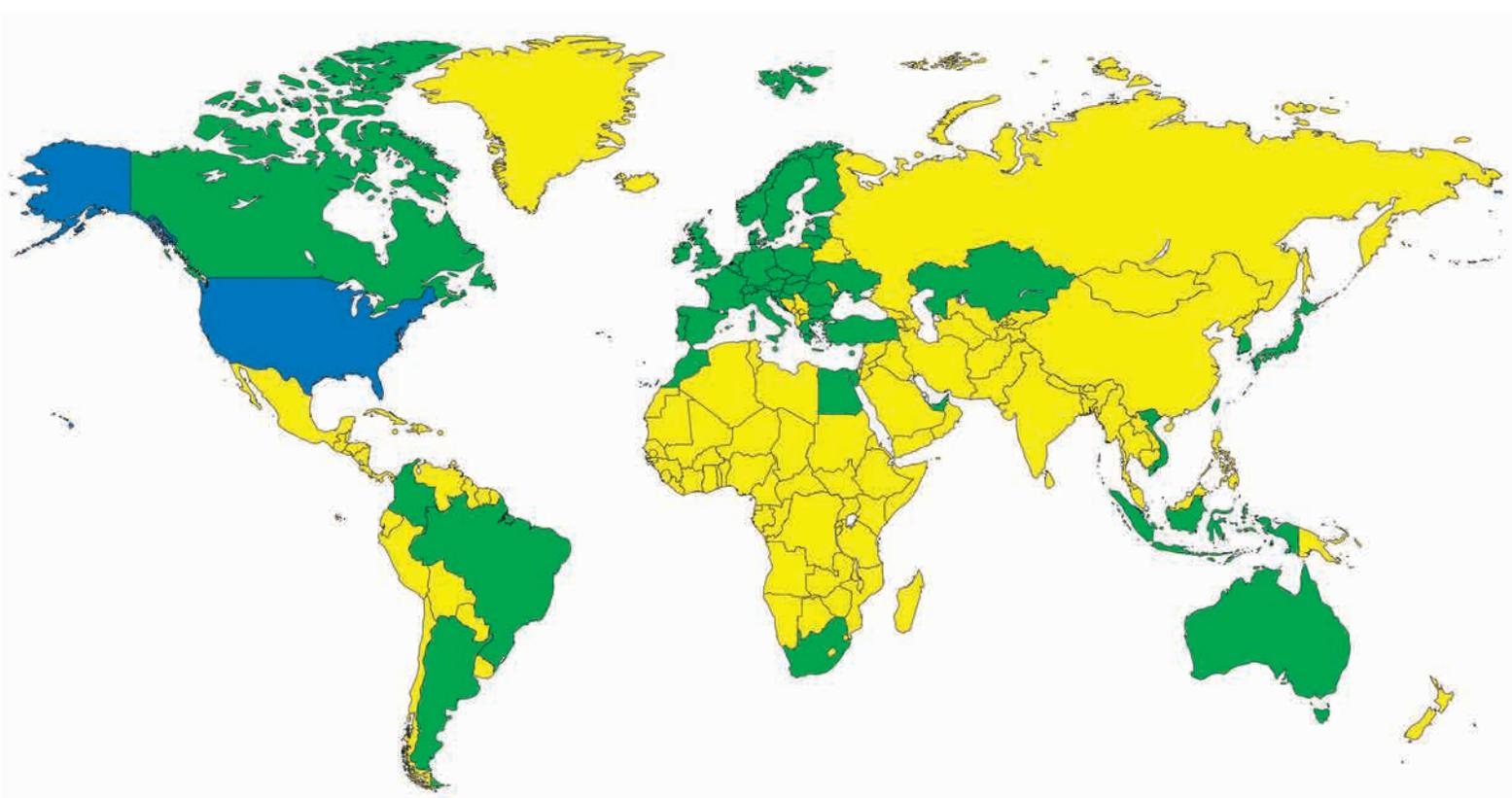


# Enabling Nuclear Innovation

# Part 810 Reform

Improving the Efficiency of U.S. Export Controls  
for Nuclear Energy Technologies



**A Report by the  
Nuclear Innovation Alliance**



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**December 2017**

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**DESIGN**

David Gerratt/[NonProfitDesign.com](http://NonProfitDesign.com)

## Acknowledgements

The author wishes to acknowledge the following reviewers for their useful comments:

Carol Berrigan, Robin Delabarre, Ashley Finan, Seth Grae, Richard Goorevich, Ted Jones, Andrew Kadak, KP Lau, Jessica Lovering, Julie Stevenson, Elina Teplinsky, and Ann Weeks.

Craig Piercy and Paul Dickman provided valuable discussion. Retired Los Alamos National Laboratory expert Jeff Bedell taught the author much about export control. Julie Lanza helped to edit the report.

## DISCLAIMER

This report does not represent a legal opinion, nor does it offer advice of counsel for the Nuclear Innovation Alliance. Readers should consult with counsel for legal advice and direction, and with the National Nuclear Security Administration, a component of the U.S. Department of Energy, to obtain guidance on activities subject to the regulations discussed in this report.

No individuals were asked to concur with the conclusions or recommendations in this report. All remaining errors are the responsibility of the author alone.

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## EXECUTIVE SUMMARY

**T**HE U.S. ENERGY INFORMATION Administration (EIA) projects that by 2050 countries around the world will add almost 200 gigawatts of new nuclear energy capacity.<sup>1</sup> Those construction projects will entail the flow of new nuclear materials, services, and equipment to a number of countries that currently do not possess significant nuclear power programs. A growth in nuclear energy use offers major commercial opportunities for nuclear reactor companies

### **In the United States, this intersection of business and national security takes place under the U.S. Department of Energy (DOE) 10 CFR Part 810 (Part 810) regulations.**

and carries implications for the global nonproliferation regime. As Table 1 shows, most of the expected deployments are projected to take place in countries that are not members of the Organisation for Economic Co-operation and Development (OECD).

Before the first reactors are under construction, however, supplier nations typically share proprietary information on their reactor designs with potential customer nations. These transactions may be the first technology transfers where the government of a supplier nation will have to consider the commercial and nonproliferation implications of broader nuclear energy cooperation with a first-time nuclear energy customer nation. Even between countries where nuclear trade has been ongoing

for decades, new transactions such as these may pose unique and complex challenges.

In the United States, this intersection of business and national security takes place under the U.S. Department of Energy (DOE) 10 CFR Part 810 (Part 810) regulations, which control the flow of unclassified nuclear energy technology and assistance to foreign atomic energy activities. These regulations and their implementation are the subject of this report.

Activities regulated by Part 810 are largely divided between those that are generally authorized—that is, companies do not have to ask the U.S. government for permission—and those that require specific authorization from the Secretary of Energy. In recent years, U.S. officials have taken longer to process applications for specific authorization (see Figure 1) to the point where industry has stated that it constitutes a “significant competitive disadvantage” for U.S. companies.<sup>2</sup> DOE has recognized this issue and begun a process improvement plan; however there are challenges associated with Part 810 reform that may need assistance from Congress and industry.

In the 1990s, specific authorizations took on average 130 days from receipt of the application by DOE to final approval by the Secretary of Energy. As Figure 1 shows, applications for specific authorization in more recent years are taking an average of close to 400 days to complete the process. One contributing factor to the increased processing time is a change in processing structure at DOE: previous to 2005, specific authorizations were signed by the Secretary of Energy “subject to the receipt of

1 EIA, “International Energy Outlook 2017.”

2 Comments of Nuclear Energy Institute, DOE Supplemental Proposed Rule, November 27, 2013. Page 10.

**TABLE 1**  
**EIA Projections for Additional Nuclear Energy Capacity by Region (capacity in gigawatts)**

Region	2015	2030	2050	Change from 2015 to 2050
OECD Countries	256	259	200	-56
Non-OECD Europe and Eurasia	42	57	56	+14
Non-OECD Asia	39	124	231	+192
Non-OECD Americas	4	6	5	+1
Africa	2	4	6	+4
Middle East	1	12	17	+16
<b>Total</b>	<b>343</b>	<b>462</b>	<b>516</b>	<b>+173</b>

Source: EIA, "International Energy Outlook 2017," Table H5.

assurances" from foreign governments. This allowed the U.S. government to process applications for specific authorization while seeking assurances from foreign governments. The pre-2005 process was more efficient and facilitated a swifter response to U.S. companies whose applications were pending.

Government to government assurances are requested as part of each specific authorization.<sup>3</sup> The United States is obligated, as part of its adherence to the Nuclear Suppliers Group (NSG) Trigger List Guidelines, to obtain two types of assurances for nuclear technology transfers. These obligations require 1) assurances of peaceful uses for transferred technology and 2) assurances regarding any subsequent retransfer of the supplied technology.<sup>4</sup> The major nuclear supplier nations are also members of the NSG, and thus U.S. competitors have the same obligations to obtain assurances for nuclear energy technology transfers.

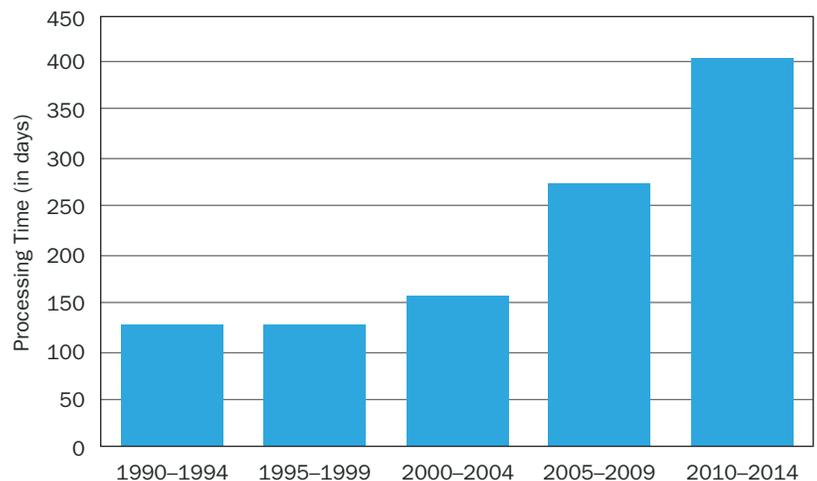
The current uncertainty in application processing times is challenging for U.S. companies as the application process may take 200 days or it may take 600 days or longer. One source of that uncertainty is that the U.S. government cannot control the response time of foreign governments supplying the requested assurances regarding peaceful uses and retransfers. In some cases, foreign governments have taken more than two years to supply the requested assurances.

When compared to other major supplier export control regimes, Part 810 is more efficient regarding activities that are generally authorized, but less efficient in some cases regarding specific authorizations. A 2012 report examined the export control regimes of foreign competitors—the Republic of

Korea (ROK), Russia, Japan, and France—and noted that the stated periods in which government entities were required to process export control applications were 15 days, 25-45 days, 90 days, and nine months, respectively. If these periods correspond even roughly with actual specific authorization application processing speeds, then these nations are significantly faster than the specific authorization process under Part 810. Furthermore, it is likely that some other major suppliers are able to obtain approvals or denials in a shorter period of time than Part 810 specific authorizations, due to the fact that many suppliers are state-owned.

Other federal regulatory regimes offer potential templates for improving the efficiency of Part 810.

**FIGURE 1**  
**Average Processing Times for Specific Authorization Applications**



Source: DOE reading room.

<sup>3</sup> The one exception is the hiring of foreign nationals by U.S. companies, which is discussed in Chapter III.

<sup>4</sup> See <http://www.nuclearsuppliersgroup.org> for the most recent documentation.

The U.S. Nuclear Regulatory Commission (NRC), for example, regulates the export of nuclear material and equipment under the 10 CFR Part 110 (Part 110) regulations. These regulations have a more risk-informed structure than Part 810 and include many different categories of exports, multiple country lists, processing structures, and levels of review depending on the significance of the proposed export. Some export applications are sent to the NRC commissioners for review, while others are not; likewise, some applications are sent to the

**The NRC has established a general license for minor reactor components to countries “sharing U.S. nonproliferation goals” and which had supplied the United States with generic assurances—in other words, certain minor exports have been expedited to countries with good nonproliferation credentials.**

Executive Branch for its views, based on a de facto assessment of risk or policy significance, while other applications are not. By contrast, the Secretary of Energy’s attention and signature is currently required for even minor applications and amendments under Part 810; this process adds weeks or even months of additional processing time, often with no clear benefit.

The NRC has also established a general license for minor reactor components to countries “sharing U.S. nonproliferation goals” and which had supplied the United States with generic assurances. In other words, certain minor exports have been expedited to countries that have demonstrated their nonproliferation credentials. This was done in part to reduce the regulatory burden on U.S. companies and NRC staff, but also to benefit U.S. nonproliferation objectives by demonstrating to other countries the advantages of supporting nonproliferation policies.

Likewise, the U.S. government should establish “fast track” approval pathways under Part 810 for countries that have made and are maintaining significant nonproliferation commitments (see Appendix A for an example list of possible

countries and criteria). One criterion for determining which countries qualify for fast track eligibility could be previous authorizations under Part 810, which clearly indicate U.S. intent to cooperate on nuclear energy. Such a criterion would be similar to how the NRC exempts review by the NRC commissioners in some cases for subsequent Part 110 exports to a country or reactor after an initial export. A new “fast track” approval pathway would also need to identify eligible activities: for example, light-water reactor (LWR) technology could be given expedited consideration, considering its widespread deployment and availability from multiple suppliers.

China, India, and Russia are the only countries that have nuclear cooperation agreements in place with the United States, and yet are not generally authorized destinations under Part 810, owing to various geostrategic considerations. U.S. companies have required specific authorization to work with Chinese and Russian entities since the regulations were first issued in 1956, and with Indian entities since 1983. China is projected to build more than half of new global nuclear generation capacity over the next three decades, making it the most attractive market for nuclear companies worldwide to seek business opportunities. The U.S. government is concerned with technology transfers to China, however, for reasons that include: China’s nuclear energy cooperation with Pakistan, whether or not China is maintaining its nonproliferation commitments, intellectual property issues, and potential diversions of civil nuclear energy technologies to military activities (e.g., naval reactor programs).

The following actions (discussed in greater detail in Chapter VI) are recommended<sup>5</sup> to improve the efficiency of U.S. export control regarding nuclear technology transfers and other unclassified assistance to foreign nuclear energy programs:

**Recommendation 1:** *DOE should initiate a rulemaking to establish two fast track authorization pathways for specified activities in countries that have made significant nonproliferation commitments. One authorization should focus on applications that need government to government assurances, and a second should involve applications that do not require such assurances. In both cases, DOE should establish the types of activities that qualify for fast track approval,*

<sup>5</sup> This report does not represent a legal opinion, nor does it offer advice of counsel for the Nuclear Innovation Alliance. Readers should consult with counsel for legal advice and direction, and with the National Nuclear Security Administration, a component of the U.S. Department of Energy, to obtain guidance on activities subject to the regulations discussed in this report.

along with a list of countries eligible for expedited consideration.

The Part 810 regulations already include a type of fast track authorization for operational safety activities in Section 810.6(c)(2). This section provides authorization for furnishing “operational safety information or assistance to existing safeguarded civilian nuclear reactors outside the United States in countries with safeguards agreements with the International Atomic Energy Agency (IAEA) or an equivalent voluntary offer, provided DOE is notified in writing and approves the activity in writing within 45 days of the notice.” Given the type of activity (operational safety assistance to IAEA safeguarded reactors) and type of destination (countries with safeguards agreements with the IAEA or an equivalent voluntary offer) the expectation is that a given application will be approved, though the process still affords the U.S. government an opportunity to review and potentially reject the application.

Following the model in Section 810.6(c)(2), the new pathways would allow companies to notify DOE that they are intending to pursue specific activities and if they do not hear back from DOE after a specified amount of time (e.g., 45 days), the activity would be deemed to be approved (pending receipt of assurances for authorizations where they are needed).

**Recommendation 2:** *The White House should issue an Executive Order that affirms the importance of efficient processing of Part 810 applications to U.S. commercial and national security interests, and directs improvements toward that aim.*

As a model, the new Executive Order should look to Executive Order 12981, which governs the export of dual-use items. Executive Order 12981 set out timelines for agency actions, as well as provisions for handling incomplete applications and establishing mechanisms to resolve interagency disputes.

The Executive Order for Part 810 should state that it is the policy of the U.S. government to continue processing applications for specific authorization while government assurances are being sought (for the cases where assurances are necessary).

**Recommendation 3:** *For specific authorization applications, DOE should return to the pre-2005 process under which the Secretary of Energy signs determinations subject to the receipt of assurances.*

*At a minimum, DOE should continue to process Part 810 packages while the interagency review process is ongoing and assurances are being sought by the State Department, so that applications are before the Secretary of Energy and ready to be signed as soon as possible upon receipt of the assurances.*

Returning to the pre-2005 policy, under which the Secretary signs determinations subject to the receipt of assurances, would provide U.S. companies an earlier notification that the U.S. government has approved the activity, pending the receipt of foreign government assurances. This would reduce uncertainty for U.S. businesses and accelerate specific authorization approvals without a reduction in nonproliferation controls.

**Recommendation 4:** *The DOE Offices of Nonproliferation and Arms Control, Nuclear Energy, and Intelligence should prepare a classified report analyzing the risks and benefits of nuclear energy technology transfers with China to provide a framework for future internal U.S. government discussions.*

An assessment of the nuclear energy technologies available and being supplied to China from other countries (e.g., Russia, France, Japan), along with China’s own independent R&D progress, would provide additional context for a balanced accounting of the risks and benefits associated with specific authorizations to China.

**DOE should return to the pre-2005 process under which the Secretary of Energy signs determinations subject to the receipt of assurances. This would reduce uncertainty for U.S. businesses and accelerate specific authorization approvals without a reduction in nonproliferation controls.**

**Recommendation 5:** *The U.S. Department of State should seek generic assurances from countries, where possible, to cover transfers under Part 810 before applications for export are submitted.*

The U.S. government should seek generic assurances from individual countries for some of the more minor exports under Part 810. DOE could then process applications to countries more quickly, perhaps in combination with a fast track approval process, as the assurances step would already be completed.

**Recommendation 6:** *DOE should re-examine its legal position that delegation of authority by the Secretary of Energy for activities under Section 57b is prohibited by Section 161n of the Atomic Energy Act of 1954 (AEA), as amended.*

The Secretary of Energy currently signs off on every new specific authorization, no matter how minor, as well as extensions and minor amendments to existing authorizations, because of DOE's

## **The delegation of minor activities by the Secretary of Energy and an expedited review for activities of lesser significance are both consistent with nuclear export control practices elsewhere in the federal government.**

legal interpretation of Section 161n as prohibiting delegation by the Secretary to others. This adds weeks, if not months, to the processing of specific authorization applications with no obvious benefit. It is difficult to see why the Secretary of Energy's attention is needed or useful in any way for approving the hiring of foreign nationals, minor amendments to existing authorizations, renewals of authorizations, or other relatively technical or small-scale activities, such as operational consultations to existing LWRs under IAEA safeguards.

For comparison, the NRC Commissioners do not review most applications for the export of materials and equipment under the NRC's Part 110 regulations, and the NRC does not send most Part 110 applications to the Executive Branch for review. In other words, the delegation of relatively minor activities by the Secretary of Energy and an expedited review for activities of lesser significance,

are both consistent with nuclear export control practices elsewhere in the federal government.

**Recommendation 7:** *If DOE continues in its determination that delegation of authority by the Secretary of Energy for activities under Section 57b is prohibited by Section 161n, Congress should amend Section 161n of the AEA to permit delegation, recognizing the very different global reality today as compared with 1954, as well as the minor activities that are currently being sent to the Secretary of Energy.*

**Recommendation 8:** *Advanced reactor companies that intend to pursue work with foreign entities should engage DOE on Part 810 early in a similar manner to the pre-application interactions with the NRC on reactor design licensing.*

Early engagement between advanced reactor companies and DOE would familiarize the U.S. government with the technologies involved and also the end users under consideration. These interactions would provide early feedback to U.S. reactor companies on potential challenges with specific destinations and end users, as well as any concerns with the reactor technology itself.

**Recommendation 9:** *Industry should create a forum to share Part 810 experiences for the purpose of raising the quality of applications that are submitted to DOE.*

Companies that are new to the Part 810 process would especially benefit from hearing more experienced companies explain what information the U.S. government needs to process applications. This should help to cut down on processing times and reduce the resources expended by both private companies and the U.S. government.

