence of a clear financial motive to the contrary—has instead been responsible for Saudi restraint in exploring alternative suppliers. This too could partially explain the reasons why Egypt and Turkey – which are re-evaluating their relationships with the United States in light of their own domestic political situations – may be inclined to explore new strategic partnerships with Russia, using their nuclear programs as an entry point.

A similar dynamic might also have played out in the context of Vietnam, had the United States refused to modify its insistence on the gold standard approach. Vietnam, after all, already had existing agreements with Russia and Japan for the construction of power reactors in the country before the conclusion of a US 123 agreement.<sup>50</sup> It not only could afford to hold out with respect to the United States until its policies shifted; it also had arguably no incentives to do otherwise except the general desire the Vietnamese had for access to US technology and the benefits that might accrue to the relationship.





## Less an Obstacle Than a Hurdle

Given the range of countries that are pursuing nuclear projects and their various sets of interests, it is reasonable to argue that some may be more influenced by financial incentives than others, just as some may be more deterred by US nonproliferation policies than others. But three general points are reasonably clear from the ongoing development of the nuclear industry internationally.

First, US nonproliferation policy is *not* stopping US nuclear commerce but other countries are taking advantage of their opportunities and their incentive structures to engage in trade.

Second, the United States may be at a competitive disadvantage *regardless* of its nonproliferation policy. Even if the United States, Russia, and China harmonized their nonproliferation policies, Russia and China would arguably present more attractive terms on financial and organizational grounds than the present US nuclear export policy, even taking into account the comparative advantage that the United States may hold with respect to its reactor technology and safety practices. *With* a more demanding US policy framework in place, Russia and China may be far better positioned.

Third, if US nonproliferation policy is not delivering results, and if it is potentially contributing to less US influence on the global nuclear stage, then it is arguably time to reconsider its core tenets. Some concepts for reforming the US process to make it more agile and capable of responding to global economic and political circumstances have been offered, most notably by Bob Einhorn in the case of Saudi Arabia (before the Khashoggi murder).<sup>51</sup> Einhorn outlined a process of sliding deadlines and extension periods that would be framed by more limited commitments by the Saudis on uranium enrichment and other fuel cycle facilities that might satisfy Saudi political interests. But few systematic changes have been proposed for the last several years that would not make the process more difficult politically for potential partners and more fractious domestically. Ideas for doing so are explored in the next section.



# CONCEPTS FOR REFRESHING THE FRAMEWORK

Contemplating the future of US participation in global nuclear commerce, there are three general paths available to the United States at present.

First, the United States could elect to do nothing different and allow the market to operate as it does. This would have the benefit of preventing the United States from “picking winners and losers” as well as preventing any undesirable financial costs or policy changes. It is, in effect, the status quo choice.

Second, the United States could seek to retain its existing nonproliferation policy framework but create a) sufficient financial incentives to override any hesitation that countries have in signing up to its more demanding approach and b) improve the strength of the domestic nuclear industry. From a nonproliferation purist perspective, this would be highly beneficial. But notwithstanding periodic signals from various administrations, members of Congress, and industry, it seems unlikely that a major infusion of US government support into the US nuclear industry is going to take place on a sustained basis to create such an incentive structure. Moreover, this aversion to subsidization of US companies in a direct way also has synchronicity with the general philosophical preference in the United States to avoid interfering in private business decision-making.

Likewise, even if direct subsidization of trade were to be avoided – in no small part due to its politically-loaded connotations – there are other options for elevating the US nuclear industry as a national priority. In history, the United States took similar approaches to math and science education after Sputnik and in confronting the challenges of terrorism after 9/11. But, absent a major, precipitating event, it seems unlikely that the United States will be able to come together to judge the current systemic weakness of the US nuclear industry with sufficient alarm as to motivate real enhancements to the civil nuclear sector that could come through investment in R&D at the national laboratories, endowment of fellowships and scholarship for students, and other forms of support to buttress the sector.

