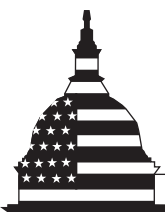


November 2010

# NUCLEAR COMMERCE

## Governmentwide Strategy Could Help Increase Commercial Benefits from U.S. Nuclear Cooperation Agreements with Other Countries



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## Why GAO Did This Study

The United States has 26 agreements in force for peaceful nuclear cooperation. Under the U.S. Atomic Energy Act of 1954, as amended, these agreements are a prerequisite to certain aspects of U.S. nuclear cooperation with other cooperating partners. GAO was asked to (1) quantify the amount and value of U.S. nuclear exports facilitated by these agreements, (2) assess U.S. efforts to support the U.S. nuclear industry's ability to compete for sales, and (3) examine U.S. nuclear industry challenges to exporting. To conduct this work, GAO reviewed and assessed data collection efforts by U.S. agencies from 1994 through 2008, analyzed available data, and interviewed U.S. industry representatives and U.S. and foreign government officials.

## What GAO Recommends

GAO recommends that Commerce (1) identify additional nuclear data that may better quantify the export benefits of nuclear cooperation agreements, (2) review its strategy document to identify markets and include benchmarks for evaluating progress, and (3) consider ways the interagency trade promotion committee may obtain a comprehensive range of U.S. industry views. Commerce agreed with our first two recommendations but disagreed with the third, stating that it already has mechanisms in place to obtain industry views. GAO is making this recommendation because Commerce needs to strengthen interagency coordination efforts to promote nuclear trade.

View [GAO-11-36](#) or key components. For more information, contact Gene Aloise, (202) 512-3841, [aloise@gao.gov](mailto:aloise@gao.gov).

## NUCLEAR COMMERCE

### Governmentwide Strategy Could Help Increase Commercial Benefits from U.S. Nuclear Cooperation Agreements with Other Countries

## What GAO Found

No single federal agency systematically tracks and reports the data necessary to determine the amount and value of U.S. nuclear exports facilitated by U.S. nuclear cooperation agreements. Data from the departments of Commerce, Energy (DOE), State, and the Nuclear Regulatory Commission (NRC) contain gaps and in some cases were not sufficiently detailed for GAO's reporting purposes. Using data from the United Nations Commodity Trade Statistics database, GAO found that the United States' share of global exports of nuclear material, reactors, and components has declined in the last 15 years. For example, the amount of U.S. exports of sensitive nuclear material such as natural and enriched uranium remained stable, while the U.S. share of global exports for these materials decreased significantly, from 29 percent to 10 percent, from 1994 through 2008. The United States also imports sensitive nuclear material, nuclear reactors, major components and equipment, and minor reactor parts from other countries. GAO found that in sum, the United States was a net importer of nuclear components and materials, which may indicate a lack of comparative advantage in this industry.

Commerce has an initiative to coordinate interagency efforts and identify and respond to the U.S. nuclear industry's trade policy challenges, but the initiative has made limited progress and does not include a well-defined strategy to support and promote U.S. nuclear industry efforts to compete globally. DOE, NRC, and State officials told us they rely on Commerce to develop and lead U.S. nuclear industry export promotion activities. In October 2008, Commerce established the Civil Nuclear Trade Initiative to help promote the competitiveness of the U.S. nuclear industry. The initiative aims to, among other things, coordinate interagency efforts and identify and respond to trade policy challenges faced by the U.S. nuclear industry. However, the initiative has made limited progress. For example, the initiative's interagency trade promotion committee to coordinate interagency efforts on behalf of U.S. industry has received briefings from only three U.S. nuclear companies; though Commerce officials report many more companies would like to participate. In addition, the initiative's strategy document has some limitations, in that it does not establish goals, does not have an implementation plan, and does not contain metrics for measuring its progress, which are critical for agencies to achieve intended goals.

Commerce, State, and DOE officials as well as U.S. industry representatives identified challenges facing the U.S. nuclear industry, including a decline in domestic manufacturing capabilities, increased international competition, and U.S. industry's liability concerns. In addition, U.S. industry representatives and U.S. foreign government officials GAO interviewed also identified challenges that, in their view, impede the U.S. nuclear industry's ability to compete globally for nuclear trade, including a DOE process for authorizing the transfer of U.S. nuclear technology and technical information overseas. In particular, industry representatives told us they believe that DOE's regulations are outdated and place U.S. companies at a competitive disadvantage.

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### Abbreviations

ASME	American Society of Mechanical Engineers
CSC	Convention on Supplementary Compensation for Nuclear Damage of 12 September 1997
CINTAC	Civil Nuclear Trade Advisory Committee
DOE	Department of Energy
EURATOM	European Atomic Energy Community
IAEA	International Atomic Energy Agency
ITA	International Trade Administration
NEI	Nuclear Energy Institute
NMMSS	Nuclear Materials Management and Safeguards System
NPT	Nuclear Nonproliferation Treaty
NRC	Nuclear Regulatory Commission
Paris Convention	Paris Convention on Third Party Liability in the Field of Nuclear Energy
SILEX	Separation of Isotopes by Laser Excitation
TPCC	Trade Promotion Coordinating Committee
UAE	United Arab Emirates
U.N. Comtrade	United Nations Commodity Trade Statistics Database
USTR	United States Trade Representative
Vienna Convention	Vienna Convention on Civil Liability for Nuclear Damage

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**United States Government Accountability Office**  
**Washington, DC 20548**