## CHAPTER I

## INTRODUCTION TO PART 810

**T**HIS INTRODUCTORY CHAPTER explains what types of activities are covered under the Part 810 regulations, though there are cases where this is less clear and DOE is the final arbiter. Companies can request a policy determination from DOE, and may also seek a legally binding view from the General Counsel of the DOE. The regulations themselves, along with federal government processing structures, are subject to change, and individuals and companies should consult DOE for the latest updates.<sup>6</sup>

Part 810 regulates, for example, the transfer of technology associated with steps in the nuclear fuel cycle for uranium and plutonium. The list of activities described in 10 CFR Part 810.2(b), includes (but is not limited to): chemical conversion, fuel fabrication, isotope separation, and reprocessing of irradiated nuclear fuel or targets. Nuclear reactors are also covered, including the “development, production or use of the components within or attached directly to the reactor vessel, the equipment that controls the level of power in the core, and the equipment or components that normally contain or come in direct contact with or control the primary coolant of the reactor core.” U.S. companies and individuals working in these areas of technology and with entities from other countries will likely find their work covered by the Part 810 regulations.

Section 810.2(c) describes activities that Part 810 does not apply to, including: transfer of publicly

available information or the results of fundamental research, uranium and thorium mining, fusion reactors, and others. Where Part 810 does apply, activities can largely be separated into two groups: those activities that are generally authorized and those that require specific authorization by the Secretary of Energy.

### A. General Authorizations and Specific Authorizations

If an activity is generally authorized, a U.S. company does not have to ask the U.S. government for permission to carry out the activity and has only to submit a report to DOE within 30 days of the activity taking place.<sup>7</sup>

To take a specific instance, Canada is a generally authorized destination listed in Appendix A to Part 810, and LWR technology is not listed as requiring specific authorization in Section 810.7(c). Thus, the transfer of a non-public, proprietary U.S. LWR design to Canada would be generally authorized. The same transfer to China, however, would require specific authorization from the Secretary of Energy, as China does not appear in the Part 810 Appendix A country list.

Figure 2 shows a map of the countries that are generally authorized destinations and those that are not. It is current U.S. government policy that having a nuclear cooperation agreement<sup>8</sup> with another country is a necessary, but not sufficient,

6 This report does not represent a legal opinion, nor does it offer advice of counsel for the Nuclear Innovation Alliance. Readers should consult with counsel for legal advice and direction, and with the National Nuclear Security Administration, a component of the U.S. Department of Energy, to obtain guidance on activities subject to the regulations discussed in this report.

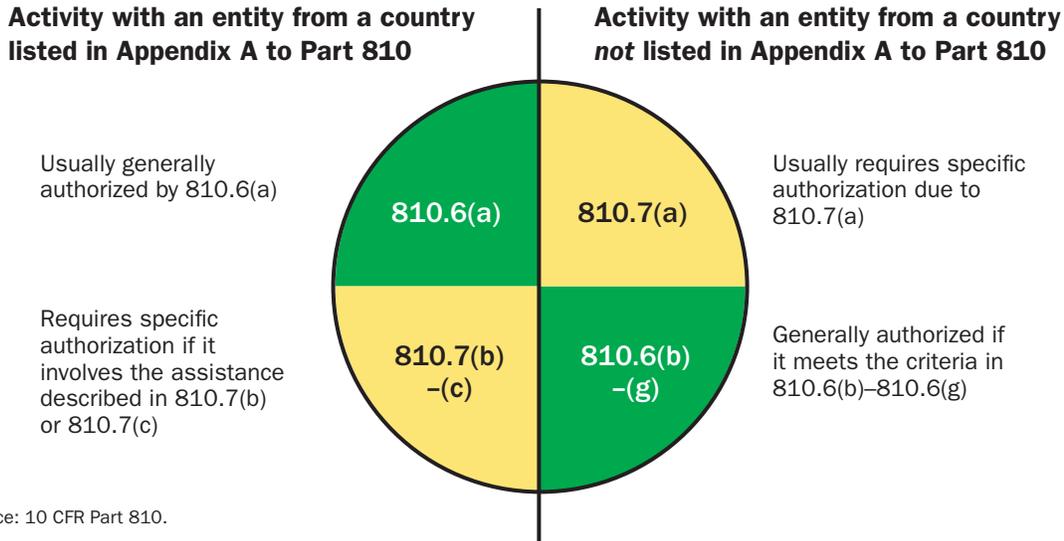
7 Reports submitted by companies on generally authorized activities are not publicly available. Appendix B, available [online](#), shows a list of generally authorized activities that were reported in 1981-1982. Data supplied by DOE/NNSA in response to a Freedom of Information Act (FOIA) request by the Clean Air Task Force, and shared with the author, showed 464 general authorization entries in just over a nine-month period (July 20, 2016 to May 8, 2017). The countries with the most general authorization entries during this time period were (in descending order): the UAE, Canada, Japan, the UK, France, Mexico, and the ROK. During the same period, 39 reports for specifically authorized activities were recorded.

8 Appendix C, which is available [online](#), shows existing U.S. nuclear cooperation agreements as of November 2017.



FIGURE 3

## Diagram of General Authorizations and Specific Authorizations by Activity



Source: 10 CFR Part 810.

and this worry has been reflected in industry comments on Part 810.<sup>10</sup>

DOE has initiated a process improvement plan to help address the long processing times.<sup>11</sup> Delays in the specific authorization could potentially push customers to other supplier nations, even if a country would otherwise prefer to work with a U.S. company. For that reason, the specific authorization process has received the most public scrutiny in recent years, and much of the rest of this report focuses on reducing the time taken by the U.S. government to give U.S. companies a yes or no answer.

## B. Role of Part 810 in Nuclear Energy Commerce and Nonproliferation

DOE's economic analysis from 2015 quoted 72 specific authorizations during the 2009-2012

time period that had dollar values reported, with a combined total worth of \$13.6 billion. Nine of those authorizations were for values of at least \$1 billion. As the economic analysis states:

In general, these transactions are associated with power reactor projects either in the planning or construction stages. Once foreign reactors are complete, technology transfer transactions tend to be much smaller in dollar volume.

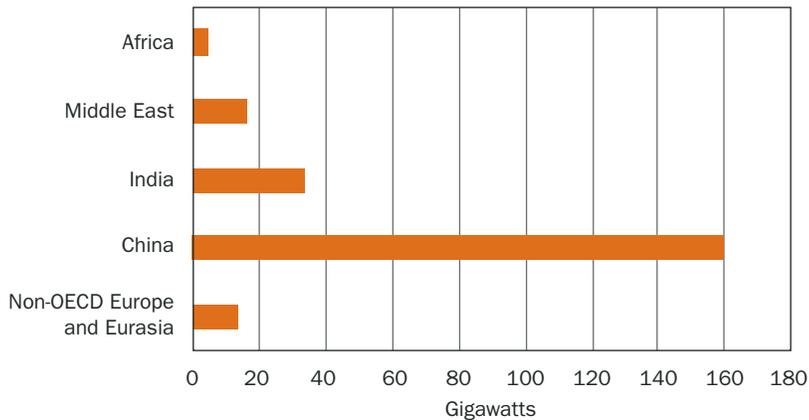
A slow or inefficient Part 810 application process does not help industry in competing with foreign companies. With the withering of the U.S. domestic market for reactor builds, and the projected large growth in nuclear energy generation in non-OECD countries, shown in Figure 4, U.S. companies will

9 78 Fed. Reg. 46829: "The Department acknowledges commenters' concerns that the timeframe for issuance of specific authorizations can impose business risks for companies seeking to make nuclear exports requiring specific authorization." 80 Fed. Reg. 9359: "... many NOPR commenters were concerned that the part 810 specific authorization process is unduly protracted, and that processing delays put U.S. suppliers at a competitive disadvantage with companies in other countries."

10 From the Nuclear Energy Institute comments on the 2011 notice of proposed rulemaking: "Currently, the DOE consumes anywhere from six months to well over one year to process a typical specific authorization. In some cases, application reviews have approached two years."

11 78 Fed. Reg. 46829: "DOE is initiating a process quality improvement program to make the processing of part 810 applications more orderly, expeditious, effective, and transparent." 80 Fed. Reg. 9359: "Anticipated improvements in the processing time of part 810 applications that may come from the PIP [process improvement program] include these recommended actions from commenters: ... Reduce application processing time—This effort will begin by DOE analyzing the authorization case database to determine causes of processing time variation and undue delay. The PIP team will conduct benchmark studies to identify best practices and methods to improve efficiency. The team will work with the DOS to find ways to request and secure foreign governments' nonproliferation assurances more promptly, and make internal DOE and interagency reviews of part 810 specific authorization applications more efficient by reducing unnecessary reviews and approvals."

**FIGURE 4**  
**Growth of Nuclear Energy in Selected Non-OECD Regions**



**Projected additions to regional nuclear energy capacity between 2015 and 2050.**

Source: EIA, “International Energy Outlook 2017,” Table H5.

increasingly depend on business in other countries. This further means that U.S. contributions to the reactor design innovation to improve people’s quality of life and reduce air pollution and greenhouse gas emissions will depend in part on efficient access to

**While nuclear energy is growing on a global scale, almost all of the projected increases in nuclear generation capacity are expected to take place outside of the United States.**

foreign markets. More than 9 GW of new nuclear capacity came online in 2016, the largest annual increase in more than 25 years.<sup>12</sup> While nuclear energy is growing on a global scale, almost all of the projected increases in nuclear generation capacity are expected to take place outside of the United States.

The other major suppliers of nuclear reactors (e.g., Russia, France, Japan, ROK, and China) together possess the full suite of nuclear technologies several times over: conversion, enrichment, fuel fabrication, reactors, and reprocessing. In other

words, the United States does not have a monopoly over any aspect of the civil nuclear energy realm.

All of these major suppliers are members of the NSG, a group of countries that “seeks to contribute to the non-proliferation of nuclear weapons through the implementation of two sets of Guidelines for nuclear exports and nuclear-related exports.” As a result, they all face the same supplier obligations as the United States, in terms of export control, and the rules in the NSG Trigger List Guidelines make it relatively clear what conditions will qualify countries for the transfer of nuclear reactor technology.<sup>13</sup>

For example, when the UAE released a policy statement in 2008 regarding its plans for a nuclear power program, it had already met the major condition in paragraph 4(a) of the NSG Trigger List Guidelines for the supply of power reactor materials, equipment, and technology.<sup>14</sup> Specifically, it had a comprehensive safeguards agreement with the IAEA in place, after having acceded to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1995. In the same 2008 policy statement, the UAE also announced its intention to adopt the IAEA’s Additional Protocol—to provide even more transparency into its nuclear program—which entered into force in 2010. Following the 2008 policy statement, the UAE entertained power reactor bids from major suppliers, and eventually selected the ROK to build four reactors (totaling 5.6 GW) at a cost of \$20B.<sup>15</sup> The UAE clearly had access to reactor technology from multiple supplier nations outside of the United States, even if the United States had ultimately decided not to do business with the UAE. The same will be true for other nations that meet the criteria in the NSG Trigger List Guidelines, if they decide to pursue nuclear power programs in the future.

Part 810 serves a variety of critical functions for the U.S. government. Its implementation fulfills U.S. obligations as a member of the NSG and as a country party to the NPT. Part 810 can prevent U.S. suppliers from unknowingly transferring technology to a foreign entity that could ultimately be diverted to a military purpose. It also serves the strategic function of regulating U.S. engagement

12 World Nuclear Association, “World Nuclear Performance Report 2017.”

13 The NSG Trigger List deals with export controls for nuclear-specific items, such as reactors, reprocessing and enrichment facilities, fuel fabrication, conversion, etc. See Chapter II for more details. The NSG Dual-Use List deals with items that have both a nuclear use and a non-nuclear use, and is thus not as relevant for Part 810.

14 [http://www.uae-embassy.org/sites/default/files/UAE\\_Policy\\_Peaceful\\_Nuclear\\_Energy\\_English.pdf](http://www.uae-embassy.org/sites/default/files/UAE_Policy_Peaceful_Nuclear_Energy_English.pdf)

15 <http://www.world-nuclear.org/information-library/country-profiles/countries-t-z/united-arab-emirates.aspx>

in the development and evolution of the global nuclear energy and nonproliferation regime, along with the NRC and U.S. Department of Commerce (DOC) regulations for the export of nuclear materials, equipment, and dual-use items (discussed in Chapter IV). If the Part 810 process is too slow, however, it can limit U.S. influence by preventing U.S. companies from spreading U.S. safety, security, and nonproliferation culture to other countries' nuclear energy programs. An inefficient process can delay innovative nuclear energy technologies from advancing and thus stall progress in building a low-carbon, clean energy future.

Chapter II will focus on the historical context for and evolution of the Part 810 regulations, along with multilateral commitments the U.S. has made that any reforms to the Part 810 regulations must respect. Chapter III provides an analysis of historical specific authorizations, including estimated processing times in the steps that make up the current specific authorization process. Chapter III also

## **An inefficient process can delay innovative nuclear energy technologies from advancing and thus stall progress in building a low-carbon, clean energy future.**

examines a comparison with other major suppliers' analogous export control functions. Chapter IV looks at the nuclear export control regimes of the NRC and the DOC, and in particular what elements of those regulatory regimes could be borrowed to improve the efficiency of Part 810. Chapter V discusses the geostrategic considerations that factor into Part 810 challenges with three major nuclear supplier countries: China, India, and Russia. Finally, Chapter VI presents recommendations to the Executive Branch, Congress, and industry for reforming and improving the Part 810 regulations and their implementation.

## CHAPTER II

## HISTORICAL CONTEXT

**T**HE LEGAL BASIS FOR THE PART 810 regulations derives from Section 57 of the AEA, as amended. The Part 810 regulations themselves have changed a great deal over the past 60 years.<sup>16</sup> During that time, the United States has made two principle multilateral commitments that are relevant to the Part 810 regulations: ratifying the NPT and adherence to the NSG Trigger List Guidelines.<sup>17</sup>

### A. Statutory Basis and Evolution of Part 810 Regulations

Originally, U.S. persons were prohibited from assisting foreign atomic energy programs by the Atomic Energy Act of 1946. In 1954, President Eisenhower wrote to Congress to request that the Atomic Energy Commission (AEC) be allowed to regulate such assistance.<sup>18</sup> Congress agreed to this request as part of the AEA.<sup>19</sup> Section 57 (a) of the AEA stated:

It shall be unlawful for any person to—... (3) directly or indirectly engage in the production of any special nuclear material outside of the United States except (A) under an agreement for cooperation made pursuant to section 123, or (B) upon authorization by the Commission after a determination that such activity will not be inimical to the interest of the United States.

This then gave the AEC the authority to regulate the involvement of U.S. entities in foreign atomic

energy endeavors. As it was deemed to be an important function, Section 161 of the AEA prohibited the AEC from delegating these functions. Today the Secretary of Energy is still considered by DOE to be prohibited from delegating Part 810 actions on account of the language in Section 161 of the AEA, as amended, even after the abolishment of the AEC and the reorganizations that took place in the 1970s.

In 1956, the AEC published the first regulations for “unclassified activities in foreign atomic energy programs” as the 10 CFR Part 110 regulations (they did not become the 10 CFR Part 810 regulations until 1975).<sup>20</sup> The regulations stated that as long as the assistance involved only unclassified information and was to a region not under Communist control, U.S. companies and persons were generally authorized to conduct their business without having to ask the U.S. government for permission. If a U.S. company wanted to do business in the 15 Communist regions or nations, however, it would have to submit an application to the AEC for specific authorization.

In 1972, the 10 CFR Part 110 regulations added a list of technology-specific activities that would require a specific authorization regardless of which country they were to take place in.<sup>21</sup> Any assistance involving enrichment, reprocessing, and heavy-water technologies to any country would require specific authorization from the U.S. government.

<sup>16</sup> The sub-Chapter on the history of the Part 810 regulations is derived from Appendix E, which is available [online](#).

<sup>17</sup> The sub-Chapter on the NPT and NSG is derived from Appendix F, which is available [online](#) and provides a greater level of detail.

<sup>18</sup> Document No. 328, 83rd Congress, 2nd Session. Message from the President of the United States transmitting recommendations relative to the Atomic Energy Act of 1946. February 17, 1954.

<sup>19</sup> The Atomic Energy Act of 1954. Public Law 83-703.

<sup>20</sup> 21 Fed. Reg. 418–419, 1956.

<sup>21</sup> 37 Fed. Reg. 92, Proposed Rule, 1972; 37 Fed. Reg. 14870, Final Rule, 1972.

A 1977 rulemaking raised to 19 the number of countries or areas that would require specific authorization to work in. It also added “fabrication of nuclear fuel containing plutonium” to the list of technology-specific activities that would require specific authorization regardless of the country.

The Nuclear Nonproliferation Act of 1978 (NNPA) had several substantial impacts on the Part 810 regulations.<sup>22</sup> The NNPA amended the AEA to require the concurrence of the U.S. Department of State and consultations with the DOC, the NRC, and the U.S. Department of Defense (DOD).

The NNPA also defined a new term—“sensitive nuclear technology” (SNT)—that would appear for the first time in a 1983 Part 810 rulemaking. SNT was defined as information not available to the public and important to the design, construction, fabrication, operation or maintenance of enrichment, reprocessing, or heavy-water facilities. Stringent conditions were imposed on exports of SNT. To cite a recent example, in order to exchange electrochemical recycling technology with ROK, the United States and the ROK entered into an agreement to satisfy the criteria in sections 127 and 128 of the AEA.<sup>23</sup>

The Part 810 rulemaking in 1983 also explained that whether a country was party to the NPT would constitute a new and major criterion for general authorization status. As many countries were still not yet party to the NPT, the final rule listed 62 countries that would then require specific authorization.

The number of countries which would require specific authorization fell to 52 in the 1986 rule “by eliminating a number of non-nuclear weapon states which have become parties to the . . . NPT.” The 1986 rulemaking also added “production reactors” to the list of technology-specific activities that would require specific authorization for assistance to any country.

In 1995, a rulemaking recognized the nonproliferation commitments made by Argentina, Brazil,

Chile, and South Africa and these four countries became generally authorized destinations.<sup>24</sup>

A 2000 rulemaking<sup>25</sup> added the requirement that NNWS have full-scope safeguards agreements in place with the IAEA to qualify as generally authorized,<sup>26</sup> and so the number of countries requiring specific authorization grew from 48 to 75 (this change followed a change in the NSG described below). The 2000 rulemaking also added “accelerator-driven subcritical assembly systems” to the list of technology-specific activities requiring specific authorization for transfers to all countries.

In 2004, Congress passed the Intelligence Reform and Terrorism Prevention Act of 2004,<sup>27</sup> which changed the relevant language in Section 57 to:

directly or indirectly engage *or participate* in the *development or* production of any special nuclear material [emphasis added]

**TABLE 2**  
**Countries and Technology Categories**  
**Requiring Specific Authorization, 1956–2015**

Year	The number of countries or regions requiring specific authorization	The number of technology categories mentioned that required specific authorization to transfer to any country
1956	15	0
1972	16	3
1977	19	4
1983	62	4
1986	52	5
1995	48	5
2000	75	6
2015	149	6

Source: See the Federal Register Notices cited in Appendix E, available [online](#).

22 The Nuclear Non-Proliferation Act of 1978. Public Law 95–242.

23 78 Fed. Reg. 32640, 2013.

24 59 Fed. Reg. 44381, Proposed Rule, 1994; 60 Fed. Reg. 43002, Final Rule, 1995.

25 64 Fed. Reg. 35959, Proposed Rule, 1999; 65 Fed. Reg. 16124, Final Rule, 2000.

26 The 1995 NSG change, discussed in the next sub-Chapter, put in place a requirement that to qualify for technology transfers associated with Trigger List items, a receiving country must have brought into force an agreement with the IAEA requiring the application of safeguards on all source and special fissionable material (i.e., a comprehensive safeguards agreement). While the 1999 notice of public rulemaking and 2000 final rule did not explicitly mention this development, the revisions made to the generally authorized list of countries align with this change.