Third, the United States could look to modify its nonproliferation policies with an eye toward reducing the *disincentives* to doing business with US firms while not substantively diminishing the actual nonproliferation value of the policies implemented. Indeed, in considering how to reform the US nuclear nonproliferation policy with respect to 123 agreements, a false choice may exist between nuclear nonproliferation and promoting US nuclear exports. It is possible to change how the United States reviews, monitors, and performs nuclear commerce that is transparent, effective in preventing proliferation, and more responsive to the global commercial environment.

This section first proposes changes intended to improve the process around and content of 123 agreements to reduce the political costs paid by foreign governments without losing the *substantive* value of the current approach. It then offers suggestions for how to strengthen US nuclear nonproliferation efforts more generally, both as a means of managing any problems created by 123 agreement reform and to ensure the effectiveness of US policy more generally.



## Refreshing the 123 Agreement

At its core, the nonproliferation process around the 123 agreement is intended to provide maximum confidence that (1) a foreign country will not choose to build nuclear weapons; and (2) if it does, that effort will be detected quickly, and it won't be because of the support and assistance provided by the United States. But given the necessary timescale involved in nuclear cooperation—agreements less than a few decades long are ill suited to long-range nuclear planning and construction—it is practically impossible for any agreement to provide cast-iron assurances in either area. Indeed, as with any agreement, the value of these assurances is in the degree to which the costs of noncompliance outweigh the benefits of noncompliance. Consequently, what is more plausible is that an agreement can reduce the likelihood of weapons-related contributions from US projects and create a sense of additional cost for the state that chooses to pursue nuclear weapons notwithstanding assurances to the contrary.

For these reasons, the value of the gold standard approach of the UAE agreement is actually linked not to the commitments to forswear enrichment and reprocessing but rather to the existence of consequences for countries should they choose to pursue such capabilities in the future. This, combined with the transparency and access created by the UAE's adherence to the IAEA Safeguards Agreement and Additional Protocol, is what creates confidence that the UAE or similarly gold standard countries won't pursue nuclear weapons, and—as the UAE demonstrated itself in the aftermath of the JCPOA—the threat of US technology curtailment will likely have real influence in a country's decision-making, especially once a nuclear cooperation relationship is well established. Likewise, the continued interest of countries in a US 123 agreement notwithstanding our more burdensome requirements for nonproliferation assurances tends to buttress the argument that technological access—both in the immediate sense and in perpetuity—is of crucial value and therefore provides leverage.

This suggests that the first thing the United States should do is to set aside its preference for gold standard legal commitments on enrichment and reprocessing and instead concentrate on making the actual obligations of 123 agreements more specific and consequential. These commitments are hardly binding in the first instance, given that the UAE still has the unilateral, sovereign right to withdraw from its agreement and pursue these capabilities. This is disproportionately less useful at present than what might be garnered by abandoning the gold standard in furtherance of changes to the technical language of the 123 agreements that would not come with the sensational element of having “renounced” sovereign rights deemed of high political value. Such options could include the following:

1. **Adopting a sliding scale approach for inspector access requirements to domestic fuel cycle and reactor facilities.** The United States has already created a general obligation for itself that agreements would involve the country in question signing up for the Additional Protocol, which—as outlined above—involves greater IAEA access rights to the nuclear program in question. As a general matter, it would be best if the rest of the nuclear supplying community were to accept a similar standard, as the United States has been encouraging since at least 2004. However, US attempts to secure a higher supplier standard have failed to date due to objections presented by those other suppliers.



Notwithstanding the lack of progress toward a higher global standard for nuclear supply and as a bridge toward that higher, general standard, the United States could include language to the 123 agreement that would require enhanced inspector access depending on the nature of the fuel cycle facilities to be constructed and operated in the country. If a country has the intention of pursuing more advanced and proliferation sensitive nuclear fuel cycle facilities, then the United States could insist on US inspector access to those facilities on a regular basis in addition to IAEA access. It could also insist that the country in question adopt enhanced monitoring provisions, such as real-time, remote monitoring of fuel cycle activities and rights for IAEA physical access if questions arise as to undeclared nuclear activities in the country. Though these would be obligations made to the United States rather than the IAEA, the United States could request that the IAEA and the country in question sign a binding memorandum of understanding that would commit that country to provide access under the IAEA Safeguards Agreement already in place if and when the United States requests it. This recommendation would come with resource requirements that would have to be factored into the implementing provisions around the 123 agreement. The United States could also propose that other states include similar provisions in their own nuclear cooperation agreements, though the history of the US efforts in this regard at the NSG and IAEA Board of Governors to date do not suggest this would be an easy sell.