November 4, 2010

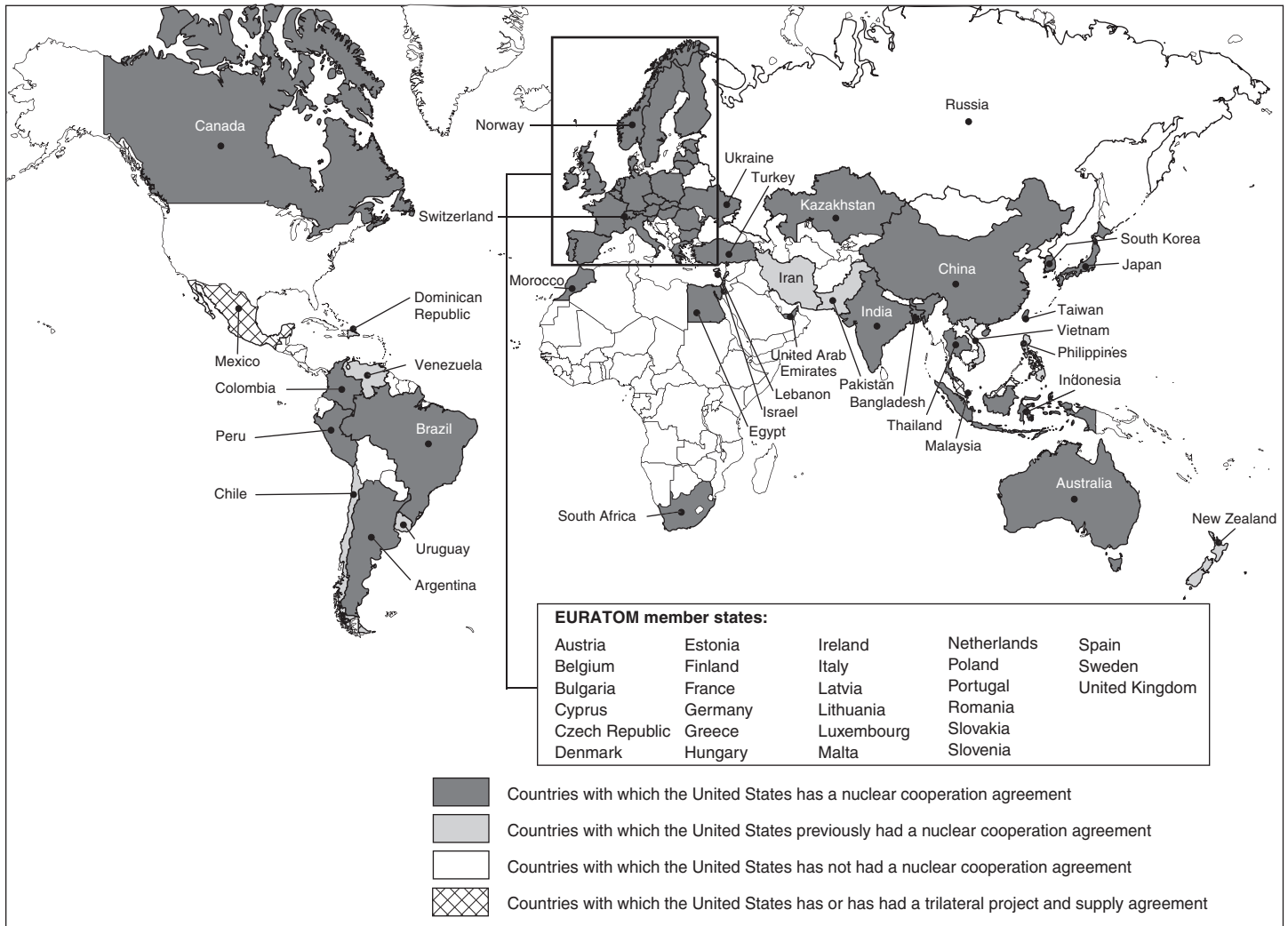
The Honorable Howard L. Berman  
Chairman  
The Honorable Ileana Ros-Lehtinen  
Ranking Member  
Committee on Foreign Affairs  
House of Representatives

The United States has 26 agreements in force for peaceful nuclear cooperation with foreign countries, the European Atomic Energy Community (EURATOM), the International Atomic Energy Agency (IAEA), and Taiwan.<sup>1</sup> A nuclear cooperation agreement is a bilateral agreement that establishes a framework for civilian nuclear cooperation, including the transfer of certain nuclear material and components of nuclear reactors between cooperating countries. Figure 1 shows the partners with which the United States has, or previously had, a nuclear cooperation agreement in force.

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<sup>1</sup>EURATOM is composed of the 27 countries of the European Union. IAEA, an independent international organization based in Vienna, Austria, is affiliated with the United Nations and has the dual mission of promoting the peaceful uses of nuclear energy and verifying that nuclear materials intended for peaceful purposes are not diverted to military purposes. IAEA had 151 member states as of December 2009. Governmental relations between the United States and Taiwan were terminated on January 1, 1979. All agreements concluded with the Taiwan authorities prior to January 1, 1979, are administered by the American Institute in Taiwan, a nonprofit District of Columbia corporation.

**Figure 1: Cooperating Partners with Which the United States Currently Has or Previously Had a Nuclear Cooperation Agreement**



Sources: GAO analysis of Department of State data and Map Resources.

Notes: The United States also has a set of trilateral project and supply agreements with Mexico and IAEA. We included these agreements because they were entered into pursuant to the United States' nuclear cooperation agreement with IAEA. The United States also previously had a trilateral project and supply agreement with Malaysia and IAEA. The United States has an additional agreement with Australia for cooperation for the Separation of Isotopes by Laser Excitation (SILEX) technology for uranium enrichment. For a list of partners with which the United States has a nuclear cooperation agreement in force, see appendix II. In addition, the United States previously had nuclear cooperation agreements with Chile, Dominican Republic, Iran, Israel, Lebanon, New Zealand, Pakistan, Philippines, Uruguay, Venezuela, and Vietnam.

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Increasing energy demand and concerns regarding climate change have heightened worldwide interest in nuclear power. IAEA has reported that more than 60 countries are considering nuclear power to help meet their energy needs and estimates that between 10 and 25 new countries will bring their first nuclear power plants online by 2030 as part of an ongoing “nuclear renaissance.” By 2030, IAEA estimates the world’s capacity for nuclear electricity production will have significantly increased, with most of this increase occurring in countries that have established civilian nuclear power programs, such as China, Japan, and South Korea. China, for example, has announced that it intends to spend \$50 billion to build 32 new nuclear plants by 2020. Both India and Pakistan are moving forward with plans to significantly increase their production of nuclear power, building plants that will more than double their production of nuclear energy in the next decade. In addition, countries such as Jordan and Vietnam, which do not yet have civilian nuclear power programs, are actively moving to build the necessary regulatory infrastructure. Other countries, such as Egypt, Indonesia, Libya, and Thailand have expressed their intent to build civilian nuclear power plants. Still others, such as Algeria, Belarus, Nigeria, and Yemen are considering moving forward with civilian nuclear power programs.