27 The Intelligence Reform and Terrorism Prevention Act of 2004. Public Law 108–458.

In 2015, DOE published a new rulemaking, which listed 51 countries as generally authorized destinations—inverting the previous paradigm of listing countries that required specific authorization.<sup>28</sup> The 2015 rulemaking effectively added 74 countries to the total number of nations that require specific authorization from the Secretary of Energy.

The number of countries requiring specific authorization, as well as the number of technology-specific activities requiring specific authorization, is shown in Table 2 as a function of year.

Most recently, the National Defense Authorization Act (NDAA) for Fiscal Year 2016 added a new requirement that the Director of National Intelligence be consulted as to the views of the intelligence community for transfers of civil nuclear technology under Part 810 to Russia and China.<sup>29</sup>

### **B. U.S. Multilateral Commitments: NPT and NSG**

There are two principle nonproliferation commitments the United States has made in a multilateral context that are relevant to the Part 810 regulations: ratifying the NPT and adhering to the NSG Trigger List Guidelines. The latter is most useful for understanding several changes to Part 810, as well as the role of government-to-government assurances in the modern Part 810 process.

The NPT that entered into force in 1970 was the embodiment of President Eisenhower's Atoms for Peace bargain. Articles IV and VI gave the non-nuclear weapon states (NNWS) what they wanted: assistance in developing nuclear energy for peaceful purposes and a commitment by the nuclear weapon states to eliminate their nuclear weapons arsenals. Articles II and III gave the nuclear weapon states what they and other nations wanted: a commitment by the NNWS not to develop nuclear weapons and agreement by the NNWS to allow international inspections by the IAEA on their nuclear materials and equipment.

Relevant to Part 810, Article I of the NPT states that nuclear weapon states undertake not to “in any way assist... any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices.” U.S. technology transfers under Part 810 must therefore

avoid inadvertently aiding a NNWS in developing nuclear weapons.

Several conditions in the 1970s led to the formation of the NSG. While the NPT contained export control duties for the sales of nuclear materials and equipment to NNWS, there was no multilateral commitment for nuclear technology controls in the NPT or elsewhere. The lack of multilateral control over the transfer of enrichment, reprocessing, and heavy-water technologies was of particular concern. Major suppliers, such as France and Japan, were not members of the NPT in the early 1970s, but wanted to engage in nuclear commerce in a responsible manner. Finally, India's nuclear explosive test in 1974 had been aided by foreign assistance from several countries, and the major suppliers wanted to prevent this from happening again.

These conditions led to the formation of the NSG, which published its first export control documents in 1978 through the IAEA in the INFCIRC/254 series.<sup>30</sup> The publication described a “Trigger List” of materials and equipment, so-named as the export of these items would “trigger” the need for IAEA safeguards in the recipient NNWS. The conditions of supply in the NSG Trigger List Guidelines would then govern the export of those items from the major suppliers.

Relevant to Part 810, paragraphs 6 and 7 of the 1978 NSG Trigger List Guidelines discussed conditions for the export of enrichment, reprocessing, and heavy-water technology. These were the only technology-related export controls in the NSG until the 1990s when the discovery of Iraq's nuclear program prompted a flurry of activity.

Iraq had signed the NPT in 1968, but subsequently pursued a multi-billion dollar nuclear weapons program in violation of that commitment. During that time, major nuclear suppliers had conducted commercial business with Iraq, and IAEA inspections did not detect the illicit weapons program. After the first Persian Gulf War, as the extent of those efforts became more clear, the global nonproliferation community started efforts to not only strengthen IAEA inspections but to raise the standards by which countries would qualify for the transfer of nuclear material, equipment, and technology.

28 80 Fed. Reg. 9359, Final Rule, 2015.

29 Public Law 114-92. November 25, 2015.

30 <https://www.iaea.org/publications/documents/infcircs/communications-received-certain-member-states-regarding-guidelines-export-nuclear-material-equipment-or-technology>

**TABLE 3**  
**Sections of the NSG Trigger List Guidelines Most Relevant to Part 810**

Section of NSG Trigger List Guidelines	Relevance to the Part 810 regulations
Paragraph 2 states that supplier nations should only transfer Trigger List technologies upon formal governmental assurances from recipient nations that explicitly exclude uses which would result in any nuclear explosive device.	The reference to “formal government assurances” that the export will not result in a nuclear explosive device corresponds to the step in the specific authorization process of obtaining assurances from a foreign government that technology transfers will be for peaceful purposes.
Paragraph 4 states that supplier nations should only transfer Trigger List technologies to NNWS with full-scope IAEA safeguards (there is a separate exception for India, as discussed below).	NNWS without full-scope safeguards cannot be generally authorized destinations; applications for specific authorization to these countries are not supposed to be approved (with the exception of India).
Paragraph 9 states that supplier nations should only transfer Trigger List technologies to recipient nations upon receipt of assurances regarding any future retransfer of those technologies.	The conditions described in this paragraph correspond with the step in the specific authorization process of obtaining assurances from a foreign government that technology transfers will not be retransferred without prior U.S. government approval.

Source: NSG Trigger List Guidelines.

In 1992, the NSG adopted a policy that for NNWS to qualify for the supply of Trigger List items, they must have IAEA safeguards applied to all of their facilities with nuclear materials and especially designed or prepared equipment.<sup>31</sup> This was a major step forward in strengthening nonproliferation standards and Paragraph 4(a) of the Trigger List Guidelines still contains this requirement.

In 1992, the NSG formed a second control list for items that had non-nuclear commercial uses, but could also be used as part of nuclear programs. This became known as the Dual-Use List and was published as INFCIRC/254 Part 2 (with the Trigger List then published as “Part 1”). The DOC administers the regulations that govern the export of most of the items controlled by the NSG Dual-Use List, as discussed in Chapter IV.

The NSG development most relevant to the Part 810 regulations, however, occurred in 1995. That year the Trigger List Guidelines were amended to add the phrase “or related technology” in several places. As a result, the technology associated with all Trigger List items (e.g., power reactors, conversion facilities, fuel fabrication plants, etc.) acquired nearly the same conditions of supply imposed on the items themselves. Paragraphs 2, 4, and 9 of the NSG Trigger List Guidelines have the most important implications for Part 810 regulations, as explained in Table 3. As a member of the NSG, the United States has committed to obtaining assurances referenced in paragraphs 2 and 9, as

have the other major supplier countries (e.g., Russia, ROK, China).

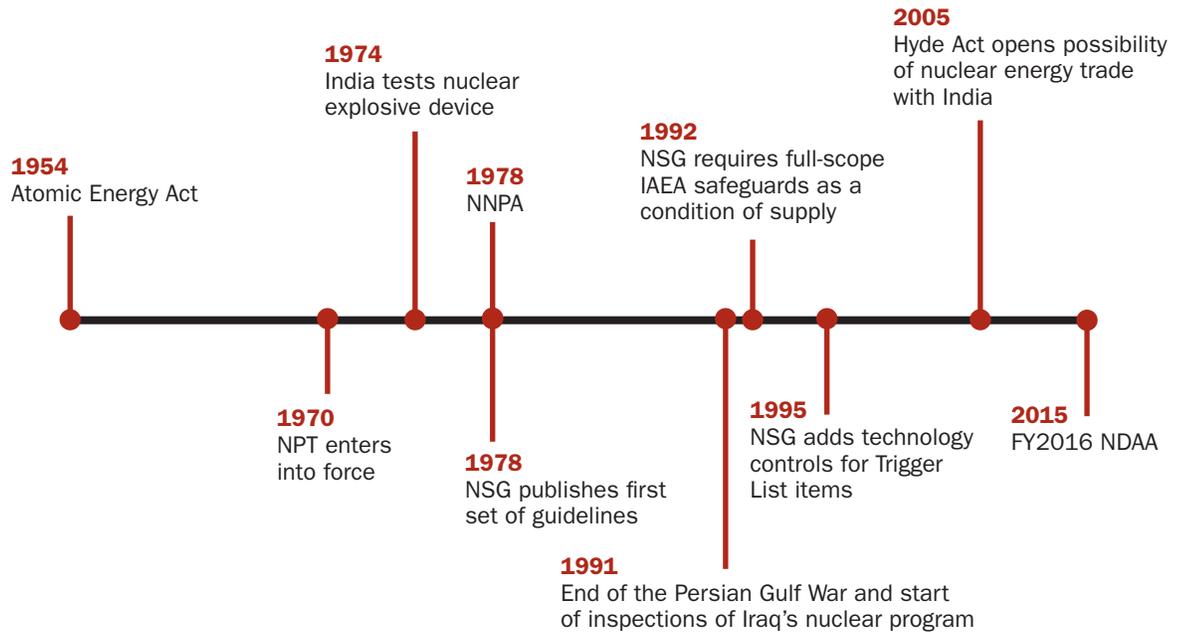
Paragraph 9 is somewhat more complicated than Paragraph 2, however. Paragraph 9a discusses obtaining assurances related to the retransfer of supplied material, equipment or technology and in particular that the country re-transferring obtain the same assurances. Paragraph 9b discusses cases where a supplier’s consent should be required for re-transfers. U.S. government policy has been to obtain assurances of no retransfer without U.S. government consent for all Part 810 specific authorizations (deemed exports aside) which is stronger than what is required by paragraph 9 (this is required for enrichment, reprocessing, and heavy-water technology transfers, but not for power reactor transfers, to take one example).

The NSG does not spell out in detail how these conditions of supply are to be implemented by participating governments at a procedural or practical level. For nations with state-owned nuclear entities (e.g., Russia’s Rosatom), the employees are government actors and could thus possibly obtain the assurances themselves. In the case of the United States, the companies with nuclear technology are private entities, distinct from the U.S. government, but it is still the U.S. government that obtains the assurances.

There is one exception to the paragraph 4 requirements to transfer Trigger List items only to NNWS with full-scope IAEA safeguards: India. In

<sup>31</sup> This is sometimes described as a state having a “comprehensive safeguards agreements” with the IAEA or having “full-scope safeguards.” The two terms are used interchangeably in this report.

**FIGURE 5**  
**Timeline of Selected Events that had Impacts on Part 810**



2008, after an intensive lobbying effort by the United States, the NSG agreed to a separate exemption for India from this requirement. This is discussed further in Chapter V.

Paragraphs 6 and 7 of the NSG Trigger List Guidelines still describe the conditions that must be met for the transfer of enrichment, reprocessing, and heavy-water technologies. These are also relevant to Part 810, though enrichment, reprocessing, and heavy water technology transfers constitute a small percentage of specific authorization

applications. The criteria described in paragraphs 6 and 7 of the NSG Trigger List Guidelines imply that only a subset of NSG members currently qualify to receive enrichment, reprocessing, and heavy water technology transfers.

Efforts to reform Part 810 regulations and their implementation will need to consider U.S. commitments under the NPT and the NSG, as well as the constraints imposed by the AEA, as amended. A timeline of the developments most relevant to Part 810 is shown in Figure 5.

## CHAPTER III

# ANALYSIS OF SPECIFIC AUTHORIZATIONS

**A**S DISCUSSED IN CHAPTER I, applications for specific authorization are where U.S. government processing times have grown in the past decade. This Chapter looks at available data sets and reports to provide some insight into the challenges in order to inform recommendations for reform.

## A. Historical Trends (1983–2015)

The DOE’s public reading room includes a partial cataloging of determinations made by the Secretary of Energy as part of the specific authorization process.<sup>32</sup> The information in the determinations is in some cases very limited, and in other cases incomplete, but they can still be used to illustrate some broad trends.

### ASSURANCES

The number of determinations that are available in the DOE reading room from the early 1980s appears to be far less than the numbers described elsewhere.<sup>33</sup> There is a thread of interesting information, however, in the determinations from the 1980s concerning the assurances sought from foreign governments. Some determinations in the 1980s make no mention at all of assurances. This could mean that no assurances were sought or it could mean that they were simply omitted from the determination that the Secretary of Energy signed. In some cases, determinations discussed receiving assurances from foreign governments for peaceful uses, and in others, they discussed obtaining

assurances regarding the retransfer of U.S. technology. A few determinations discussed obtaining both types of assurances, though this did not begin to standardize until around 1994.

As discussed in Chapter II, this standardization took place around the same time that the NSG added “or related technology” to its Trigger List Guidelines in several places, including paragraphs 2 and 9, which call for assurances on peaceful uses and retransfers. Subsequently, secretarial determinations (with the exception of deemed exports, where foreign government assurances are not sought) on record in the DOE reading room mention foreign government assurances for peaceful uses and retransfers.

A qualitative change to the specific language used in discussing those assurances occurred around 2005 to 2006, when determinations began to refer to assurances that had been received, as opposed to the determinations being “subject to the receipt of assurances” as in years prior to 2005. This implied change in the processing of non-deemed export specific authorization applications is depicted in Figure 6. Inherently, the change could only have lengthened the time between an application being received and the Secretary of Energy signing a determination, and is likely a contributing cause in the rise of application processing times shown in Figure 7.

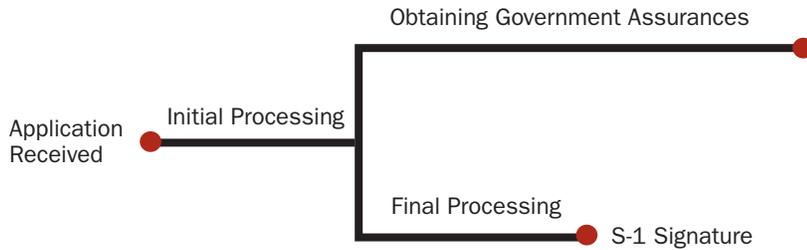
Previous to 2005, when the Secretary of Energy signed a determination, the pertinent U.S. company or companies might not have been able to start the

32 Not all determinations are made publicly accessible in the reading room. The GAO report cited later in this Chapter states that there were 89 applications for specific authorization approved from 2008 to 2013, which is greater than the 49 available in the reading room for the same time period.

33 For example, GAO mentions in 1986 testimony: “From 1980 through 1985, DOE authorized 47 exports...” which is well over the 28 listed in DOE reading room documents for that time period.

**FIGURE 6**  
**Pre-2005 Parallel Processing Structure and Post-2006 Serial Processing Structure**

**Pre-2005 Secretarial Determination Process**



**Post-2006 Secretarial Determination Process**



proposed activity if the assurances had not been received. On the other hand, the company would have the certainty of knowing that the U.S. government had approved the export at an earlier point in time.

**PART 810 PROCESSING TIMES AND COUNTRY DESTINATIONS**

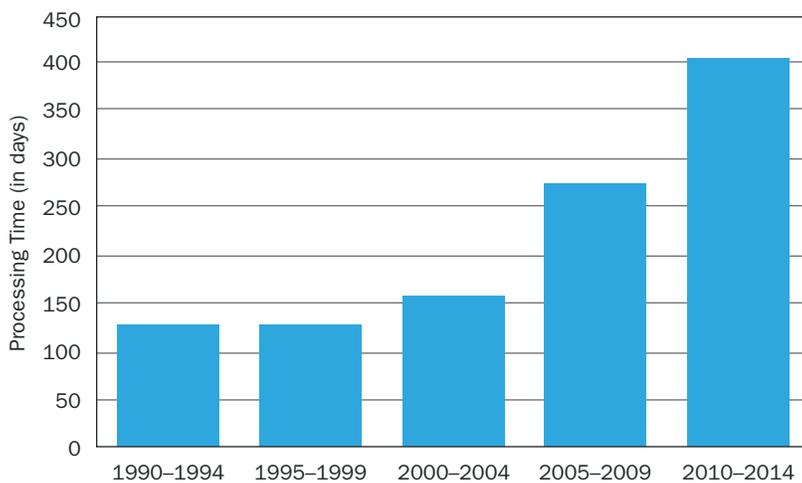
There are other odd irregularities in the data set for the 1980s, such as the group of 19 applications approved to China with one signature in 1985.

(Usually, each application was signed individually; this group of authorizations was likely related the 1985 submission of the U.S. nuclear cooperation agreement with China to the U.S. Congress.) There are also applications from the 1980s that involve the transfer of physical parts, which happened occasionally in the 1990s, though does not appear to have happened after 2000.<sup>34</sup> On account of the deficiency of the data and the changing scope of Part 810 regulations, these determinations are less useful to understanding the present; thus, the analysis below will focus on the 1990s and 2000s.

Figure 7 shows a histogram of processing times for specific authorizations in the 1990s. The processing times are defined to be the days between when an application is submitted and when the secretarial determination is signed. There is some ambiguity here in that some applications refer to amendments to applications and resubmittals. For consistency, the earliest application date mentioned is used. Also, each signature by the Secretary of Energy is counted as one determination, even if it is for multiple countries and activities. The figure shows a rise in processing times from roughly 130 days in the 1990s to closer to 400 days in more recent years.

Another challenge for U.S. companies working with Part 810 regulations is the uncertainty involved. Figure 8 shows the spread of processing times for specific authorization applications between 2006 and 2015.

**FIGURE 7**  
**Average Processing Times for Specific Authorization Applications**



Source: DOE reading room.

<sup>34</sup> The types of activities authorized in the 1980s are provided in Appendix D, which is available [online](#).

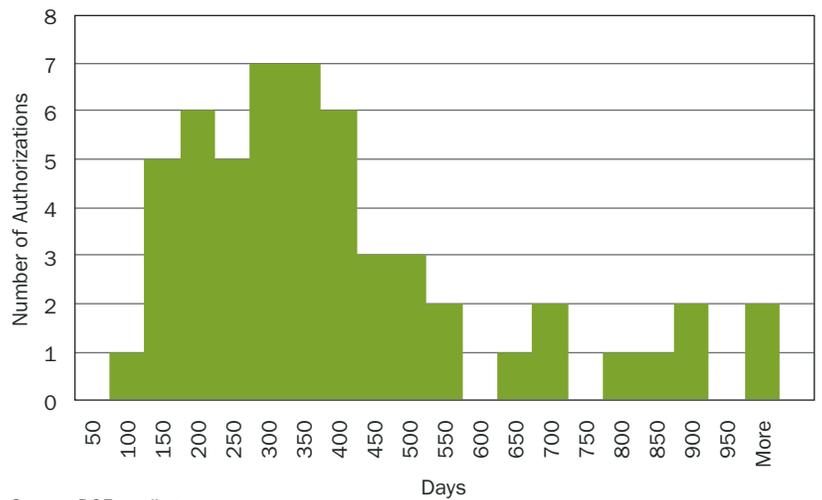
The wide distribution in Figure 8—150 to 550 days or greater—illustrates the uncertainty U.S. companies must contend with. The same distribution looked very different for specific authorization applications in the 1990s, as shown in Figure 9, when the uncertainty was much less.

As Table 4 shows, the application processing times can vary greatly depending on the destination country. This is partly a reflection of the response time of the destination country in providing the requested assurances, but may also be driven by U.S. considerations of the particular country involved, as discussed in Chapter V.

Specific authorizations by country are shown in Figure 10. The 2000–2015 time period is used to give a more representative depiction of where specific authorization applications are targeting, though some changes have already taken place. For example, the UAE became a generally authorized destination in 2015, so activities there will no longer require permission from the U.S. government (unless they involve activities noted in 810.7c). The data set in the reading room is not complete, so this should not be taken as exact. The data set in the public reading room does not, for example, include the same of number of determinations quoted in the 2014 GAO report, as shown in Figure 11. As Figure 11 also shows, the number of specific authorizations each year varies widely—more than 20 determinations in some years, and zero in others.