Crucially, the requirements for access could be adaptive, responding to the nature of the activities involved. Small scale fuel manufacturing test facilities would be of less importance than fully constructed enrichment plants and could be accorded only the standard IAEA access requirements. To address the future risk, the United States could insist that any projects that involve R&D in these capabilities be declared at inception not only to the IAEA but also to the United States, permitting access as appropriate given what facilities are involved.

On the other hand, if the country in question has no interest in fuel cycle facilities, then these provisions would not become operative. Conventional IAEA inspector access requirements would be deemed sufficient.

Of course, none of this is intended to imply that the United States would acquiesce meekly to countries' stated intent to pursue enrichment and reprocessing technologies. It is assumed that the United States would continue to push back on such endeavors, and there could be various mechanisms embedded in 123 agreements that would be activated upon the determination of a country that it wishes to consider these capabilities. This could include, as Bob Einhorn has proposed, dialogue intended to deflect such interest and to find alternative means for providing the assurances for fuel supply and/or security that, presumably, an enrichment and reprocessing technology development decision would involve.

It is also true that this would expose the United States to the risk that other countries with lower standards would argue that their own inspector supplementation of the IAEA system is equal to that of the United States. For this reason, this proposal does not suggest reducing the present standard of IAEA access to any country or



replacing the IAEA system with a national one. Instead, it argues in favor of effective supplementation where and when possible, with the hope that – in time – an expansion of inspector access privileges and practices can be once more integrated into the global approach undertaken by the IAEA.

2. **Adopting a favorable view of black box transfers with respect to nuclear reactors.**

Another element of this revised approach would be to accept the concept that black box transfers pose less risk than the facilitation of real technology transfer to the country in question. Though some countries wish to have full nuclear programs with all the knowledge benefits to their local scientific communities or may resent the paternalistic nature of limited transfers, others may not share that view. Taken in combination with advances in technology, it may soon be possible to transfer reactor systems to countries in which there is no need for local expertise and—consequently—an opportunity to save on inspector access demands and requirements. Doing so would create an effective black box for the core nuclear technology involved, reducing the involvement of local technicians and thereby the risk of proliferation. Such new designs may also be sufficiently exotic that their inner workings would still be proprietary in any event and not already publicly available, as many reactor designs are.

Black box approaches are not perfect. There is always the chance that a country would elect to “peek inside” the box or break it open in a future noncompliance scenario. For this reason, the United States would not be able to entrust its full faith in the sanctity of the “box” and would have to select those partners with whom it chooses to undertake such an approach carefully. Possible elements for deciding what countries might be eligible for this approach might include overall technological status (especially with other nuclear technology) and nonproliferation history.

Specific safeguard approaches will need to be defined for such new reactor designs, something the IAEA will necessarily have to be responsible for in the long run. But combinations of technology (especially for remote monitoring) and the design of the systems themselves should make it possible for the United States to adopt a less aggressive set of nonproliferation demands of the countries themselves. Depending on the new reactor design concepts that may emerge, it may also be possible to add to this concept a requirement that any spent nuclear fuel be repatriated to the originating country. While some may be reluctant to compromise on their sovereign “rights,” the practical benefits of a quick, easy, and straightforward path to accessing the benefits of technology may be appealing, especially to developing countries. The United States should incentivize this by committing to streamline its own policies and procedures to make concluding and implementing these agreements quick and painless.