These markets potentially represent substantial economic opportunities for the United States and the international nuclear industry. For example, in December 2009 the United Arab Emirates (UAE) selected a consortium led by a South Korean company to build four nuclear power plants, a deal reportedly valued at \$20 billion.<sup>2</sup> According to the U.S.-UAE Business Council, a business organization committed to advancing trade between the United States and the UAE, had a U.S. firm been selected, this deal could have potentially generated 10,000 jobs in the United States. The Department of Commerce estimates that every \$1 billion in exports by U.S. companies represents 5,000 to 10,000 jobs. President Obama has announced an administration goal of doubling U.S. exports over the next 5 years, and in March 2010 established the National Export Initiative to enhance and coordinate federal efforts to facilitate the creation of U.S. jobs through the promotion of exports.

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<sup>2</sup>Westinghouse Electric, a U.S.-based nuclear technology supplier, was selected as a part of the consortium to provide instrumentation, control systems, technical design, and engineering support.



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This report responds to your request that we conduct a review of the export benefits of these nuclear cooperation agreements.<sup>3</sup> Specifically, our objectives were to (1) quantify the amount and value of U.S. nuclear exports facilitated by these agreements from 1994 through 2008, (2) assess U.S. government efforts to support the U.S. nuclear industry's ability to compete for sales facilitated by nuclear cooperation agreements between the United States and other partners, and (3) examine U.S. nuclear industry challenges to exporting, as identified by industry representatives and U.S. and foreign government officials.

To quantify the amount and value of U.S. nuclear exports, we reviewed and assessed data collection efforts by the departments of Commerce, Energy (DOE), and State; the Nuclear Regulatory Commission (NRC); and other U.S. agencies, including the International Trade Commission, Customs and Border Protection, and the Office of the United States Trade Representative (USTR). We obtained and reviewed data from DOE's and NRC's Nuclear Materials Management and Safeguards System (NMMSS), Commerce's Bureau of the Census, and reviewed NRC records on specific licenses for material exports. We determined the value of U.S. exports of nuclear material, reactors, major components and equipment, and minor reactor parts, and determined the United States' relative share of global exports for these commodities, by analyzing data from the United Nations Commodity Trade Statistics Database (U.N. Comtrade) to estimate the value of U.S. exports using other countries' reported U.S. import data.<sup>4</sup> For nuclear reactors, major components and equipment, and minor parts, we analyzed data only under that specific category in the Harmonized System. To assess the reliability of the data from U.N. Comtrade, we reviewed United Nations' records of data evaluation and related documentation and determined that the data were sufficiently reliable for our purposes to estimate exports of nuclear material, reactors, major components and equipment, and minor reactor parts from 1994 through 2008, the most recent year for which complete data were available. To assess U.S. government efforts to support the U.S. nuclear industry's ability to compete for sales facilitated by nuclear cooperation agreements between the United States and other countries, we analyzed pertinent

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<sup>3</sup>In a separate report to be issued early next year, we plan to assess DOE's efforts to monitor and evaluate the security of nuclear material transferred under nuclear cooperation agreements.

<sup>4</sup>Economists generally agree that import data are generally more accurate than export data, due to countries' interest in tracking imports for tariffs and other fees.

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documentation and interviewed Commerce, State, DOE, and NRC officials to identify key U.S. nuclear export initiatives and activities, and discussed coordination, evaluation, and outcomes of these efforts. Specifically, we reviewed and evaluated Commerce's Civil Nuclear Trade Initiative. We also reviewed NRC export license data to identify suppliers of U.S. nuclear material, reactors, major components and equipment, and minor reactor parts in the last 15 years. To examine challenges to the U.S. nuclear industry, we conducted interviews with a nonprobability sample of seven U.S. or foreign nuclear industry companies and industry representatives with significant business interests in the United States, including companies that obtained NRC-specific licenses to authorize the export of nuclear reactors or major components from 1994 through 2008. We interviewed industry representatives and government officials regarding the challenges they face. Because these industry representative interviews offer opinions regarding the U.S. government's efforts to promote U.S. nuclear technology, they cannot be generalized to the entire universe of civilian nuclear exporters. We reviewed U.S. government regulations including DOE's 10 C.F.R. Part 810 and NRC's 10 C.F.R. Part 110 that govern the process for obtaining authorizations for U.S. persons to engage in the production of special nuclear material in foreign countries, or licenses to export nuclear material and equipment, respectively. We also conducted interviews with officials from several major nuclear importing and exporting countries. Additional details on our scope and methodology can be found in appendix I.

We conducted our work from August 2009 through November 2010 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

Under Section 123 of the U.S. Atomic Energy Act of 1954, as amended, nuclear cooperation agreements are a prerequisite to certain aspects of civilian U.S. nuclear cooperation with countries and other cooperating partners. The Atomic Energy Act also requires that these agreements include, among other things, guarantees from the partners that they will maintain safeguards over nuclear materials and equipment transferred and adequate physical security for all nuclear material transferred. Nuclear cooperation can include exports of sensitive nuclear material, including special nuclear material such as Plutonium-239, Uranium-235, and

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Uranium-233, and source nuclear material such as natural uranium; nuclear reactors and their major components; and other activities related to the nuclear fuel cycle.<sup>5</sup> While these agreements provide the framework and authorization for civilian nuclear cooperation, they do not guarantee that cooperation will take place or that material or components will be transferred. Even after a nuclear cooperation agreement has entered into force, a U.S. company seeking to export special nuclear material, reactors, or reactor components must obtain a license from NRC to do so.

Several U.S. federal agencies develop, implement, and monitor nuclear cooperation agreements and nuclear trade:

- State is responsible for negotiating any proposed nuclear cooperation agreement, with the technical assistance and concurrence of DOE and in consultation with NRC officials. The nuclear cooperation agreement is accompanied by a summary of relevant classified information prepared for the President in consultation with the Director of National Intelligence. State takes the lead in working with country officials to develop the specific terms and conditions that are included.
- DOE has a statutory role in negotiating the agreements, and under Section 57b of the Atomic Energy Act is responsible for authorizing activities that may directly or indirectly assist in the production of special nuclear material outside of the United States. According to DOE documents, such activities include design information for technology and consulting

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<sup>5</sup>The nuclear fuel cycle uses uranium in different chemical and physical forms. This cycle typically includes the following stages: uranium mining, conversion, enrichment, deconversion, fuel fabrication, use of fuel in reactors, interim storage, recycling, and final disposal. Nuclear technology and assistance may be exported without a nuclear cooperation agreement. For example, U.S. companies can obtain what is known as a DOE “Part 810 authorization” to share technical information regarding the company’s product specifications and capabilities when bidding on new reactor tenders in foreign countries without a nuclear cooperation agreement in place. In addition, U.S. companies can obtain a license from the Nuclear Regulatory Commission to export certain small quantities of nuclear material and minor reactor components to foreign countries without a nuclear cooperation agreement in place. Also, dual-use items—items that can be used for both civilian and military applications—can be exported without a nuclear cooperation agreement.