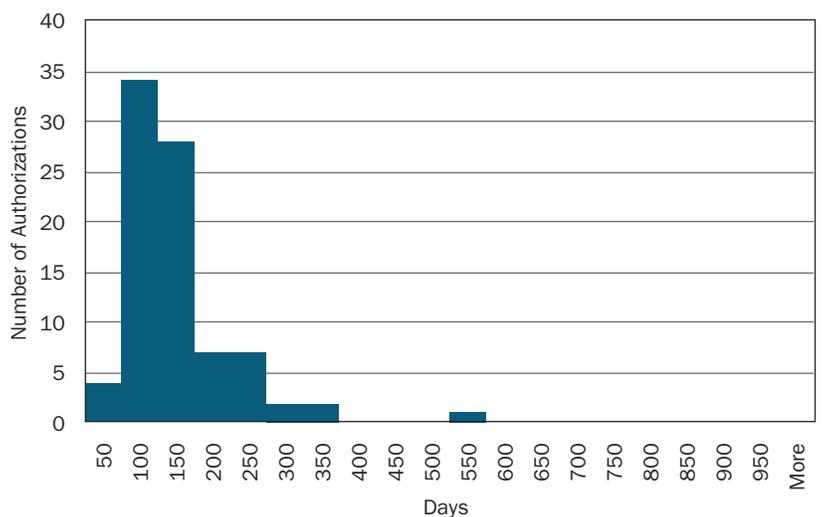
Separate from new applications for specific authorization, U.S. companies must also apply for the renewal of existing specific authorizations. If a U.S. company is granted a specific authorization for five years, then towards the end of that time period, the company must apply for a renewal of the authorization if it wants to continue the work. Also, existing authorizations may sometimes need to be amended within the authorization period. For example, a foreign entity's address or name may change, or a company may wish to hire another foreign national from the same country as an existing authorization. Data provided by DOE/NNSA to the Clean Air Task Force under FOIA, and shared with the author, indicate that between applications for new specific authorizations, authorization renewals, and amendments to existing authorizations, at times DOE receives applications under Part 810 in need of a response on an almost weekly basis.

**FIGURE 8**  
**Histogram of Processing Times for Specific Authorization Applications, 2006–2015**



Source: DOE reading room.

**FIGURE 9**  
**Histogram of Processing Times for Specific Authorization Applications, 1990–1999**

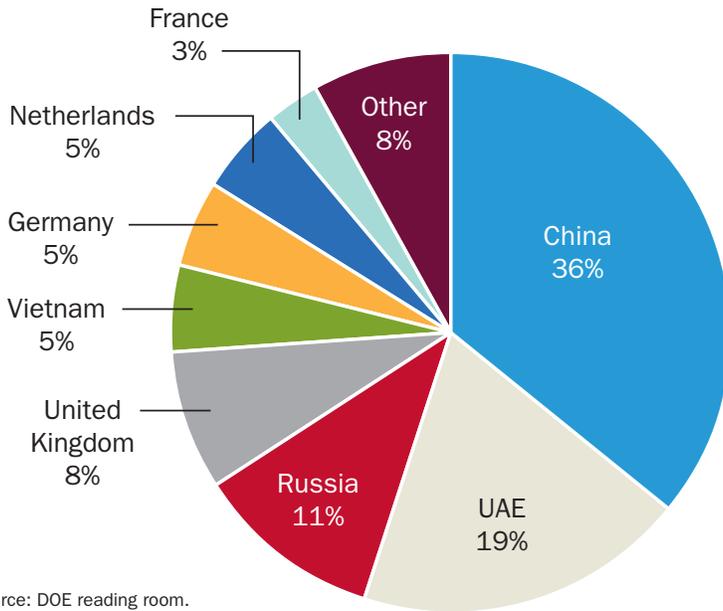


Source: DOE reading room.

### CATEGORIES

Developing more explicit categories of the types of activities regulated by Part 810 would enable a more risk-informed structure to the regulations. As discussed in Chapter IV, other federal nuclear export control regimes assign different levels of review depending on the significance of the activity in question. The determinations available in the public reading room from 1983 to 2015 encompass a very broad class of activities, however, making this analysis difficult.

**FIGURE 10**  
**Specific Authorizations by Country, 2000–2015**



Source: DOE reading room.

For example, the following are activities that were licensed under Part 810 in the 1980s and early 1990s, according to the determinations available in the DOE reading room:

- to export a copper vapor laser and electron beam supply for use in laser isotope separation research

**TABLE 4**  
**Specific Authorizations to Russia, China, and the UAE, 2007–2015**

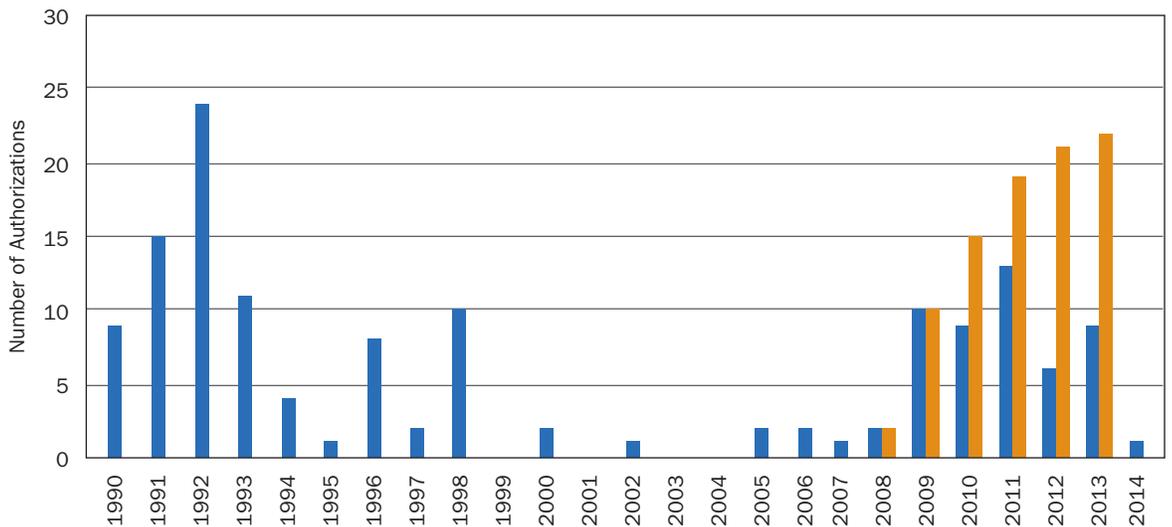
Country	Number of authorizations	Average processing time (in days)
Russia	6	505
China	18	487
UAE	12	193

Source: Data supplied by DOE/NNSA in response to a FOIA request by the Clean Air Task Force.

- to export bellows seals
- to export spare components for nuclear-qualified pressure transmitters
- to ship a tunable diode laser
- to perform decontamination services
- to develop enriched gadolinium production technology jointly
- to permit a subsidiary to sell 3,100 fuel bundles
- to sell and install silicon dioxide insulated cable as part of a safety upgrade
- to jointly develop a thermionic space nuclear power system

Several of these activities would likely be considered outside the scope of Part 810 today. To try to better capture the types of nuclear activities regulated in recent years, this report uses only determinations

**FIGURE 11**  
**Number of Specific Authorizations Granted Each Year, 1990–2014**



The number of authorizations documented in the DOE reading room is shown in blue, while the estimated number from the 2014 GAO report is shown in orange.

Source: DOE reading room; Figure 4 of GAO, “Additional Actions Needed to Improve DOE’s Export Control Process,” 2014.

since the rulemaking in 2000 to construct the following categories of Part 810 activities:

- General consulting services where no non-public, proprietary Trigger List item design is transferred
- Deemed exports (the hiring of foreign nationals by U.S. companies)
- Fuel fabrication (divided into two categories: with or without plutonium in the fuel)
- Software transfers (e.g., RELAP) involved in reactor operational and design consulting (divided by whether source code or only object code is transferred)
- LWRs (divided into three sub-categories: 1) operational and maintenance consulting for existing reactors; 2) design of new LWRs; and 3) transfer of LWR designs to countries that have announced reactor bids)
- Non-light water reactors (e.g., thermal high temperature gas reactors, sodium fast reactors, and molten salt reactors); this could be divided into subcategories by technology type
- Enrichment, reprocessing, and heavy-water technologies

DOE could use this type of categorization in analyzing which types of activities could be expedited. Chapters IV and VI discuss possible fast track authorization pathways making use of both specified activities and limited country destinations.

### B. U.S. Government Steps for Processing Specific Authorization Applications

This sub-Chapter describes in greater detail how the U.S. government processes applications for specific authorization. The U.S. Government Accountability Office (GAO) produced a report<sup>35</sup> in 2014 on the Part 810 regulations, and described the specific authorization process as being composed of three stages:<sup>36</sup>

1. Initial review, during which DOE staff writes initial analysis and recommendations before the application and recommendations are sent out for interagency review;
2. Interagency review, during which the State Department may obtain written nonproliferation assurances from host governments and

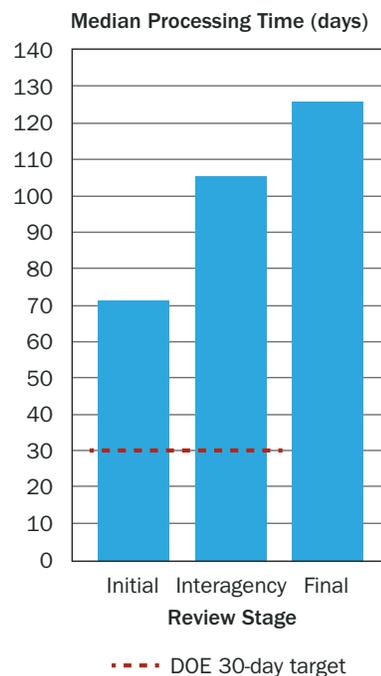
then provide its concurrence or non-concurrence, while the DOC, the NRC, and the DOD provide consultations; and

3. Final review, during which DOE staff drafts authorization approval recommendations which are then reviewed by the proper DOE offices before they go to the Secretary of Energy's desk for signature.

GAO found that DOE consistently missed its 30-day targets for the initial and interagency review stages when processing applications. Figure 12 shows a GAO graph that illustrates how much time is taken in each review stage.

As Figure 12 indicates, GAO calculated that the DOE takes a median of 71 days for initial review, in addition to a median of 105 days for interagency review and obtaining government to government assurances. After interagency review, GAO

**FIGURE 12**  
GAO Estimates for Specific Authorization Processing Times by Stage, 2008–2013

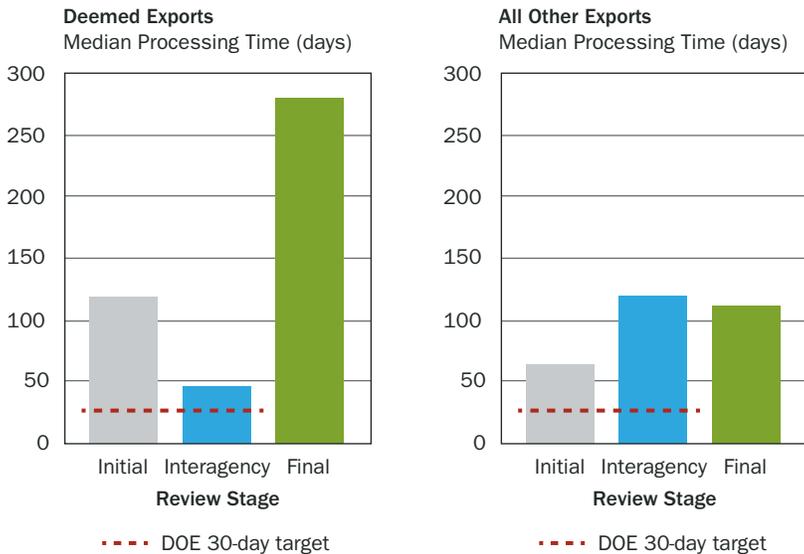


Source: Figure 2 of GAO, "Additional Actions Needed to Improve DOE's Export Control Process," 2014.

<sup>35</sup> GAO, "Additional Actions Needed to Improve DOE's Export Control Process," 2014.

<sup>36</sup> The 2014 GAO report was done before the NDAA for Fiscal Year 2016 was passed, and therefore did not discuss the added step of the Office of the Director for National Intelligence reviewing specific authorization applications to China and Russia. Given how recently the NDAA passed, and thus how little data is available to analyze any resulting changes to processing times, this report does not focus on that additional step, beyond noting that it adds to the complexity of these types of applications.

**FIGURE 13**  
**GAO Estimates for Deemed Export and Other Exports Processing Times by Stage, 2008–2013**



Source: Figure 3 of GAO, “Additional Actions Needed to Improve DOE’s Export Control Process,” 2014.

calculated that DOE takes a median of 125 days to approve the authorization. GAO further divided the specific authorization data into two categories—deemed exports and non-deemed exports—as shown in Figure 13.

The median time taken for interagency review of deemed export applications is shorter than for other exports. This would appear to make sense, as deemed exports do not require the obtaining of government to government assurances. Less clear is why the median times for initial and final reviews for deemed export applications are so much greater than for non-deemed export applications, though GAO offered some individual explanations.<sup>37</sup>

The 2014 GAO study examined 89 specific authorizations during the years 2008–2013. Data provided by DOE/NNSA to the Clean Air Task Force under FOIA, and shared with the author, documented the processing timeframes for 24 specific authorization applications that were signed by the Secretary of Energy in the years 2014, 2015, 2016, and during the first five months of 2017. The average processing time for these applications was 493 days and for the 10 deemed export applications in this group, the average processing time was 330 days. For applications to China, the average was 812 days, where the average for non-China applications was 386 days.

The 2014–2017 data provide some other processing step data, albeit with very limited statistical precision in some cases. The FOIA data consistently show dates for when an application for specific authorization is submitted to DOE and when either a) the Secretary of Energy provides concurrence or b) a transmittal letter is sent. Dates are sometimes provided for 1) when an application is sent out for initial DOE review; 2) an application is sent out for interagency review; and 3) when an application is submitted for final review in DOE. In some cases, dates are provided for when the other agencies involved (DOC, NRC, State Department, and DOD) send their response (concurrence for State Department, views for the other three) to DOE regarding Part 810 applications.

Based on this limited data set, rough estimates for processing step times in specific authorization applications are shown in Table 5. The first two columns describe two steps that are treated as one stage (the “initial stage”) in the 2014 GAO report. The sum of the average processing step times is 446 days, which does not match the overall processing average for the full data set because individual step data are not available for all applications.

The data allow development of estimates for agency response time from when an application is submitted for interagency review to when individual agencies provide responses. The statistics are even more limited in this case, but estimates are shown in Table 6.

However, these response times are for a data set of only 12 applications where half are deemed exports without foreign government assurances. As a result, the average time for State Department is greatly distorted in comparison to non-deemed export specific authorizations; the latter is where the greatest commercial opportunities and non-proliferation considerations are found. For the non-deemed export applications where both a submission date for interagency review and a response time from State Department are provided in the FOIA data set, there are two applications to the UAE where State Department’s response times are 29 and 17 days. For the other three cases, State Department’s response time was 308 days, 206 days, and 293 days. These longer times may be due to delays in the respective foreign governments in providing assurances, though the data do not include reasons for delays.

<sup>37</sup> See pages 14–16 of GAO, “Additional Actions Needed to Improve DOE’s Export Control Process,” 2014.

TABLE 5  
Average Days to Complete Specific Authorization Application Processing Steps, 2014–2017

Application received to start of DOE initial review	Start of DOE initial review to submission for interagency review	Submission for interagency review to start of DOE final review	Start of DOE final review to Secretary of Energy concurrence (or transmittal letter sent)
86	50	172	138

Source: Data supplied by DOE/NNSA in response to a FOIA request by the Clean Air Task Force.

TABLE 6  
Average Days Taken for Agencies to Respond to Specific Authorization Applications, 2014–2017

DOC	NRC	State Department	DOD
19	24	73	66

Source: Data supplied by DOE/NNSA in response to a FOIA request by the Clean Air Task Force.

### C. Comparison with Other Major Supplier Export Control Regimes

In 2012, a study on nuclear export controls by Pillsbury Winthrop Shaw Pittman LLP looked at four other major suppliers' export control regimes—Russia, Japan, ROK, and France—and compared them with the U.S. export control system, including Part 810.<sup>38</sup> In general, the study found that the U.S. nuclear export regime, compared to other major suppliers' regimes, is “in many respects, more complex, restrictive and time-consuming to navigate and fulfill.” Specific to Part 810, the study found that compared to other technology control regimes, Part 810 created “a more expansive and less predictable scope of jurisdiction.” The study also noted that in some instances—particularly, the general authorizations available—the Part 810 system was less burdensome than other export control regimes.

Pillsbury observed that the retransfer assurances the U.S. government seeks from other countries as part of the specific authorization process are typically stronger than what is required in paragraph 9 of the NSG Trigger List Guidelines. Specifically, the NSG requires the supplier's consent for retransfers of enrichment, reprocessing or heavy-water production technologies, but not necessarily for activities involving other technology, such as power reactors (Chapter II discusses paragraph 9 of the NSG Trigger List Guidelines, which deals with retransfer conditions of supply). U.S. government policy is to seek assurances from foreign governments for prior consent for retransfers of all types of technology in Part 810 specific authorizations.

The study observed that ROK and Japan are stricter than the United States in some of the conditions they impose on retransfers of controlled items, and they also go beyond the requirements of the NSG Guidelines with respect to retransfers. ROK regulations require permission from ROK's

**In general, the study judged that generally authorized transfers under Part 810 were less burdensome than other countries' export control systems for equivalent transfers.**

government before ROK technology can be retransferred to any destination. Similarly, the Japanese government has in the past sought assurances from the U.S. government that specified Japanese-controlled nuclear technologies will not be retransferred from the United States to any country without prior consent from the Japanese government.

In addition, the study judged that generally authorized transfers under Part 810 were less burdensome than other countries' export control systems for equivalent transfers. In particular:

U.S. DOE regulations and practice provide that DOE-controlled technology, once exported to a country not listed on the DOE's 810.8(a) restricted list, cannot be retransferred to countries listed in 10 CFR 810.8(a) (restricted countries) without prior U.S. Government approval. Conversely, as DOE officials have confirmed,

38 Pillsbury Winthrop Shaw Pittman LLP, “Nuclear Export Controls: A Comparative Analysis of National Regimes for the Control of Nuclear Materials, Components and Technology,” 2012.

DOE-controlled technology can be freely retransferred to non-810.8(a) countries.

To take one hypothetical example, power reactor technology transferred from the United States to France could not be retransferred to China without prior U.S. government permission, though it could be retransferred to Japan without obtaining an authorization from DOE.

**It is likely that some other major suppliers are able to carry out approvals in a shorter amount of time than Part 810 specific authorizations, in part due to the state-owned nature of those foreign entities.**

Another observation from the Pillsbury study was that a number of the regimes appeared to be more favorable to exporters because the suppliers in some countries were primarily, if not exclusively, government-owned vendors. In the Russian regime, for example, the Russian exporter obtains the needed assurances from the appropriate governmental authority of the end user, which helps to streamline the application review process. This is not how assurances are obtained in the United States, where private companies are separate from the U.S. government, and the latter requests assurances from foreign governments. The Pillsbury study further noted that government-owned entities are likely in a better position to understand the export control

regimes on account of this government-industry relationship.

As a proxy for application processing time data, the Pillsbury study used the stated periods that governmental entities are supposed to process technology export applications, which they listed as 15 days, 25–45 days, 90 days, and 9 months for ROK, Russia, Japan, and France, respectively. If these stated periods are close to the actual application processing speeds for each country, they are substantially faster than the specific authorization process in Part 810 (though not as fast as the general authorization). An outstanding question is to what extent provisions in these countries' nuclear cooperation agreements may expedite the assurances step. U.S. nuclear cooperation agreements do not cover technology exports, with the exception of the new nuclear cooperation agreement with China, and that particular provision has not yet been implemented.

The increase in processing times for Part 810 applications noted earlier in this Chapter pose a challenge for the U.S. government and the competitiveness of the U.S. nuclear energy industry. If foreign export control regimes had similar processing speeds, the impacts might be blunted, but it is likely that some other major suppliers are able to carry out approvals in a shorter amount of time than Part 810 specific authorizations, in part due to the state-owned nature of those foreign entities. The next Chapter will look at other federal regulations for nuclear export control to see what lessons can be gleaned to improve Part 810.

## CHAPTER IV

# OTHER FEDERAL NUCLEAR EXPORT CONTROL REGULATIONS

**T**HE NRC 10 CFR PART 110 (Part 110) regulations cover the export of nuclear materials and equipment. The DOC Export Administration Regulations (EAR) cover dual-use items that are controlled for nonproliferation reasons, as well as other dual-use items that are controlled for different reasons. This Chapter describes elements of those two regulations and what elements could potentially be used to improve the efficiency of Part 810.

## A. NRC Part 110 Regulations

Similar to Part 810, NRC-controlled commodities under Part 110 must be authorized by either a general export license or a specific export license. Section 110.2 defines each to be:

*General license* means an export or import license effective without the filing of a specific application with the Commission or the issuance of licensing documents to a particular person. A general license is a type of license issued through rule-making by the NRC and is not an exemption from the requirements in this part. A general license does not relieve a person from complying with other applicable NRC, Federal, and State requirements.