3. **Creating a new sanctions regime to cover countries that pursue enrichment and reprocessing capabilities after concluding a 123 agreement.** Currently, the United States does have mechanisms to enforce the terms of 123 agreements. These are largely contained within the scope of the AEA itself<sup>52</sup> as well as other acts of Congress, such as the Nuclear Nonproliferation Act of 1978 and the Nuclear Proliferation Prevention Act.<sup>53</sup> In addition, the Arms Export Control Act (sections 101 and 102) provides for a cutoff of certain foreign assistance to any country that delivers or



receives enrichment or reprocessing equipment, material, or technology. Other discretionary authorities also exist that would permit the United States to impose sanctions on those who engage in nuclear transfers that could contribute to nuclear weapons proliferation or for those who test nuclear weapons.

The United States could augment these authorities by creating a new sanctions regime that would impose severe penalties on countries that pursue enrichment and reprocessing programs that were not previously acknowledged and accepted while engaged in nuclear commerce with the United States, either under a 123 agreement or one of the assorted memoranda of understanding or other vehicles used for the trade. This regime could not only include a prohibition on new nuclear exports (as the present regime envisions only for violations of binding obligations) but also sweeping penalties, including a broad prohibition on financial and trade links with countries so identified. Discretion could be provided via waiver authorities, but these could also be circumscribed to require public reporting (supplemented by classified reporting to Congress, if necessary) on the nature and extent of the contribution of US-origin goods to the programs in question. This could provide a basis for Congress to block, via a majority vote, further nuclear cooperation with such a country.

For countries that do not intend to pursue enrichment and reprocessing technology, these authorities would be meaningless in practice. Those that may consider such options would, on the other hand, face a far more substantiated set of threats based on these authorities. This would help to deter violations. More importantly, these authorities would exist in the background, creating a sense of threat and risk but without requiring countries to engage in the politically sensitive process of foregoing—publicly—their exercise of sovereign nuclear rights.

Other countries could object to these provisions, noting that this would in effect result in a loaded gun being pointed at them, capable of being set off by a future Administration with hostile intent toward the countries in question. To some extent, this is a real risk but not a unique one: under existing US law, the president could issue such sanctions on a one-off basis by simply declaring a national emergency. So, even absent this new suggested authority, countries that fear that they might be targeted in the future would not be safe from such threats. Moreover, if a country fears being sanctioned under these authorities such that it would be deterred from engaging in nuclear commerce with the United States, then it is probable that such countries would not be prepared to accept the “gold standard” agreement either. In such cases, little is lost by adopting authorities that – in an ideal circumstance – would never have to be used but which would potentially obviate the need for a proactive surrendering of national sovereignty, as some have deemed the “gold standard” approach.

## Building a Better Policy

Some elements of this revised approach to cooperation agreements may be appealing to the US Congress and other skeptics of the spread of nuclear technology, while others—particularly the reversal of US demands on enrichment and reprocessing in favor of access and verification—will be seen as significant steps back on the nonproliferation agenda.



Fortuitously, there is far more work to be done on the nonproliferation agenda that would likely prove more useful than revocable commitments on enrichment and reprocessing. These ideas also do not need to be part of the identified, refreshed approach to 123 agreements in order to be effective, though they could help to address concerns that might arise from those who do not believe US nonproliferation policy is tough enough and would oppose the changes outlined above.

Much of this work involves greater cooperation and information sharing with industry, not least because—as the people on the front lines of the nuclear proliferation challenge—they are in the best position to help identify potentially dangerous developments or trends. They may find it also is helpful to their shareholders to engage in such practices as a means of demonstrating the seriousness with which they take their nonproliferation commitments and the rigor through which they approach their trade. But by the same token, it is potentially contrary to their business interests to identify customers and partners that might be pondering illicit nuclear activity. Further, some may resent and push back against the concept that they be functionally deputized to help the US government implement its nonproliferation agenda. At the core of its efforts, therefore, the United States needs to help shift some of this thinking and the business interests of those companies.

For starters, the United States should seek to put more information into the hands of corporate compliance officers regarding the trends and risks that they see. The US Commerce Department and other agencies do engage in industry outreach on a regular basis, but conferences and talks may not be as reliably available as standing information on government websites or available via privileged databases. The United States should therefore develop two information-sharing tools that can be accessible 24-7 and be available as a resource for corporate compliance.