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services related to the production of special nuclear material.<sup>6</sup> DOE has promulgated regulations implementing its authorization process at 10 C.F.R. Part 810, known as “Part 810 authorizations.” In addition, DOE, in coordination with NRC, maintains the NMMSS, a database that contains current and historic data on the possession, use, and shipment of nuclear materials, including data on U.S.-supplied nuclear material transactions with other countries and international organizations. DOE, NRC, and other federal agencies primarily rely on NMMSS to track nuclear material exports to foreign countries.

- NRC is responsible for issuing licenses for nuclear exports. The commodities under NRC export licensing authority include: nuclear reactors; major components, equipment, and minor reactor parts; and sensitive nuclear materials such as enriched uranium, plutonium, and depleted uranium. A specific license, which is a license that must be individually approved by NRC, is required for most transfers of special nuclear material, major reactor components, and some minor reactor components.<sup>7</sup> A general license, which is a license that is provided for by rule and which allows exports of certain material without an application to NRC, is required for small quantities of nuclear material and for minor reactor components that do not require a specific license.<sup>8</sup> A NRC license does not guarantee that an export will take place.

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<sup>6</sup>According to DOE officials, such items are those not covered by a NRC license. DOE’s responsibility derives from section 57b of the Atomic Energy Act, as amended, which prohibits U.S. persons from directly or indirectly engaging or participating in the development or the production of special nuclear material outside the United States, except as specifically authorized by a nuclear cooperation agreement or upon authorization by the Secretary of Energy after a determination that such activity will not be inimical to the interest of the United States.

<sup>7</sup>A specific license is issued to a named person and is effective upon approval of an application by NRC and issuance of licensing documents to the applicant. Major reactor components requiring a specific license include reactor pressure vessels, reactor control rod systems, and primary coolant pumps. Minor reactor components that may require a specific license include reactor pressure tubes, zirconium tubes, reactor internals, and reactor control rod drive mechanisms. A specific license is required for transfer of minor reactor components unless the export is to a country listed in the agency’s regulations as approved to receive minor components under a general license.

<sup>8</sup>A general license is effective without the filing of an application with NRC or the issuance of licensing documents to a particular person. Items approved for export under a general license may not be exported to countries that are embargoed, or, in certain cases, restricted. Minor reactor parts may only be exported under a general license to countries listed in NRC regulations. Exports of minor reactor parts to other countries not listed must be under a specific license.

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- Commerce works to maximize U.S. commercial competitiveness by increasing market access for U.S. businesses and promoting export growth and has a critical role in implementing the Administration's National Export Initiative. Within Commerce, the International Trade Administration (ITA) mission includes: (1) strengthening the competitiveness of U.S. industry, (2) promoting trade and investment, and (3) working to ensure fair trade and compliance with trade agreements. In particular, ITA's Office of Energy and Environmental Industries' primary mission is to facilitate global trade and to support the economic competitiveness of U.S. energy and environmental technologies firms. It provides economic and policy analysis to help U.S. energy companies compete in the global market and works with industry to ensure that its input is reflected in trade and domestic policy development, negotiations, and implementation. In addition, Commerce's Bureau of the Census compiles export statistics on nuclear material, nuclear reactors, major components, and equipment exported. The Bureau of the Census reports this information to U.N. Comtrade database. Finally, Commerce's Bureau of Industry and Security licenses the exports of dual-use items—items that can be used for both civilian and military applications, some of which are nuclear-related items.

The United States has recently signed a number of nuclear cooperation agreements, some of which have raised concerns. For example, the 2008 U.S.-India nuclear cooperation agreement raised concerns that the agreement would negatively impact the international nuclear nonproliferation regime under the Nuclear Nonproliferation Treaty (NPT).<sup>9</sup> The 2009 U.S.-UAE agreement raised concerns based on UAE's past lack of cooperation with international sanctions to prevent Iran from developing nuclear weapons and ballistic missiles. Notwithstanding those concerns, the UAE deal has also been cited as a model for future U.S. nuclear cooperation agreements, as it secured additional nonproliferation commitments from the UAE. In particular, the UAE agreement to forgo domestic enrichment of uranium or reprocessing of spent nuclear fuel without agreement of the parties has alleviated some proliferation

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<sup>9</sup>India has not signed or ratified the NPT, under which, among other things, parties undertake to pursue negotiations in good faith on effective measures relating to nuclear disarmament, and nonnuclear weapon state parties undertake not to manufacture or otherwise acquire nuclear weapons or seek or receive any assistance in the manufacture of nuclear weapons or other nuclear explosive devices, and to accept IAEA safeguards on all source or special fissionable material in all peaceful nuclear activities in their territories or under their jurisdiction or control so that IAEA can verify that its nuclear programs are not being used for nuclear weapons purposes.

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concerns.<sup>10</sup> In May 2010, the Administration resubmitted to Congress a peaceful nuclear cooperation agreement with Russia to, among other things, establish a legal framework for DOE to work with Russia on large-scale development of nuclear energy.<sup>11</sup> However, as we reported in June 2009 and September 2010,<sup>12</sup> when the agreement was first submitted to Congress by the Bush Administration on May 13, 2008, Russia's status as a nuclear weapons state, the size of its nuclear complex, and past proliferation concerns—including weaknesses in the Russian export control system—raised concerns.<sup>13</sup>

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<sup>10</sup>Uranium enrichment and reprocessing spent nuclear fuel are the nuclear activities of greatest proliferation concern. Uranium enrichment can produce low-enriched uranium for nuclear reactor fuel or highly enriched uranium, which can be used as fissile material in nuclear weapons. Reprocessing spent nuclear fuel separates plutonium from that fuel. Plutonium can also be used as fissile material in nuclear weapons.