*Specific license* means an export or import license document issued to a named person and authorizing the export or import of specified nuclear equipment or materials based upon the review and approval of an NRC Form 7 application filed pursuant to this part and other related submittals in support of the application.

For specific licenses, all Form 7 applications are made public and some require Federal Register

notices. Processing fees (\$1,300 to \$17,400) depend on level of review required (proliferation significance of commodity). Most applications require interacting with foreign governments.

**These differing levels of review imply a difference in assessed risk: some exports are judged to be less significant than others and are assigned a lower (and faster) level of review.**

Section 110.40 describes the conditions wherein applications will be subject to review by NRC Commissioners. For example:

- the export of more than five effective kilograms of high-enriched uranium, plutonium, or uranium-233
- exports involving assistance to end uses related to isotope separation, chemical reprocessing, heavy-water production, advanced reactors, or the fabrication of nuclear fuel containing plutonium
- the initial export to a country since March 10, 1978 of source or special nuclear material for nuclear end use
- An initial export to any country listed in Sections 110.28 or 110.29 involving over:
  - 10 grams of plutonium, uranium-233 or high-enriched uranium
  - one effective kilogram of low-enriched uranium
  - 250 kilograms of source material or heavy water
  - 37 TBq (1,000 curies) of tritium

- export license applications raising significant policy issues

Section 110.41 describes the conditions whereby applications will be forwarded to the U.S. Department of State to then request Executive Branch views. For example:

- More than one effective kilogram of high-enriched uranium or 10 grams of plutonium or uranium-233
- Nuclear grade graphite for nuclear end use
- An export involving assistance to end uses related to isotope separation, chemical reprocessing, heavy-water production, advanced reactors, or the fabrication of nuclear fuel containing plutonium
- The initial export of nuclear material or equipment to a foreign reactor
- An export to any country listed in Sections 110.28 or 110.29
- An export raising significant policy issues

## Apart from deemed exports, Part 810 does not have a substantially different set of authorization pathways for different categories of exports.

These differing levels of review imply a difference in assessed risk: some exports are judged to be less significant than others and are assigned a lower (and faster) level of review. This is to be contrasted with Part 810, where each new specific authorization is judged to require the Secretary of Energy's attention.

In general, the review process for NRC's specific licenses can take anywhere from 40 days to four months or more to coordinate internal and inter-agency reviews. Applications may be withdrawn or returned without action, and licenses may be issued or denied. The licenses issued are signed by the Office of International Programs Deputy Director and include named parties, identified end users and end uses, and set expiration dates. The licenses can be amended and renewed prior to the expiration date.<sup>39</sup>

Specific license types for exports are broken down into the following categories:

XSNM = export of special nuclear material  
 XSOU = export of source material  
 XMAT = export of material (i.e., deuterium)  
 XB = export of byproduct material  
 XR = export of reactor (or major components)  
 XCOM = export of minor components  
 XW = export of radioactive waste

The criteria for “major” (XSNM, XSOU, XR) exports are that the destination country has an agreement for cooperation (a “123 Agreement”) with the United States and full-scope IAEA safeguards in recipient NNWS. Similar to Part 810 and consistent with NSG obligations, the U.S. government obtains assurances from the foreign government on a case-by-case basis that material or equipment will be made subject to the 123 Agreement with respect to:

- No nuclear explosive use or R&D on any nuclear explosive device
- Adequate physical security will be maintained
- No retransfer or alteration in form (reprocessing) without prior U.S. government consent

The criteria for “minor” (XCOM, XMAT) exports are that the U.S. government must obtain assurances from the foreign government on a case-by-case basis that:

- IAEA (full-scope) safeguards will apply in NNWS
- No nuclear explosive use or R&D on such device
- No retransfer without prior U.S. government consent

Again, there is a division between “major” and “minor” exports in that they are subject to differing requirements and processing structures. XMAT and XSOU cases involving the export of materials for non-nuclear end-uses do not require recipient government assurances. Apart from deemed exports, Part 810 does not have a substantially different set of authorization pathways for different categories of exports, with the small exception of Section 810.6(c).

Export licenses consider both the item, material, or technology that is proposed for export as well as the destination. While Part 810 regulations contain

<sup>39</sup> In general, this section strongly draws on public NRC presentations on Part 110, such as: [http://www.lanl.gov/projects/export-control-coordinators-org/\\_assets/docs/2013/2013-steve-baker.pdf](http://www.lanl.gov/projects/export-control-coordinators-org/_assets/docs/2013/2013-steve-baker.pdf) and [https://nnsa.energy.gov/sites/default/files/nnsa/inlinefiles/3\\_NRC\\_ExportImport\\_Updates\\_Lauren\\_Mayros.pdf](https://nnsa.energy.gov/sites/default/files/nnsa/inlinefiles/3_NRC_ExportImport_Updates_Lauren_Mayros.pdf)

only one list of generally authorized countries, Part 110 regulations incorporate four different country lists:

1. *List of embargoed destinations.* General licenses for exports/imports do not authorize exports to the embargoed destinations listed in Section 110.28: Cuba, North Korea, Iran, Syria, Iraq, and Sudan.
2. *List of restricted destinations.* General licenses authorize only limited exports to the restricted destinations listed in Section 110.29: Afghanistan, Andorra, Angola, Burma (Myanmar), Djibouti, India, Israel, Libya, Pakistan, and South Sudan.
3. *List of NSG members.* Sections 110.21(c) and 110.22(d) grant general licenses for the export of various plutonium, uranium, and thorium isotopes in quantities less than specified amounts to any country listed in Section 110.30, which includes the members of the NSG. The NSG list is also used in Section 110.23 for general licenses related to the export of byproduct material.
4. *Country list in Section 110.26.* Section 110.26 includes a list of countries where general licenses are available for the export of certain reactor components: Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Indonesia, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Philippines, Poland, Portugal, Republic of Korea, Romania, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan, and United Kingdom.

This creates a more detailed risk-assessment in the form of country tiers. For example, the NRC has assessed that membership in the NSG justifies expediting certain lower-level exports to those countries. In a different direction, the list of countries on the restricted list was determined based on recommendations from the Executive Branch, as the regulations explain:

*The term ‘restricted destinations’ means countries that are listed in §110.29 based on recommendations from the Executive Branch. These countries may receive exports of certain materials and quantities under a general license, but some exports to restricted destinations will require issuance of a specific license by the NRC*



**TRISO fuel particle.** Source: Idaho National Laboratory.

including Executive Branch review pursuant to § 110.41.

Section 110.26 of Part 110 provides an authorization pathway that could serve as a partial template for creating a Part 810 fast track for certain applications. Section 110.26 describes a set of exports—items in paragraphs 5 through 11 of Appendix A to Part 110—eligible for a general license to a group of countries under specific conditions. The items referenced in that appendix include: reactor pressure tubes, zirconium tubes, reactor internals, reactor control rod drive mechanisms, heat exchangers, external thermal shields, and any other component especially designed or prepared for use in a nuclear reactor. The section specifically calls out exports for use “in a light or heavy water-moderated power or research reactor.”

Excerpts from the NRC’s explanation in announcing the creation of Section 110.26 in a 1984 Federal Register notice are informative:

These amendments would reduce the number of actions that would require an exporter to apply for and obtain a specific NRC license that would authorize the export of certain types of nuclear equipment and certain quantities of nuclear

material, thereby reducing the regulatory burden on the public and the administrative burden on the NRC staff.

The new and revised general licenses incorporate for the first time in NRC's regulations the U.S. Government policy of facilitating nuclear cooperation with countries sharing U.S. nonproliferation goals. The Departments of Commerce and Energy have adopted similar general licensing provisions for nuclear-related commodities and technology under their respective export licensing and approval authorities. . . .

The new component general license is further limited to only those countries which, in addition to sharing good nonproliferation credentials, have provided the U.S. with generic assurances that they meet the criteria set out in section 109 of the Atomic Energy Act. . . .

### Exports deemed to be of greater significance or headed to destinations of greater concern are subject to correspondingly higher levels of review.

The Commission believes that this new approach to general licenses can benefit U.S. nonproliferation objectives by demonstrating to countries abroad the advantages of supporting effective nonproliferation policies. . . .

The new or revised general licenses are as follows: . . . 10. Section 110.26: New general license for the export of nuclear reactor components to light water- or heavy water-moderated research or power reactors in designated countries which have acceptable nonproliferation credentials and which have also provided the U.S. with generic assurances that they meet the Section 109 criteria of the Atomic Energy Act. Except for France, NPT adherence or acceptance of full-scope IAEA safeguards is a necessary condition for placing a country on the authorized list.

Significantly, Part 110 regulations have different pathways towards licensing exports that depend both on the physical export itself and also the destination. Exports deemed to be of greater significance

or headed to destinations of greater concern are subject to correspondingly higher levels of review, while exports of lesser significance or to countries that have made higher nonproliferation commitments or are judged to share U.S. nonproliferation goals are processed in an expedited manner.

### B. DOC Export Administration Regulations

The EAR regulate the export of certain nuclear-related items, including most of the items on the NSG Dual-Use List.<sup>40</sup> The EAR also control other types of items, including those related to missile programs and chemical and biological weapons programs. The items controlled under the EAR are commonly referred to as "dual use," as they have both commercial and military or proliferation applications.<sup>41</sup>

The DOC Commerce Control List (CCL) is divided into 10 broad categories and each category is further subdivided into five product groups. The 10 categories are:

- 0 = Nuclear materials, facilities, and equipment (and miscellaneous items)
- 1 = Materials, Chemicals, Microorganisms, and Toxins
- 2 = Materials Processing
- 3 = Electronics
- 4 = Computers
- 5 = Telecommunications and Information Security
- 6 = Sensors and Lasers
- 7 = Navigation and Avionics
- 8 = Marine
- 9 = Aerospace and Propulsion

The five product groups for each category are:

- A. Systems, Equipment and Components
- B. Test, Inspection and Production Equipment
- C. Material
- D. Software
- E. Technology

Each item falls under the following identified categories for control: Chemical and Biological Weapons, Nuclear Nonproliferation, National Security, Missile Tech, Regional Stability, Firearms Convention, Crime Control, Anti-Terrorism.

<sup>40</sup> The NSG website links to the most recent dual-use list: <http://www.nuclearsuppliersgroup.org/en/guidelines>

<sup>41</sup> See page 1 of <https://www.bis.doc.gov/index.php/documents/regulations-docs/142-eccn-pdf/file>



**NuScale Power's full-length helical coil steam generator.**  
© NuScale Power, LLC

There is a rigorous and detailed categorization of the exports under the EAR. On the destination side of the equation, the Commerce Country Chart (Supplement No. 1 to Part 738) lists every country and each category for control to which it applies.<sup>42</sup> If a country has an “X” under a specific reason for control (e.g., “Nuclear Nonproliferation”) then all EAR-controlled items that are identified as being controlled for that particular reason will require a license for export to that country. Items that appear on the NSG Dual-Use List and appear on the CCL will have “Nuclear Nonproliferation” as a reason for control.

The CCL and the Country Chart together alert companies as to whether a license is needed to export a product to an individual country. For example, dual-use items, such as certain pressure transducers, that are controlled for nuclear nonproliferation reasons will require a license for export to China. This is similar to how the general authorization country list (Appendix A to Part 810) works with the technologies called out in Sections 810.7(b) and (c) to identify whether a specific authorization from the Secretary of Energy is needed.

Virtually all exports to embargoed destinations and countries designated as supporting terrorist activities require a license. 15 CFR Part 746 of the EAR describes embargoed destinations and refers to certain additional controls imposed by the Office of Foreign Assets Control of the Treasury Department. EAR Part 744, Supplement 4 further contains a list of parties whose presence in a transaction can trigger a license requirement under the EAR.

Most pertinent to improving the efficiency of Part 810, the EAR regulations are aided by Executive Order 12981, which serves to ensure timely reviews and dispute resolution among the federal agencies involved in dual-use item licensing. The Executive Order was originally issued in 1995 and describes timelines for each stage of the application processing, as well as procedures to resolve disagreements.

The Executive Order states that within 30 days of the receipt of a license application and all required information a department or agency must provide the Secretary of Commerce with

### **The EAR regulations are aided by Executive Order 12981, which serves to ensure timely reviews and dispute resolution among the federal agencies involved in dual-use item licensing.**

a recommendation either to approve or deny the license application. If a department or agency fails to provide a recommendation within 30 days, it is deemed not to have an objection to the decision of the Secretary of Commerce (in other words, silence is taken for assent).

The Executive Order also establishes bodies for resolving disagreements, including an Operating Committee and an Advisory Committee on Export Policy. The Operating Committee—with membership including the U.S. Departments of Commerce, Defense, Energy, and State—reviews all license applications on which the reviewing department and agencies are not in agreement. In FY 2016, 329 cases were escalated to the Operating Committee for dispute resolution. The Chair of the Operating Committee is required to make a decision within 14 days of receiving department and agency recommendations.

If a department or agency disagrees with the licensing determination of the Chair of the Operating Committee, it can appeal the matter to the Advisory Committee on Export Policy. The appeal must be made within five days of the decision, however, or the decision is final. In FY 2016, 36 cases were further escalated to the Assistant Secretary-level Advisory Committee on Export Policy for resolution.

Ultimately, all license applications are to be resolved or referred to the President no later than

<sup>42</sup> <https://www.bis.doc.gov/index.php/forms-documents/regulations-docs/14-commerce-country-chart/file>

90 calendar days after registration of the completed license application.

These detailed timeframes and methods for resolving disagreements have yielded impressive efficiencies. DOC's Annual Report for Fiscal Year 2016 states that the agency processed a total of 33,615 export license applications, with an average processing time to review license applications of 22.4 days, including time for reviews by other agencies.<sup>43</sup> DOC approved 28,761 license applications (85.6 percent), returned 4,552 applications without action (13.5 percent), and denied 302 applications (0.9 percent).

## All license applications are to be resolved or referred to the President no later than 90 calendar days after registration of the completed license application.

More specific to nuclear energy-related exports, in FY 2016, DOC approved 2,009 applications, valued at \$1.6 billion, for the export or re-export of items controlled for nuclear nonproliferation reasons. In addition, DOC rejected 11 applications valued at \$4.6 million and returned without action 92 applications valued at \$144.2 million.

The remainder of this Chapter will describe elements from the EAR and Part 110 regulations that could be used to improve the efficiency of Part 810 regulations.

### C. Elements that Could Improve Part 810 Efficiency

There are important differences between the regulatory regimes described above and DOE's Part 810 regulations. For example, technology transfer is inherently more nebulous than the physical materials and equipment under NRC's jurisdiction. It can take place via a USB disk, over email, conversations, training or services, and so on. General unclassified assistance can occur at a very early stage in a country's development—well before material and equipment exports—and so the U.S. government may not have done previous nonproliferation assessments on a particular country before the first application for specific authorization under Part 810.

In another variation, by statute, the U.S. Department of State is the only agency that provides concurrence to DOE for specific authorizations under Part 810, while DOC, DOD, NRC are “consulting” agencies. In the DOC EAR, on the other hand, all of the involved agencies are equal in licensing deliberations.

With those caveats, there are several useful concepts from the Part 110 regulations:

- Break up exports into categories
- Separate countries by nonproliferation commitments
- Assign a processing structure commensurate with the risk involved, based on the item for export, the destination, and other factors such as assurances provided
- After initial exports to a country, similar exports to the same destination should have a shorter review process

There are several elements from Part 110 and the EAR that could be applied to the Part 810 regulations.

### CREATE A FAST TRACK FOR SPECIFIC TECHNOLOGIES AND DESTINATIONS

A fast track authorization could be created in Part 810 based in part on the concept of general licenses in Part 110 to NSG members and the countries listed in Section 110.26. It would not be a general license in the sense that there would still be a chance for the U.S. government to reject the license, but it could be a significantly expedited process along the lines of the procedures outlined in Section 810.6(c)(2). That is, a U.S. company would submit an application matching the fast track criteria—potentially in a standardized format, similar to Form 7 used in NRC's Part 110 regulations—and the U.S. government would process it under the presumption of approval.

Similar to Section 110.26 of Part 110, DOE could create a list of fast track countries and a list of fast track technologies. As current U.S. government policy is that a nuclear cooperation agreement is necessary, but not sufficient, for a country to be generally authorized, such a fast track could focus on countries that have made significant nonproliferation commitments, but still do not have nuclear cooperation agreements in place with the United

<sup>43</sup> DOC Bureau of Industry and Security, “Annual Report to Congress for Fiscal Year 2016.”

States. Appendix A to this report shows a list of countries with which the United States does not have a 123 Agreement in place, and are thus not generally authorized destinations. They are NNWS that are party to the NPT with a comprehensive safeguards agreement in place and an Additional Protocol in force with the IAEA. These objective criteria could form the basis for a fast track status, and help to incentivize adoption of the Additional Protocol (a greater IAEA safeguards commitment for NNWS).

There are several criteria that could be used to show that the U.S. government considers a country to have acceptable nonproliferation credentials. For example, the Philippines meets the objective criteria above and is also on the NRC's Section 110.26 country list. As the Federal Register notice cited above stated, the United States clearly considers the Philippines a commercial partner that shares its nonproliferation goals: this could be used as part of the criteria to justify fast track status. Chile has in place a project supply agreement with the United States, and so the United States has on record examined working with Chile from a nonproliferation point of view: this too could be used as rationale for fast track status (the United States also once had a 123 Agreement in force with Chile). Iceland and New Zealand are members of the NSG, a status only granted by consensus, so the U.S. government clearly decided both were like-minded countries on the subject of nonproliferation.

None of the nations noted above currently has a 123 Agreement in place with the United States, and so none of them is generally authorized (except for specific project supply agreement activities). All of these countries are NNWS that are party to the NPT and have a comprehensive safeguards agreement and an Additional Protocol in force with the IAEA.

Another criterion that could be used to qualify for fast track eligibility is previous Part 810 authorizations. For example, Armenia is a country that meets the objective criteria above and has been granted four Part 810 authorizations, from the 1990s to as late as 2010. Thus, the U.S. government has already examined Armenia from a nonproliferation perspective and decided that these U.S. commercial transactions were acceptable. Using previous Part 810 authorizations as criteria for fast track status would imply that initial applications to a country would be processed as usual, with eligibility for fast track status coming subsequent to the U.S. government having completed

the assessments involved with the first applications. This approach would proceed much the same way the NRC sends the initial application for export of nuclear material or equipment to a foreign reactor to the Executive Branch for review, or how the Commission sends initial applications for export to a country of source or special nuclear material for nuclear end use to the NRC Commissioners for review; but higher levels of review would no longer be needed for future exports.

Mexico might be the ideal candidate for fast track status because it meets several of the criteria above. In addition to meeting the objective criteria (NNWS party to the NPT, comprehensive safeguards agreement and Additional Protocol in force with the IAEA) described above, Mexico has a project supply agreement in place with the United States for the Laguna Verde reactor, is a member of the NSG, and has already been granted previous specific authorizations by the Secretary of Energy. Mexico has been discussed as a candidate country for a new U.S. nuclear cooperation agreement, in which case it could then become a generally authorized destination.

## **LWR technology should be one candidate for fast track authority, given the number of suppliers of LWR technology available and the large deployment of LWR technology around the world.**

In addition to identifying a list of countries eligible for fast track status, the U.S. government will need to identify activities that qualify for potential fast tracks. There would likely be two fast track pathways divided between applications needing government to government assurances and those that do not. For example, deemed exports do not need assurances, and other activities such as general consulting—where no non-public, proprietary Trigger List design information is transferred—may not either.

LWR technology should be one candidate for fast track status, given the number of suppliers of LWR technology available and the large deployment of LWR technology around the world. At the end of 2016, 347 GW of the total worldwide 391 GW of nuclear generating capacity—89%—came from LWRs.<sup>44</sup> The IAEA has extensive experience

safeguarding LWR technology in NNWS. Thermal high-temperature gas reactors, and potentially other technologies, could also be eligible.