The first would be an **annual nonproliferation indicators publication** that would be released by the US Departments of Commerce, Energy, and State. It would identify trends in proliferation, including the kinds of goods that proliferators are potentially seeking. Some care would have to go into this document to avoid being seen as a “proliferators’ cookbook,” as some export control lists have been dubbed in the past, but beyond items themselves, this publication could also help to identify tactics and tricks being used by proliferators in their engagement with industry. It would also be important to avoid the document becoming so reductive as to be useless, offering nothing more than a brochure of US nonproliferation policies. Done properly and at its heart, the document would give a picture of the operating environment for industry, including identifying in at least general terms the sorts of goods that are being commonly sought and the vectors through which procurement attempts have been made.

This document would also include a list of countries where there are presently enhanced concerns regarding national nuclear programs or concerns about transshipment and export control risk. To be effective and to avoid being caught up in potential efforts to make this document a sanctions targeting list, the document would have to deal with the entire world and provide some nuance in its analysis of the risks involved in particular countries. Its objective would not be to serve as a proxy for future sanctions designations decisions but rather to give a broad perspective of the challenges that exist with particular jurisdictions,



even—and perhaps especially—if there is no need or justification for sanctions at present. After all, corporate compliance officers should need little encouragement to deny exports to North Korea; they may need more help in parsing out a transaction involving goods destined for Europe. Certainly, such a publication would also come with complex diplomatic ramifications. It may be that, in the preparation of the materials for this publication, information comes to light that either is classified or embarrassing to US partners. The act of preparing the publication could offer impetus to the US government to engage with those partners involved to discourage or block whatever illegitimate activity is either underway or planned.

A second, more complicated recommendation would be the development of a **warning system for sought-after goods**. At present, the US nonproliferation community has a variety of means for identifying goods that proliferators are seeking, and there are industry outreach events in which the US government shares some information as to its primary areas of interest and concern. But much of this information tends to be classified and of great sensitivity, especially where ongoing operations might be concerned. Yet, just as with terrorist plots, the intelligence-related needs for proliferation might occasionally need to take a back seat when there is an opportunity to disrupt a proliferator's plans and activities. The United States should work with industry to develop a restricted database that would identify sensitive goods that are being sought. This database would be accessible to corporate compliance officers who would be vetted for access to the information. They could be granted limited access to it, perhaps depending on their company's product line, or full access if they had been found sufficiently reliable to meet the standards of a US government security clearance. Within it, the database could also include additional information about the sorts of tactics being employed by proliferators. This would be especially useful in dealing with items that are below the export control thresholds of the NSG, and in time, it could also be broadened to include companies outside the United States (perhaps beginning with those of the North Atlantic Treaty Organization and other allies).

Third, the United States can and should **make greater use of end use verification** as a means of facilitating monitoring of the nonproliferation commitments of countries, particularly regarding dual use technology. The United States already has a robust set of end use verification processes that it uses to check on the exports that are undertaken to countries worldwide. It also has a network of US officials located at its embassies and consulates who can perform the checks.

By their very nature, these checks are episodic and limited; it is simply not possible to check 100 percent of all goods exported by the United States. Moreover, the United States is at the forefront of what countries do, with many others countries struggling to provide reliable assurances for their exports. The United States should therefore consider expanding its end use verification program by bringing on additional compliance officers for the Commerce Department and widening their geographic dispersal. The United States should also explore mechanisms for burden sharing with partners and allies, perhaps enlisting partners with larger embassies in various locales to take responsibility for US export verification missions in those countries and take on those countries' end use verification missions in countries where US capabilities are strongest.





Likewise, the United States could develop programs for compliance officers of the largest companies to permit them to execute their own end use verification missions, creating incentives—in the form of faster export license processing, perhaps—and disincentives—including limitations on licenses—for those companies in this position. Monitoring and spot checks would still be necessary functions for the US government, but by enlisting the private sector in at least some areas, the United States would reduce its burden while simultaneously giving private industry a greater stake in ensuring the effectiveness of export controls.