<sup>11</sup>Pursuant to Section 123 of the Atomic Energy Act, the President submits the text of a proposed agreement to the Committee on Foreign Relations of the Senate and the Committee on Foreign Affairs of the House of Representatives for consultation for a period of 30 days of continuous session. The proposed agreement is then to be submitted to Congress (and referred to the above mentioned Committees) for a period of 60 days of continuous session, during which the committees consider it and report recommendations. An agreement that contains all the required elements may be brought into force after expiration of 90 days of continuous session, unless a joint resolution disapproving the agreement has been enacted during that period.

<sup>12</sup>See GAO, *U.S.-Russia Nuclear Agreement: Interagency Process Used to Develop the Classified Nuclear Proliferation Assessment Needs to Be Strengthened*, [GAO-09-743R](#) (Washington, D.C.: June 30, 2009) and GAO, *2010 Resubmission of the U.S.-Russia Nuclear Cooperation Agreement: Further Actions Needed by State and Other Agencies to Improve the Review of the Classified Nuclear Proliferation Assessment*, [GAO-10-1039R](#) (Washington, D.C.: Sept. 21, 2010).

<sup>13</sup>The Bush Administration withdrew the agreement from congressional review in September 2008 because of the conflict between Russian and Georgia that erupted in the prior month.

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**Although No Federal Agency Systematically Tracks Data to Assess Export Benefits of Agreements, Available Information Indicates U.S. Share of Global Nuclear Exports Has Decreased Significantly Over the Last 15 Years**

No single federal agency systematically tracks and reports the data necessary to determine the amount and value of U.S. nuclear exports facilitated by U.S. nuclear cooperation agreements. However, based on available information, we found that the United States' share of global exports of nuclear material, reactors, and components has declined in the last 15 years.

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**U.S. Agencies Do Not Systematically Track and Report Data Needed to Assess Export Benefits Facilitated by Nuclear Cooperation Agreements**

No single federal agency systematically tracks and reports the data necessary to determine the amount and value of U.S. nuclear exports facilitated by U.S. nuclear cooperation agreements. Existing data from Commerce, DOE, and NRC contain gaps and in some cases were not sufficiently detailed for our reporting purposes. Specifically:

- *Number of reactors, major components, equipment, and minor reactor parts.* No federal agency tracks the number of nuclear reactors and major components exported.<sup>14</sup> While a NRC export license authorizes the potential transfer of a nuclear reactor, major components, or equipment, NRC does not require an exporter to report the actual transfer or export of such commodities. In addition, according to NRC officials, a NRC-issued specific license may be valid for a decade or longer, and a company could export a number of major components under a single license, which complicates attempts to identify whether and when a company exported a particular component. Further, NRC does not have an electronic record-keeping system to track specific licenses for export of nuclear reactors, major components or equipment, or special nuclear material. NRC officials told us that they were working on a system to track licenses but that the

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<sup>14</sup>Civilian nuclear reactors are generally assembled at the site where they will be operating. Major components for the reactors are shipped separately. Therefore, the export of a "nuclear reactor" does not mean the export was of a fully assembled nuclear reactor, but instead likely indicates export of its major components.

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only authoritative records of specific licenses are the paper files at NRC. NRC officials told us they informally track licenses with a spreadsheet they estimated to be reliable to approximately the mid-1990s but could not guarantee that it was authoritative. Commerce collects data that report the volume of nuclear reactors, major components and equipment, and minor reactor parts, exported by weight; however, these data do not capture the number of nuclear reactors, major components and equipment, or minor reactor parts exported.

- *Type of major component, equipment, or minor reactor part.* Commerce data do not provide sufficient detail to determine the type of major component, equipment, or minor reactor part exported. While Commerce data capture the value of nuclear reactors and nuclear reactor parts exported, the data on nuclear parts do not differentiate between the components and equipment exported under a NRC specific license and the components and equipment exported under a NRC general license.
- *Value of nuclear material exports.* DOE-NRC's NMMSS data and Commerce data contain gaps regarding the trade value of nuclear material exports. In particular, while NMMSS captures the value of DOE's U.S. government-owned sensitive nuclear material exports, such as highly enriched uranium—which it maintains as classified information—NMMSS does not record data regarding the value of commercially exported material such as low-enriched uranium. NRC and DOE officials told us they do not track the estimated value of exports because this is the proprietary information of exporting companies. Furthermore, DOE has not configured NMMSS to include the World Customs Organization international standard for classification of traded goods, the Harmonized Commodity Description and Coding System. This system, used by Commerce to classify traded goods, including nuclear material, reactors, and components, could assist in determining which NMMSS records on the specific shipments of U.S. special nuclear material exports and NRC-specific licenses correspond to Commerce's value data. In addition, Commerce's data do not record the specific enrichment level of enriched uranium. In particular, Commerce's data do not specify the varying degree of enrichment of low-enriched uranium, which could range from 1 percent of the isotope U-235 to 20 percent of the isotope U-235 in a particular batch of enriched uranium and could have widely varying values. Therefore, we were unable to determine the value of exports of U.S. enriched uranium to other countries from 1994 through 2008 using DOE, NRC, and Commerce data.
- *Volume or value of U.S. nuclear services exported.* We found there are no available data regarding exports of services, which according to



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Commerce officials is an increasingly important and growing market segment for the U.S. nuclear industry.<sup>15</sup>

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### The U.S. Share of Global Exports of Sensitive Nuclear Material and Reactors, Major Components, and Minor Parts Has Declined in the Last 15 Years

Based on available data, while the value of U.S. exports of sensitive nuclear material has remained stable from 1994 through 2008, the U.S. share of global exports of sensitive nuclear material declined significantly over the same period. Furthermore, while the value of U.S. exports of nuclear reactors, major components, and minor parts increased, the U.S. share of global exports declined slightly over this same period.