As the NRC described in 1984 when it announced the general license in Section 110.26, a new fast track under Part 810 could be a way of incentivizing countries to make higher nonproliferation commitments (in this case, an Additional Protocol) by rewarding them with more efficient civil nuclear energy cooperation. A Part 810 fast track would still involve review by the U.S. government before approval (whereas Section 110.26 does not), and it could be modeled on the more efficient procedure outline in Section 810.6(c)(2). When an application is submitted, if no objection has been raised by the U.S. government within a certain period of time (e.g., 45 days), the application is deemed to be approved (subject to the receipt of assurances for activities requiring assurances). Applications for authorization under Section 810.6(c) for operational safety have been successfully processed and approved in recent years, so this framework appears to be viable.

## Advanced reactor companies should engage with DOE at an early stage.

### SEEK GENERIC ASSURANCES

In addition to the fast track described above, and more similar to Section 110.26, the U.S. government could seek generic assurances from individual countries for some or all exports under Part 810. DOE could then process applications to those countries more quickly, perhaps in combination with a fast track approval process, as the assurances step would already be completed. This approach would be dependent on foreign governments being willing to provide such assurances, however, and there is no guarantee that any countries would be willing to do so. Further exploration of this option would still be useful.

### ISSUE AN EXECUTIVE ORDER TO ENFORCE TIMELY PROCESSING OF APPLICATIONS

As discussed earlier in this Chapter, the EAR benefits from Executive Order 12981 in terms of timely processing of applications and adjudicatory

mechanisms for resolving disputes. A similar Executive Order could be issued for Part 810, though it would have to take into account the different statutory responsibilities of the relevant federal agencies and the seeking of assurances in some authorizations subject to a foreign government's response. An overriding principle in the Executive Order should be that DOE Offices, the State Department, and the consulting agencies provide their views on applications within a set time period. It should be firmly established in the Executive Order that all agencies understand that the requisite assurances will need to be provided for the activity to go forward, but agencies must independently provide their views within a specific period of time on the merits of proposed activities.

Part 810 would also benefit from a standing body to resolve disagreements about the regulations and provide a forum for agencies to present argument for and against certain applications. The U.S. government could make use of existing export control bodies, such as the Advisory Committee on Export Policy, or establish new ones, potentially housed in the White House or DOE. The objective would be to have regular discussions on Part 810 applications so that disagreements are known earlier in the process and companies can be made aware of problems in a shorter amount of time.

### PRE-APPLICATION INTERACTIONS

Though not an export control function from Part 110, one element of NRC's domestic regulation of new reactor construction could be used to help improve the functioning of Part 810. The NRC has a policy of encouraging reactor developers to engage early—in advance of submitting an application for reactor licensing—to identify and resolve potential licensing issues early in the licensing process. Likewise, advanced reactor companies should engage with DOE at an early stage—in advance of submitting an application for specific authorization—to discuss their technology with DOE, and share with DOE the potential foreign entities a company is thinking about working with. These interactions could provide U.S. companies with feedback to use in writing their applications for specific authorization, which could potentially avoid some delays, depending on the proposed technology transfers and end users.

## CHAPTER V

# GEOSTRATEGIC CONSIDERATIONS

**A**S DISCUSSED IN CHAPTER II, the language in Section 57b of the AEA, as amended, requires the Secretary of Energy to make a determination as to whether a particular activity involving foreign entities will be “inimical” to the interests of the United States. The words “nonproliferation” and “nuclear weapons” are not mentioned in this section, and the criteria that go into determinations are broader than nonproliferation considerations.

For example, in the initial promulgation of the regulations in 1956, the AEC generally authorized all unclassified nuclear energy technology and assistance to non-Communist countries—an inimicality finding rooted in geostrategic considerations rather than nonproliferation assessments. For Communist countries, inimicality findings would be decided on a case-by-case basis through specific authorizations.

The list of countries that are generally authorized destinations has shortened over time, and the list of nuclear technologies requiring specific authorization has grown. But the treatment of certain countries, based on factors beyond nonproliferation concerns, remains. Today, having a nuclear cooperation agreement in place is a necessary, but not sufficient, condition for a country to appear on the generally authorized destination list in Appendix A of Part 810. The three countries with which the United States has a nuclear cooperation agreement but which are not generally authorized destinations, are China, India, and Russia. As Figure 14 shows, these three countries have substantial nuclear power programs and those programs are expected to grow significantly over the next few decades. U.S. exports to these countries can advance innovative nuclear reactor designs, and help to reduce air pollution and greenhouse gas emissions. They are therefore

important trading partners for U.S. companies, though with unique challenges that are discussed below.

## A. China

U.S. nuclear technology exports to China have required specific authorization since the regulations were first published in 1956. Back then, the basis for requiring specific authorization was that China was a Communist country. Today, the basis for requiring specific authorization is still geostrategic in nature, though not solely derived from considerations of Communism. Vietnam, for example, is a Communist country that had required specific authorization since 1956 (at least, for the Communist-controlled areas) until it became a generally authorized destination in 2015 after the U.S.-Vietnam nuclear cooperation agreement went into force.

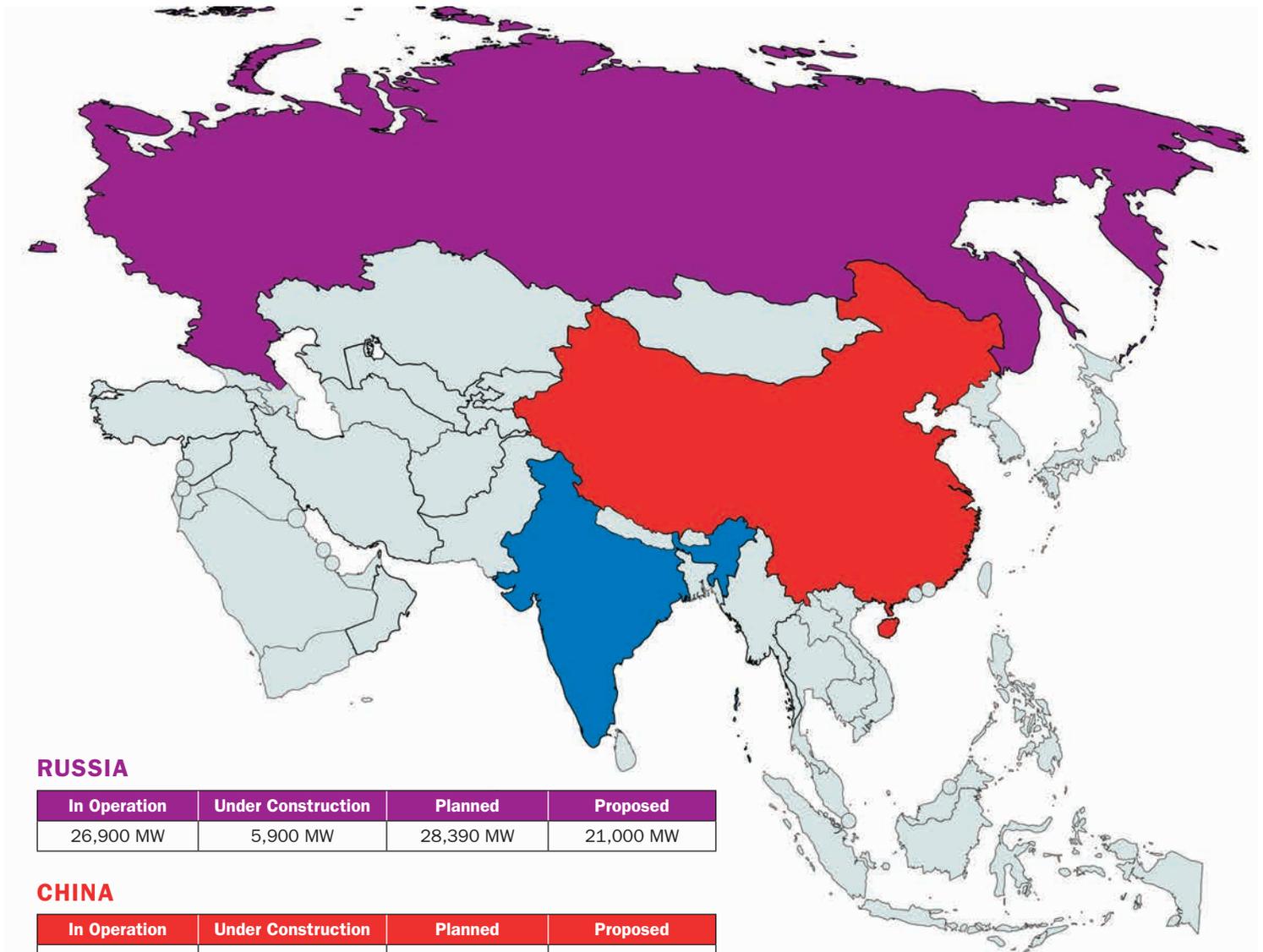
## Nuclear energy capacity in China is projected to grow at an enormous rate.

As Figure 15 shows, nuclear energy capacity in China is projected to grow at an enormous rate—with China surpassing the United States as home to the world’s largest nuclear reactor fleet by 2035, or potentially earlier, depending on the rate of retirements of U.S. nuclear plants and new build rate. As Figure 4 in Chapter I shows, most of the new nuclear generating capacity additions worldwide out to 2040 are projected to take place in China. At the end of 2016, 20 of the 61 power reactors under construction around the world were in China.<sup>45</sup>

China’s electricity consumption continues to rise and it remains committed to meeting its

<sup>45</sup> Page 4 of World Nuclear Association, “World Nuclear Performance Report,” 2017.

FIGURE 14  
**Chinese, Russian, and Indian Nuclear Power Programs**



Source: World Nuclear Association.

greenhouse gas emission reduction goals—it has agreed to halt its rapid rise in carbon dioxide emissions by no later than 2030. Additionally, China pledged to increase its non-fossil fuel energy share to 20% by 2030, which has been estimated to lead to the deployment of an additional 800 to 1000 gigawatts of nuclear, wind, solar, and other zero-

emission generation capacity by that year.<sup>46</sup> Current air pollution levels in China are also having significant health impacts on its population.<sup>47</sup>

Given the weak U.S. domestic market, it is not surprising that U.S. companies want to do business in a country that has a vibrant and growing nuclear energy sector. However, when new U.S. reactor

46 CRS, “U.S.-China Nuclear Cooperation Agreement,” 2015.

47 <https://www.usatoday.com/story/news/world/2017/09/18/chinas-air-pollution-causing-its-residents-die-early/677099001>

companies begin establishing business relationships in China, it may be their first interaction with Part 810 regulations, and possibly a frustrating one. If a company's first experience with Part 810 involved a generally authorized destination, such as Canada, their experience would be completely different.

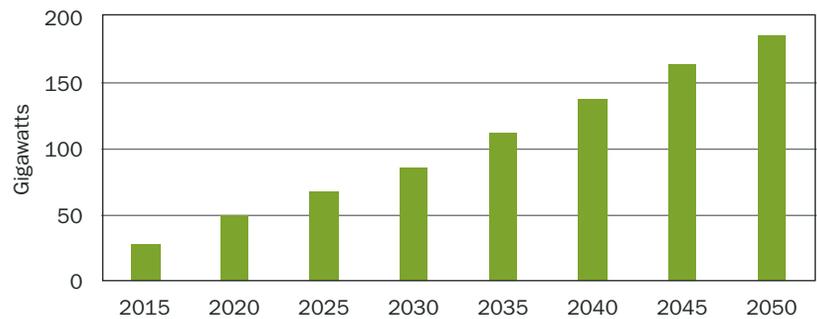
Historically, there have been several instances where specific authorizations to China have been delayed: in the mid-1980s when the Reagan Administration was getting ready to submit a proposed nuclear cooperation agreement with China to Congress,<sup>48</sup> in the late 1990s as the Clinton Administration was getting ready to implement the agreement,<sup>49</sup> and in recent years.<sup>50</sup>

China is simultaneously the largest nuclear reactor market and also possibly the most sensitive country for U.S. companies to work with in the eyes of the U.S. government (an argument could be made for Russia, as discussed below, though the business opportunities in Russia are more limited). The history of U.S. nuclear energy cooperation with China is complicated and not without controversy.

When President Reagan first submitted a nuclear cooperation agreement with China to Congress on July 24, 1985, he noted that it was the first proposed agreement for cooperation with a Communist country and the only agreement with another nuclear weapon state (UK and France were covered under the EURATOM agreement).<sup>51</sup> Members of Congress raised concerns with the agreement, including the lack of a guarantee for prior approval for any reprocessing or enrichment by China of U.S. nuclear materials or material produced by U.S. equipment or technology. Congress went on to pass a bill (PL 99-183), signed by President Reagan, that required the President to submit a one-time certification and a one-time report regarding nuclear cooperation with China, which did not happen until 1998.

After the Tiananmen crackdown in 1989, Congress responded by passing sanctions that

**FIGURE 15**  
**Projected Growth of Nuclear Energy Capacity in China**



Source: EIA, "International Energy Outlook 2017," Table H5.

**China is simultaneously the largest nuclear reactor market and also possibly the most sensitive country for U.S. companies to work with in the eyes of the U.S. government.**

suspended nuclear cooperation with China. As the Congressional Research Service (CRS) described it:

Section 902(a)(6) of P.L. 101-246 suspended nuclear cooperation with China until the President (1) certified to Congress that the PRC "has provided clear and unequivocal assurances to the United States that it is not assisting and will not assist any non-nuclear weapon state, either directly or indirectly, in acquiring nuclear explosive devices or the materials and components for such devices"; (2) makes the certifications and submits the report required by P.L. 99-183; and (3) makes a report under subsection (b)(1) or (2), reporting that the PRC government has made progress in political reforms or that it is "in the national interest" of the United States to terminate a suspension or disapproval.

<sup>48</sup> The secretarial determinations from the DOE reading room show that 19 determinations were signed on the same day in 1985, where some applications had been submitted two and three years earlier.

<sup>49</sup> CRS, "U.S.-China Nuclear Cooperation Agreement," 2015: "According to a reported NRC memorandum of April 4, 2000, DOE officials had held up 16 applications for authorization to export U.S. technology since 1998, due to disagreement about assurances, including a U.S. demand for a blanket assurance and a PRC offer of case-by-case assurances."

<sup>50</sup> The recent slowdown, discussed in the previous Chapter, may or may not have something to do with the new nuclear cooperation agreement with China that was submitted and entered into force in 2015. In any case, delays in specific authorizations to China have coincided with nuclear cooperation agreement developments on at least three occasions. The role of the Chinese government in these instances is unclear: long delays in receiving government assurances from China have been cited in part for slow approvals in the 1990s and in recent years, but the publicly available data include no dates for when assurances were requested and when they were received.

<sup>51</sup> This sub-Chapter draws greatly on the CRS report, "U.S.-China Nuclear Cooperation Agreement" by Mark Holt and Mary Beth D. Nikitin, 2015. In particular, the CRS report discusses the unclassified nonproliferation assessment statement which accompanied the nuclear cooperation agreement submittal to Congress in 2015.

Both Presidents Reagan and George H.W. Bush declined to issue the required certifications to implement the U.S.-China 123 Agreement.

In 1992, China joined the NPT and in 1997, before a U.S.-China summit, the PRC joined the NPT Exporters' Committee (also known as the Zangger Committee). China also pledged in a confidential letter to Secretary of State Madeleine Albright that it would not begin new nuclear projects in Iran. On January 12, 1998, partly on the basis of these new nonproliferation commitments, President Clinton signed the required certifications to implement the 1985 agreement for nuclear energy cooperation.

China later brought into force an Additional Protocol to its IAEA safeguards agreement. It joined the NSG in 2004, and has sought membership in the Missile Technology Control Regime, though has not applied to join the Australia Group or Wassenaar Arrangement.<sup>52</sup> China passed the Foreign Trade Law in 1994, which forms the basis for its export control regulations and allows Beijing to control certain goods based on, for example, China's nonproliferation commitments.

China's enforcement of domestic export control policies and regulations targeting proliferation have fallen short in the eyes of the U.S. government, and these shortcomings have raised concerns about China's commitment to nonproliferation. They have also resulted in the United States sanctioning several Chinese entities for proliferation activities. The overriding concern is a lack of willingness by the Chinese government to enforce its own export controls and regulations to combat proliferation. State-owned entities have been sanctioned multiple times by the United States in connection with proliferation activities, including sales of dual-use goods to Iran and North Korea.<sup>53</sup> Li Fangwei, aka

"Karl Lee," a Chinese national, has been sanctioned multiple times and charged by the U.S. government with "using a web of front companies to evade U.S. sanctions."<sup>54</sup> The FBI stated that Li Fangwei's companies had, for example, transferred items controlled by the NSG to Iran and assisted Iran's ballistic missile program.

The United States also has industrial espionage concerns when it comes to China. In May 2014, the U.S. indicted five Chinese military hackers for computer hacking, economic espionage and other offenses directed at six American firms in the U.S. nuclear power, metals, and solar products industries.<sup>55</sup> One individual was accused of hacking Westinghouse to steal confidential and proprietary technical and design specification information regarding the AP1000 reactor, as well as emails discussing company strategy for technology transfer negotiations with the Chinese entity that was buying the reactors.

In 2015, the Obama Administration submitted a new nuclear cooperation agreement with China to replace the expiring one. Relevant to Part 810 space, the new agreement is unique among existing U.S. nuclear cooperation agreements in that it includes the possibility to cover nuclear energy technology transfers.<sup>56</sup> These provisions could lead to a different paradigm in providing assurances for technology transfers, where instead of requesting assurances on a case-by-case basis, technology transfers are placed on a list that is regularly updated.<sup>57</sup> To date, however, this type of arrangement has not been put into practice and specific authorizations to China are still being processed under the traditional Part 810 approach of seeking assurances on a case-by-case basis. However, if a new model proves successful, it could provide a template for handling assurances in other countries, such as India.

52 In addition to the NSG, these are the other major multilateral export control groups that deal with missile technology, chemical and biological weapons, and conventional arms.

53 <https://www.voanews.com/a/us-lists-new-iran-sanctions-on-several-chinese-firms/1601679.html>; See <https://www.state.gov/documents/organization/261144.pdf> for a complete list of sanctioned entities.

54 <https://www.fbi.gov/contact-us/field-offices/newyork/news/press-releases/karl-lee-charged-in-manhattan-federal-court-with-using-a-web-of-front-companies-to-evade-u.s.-sanctions>; see also <http://www.newsweek.com/2015/07/31/iran-nuclear-deal-china-karl-lee-353591.html>

55 <https://www.justice.gov/opa/pr/us-charges-five-chinese-military-hackers-cyber-espionage-against-us-corporations-and-labor>

56 CRS, "U.S.-China Nuclear Cooperation Agreement," 2015: "The Agreed Minute includes a section on retransfers and technology exchanges. Retransfers to a third country are still subject to the requirements of the original supplier country and will need to have written consent. The United States and China are to implement a process for "obtaining government assurances needed for certain technology or information transfers." This includes a Pre-Approved Activity and Nuclear Technology List (based on the Nuclear Suppliers Group (NSG) Trigger List) and a Pre-Approved Entity List. For example, if China or the United States authorizes a transfer of a technology on the preapproved list to an entity on the preapproved list, it will notify the other party of this transfer. These lists will be updated on a yearly basis. This transfer will still be subject to transfer conditions. These measures are to give additional assurance for U.S. consent rights on further transfers within and outside of China."