Both expanded programs would come with costs. But it is worth keeping these costs in perspective. The FY 2019 budget request for the *entire* Bureau of Industry and Security at the Department of Commerce is \$120.6 million. Commerce has reported that, over FY 2012–2017, its special agents have “recovered \$584M in criminal fines and \$349M in forfeitures. In addition, during that same period, over \$795M was assessed in administrative/regulatory fines.”<sup>54</sup> A literal doubling of the Export Enforcement budget from 2017 would result in a budget of only \$110 million, less than a third of what this office recovered on an annualized basis.

Of course, with the privileges of additional support for compliance should come additional risks for those that still provide sensitive technologies to proliferators or refuse to implement the most scrupulous of compliance programs. A last recommendation would be to **amend Executive Order 13382, which provides for sanctions against proliferators of weapons of mass destruction, to add a prong of “willful negligence.”** A similar approach should also be taken for domestic laws concerning proliferation and US companies; the penalties for those sanctioned under such prongs may need to be different than those sanctioned under prongs that involve actual transfers, focusing instead on denial of future export privileges. At present, Executive Order 13382 and export rules allow for the imposition of sanctions against companies that engage in proliferation or fail to prevent it by observing all reasonable efforts at due diligence. Though sensible enough, this has not stopped sensitive goods from being exported to proliferators and diverted in pursuit of a range of illicit projects. Regularly, pictures of Iranian nuclear facilities highlight equipment and goods obtained from non-Iranian companies, and not all of this equipment found its way to Iran because of particularly crafty evasion or smuggling efforts. Changing the US sanctions enforcement standard to make culpable poor compliance standards would help to create a real sense in global industry that the risks of such noncompliance outweigh their benefits. And, since the use of Executive Order 13382 would remain discretionary, the United States could rather easily adopt such a general standard but also retain the ability to make case-by-case determinations of culpability and the appropriateness of sanctions invocation.



# CONCLUSION

Though it is possible that US nonproliferation policy has had only a secondary impact on the US commercial nuclear industry and its ability to engage internationally, there are reasonable, common sense changes that could still be made to nuclear cooperation agreements and the process whereby they are negotiated that could (1) improve nonproliferation performance, (2) demonstrate awareness of and adaptation to the changing international landscape, and (3) improve the viability of US civil nuclear commerce. For these reasons, this paper has recommended changes both to the agreements themselves as well as enhancements to US nuclear nonproliferation policy more generally.

At the core of these proposals are two conceptual changes: first, that the United States embrace greater flexibility and tailored approaches for creating nonproliferation commitments and leverage to enforce them, and second, that the United States find ways to embrace and build upon the competencies of the civil nuclear and associated industries to improve nonproliferation performance.

Such changes will not address current problems like Iran or North Korea. They will not arrest arms buildups in South Asia, nor will they improve the atmosphere for arms control between the United States and Russia (or, for that matter, other countries in possession of nuclear weapons). But they may help contribute to a robust civil nuclear sector domestically and internationally that can help combat climate change and minimize the risks of future nuclear problems from emerging.

Fortuitously, many of these steps could be implemented swiftly. Changes to the 123 agreement process and requirements would require legislative action, which itself would be complicated in the next one to two years due to the US elections in 2020 and the intense political atmosphere of Washington presently. Changes to Executive Order 13382 and establishing nonproliferation warning and indicators materials could be executed in the absence of legislation, but this would require directives from the president and some time for the construction of the necessary systems to ensure appropriate dissemination and classification protections. Expanding the end use verification system is probably the most complex recommendation made for both bureaucratic and budgetary reasons, but more work could be done now to flesh out the concepts and begin developing a legislative proposal that would resolve any specific issues with respect to charter and funding. Perhaps more important, each of these ideas could begin immediate circulation in Washington as part of the process for improving US nuclear nonproliferation mechanisms while still seeking to reenergize the United States as part of the global nuclear industry. The US Senate is presently debating S. 903, the Nuclear Energy Leadership Act, which the Senate may vote on in the next several months; a companion bill, H.R. 3306, is also being discussed in the House. As this legislation is mooted, it would be imperative to consider the other part of the equation carefully: how to ensure US nonproliferation policy adapts once more to the requirements of the modern nuclear commerce era.



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