### U.S. Share of Global Exports of Sensitive Nuclear Material Declined Significantly Over the Last 15 Years

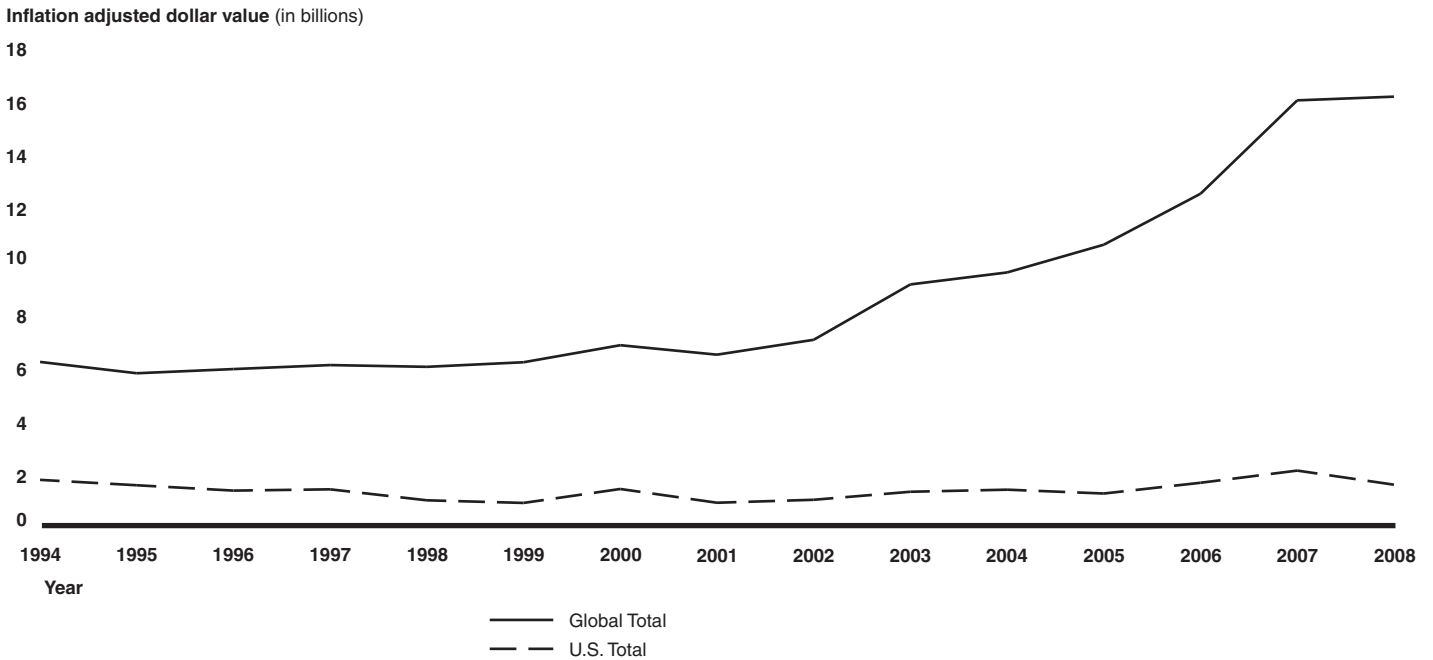
Based on U.N. Comtrade data,<sup>16</sup> we found the value of U.S. exports of sensitive nuclear material such as natural uranium, enriched uranium, and plutonium remained stable, while the U.S. share of global exports for these materials decreased significantly from 1994 through 2008. Specifically, according to U.N. Comtrade data, U.S. exports of natural uranium, enriched uranium, and plutonium were approximately \$1.8 billion in 1994 and \$1.6 billion in 2008, in 2010 U.S. dollars. However, over this same period, annual global exports of such material more than doubled from \$6.2 billion in 1994 to \$16.1 billion in 2008, as indicated in figure 2. Effectively, over this 15-year period, the U.S. share of the annual global export market decreased significantly from approximately 29 percent to 10 percent, or from one-third to one-tenth of the market. Global exports of sensitive nuclear material remained relatively unchanged until approximately 2002, when global exports increased rapidly from \$7 billion in 2002, to \$9.5 billion in 2004, and to \$12.5 billion in 2006.

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<sup>15</sup>Commerce did not provide documents to support its assertion regarding the growth in the U.S. nuclear services market.

<sup>16</sup>In part because of the data limitations we identified earlier in this report, we used U.N. Comtrade data to estimate U.S. exports by totaling other countries' reported imports from the United States. Economists generally agree that import data are generally more accurate than export data, due to countries' interest in tracking imports for tariffs and other fees. For example, in 2002 the U.S. Commerce Foreign Trade Division reported that, because of the volume of trade with Canada, the United States derives its statistics on exports to Canada from import data reported by Canada.

**Figure 2: Comparison of Value of U.S. and Global Exports of Natural Uranium, Enriched Uranium, and Plutonium, 1994 through 2008, in 2010 U.S. Dollars**



Source: GAO analysis of U.N. Comtrade data.

U.N. Comtrade data also indicate that from 1994 through 2008, the United States exported approximately \$20.7 billion, in 2010 U.S. dollars, in natural uranium, enriched uranium, and plutonium to countries with which the United States has a nuclear cooperation agreement. As indicated in table 1, Japan was the United States' largest foreign customer for sensitive nuclear material, and accounted for an estimated \$12.9 billion, approximately 63 percent, of U.S. sensitive nuclear material exports.

**U.S. Share of Global Exports of Nuclear Reactors, Major Components and Equipment, and Minor Reactor Parts Decreased Over Last 15 Years**

**Table 1: Top Foreign Customers for U.S. Exported Natural Uranium, Enriched Uranium, and Plutonium from 1994 through 2008, in 2010 U.S. Dollars**