57 This approach utilizes section 57 b. (1) of the AEA, instead of 57 b. (2).

Accompanying the nuclear cooperation agreement submittal, the Obama Administration also submitted an unclassified nonproliferation assessment statement (NPAS) which identified a number of areas of concern for nuclear energy cooperation with China:

- *Military diversion:* CRS quotes the NPAS as stating: “China’s strategy for strengthening its military involves the acquisition of foreign technology as well as greater civil-military integration and both elements have the potential to decrease development costs and to accelerate military modernization. This strategy requires close scrutiny of all end users of U.S. technology under the proposed Agreement.” Concerns were also raised in the NPAS regarding domestic manufacturers producing components for both civil nuclear plants and China’s naval program.
- *Cooperation with Pakistan:* China and Pakistan have cooperated on nuclear issues dating to 1976. In the 1990s, China supplied unsafe-guarded facilities in Pakistan, linked to the Pakistani nuclear weapons program, with dual-use equipment. When China joined the NSG in 2004, it declared the supply of the Chasma 2 reactor as grandfathered (i.e., a pre-existing contract) and thus not subject to the full-scope safeguards condition in the Trigger List Guidelines. However, in 2008, partly in response to the U.S.-India Peaceful Nuclear Cooperation Agreement, China and Pakistan agreed to build two new power reactors, Chasma 3 and 4. As these reactors were not declared to the NSG in 2004, they were not grandfathered under NSG rules and their supply to a country without full-scope safeguards was inconsistent with China’s obligations under the NSG.<sup>58</sup> China has discussed supplying two additional reactors to Pakistan in Karachi and potentially three more in Muzaffargarh.<sup>59</sup>

More recently, in 2016, the U.S. Department of Justice unveiled an indictment against a U.S.

nuclear engineer, Szuhsiun Ho (aka “Allen Ho”), and one of the large, state-owned nuclear power companies in China, China General Nuclear Power Company (CGNPC).<sup>60</sup> The press release announcing the indictment stated that the two entities were charged with “conspiracy to unlawfully engage and

## **In 2016, the U.S. Department of Justice unveiled an indictment against a U.S. nuclear engineer, Szuhsiun Ho (aka “Allen Ho”), and one of the large, state-owned nuclear power companies in China, China General Nuclear Power Company.**

participate in the production and development of special nuclear material outside the United States, without the required authorization from the U.S. Department of Energy.”<sup>61</sup> It was the first U.S. indictment based on violations of the Part 810 regulations.<sup>62</sup> Allen Ho was also charged with conspiracy to act in the United States as an agent of a foreign government. In January 2017, Ho pleaded guilty in a plea agreement.<sup>63</sup> He was sentenced to two years in prison in August 2017.<sup>64</sup> A remaining question related to Part 810 for the U.S. government is how to treat entities in China that have relationships of varying degrees with CGNPC, an entity that has been indicted by the U.S. government.

A separate concern is that China will take transferred U.S. intellectual property and subsequently claim that it has “indigenized” the technology. This would mean that China could sell the same technology to other countries without respecting the intellectual property rights and without U.S. government permission. This concern underscores a challenge for the U.S. government and for U.S. companies which are faced with two bad options: cross off the Chinese market and potentially perish from lack of business, or sell technology once and risk that it could be altered, branded as “indigenous,”

58 <http://carnegieendowment.org/2010/06/17/china-pakistan-and-nuclear-suppliers-group-pub-41027>

59 <http://www.world-nuclear.org/information-library/country-profiles/countries-o-s/pakistan.aspx>

60 <https://www.justice.gov/opa/file/841036/download>

61 <https://www.justice.gov/opa/pr/us-nuclear-engineer-china-general-nuclear-power-company-and-energy-technology-international>

62 <http://powersource.post-gazette.com/powersource/companies/2016/09/15/Nuclear-secrets-The-ex-Westinghouse-employee-accused-of-helping-a-foreign-power/stories/201609140193>

63 <https://www.documentcloud.org/documents/2819720-Plea-agreement-for-Ching-Ning-Guey-in-nuclear.html>

64 <https://www.justice.gov/opa/pr/us-nuclear-engineer-sentenced-24-months-prison-violating-atomic-energy-act>

and re-exported in competition with the company's original design.

To take a specific example of the complex considerations at work with nuclear technology transfers to China, consider the transfer of the AP1000 technology and the potential for China to export reactors based on Westinghouse technology. The AP1000 reactor design might not have been developed in the first place without a Chinese customer. Questions have been raised, however,

## The most important discussions for both legal and policy reasons today in Part 810 concern what U.S. government policy should be towards nuclear technology transfers and assistance to China.

as to what level of control, if any, the United States will have on the export of reactor technology from China that is based on U.S. designs, as well as control over the materials produced in any reactors based on U.S. technology.

CRS writes of the AP1000:

According to Baker Donelson, the Westinghouse technology transfer agreement for the AP1000 reactor grants the Chinese only a “nonexclusive license to use that technology in China,” with Westinghouse retaining all its intellectual property rights. The agreement allows the Chinese to modify the AP1000 design but they cannot export such variants “unless they do so with Westinghouse under a marketing alliance.”

However, the Westinghouse agreement does give China the right to export a “large passive plant,” essentially a larger version of the AP1000. Such plants could be sold to any country except the United States and Japan, subject to U.S. export control laws, according to Baker Donelson. Westinghouse would have the right to participate in such export projects to the extent that they incorporated AP1000 technology. If China did not include Westinghouse in such exports, then Westinghouse would have to be compensated for any of its technology that was used.

With help from Westinghouse, the Chinese have been developing the CAP1400, the “large passive plant,” both for domestic deployment and potential export.<sup>65</sup>

A reduction in nuclear energy technology transfers with China on the basis of previously noted concerns would have some negative impacts on the United States. It would directly reduce U.S. efforts to influence Chinese safety and security culture in a positive manner. It would negatively impact the competitiveness of the U.S. nuclear industry, which would in turn reduce the capacity of the United States to spread its safety, security, and nonproliferation stances elsewhere in the world. Finally, it would negatively impact efforts to reduce air pollution and greenhouse gas emissions in China, and potentially elsewhere.

On a positive note, China has recently worked with the U.S. government (State Department and NNSA) on various nonproliferation and security issues. For example, China committed to a Nuclear Security Center of Excellence at the 2010 Nuclear Security Summit. In 2013, China signed an arrangement with NNSA to cooperate on deterring, detecting, and interdicting smuggling of special nuclear material and other radiological materials.<sup>66</sup>

For the reasons discussed above, the most important discussions for both legal and policy reasons today in Part 810 concern what U.S. government policy should be towards nuclear technology transfers and assistance to China. This continues to be an active area of debate within the U.S. government, and accounts in part for delays in processing specific authorization applications to China.

### B. India

Like China, India has growing electricity demand and is projected to build a large number of new reactors, as shown in Figure 14. Unlike in Russia, those nuclear builds could theoretically include U.S. designs. Although India committed to build U.S. reactors during the U.S.-India nuclear cooperation agreement negotiations, it has yet to build any of these reactors, and concerns persist about the potential impact of India's liability laws on U.S. companies.

In contrast to China and Russia, India was originally a generally authorized country. It became

65 <http://www.world-nuclear-news.org/NN-CAP1400-reactor-vessel-passes-pressure-tests-2203174.html>

66 <https://nnsa.energy.gov/mediaroom/pressreleases/china081513>

a destination requiring specific authorization in 1983. Between 1956 and 1972, all unclassified assistance would have been generally authorized to India, including power reactor, reprocessing, enrichment, and heavy-water technologies.

Canada and the United States provided assistance to India in building the CIRUS (Canada-India-Reactor-United-States) research reactor at Trombay.<sup>67</sup> The IAEA did not exist when the assistance began in 1954, and the reactor was not under IAEA safeguards when it went critical in 1960, nor at any time during the rest of its operations. The United States provided the initial supply of heavy water to operate the reactor, Canada supplied the reactor, and India made pledges to both countries that the CIRUS reactor would only be used for peaceful purposes. Despite these pledges, India took the used nuclear fuel from the CIRUS reactor, reprocessed the material at an unsafeguarded reprocessing facility, and used the plutonium for a nuclear explosive test in 1974. India called the test a “peaceful nuclear explosion,” though it was clearly the first test of a nuclear weapons program that continues today, and India tested more nuclear weapons in 1998. The International Panel on Fissile Materials estimates that before it was shut down in 2010, CIRUS produced 165 to 270 kg of plutonium<sup>68</sup> and that by the end of 2014, India possessed 110-120 nuclear warheads.<sup>69</sup>

India’s nuclear explosive test in 1974 spurred the passage of the NNPA. As discussed in Chapter II, the NNPA added the requirement of State Department concurrence to Secretarial determinations under Part 810, and consultations with the DOD, DOC, and the NRC. The NNPA also added language to Section 123 of the AEA which included a new requirement that future nuclear cooperation agreements should only be negotiated with NNWS that accept IAEA safeguards on all of its nuclear materials (i.e., “full-scope safeguards”), which would exclude countries like India, Pakistan, and Israel.

India has not signed the NPT and is considered a NNWS under the NPT as it did not test its nuclear weapons prior to 1967. This means that under Article I of the NPT, the United States and other NWS can do nothing that might “in any way assist” India “to manufacture or otherwise acquire

nuclear weapons or other nuclear explosive devices.” Also, India has made no legally binding commitment to eliminate its nuclear weapons arsenal, as Russia, the UK, China, France, and the United States are all bound to by Article VI of the NPT.

As was also discussed in Chapter II, the nuclear explosive test in 1974 partly led to the formation of the NSG and ultimately international isolation of India from nuclear energy commerce. In 1992, the NSG adopted a stronger nonproliferation stance that required suppliers to authorize transfers of Trigger List items to NNWS only when full-scope safeguards were in place. This followed the policy set out in the NNPA, and meant that the major nuclear suppliers would not trade with countries such as India, Pakistan, and Israel.

In 1995, the NSG added “or related technology,” which made the technology associated with Trigger List items subject to the same conditions of supply. As a result, India did not qualify for these additional nuclear energy technology transfers under Part 810.

After the George W. Bush Administration began pushing to open civil nuclear trade with India, Congress passed the Hyde Act in 2006,

## **India has not signed the NPT and is considered a NNWS under the NPT as it did not test its nuclear weapons prior to 1967.**

which put in place several requirements for any such trade. In particular, the President was required to make a determination on several items in order to waive the sections of the AEA, as amended, that would otherwise prevent commercial trade with India.

For example, as discussed above, Section 123 a.(2) of the AEA, as amended, would prohibit nuclear cooperation agreements with NNWS that do not have IAEA safeguards “maintained with respect to all nuclear materials in all peaceful nuclear activities.” In order to waive Section 123 a.(2), the Hyde Act required the President to make a determination that several actions had occurred, including:

<sup>67</sup> <http://www.nti.org/learn/facilities/832>

<sup>68</sup> [http://fissilematerials.org/blog/2010/12/india\\_shuts\\_down\\_cirus\\_re.html](http://fissilematerials.org/blog/2010/12/india_shuts_down_cirus_re.html)

<sup>69</sup> <http://fissilematerials.org/countries/india.html>

- (1) India has provided the United States and the IAEA with a credible plan to separate civil and military nuclear facilities, materials, and programs, and has filed a declaration regarding its civil facilities and materials with the IAEA...
- (7) The NSG has decided by consensus to permit supply to India of nuclear items covered by the guidelines of the NSG.

The conference report to the Hyde Act also stated: “Clause (B)(ii) would require that, with respect to any authorizations issued by the Secretary of Energy pursuant to section 57 b. of the Atomic Energy Act of 1954 (42 U.S.C. 2077(b)): ...the nuclear technology identified for transfer will be used only for safeguarded nuclear activities...”

A list of Indian facilities that would be placed under IAEA safeguards was eventually developed.<sup>70</sup> In order to satisfy the provision regarding the NSG, the United States pushed for an exemption to the NSG requirement of full-scope safeguards for civil nuclear energy trade, which was agreed to at an extraordinary plenary session of the NSG in September of 2008.<sup>71</sup> The document describing this exemption, INFCIRC/734, allows nuclear cooperation between NSG-participating governments and India, but treats India as a NNWS: only trade with IAEA-safeguarded facilities is allowed. As the IAEA does not typically safeguard nuclear facilities (e.g., power reactors) in nuclear weapons states, the United States is allowed to, for example, provide materials and equipment to unsafeguarded power reactors in the UK. INFCIRC/734 states:

Notwithstanding paragraphs 4(a), 4(b) and 4(c) of INFCIRC/254/Rev.9/Part 1, Participating Governments may transfer trigger list items and/or related technology to India for peaceful purposes and *for use in IAEA safeguarded civil nuclear facilities*, provided that the transfer satisfies all other provisions of INFCIRC/254/Part 1, as revised, and provided that transfers of exports remain subject to paragraphs 6 and 7 of the Guidelines. [emphasis added]

That is another reason India cannot be completely designated as a generally authorized destination: technology transfers to unsafeguarded sites would be in violation of U.S. commitments under the NSG Trigger List Guidelines and potentially Article I of the NPT. As noted in INFCIRC/734, paragraphs 6 and 7 still apply to India, and in as much as those paragraphs require NPT membership for the transfer of enrichment, reprocessing and heavy-water equipment and technology, India does not qualify for such technology transfers.

After the exemption for India was agreed to in the NSG, Congress approved the U.S.-India nuclear cooperation agreement, signed by President Bush in October 2008.<sup>72</sup>

### C. Russia

Similar to the situation with China, U.S. companies have been required to get specific authorization to do work with Russian entities since 1956. Unlike China and India, however, there is no real prospect for building a U.S.-designed reactor in Russia. The United States does, however, engage in cooperation with Russia in some areas of nuclear energy research and the two nations have a nuclear cooperation agreement in force. For example, the BOR-60 reactor in Russia is used by some U.S. entities for testing purposes. TerraPower is one U.S. company using the BOR-60 reactor for some of its experimental work.<sup>73</sup>

Also similar to China, the nuclear energy cooperation relationship with Russia is complicated and subject to considerations beyond nonproliferation. The United States and Russia originally tried to sign a civil nuclear energy cooperation agreement in 2008, but the agreement was withdrawn later that year in response to Russia’s military actions in Georgia. The agreement was then submitted in 2010 and was considered approved by the end of that year.

Following the Russian annexation of Crimea, the United States imposed sanctions on Russia in 2014, and Russia ultimately suspended a 2013 nuclear energy research and development agreement in retaliation.<sup>74</sup> The Russian incursion in Ukraine

70 See INFCIRC/731: <https://www.iaea.org/sites/default/files/publications/documents/infcircs/2008/infcirc731.pdf>

71 <https://www.iaea.org/sites/default/files/publications/documents/infcircs/2008/infcirc734c.pdf>

72 [http://www.nti.org/medial/pdfs/india\\_nuclear.pdf?\\_=1316466791](http://www.nti.org/medial/pdfs/india_nuclear.pdf?_=1316466791)

73 <http://terrapower.com/technologies/progress>

74 <http://www.world-nuclear-news.org/NP-Russia-withdraws-from-US-nuclear-cooperation-07101601.html>

led to a separate section of the Part 810 regulations that exclusively deals with activities there (Section 810.14).

Specifically, the final Part 810 rulemaking in 2015 stated:

Recent geopolitical developments in Ukraine involving the Russian Federation underlie the U.S. Government's determination to help ensure that Ukraine is able to maintain a stable civil nuclear energy program independent of and without support from the Russian Federation.

In 2017, in response to Russian interference in the 2016 U.S. election, S.94, the “Counteracting Russian Hostilities Act of 2017,” was introduced in Congress. Section 209 of the bill would create, among other things, sanctions “with respect to the development of civil nuclear projects by the Russian Federation.” As it includes “goods, services, technology, information, or support that could directly and significantly facilitate the maintenance or expansion of the construction, modernization, or repair of civil nuclear plants by the Russian Federation,” there could be an impact on specific

authorizations.<sup>75</sup> A bill with different sanctions against Russia, H.R. 3364 (“Countering America’s Adversaries Through Sanctions Act”), was however passed on August 2, 2017.

### **Similar to China, the nuclear energy cooperation relationship with Russia is complicated and subject to considerations beyond nonproliferation.**

Nuclear energy cooperation between the United States and China, India, and Russia remains complicated and in some cases, deeply frustrating to U.S. nuclear energy companies. Improving the U.S. government processing steps and speed to give U.S. companies an answer—one way or another—would improve the situation to a degree, though delays from government to government assurances from these countries are out of U.S. government control. The next Chapter will recommend ways that the Part 810 regulations and their implementation could be improved.

<sup>75</sup> See <https://www.morganlewis.com/blogs/upandatom/2017/03/senate-bill-would-restrict-us-civil-nuclear-cooperation-with-russia> for a discussion of S.94 and potential impacts.

## CHAPTER VI

## RECOMMENDATIONS

**A**S PREVIOUS SECTIONS HAVE discussed, the general authorization available under Part 810 provides an efficient way for U.S. companies to do business with specified foreign entities. Current U.S. policy is that countries can only become generally authorized destinations after they have concluded nuclear cooperation agreements with the United States.

**The United States should seek to incentivize nonproliferation commitments by providing more efficient and effective access to civil nuclear energy services and products.**

This means that U.S. companies will have to use the specific authorization process for both the large existing markets of China and India, as well as emerging opportunities in nations such as Jordan and Saudi Arabia. Providing U.S. companies with an answer—either an approved authorization or a denial—in a shorter and more predictable amount of time, would be helpful in both circumstances. This Chapter focuses on recommendations to achieve this goal, based on the analysis in the preceding Chapters.<sup>76</sup>

When nations step forward to begin new nuclear power programs, as long as they meet the criteria in the NSG Trigger List Guidelines, they will have access to multiple alternate suppliers if the U.S. chooses not to do business with them (or is simply too slow in approving licenses, or is perceived to be too burdensome to work with). This reality should

be embedded in the analysis framework of Part 810.

The U.S. government should recognize that NNWS that are party to the NPT and have in place both a comprehensive safeguards agreement and an Additional Protocol with the IAEA have made substantial nonproliferation commitments. The United States should seek to incentivize nonproliferation commitments by providing more efficient and effective access to civil nuclear energy services and products. Using additional criteria that demonstrate U.S. intent to cooperate on nuclear energy matters, including other U.S. regulations (e.g., the multiple country lists in Part 110), membership in the NSG, existing project supply agreements, and previous Part 810 authorizations, DOE should create a set of countries for which Part 810 authorizations can be fast tracked.<sup>77</sup> In addition, DOE should develop categories of activities, similar to the categories proposed in Chapter III, that are eligible to be fast tracked.

This would effectively create new authorization pathways between the general authorization and specific authorization poles of Part 810 to more appropriately process applications based on the significance of the proposed activity. This is schematically illustrated in Figure 16 for fast track activities that need government to government assurances, and those that do not.

For reforms to succeed, the Office of the Secretary of Energy will need to be involved, as two of the offices that are involved in processing applications for specific authorization are outside of NNSA and one of them reports directly to the Secretary (the Office of General Counsel) while the other (the Office of Nuclear Energy) reports to the

<sup>76</sup> This report does not represent a legal opinion, nor does it offer advice of counsel for the Nuclear Innovation Alliance.

<sup>77</sup> Appendix A to this report shows an example list of countries that meet the objective criteria described above and individual countries are highlighted by various indications of U.S. intent to cooperate on nuclear energy.

Undersecretary for Energy and Science (who does not sign specific authorization packages). The organization chart for the relevant DOE offices is depicted in Figure 17.

To achieve a more efficient and risk-informed licensing process, the following actions are recommended:

### A. Executive Branch

**Recommendation 1:** *DOE should initiate a new rulemaking to establish two fast track authorization pathways for specified activities in countries that have made significant nonproliferation commitments. One fast track authorization should focus on applications that need government to government assurances, and a second should involve applications that do not require such assurances. In both cases, DOE should establish the types of activities that qualify for fast track approval, along with a list of countries eligible for expedited consideration.*

The Part 810 regulations already have in place a type of fast track authorization for operational safety activities in Section 810.6(c)(2). This section provides authorization for furnishing “operational safety information or assistance to existing safeguarded civilian nuclear reactors outside the United States in countries with safeguards agreements with the IAEA or an equivalent voluntary offer, provided DOE is notified in writing and approves the activity in writing within 45 days of the notice.” Given the type of activity (operational safety assistance to IAEA safeguarded reactors) and the type of destination (countries with safeguards agreements with the IAEA or an equivalent voluntary offer) the expectation is that a given application will be approved, though the process still affords the U.S. government an opportunity to review and potentially reject the application.

The first fast track authorization pathway could be modeled on Section 810.6(c)(2), where the identified activities and destinations would not need government-to-government assurances. Following the model in Section 810.6(c)(2), the new pathway would allow companies to notify DOE that they are intending to pursue specific activities and if they do not hear back from DOE after a specified amount of time, e.g., 45 days, that the activity is deemed to be approved. For example, two types of activities could be candidates for this fast track approval: (1) deemed exports and (2) consulting services for LWRs and thermal-spectrum gas-cooled reactors (and perhaps other

FIGURE 16

### Adding New Fast Track Authorization Pathways to Part 810

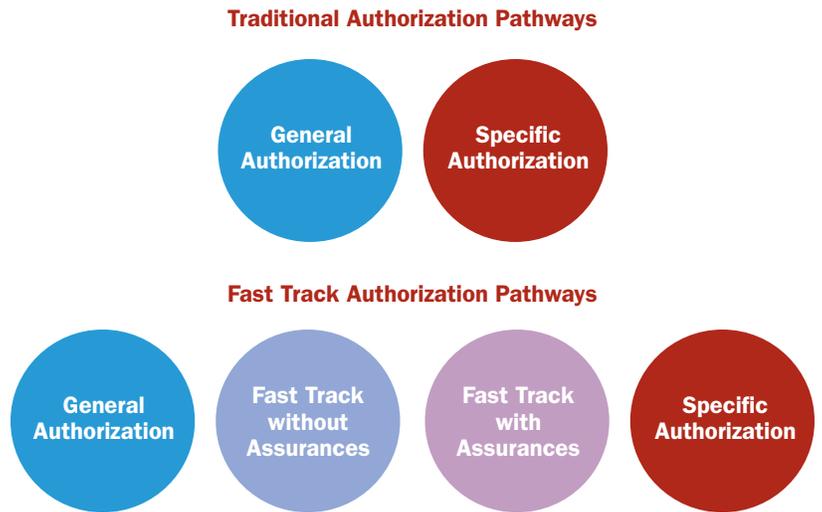
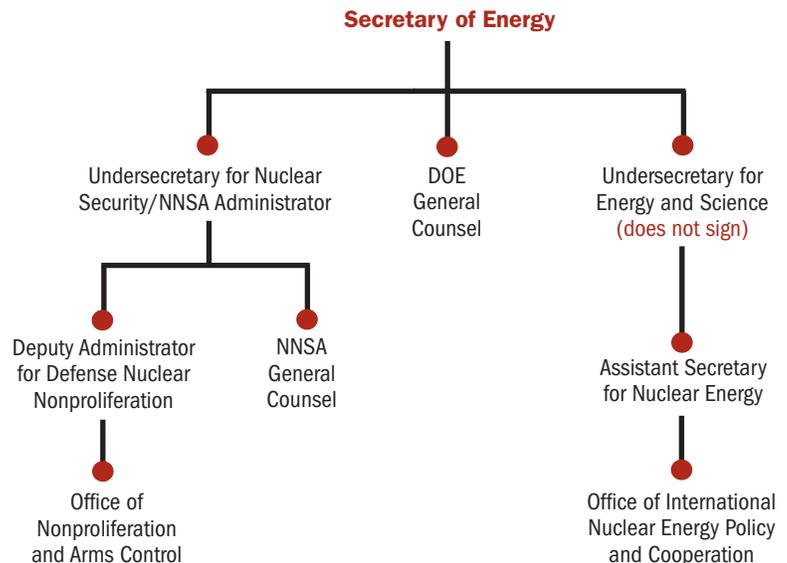


FIGURE 17

### DOE Offices Involved in Processing Specific Authorization Applications



technologies identified by DOE) that are under IAEA safeguards.

DOE could base its proposal on several objective criteria to begin constructing a list of countries eligible for fast track status. For example, the agency could start with NNWS that are party to the NPT and have a comprehensive safeguards agreement and an Additional Protocol in place with the IAEA. Second, DOE could consider previous indications of U.S. intent to cooperate with countries, in the form of existing project supply agreements,

membership in the NSG, the country list in NRC's 10 CFR Part 110.26, and prior Part 810 authorizations. Appendix A to this report shows a list of countries that meet the first set of criteria and highlights some countries that meet elements of the second criteria.

The second fast track authorization pathway should be for activities in which country-to-country assurances are required. For specific technologies (e.g., LWRs, thermal high temperature gas reactors, and perhaps others) DOE's proposed

## DOE's proposed rule should establish an authorization pathway through which applications are immediately sent to the State Department to begin the process of seeking assurances.

rule should establish an authorization pathway through which applications are immediately sent to the State Department to begin the process of seeking assurances, again with the expectation of approval given the bounded set of activities and destinations. As with the first pathway, if the U.S. government does not object within a set amount of time (e.g., 45 days) the company is notified that their proposed activity is deemed to be approved, and they can begin work upon receipt of the government to government assurances. The destination criteria should be similar to the country criteria described in the first fast track pathway above.

**Recommendation 2:** *The White House should issue an Executive Order that affirms the importance of efficient processing of Part 810 applications to U.S. commercial and national security interests, and directs improvements toward that aim. The Executive Order should establish timelines for each stage of the specific authorization process, and state that the relevant federal agencies should continue to process applications for specific authorization while government to government assurances are being sought.*

As a model, the new Executive Order should look to Executive Order 12981, which governs the export of dual-use items. That Executive Order set out timelines for agency actions, as well as provisions for handling incomplete applications and establishing mechanisms to resolve interagency disputes.

The Executive Order for Part 810 should state that it is the policy of the U.S. government to continue processing applications for specific authorization while government assurances are being sought (for the cases where assurances are deemed to be needed). Specifically, the Executive Order should direct the consulting agencies to provide their views within a specified amount of time (e.g., 30 days) regardless of whether the assurances for a given application have been received. Similar to Executive Order 12981, silence from any agency after that deadline should not hold up the process. The State Department should also be directed to provide its views in the same amount of time, but may provide its concurrence subject to the receipt of assurances. The Executive Order should direct DOE to continue processing Part 810 applications while government assurances are being sought and while the interagency review is ongoing. It should direct the Secretary of Energy to either issue an authorization, deny an authorization, or issue an authorization subject to the receipt of assurances within 20 days of interagency review completion. The Executive Order should explicitly reflect the understanding among the federal agencies involved that ultimately, for applications that are deemed to require government to government assurances, the proposed activities will not go forward unless the requisite assurances are received; however, the U.S. government will continue to process applications while those assurances are being sought to better ensure a timely response to U.S. companies.

The Executive Order should also direct DOE to transmit applications for specific authorization to the relevant federal agencies within 30 days of receipt. For applications to China and Russia, pursuant to the Fiscal Year 2016 NDAA, the Executive Order should include provisions for the Office of the Director of National Intelligence to provide the views of the intelligence community in a timely manner (e.g., within 30 days).

Separate from application processing timelines, the Executive Order should direct the U.S. Department of State to proactively seek generic assurances from States (as discussed in Recommendation 5 below), where possible, to eliminate the assurance step in the specific authorization process to the maximum extent possible.

Finally, the Executive Order should direct the relevant federal agencies to have regular (e.g., monthly) meetings to discuss specific authorization cases where disputes have arisen. This would be similar to the Operating Committee and Advisory



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The NuScale Power Control Room Simulator is designed to simulate the operation of a 12-module NuScale power plant.

Committee on Export Policy meetings established by Executive Order 12981 for dual-use item licensing. Currently, there is no formal in-person meeting for the involved agencies to discuss specific authorization cases. In-person meetings would improve the efficiency of dispute resolution.

**Recommendation 3:** *For specific authorization applications, DOE should return to the pre-2005 process under which the Secretary of Energy signs determinations subject to the receipt of assurances. At a minimum, it should continue to process Part 810 packages while the interagency review process is ongoing and assurances are being sought by the State Department, so that applications are before the Secretary of Energy and ready to be signed immediately upon receipt of the assurances.*

As Figure 12 and Table 5 show, after the interagency review has concluded and the assurances have been provided, DOE still takes a long time to complete processing applications for specific authorization. There is no reason, however, that DOE needs to delay its processing of applications until the interagency review stage is finished. Various DOE offices do not need to see the government to government assurances themselves to sign off on specific authorization packages headed to the Secretary's desk for signature. It should be clearly understood that any proposed activity will not go forward without assurances being provided for the

activities where they are deemed to be necessary. This procedural change would save potentially months of processing time and give U.S. companies a decision more quickly.

Returning to the pre-2005 policy, under which the Secretary signs determinations subject to the receipt of assurances would provide U.S. companies an earlier notification that the U.S. government has approved the activity, pending the receipt of foreign government assurances. This would reduce uncertainty for U.S. businesses and speed up specific authorization approvals without any reduction in nonproliferation controls.

**It should be clearly understood that any proposed activity will not go forward without assurances being provided for the activities where they are deemed to be necessary.**

**Recommendation 4:** *The DOE Offices of Non-proliferation and Arms Control, Nuclear Energy, and Intelligence should prepare a classified report analyzing the risks and benefits of nuclear energy technology transfers with China to provide a framework for future internal U.S. government discussions.*

These offices together have the capabilities to assess the commercial, nonproliferation, and intelligence aspects of nuclear energy technology transfers to



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**TerraPower explores the features and performance characteristics of the fuel and fuel assemblies for their sodium-cooled reactor in their Bellevue, WA based laboratory.**

China. The report should break nuclear energy technology transfer into categories, such as those listed in Chapter III, and analyze the risks and benefits of transfers to China for each. The study should also discuss the risks and benefits of *not* transferring technologies to China, including potentially slowing down progress on decarbonization and reducing air pollution in East Asia (and elsewhere), adverse impacts on the U.S. nuclear industry and associated national security concerns, as well as other considerations. An assessment of the nuclear energy technologies available and being supplied to China from other countries (e.g., Russia, France, ROK, Japan), along with China's own independent R&D progress, would provide additional context for a balanced accounting of the risks and benefits associated with specific authorizations to China.

**Recommendation 5:** *The U.S. Department of State should seek generic assurances from countries, where possible, to cover transfers under Part 810 before applications for export are submitted.*

A strategy independent from the fast track described above, and more similar to Section 110.26, is that the U.S. government should seek generic assurances

from individual countries for some or all of the exports under Part 810. DOE could then process applications to countries more quickly, perhaps in combination with a fast track approval process, as the assurances step would already be completed. Even without a fast track, this would speed up the conventional specific authorization process. The success of this approach would depend on the willingness of foreign governments to provide such assurances, of course, and there is no guarantee that individual countries would be willing to do so. The scope of what the assurances cover—what types of activities, what projects, etc.—would likely vary from case to case, but could still save the U.S. government and U.S. companies time and resources.

**Recommendation 6:** *DOE should re-examine its legal position that delegation of authority by the Secretary of Energy for activities under Section 57b is prohibited by Section 161n of the AEA.*

The Secretary of Energy currently signs off on every Part 810 specific authorization, no matter how minor, as well as extensions and relatively minor amendments to existing authorizations, because of the DOE's legal interpretation of Section 161n as prohibiting delegation by the Secretary to others.

This requirement adds weeks, if not months, to the processing of specific authorization applications, with no obvious benefit. It is difficult to see why the Secretary of Energy's attention is needed or useful in any way for approving the hiring of foreign nationals, minor amendments to existing authorizations, renewals of authorizations, or other relatively technical or small-scale activities, such as operational consultations to existing LWRs under IAEA safeguards.

The other functions listed in Section 161n (Sections 51, 61, 108, 123, 145 b., 145f., and 161a. of the AEA) include, for example, major nuclear energy actions that are infrequent. The negotiation of a nuclear cooperation agreement under Section 123 is rare (perhaps once a year or less) and the AEA requires the President to submit it to Congress—clearly a function of high importance. By contrast, between specific authorization applications, amendments to existing authorizations, and renewals to existing authorizations, there are actions under Part 810 that DOE must sometimes handle on an almost weekly basis, and which are comparatively minor in nature.

In 1954, prohibiting delegation by the AEC made sense: a determination to transfer nuclear technology from the United States could very well mean that a country might have a new nuclear energy program in a substantially shorter amount of time. But that was during a period when the United States was the predominant supplier of nuclear technology and aspiring countries had few alternatives for assistance, if any.

Today, the United States has had a comparatively weak role in new nuclear builds over the past several decades, and other supplier countries are in a better position to provide many of the services that are licensed under Part 810. The long processing times for specific authorizations make it harder for U.S. companies to win competitive bids against foreign suppliers. A more nimble, flexible process is needed to compete in today's marketplace, and moving away from a requirement for the Secretary of Energy to sign off on minor details for Part 810 authorizations is a sensible and appropriate step towards more efficient engagement with the global nuclear market.

By contrast, the NRC Commissioners do not review most applications for the export of materials

and equipment under the NRC's Part 110 regulations, and the NRC does not send most Part 110 applications to the Executive Branch for review. In other words, the delegation of relatively minor activities by the Secretary of Energy, and an expedited review for activities of lesser significance, is consistent with nuclear export control practices elsewhere in the federal government.

## The long processing times for specific authorizations make it harder for U.S. companies to win competitive bids against foreign suppliers.

### B. Congress

**Recommendation 7:** *If DOE continues in its determination that delegation of authority by the Secretary of Energy for activities under Section 57b is prohibited by Section 161n, Congress should amend Section 161n of the AEA to permit delegation, recognizing the very different global reality today as compared with 1954, as well as the minor activities that are currently being sent to the Secretary of Energy.*

The rationale for this action is the same as that for Recommendation 6.

### C. Industry

**Recommendation 8:** *Advanced reactor companies that intend to pursue work with foreign entities should engage DOE on Part 810 early in a similar manner to the pre-application interactions with the NRC on reactor design licensing.*

The NRC has a policy of encouraging early discussions with potential applicants for reactor design certification to offer licensing guidance and to identify and resolve potential licensing issues early in the process.<sup>78</sup> Similarly, early engagement between advanced reactor companies and DOE would familiarize the U.S. government with the technologies involved and also the potential end users under consideration. These interactions would provide early feedback to U.S. reactor companies on potential challenges with specific destinations and end users, as well as any concerns with the

<sup>78</sup> For example, see: <https://www.nrc.gov/reactors/new-reactors/advanced/oklo.html> or <https://www.nrc.gov/reactors/new-reactors/design-cert/nuscale/pre-app.html>

reactor technology itself. In this way, companies can get a “pre-run” of future exports, and even ask for an official “request for determination” to get a particular statement in writing. Unlike the NRC, DOE does not charge U.S. companies either for pre-application interactions or for the processing of applications for specific authorization.

**Recommendation 9:** *Industry should create a forum to share Part 810 experiences for the purpose of raising the quality of applications that are submitted to DOE.*

**Companies that are new to the Part 810 process would especially benefit from hearing more experienced companies explain what information the U.S. government needs to process applications.**

One challenge for the U.S. government in processing Part 810 applications is the submission of incomplete applications where the government deems it necessary to return to the applicant for additional information. Companies that are new to the Part 810 process would especially benefit from hearing more experienced companies explain what information the U.S. government needs to process applications. An industry forum to share successful application approaches would help newer companies understand what information to include in deemed export applications, general consulting services applications, reactor bid competitions, etc. The point is to identify the kinds of information needed by the government in different types of Part 810 applications to facilitate successful processing, and to share knowledge about application structures that have worked well. This should help to cut down on processing times and reduce the resources expended by both private companies and the U.S. government.

## ABBREVIATIONS

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<b>AEA</b>	Atomic Energy Act of 1954
<b>AEC</b>	Atomic Energy Commission (U.S.)
<b>CCL</b>	Commerce Control List
<b>CIRUS</b>	Canada-India-Reactor-United-States
<b>CRS</b>	Congressional Research Service
<b>DOC</b>	Department of Commerce (U.S.)
<b>DOD</b>	Department of Defense (U.S.)
<b>DOE</b>	Department of Energy (U.S.)
<b>EAR</b>	Export Administration Regulations
<b>EIA</b>	Energy Information Administration (U.S.)
<b>FOIA</b>	Freedom of Information Act
<b>GAO</b>	Government Accountability Office (U.S.)
<b>IAEA</b>	International Atomic Energy Agency
<b>LWR</b>	Light-water reactor
<b>NDAA</b>	National Defense Authorization Act
<b>NNPA</b>	Nuclear Nonproliferation Act of 1978
<b>NNSA</b>	National Nuclear Security Administration (U.S.)
<b>NNWS</b>	Non-nuclear weapon state
<b>NRC</b>	Nuclear Regulatory Commission (U.S.)
<b>NSG</b>	Nuclear Suppliers Group
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>Part 110</b>	10 CFR Part 110
<b>Part 810</b>	10 CFR Part 810
<b>ROK</b>	Republic of Korea

## APPENDIX A

### Representative countries and criteria for fast track destination list

**T**HE FOLLOWING COUNTRIES ARE NNWS THAT ARE PARTY TO THE NPT, AND have a comprehensive safeguards agreement<sup>79</sup> and an Additional Protocol<sup>80</sup> in force with the IAEA, but are not generally authorized destinations under Part 810. Countries in bold meet at least one of the fast track criteria discussed in Chapter IV.

- |  |   |  |
|--|---|--|
| 1. Afghanistan   | 30. Gambia  | <b>58. New Zealand</b> –<br><i>appears on NRC’s 110.26<br/>country list; membership<br/>in the NSG</i>                     |
| 2. Albania   | 31. Georgia   | 59. Nicaragua  |
| 3. Andorra   | 32. Ghana   | 60. Niger  |
| 4. Angola  | 33. Guatemala   | 61. Nigeria  |
| 5. Antigua and Barbuda   | 34. Haiti   | 62. Palau  |
| <b>6. Armenia</b> –<br><i>previous Part 810<br/>authorizations on record</i> | 35. Holy See  | 63. Panama   |
| 7. Azerbaijan  | <b>36. Iceland</b> –<br><i>membership in the NSG</i>  | 64. Paraguay   |
| 8. Bahrain   | 37. Iraq  | <b>65. Peru</b> –<br><i>project supply agreement<br/>in place</i>  |
| 9. Bangladesh  | 38. Jamaica   | <b>66. Philippines</b> –<br><i>appears on NRC’s 110.26<br/>country list, previous Part 810<br/>authorization on record</i> |
| 10. Bosnia and Herzegovina   | 39. Jordan  | 67. Republic of Moldova  |
| 11. Botswana   | 40. Kenya   | 68. Rwanda   |
| 12. Burkina Faso   | 41. Kuwait  | 69. Seychelles   |
| 13. Burundi  | 42. Kyrgyzstan  | <b>70. Singapore</b> –<br><i>previous Part 810<br/>authorization on record</i>   |
| 14. Cambodia   | 43. Lesotho   | 71. St. Kitts and Nevis  |
| 15. Cameroon   | 44. Libya   | 72. Swaziland  |
| 16. Central African Republic   | 45. Liechtenstein   | 73. Tajikistan   |
| 17. Chad   | 46. Madagascar  | 74. The FYROM  |
| <b>18. Chile</b> –<br><i>project supply agreement<br/>in place</i>           | 47. Malawi  | 75. Togo   |
| 19. Comoros  | 48. Mali  | 76. Turkmenistan   |
| 20. Congo  | 49. Marshall Islands  | 77. Uganda   |
| 21. Costa Rica   | 50. Mauritania  | 78. United Republic of Tanzania  |
| 22. Cote d’Ivoire  | 51. Mauritius   | 79. Uruguay  |
| 23. Cuba   | <b>52. Mexico</b> –<br><i>project supply agreement<br/>in place; membership in the<br/>NSG; previous Part 810<br/>authorization on record</i> | 80. Uzbekistan   |
| 24. D.R. Congo   | 53. Monaco  | 81. Vanuatu  |
| 25. Dominican Republic   | 54. Mongolia  |  |
| 26. Ecuador  | 55. Montenegro  |  |
| 27. El Salvador  | 56. Mozambique  |  |
| 28. Fiji   | 57. Namibia   |  |
| 29. Gabon  |   |  |

79 As of April 30, 2015: <https://www.iaea.org/publications/factsheets/npt-comprehensive-safeguards-agreements>

80 As of October 7, 2016: <https://www.iaea.org/safeguards/safeguards-legal-framework/additional-protocol/status-of-additional-protocol>



# Enabling Nuclear Innovation

# Part 810 Reform

Improving the Efficiency of U.S. Export Controls  
for Nuclear Energy Technologies



The purpose of this report is to propose actions for Congress, the Executive Branch, and industry that will provide U.S. companies with either approval or denial of their export applications in a shorter period of time. The current 10 CFR Part 810 (Part 810) specific authorization process has lengthened to the point where industry has stated that it is impacting U.S. commerce. A more efficient process will aid nuclear energy innovation, as the projected growth in nuclear energy use is primarily in developing regions of the world, where U.S. activity is regulated by Part 810. Improving regulatory efficiency will help to reduce greenhouse gas emissions and air pollution, while also improving the quality of life for people around the world and creating U.S. jobs.

Recommendations include an Executive Order to set timelines for the efficient processing of export applications, fast track authorization pathways for specified activities and destinations, changes to the current processing structure for export applications, industry forums to improve application quality, and delegation by the Secretary of Energy of less significant activities under Part 810.