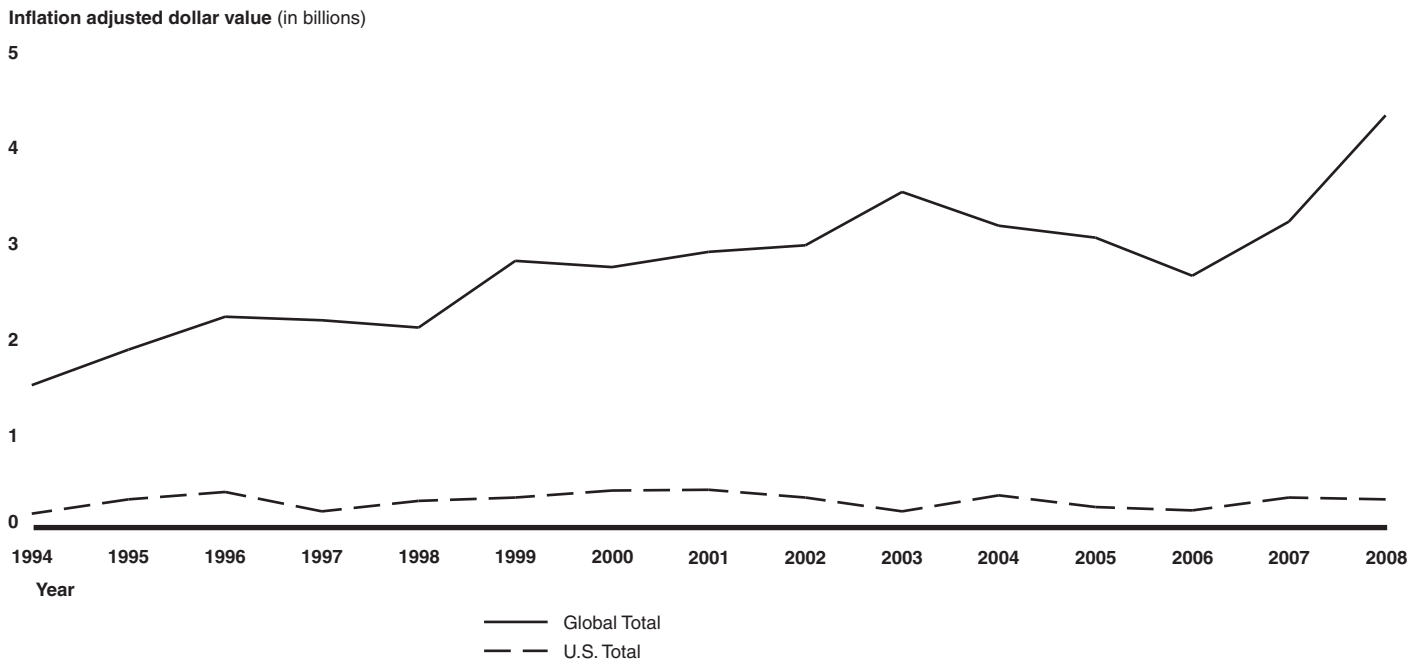
Billions of dollars		
Country	Total	Percentage
Japan	\$12.9	63%
Netherlands	2.1	10
France	1.2	6
South Korea	1.2	6
Germany	1.0	5
Subtotal	18.5	90
Other <sup>a</sup>	2.1	10
<b>Total</b>	<b>\$20.7</b>	<b>100%</b>

Source: GAO analysis of U.N. Comtrade data.

<sup>a</sup>Note: According to U.N. Comtrade, the other countries that the United States exported nuclear material including natural uranium, enriched uranium, and plutonium to include Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Canada, China, Colombia, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Finland, Greece, Hungary, Indonesia, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Luxembourg, Malta, Mexico, Morocco, Norway, Peru, Poland, Portugal, Republic of South Africa, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, and the United Kingdom.

Based on U.N. Comtrade data, we found that although the value of U.S. exports of nuclear reactors, major components and equipment, and minor reactor parts increased during the period from 1994 through 2008, the U.S. share of global exports of such goods has decreased. Specifically, according to U.N. Comtrade data, the value of U.S. exports of nuclear reactors, major components and equipment, and minor reactor parts increased from approximately \$160 million in 1994 to \$308 million in 2008, while annual global exports of these commodities nearly tripled from \$1.5 billion in 1994 to \$4.3 billion in 2008, in 2010 U.S. dollars, as indicated in figure 3. Because U.S. exports did not increase at the same rate as global trade, the United States' share of the global export market for these goods effectively declined from approximately 11 percent to 7 percent. Over time, global exports of nuclear goods have increased steadily, experiencing a slight dip in 2006 to \$2.6 billion, but recovering by 2008 to \$4.3 billion.

**Figure 3: Comparison of Value of U.S. and Global Exports of Nuclear Reactors, Major Components and Equipment, and Minor Reactor Parts, 1994 through 2008, in 2010 U.S. Dollars**



Source: GAO analysis of U.N. Comtrade data.

We found the United States exported approximately \$4.4 billion, in 2010 U.S. dollars, of nuclear reactors, major components and equipment, and minor reactor parts to countries with which it had a nuclear cooperation agreement. According to our analysis, the United States' top customers for nuclear reactors, major components and equipment, and minor reactor parts were Japan, South Korea, Mexico, Spain, and the Czech Republic. As shown in table 2, these five countries accounted for \$3.1 billion, or approximately 70 percent in 2010 U.S. dollars, of all of U.S. exports of nuclear reactors, major components and equipment, and minor parts.

**Table 2: Top Foreign Customers for U.S. Exported Nuclear Reactors, Major Components and Equipment, and Minor Reactor Parts from 1994 through 2008, in 2010 U.S. Dollars**

<b>Millions of dollars</b>		
<b>Country</b>	<b>Total</b>	<b>Percentage</b>
Japan	\$920	21%
South Korea	683	16
Mexico	532	12
Spain	492	11
Czech Republic	434	10
Subtotal	3,062	70
Other <sup>a</sup>	1,324	30
<b>Total</b>	<b>\$4,386</b>	<b>100%</b>

Source: GAO analysis of U.N. Comtrade data.

<sup>a</sup>Note: According to U.N. Comtrade, the other countries that the United States exported nuclear reactors, major components and equipment, and minor reactor parts to include Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Canada, China, Colombia, Cyprus, Denmark, Egypt, Finland, France, Germany, Indonesia, Ireland, Italy, Kazakhstan, Morocco, Netherlands, Norway, Peru, Poland, Republic of South Africa, Romania, Slovakia, Slovenia, Sweden, Switzerland, Thailand, Turkey, Ukraine, and United Kingdom.

In addition, our review of NRC records of specific licenses indicates that U.S. companies did not participate in the majority of new reactor construction projects overseas during this period, consistent with the declining share of the United States in global nuclear trade. Specifically, NRC issued eight licenses authorizing the export of nuclear reactors and major components from 1994 through 2008: three licenses for projects in South Korea, three for projects in China, one for Colombia, and one for Thailand. In addition, six licenses issued before 1994 were extended for use as of July 2010 for projects in Brazil, Slovenia, South Korea, and Taiwan. For purposes of comparison with the global market, according to

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World Nuclear Association data, 61 civilian nuclear power reactors in 14 foreign countries began operating from 1994 through 2008.<sup>17</sup>

Finally, the United States imports sensitive nuclear material, nuclear reactors, major components and equipment, and minor reactor parts from other countries. U.N. Comtrade data indicate that the United States imported \$39.2 billion in natural uranium, enriched uranium, and plutonium, in 2010 U.S. dollars, from 1994 through 2008. The United States imported the greatest amount of these materials from Russia, at a cost of approximately \$11.3 billion. During this period, the United States also imported approximately \$1.2 billion in nuclear reactors, major components and equipment, and minor reactor parts from other countries. The United States imported the greatest amount of these nuclear reactors, components, and equipment from Sweden, at a cost of approximately \$362.7 million. In sum, the United States was a net importer of nuclear components and materials, which may indicate a lack of comparative advantage in this industry.

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<sup>17</sup>According to Commerce officials, 8 of these 61 reactors went into operation in India, and construction for these reactors was started before the U.S.-India nuclear cooperation agreement. An additional 11 reactors were constructed in China, some of which began construction before the U.S.-China nuclear cooperation agreement was registered in 2004; and since that time Westinghouse, a U.S.-based nuclear company, has had success there. In addition, 18 reactors came into operation from markets that are de facto closed to U.S. company participation because of the presence of a state-owned competitor: namely, in France, Russia, and South Korea. Finally, an additional 11 came online in Japan, at least 2 of which, according to Commerce officials, were designed by a consortium, which included a U.S. reactor vendor.

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## Commerce Has an Initiative to Coordinate Interagency Efforts, but Has Made Limited Progress and Does Not Have a Well-Defined Strategy to Promote the U.S. Nuclear Industry Globally

DOE, NRC, and State officials told us they rely on Commerce to develop and lead U.S. nuclear industry export promotion activities because Commerce's mission includes providing trade support to U.S. businesses and trade promotion. Commerce launched the Civil Nuclear Trade Initiative in 2008 to help promote the competitiveness of the U.S. nuclear industry; however, this initiative has made limited progress. According to Commerce officials, the initiative aims to identify the U.S. civil nuclear industry's most pressing trade policy challenges and most promising commercial opportunities and coordinate public and private sector efforts to address them in a way that supports the industry's endeavors to rebuild its manufacturing base.

Specifically, the initiative, as outlined in Commerce's export promotion strategy document, consists of the following four major activities:

- *Interagency nuclear trade coordination committee.* In 2008, under the Trade Promotion Coordinating Committee (TPCC), Commerce formed the TPCC Civil Nuclear Trade Working Group, an interagency nuclear industry subcommittee, to coordinate interagency efforts related to commercial nuclear trade. Membership is drawn from Commerce, State, DOE, among other agencies. Commerce officials told us that the TPCC Civil Nuclear Trade Working Group meets about four times a year, when there are pertinent issues to discuss. Commerce, DOE, NRC, and State officials told us that the meetings are a useful forum to promote interagency dialogue and inform agency officials of ongoing efforts to assist the U.S. nuclear industry. As of June 2010, Commerce officials told us the TPCC Civil Nuclear Trade Working Group had received briefings from three companies that construct civilian nuclear power reactors and reactor components. However, Commerce officials said five other smaller companies who supply nuclear materials and services had expressed an interest in briefing the TPCC Civil Nuclear Trade Working Group, but had not yet had an opportunity to do so. In July 2010, Commerce decided to hold monthly meetings of the TPCC Civil Nuclear Trade Working Group to increase the interaction between U.S. industry and the interagency community.
- *Nuclear trade industry advisory committee.* Commerce established the Civil Nuclear Trade Advisory Committee (CINTAC) to obtain industry advice on enhancing U.S. nuclear industry competitiveness. Members are drawn from the U.S. nuclear industry. Established in October 2008, Commerce officials told us CINTAC did not meet for more than 16 months because of delays associated with the change in U.S. administrations, and associated delays in administrative guidance on selecting and confirming members. According to Commerce officials, as of August 2010, CINTAC

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had held three formal meetings and formed five subcommittees. Some of the issues raised by the committee include (1) strengthening the U.S. commercial nuclear manufacturing industry through tax credits, loan guarantees, and other incentives; (2) streamlining U.S. export controls; and (3) pursuing the Convention on Supplementary Compensation for Nuclear Damage.<sup>18</sup> CINTAC's charter expired in September 2010, requiring a new charter and appointment of new members. A June 2, 2010, letter from the Chairman of CINTAC to the Secretary of Commerce stated that CINTAC's subcommittees intended to make recommendations before the end of its charter, but requested that the charter be renewed to give the group sufficient time to add to the recommendations it is developing on behalf of the U.S. nuclear industry. CINTAC made the following two recommendations to the Secretary of Commerce: (1) that Commerce request the Office of the United States Trade Representative (USTR) conduct an accelerated assessment of what the committee called uncompetitive trade practices in the global commercial nuclear industry and (2) that Commerce work with USTR to issue an interim report within 6 months focused on the global civilian nuclear industry. A USTR official told us that the agency had reviewed CINTAC's letter to the Secretary of Commerce and was discussing with Commerce officials and CINTAC committee members how best to address the needs of the industry group. In addition, on September 16, 2010, CINTAC made its final recommendations to the Secretary of Commerce. CINTAC recommended, among other things, (1) creating a team of U.S. industry representatives, government officials, and other experts to focus on supporting nuclear opportunities domestically and internationally, and leveling the international playing field; and (2) establishing a policy in coordination with DOE, State, and USTR to encourage international companies that are owned, controlled, or subsidized by their national governments to eliminate unfair competitive structures or financing.

- *Stakeholder resources.* The initiative's stakeholder resources consist of a May 2009 online Civil Nuclear Exporters Guide that presents information generally publicly available on the Internet, including overviews of U.S. export licensing procedures and contact information for key U.S. agency export control offices. Commerce officials told us they were in the process of updating the guide. Commerce has also participated in export control

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<sup>18</sup>The United States has ratified the Convention on Supplementary Compensation for Nuclear Damage of 12 September 1997 (CSC). At the time of our review, the CSC had not entered into force because it had not yet met the threshold of participation with ratification by at least five countries with a combined capacity of at least 400,000 units of installed nuclear capacity.



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seminars and presented briefings to U.S. companies. Future plans include: (1) developing criteria for prioritizing best prospect markets for U.S. nuclear industry, (2) developing in-depth export control workshops for U.S. industry, (3) improving the quality of data from current collection efforts, and (4) providing a more thorough analysis of existing data on the economic benefits accrued from U.S. civilian nuclear exports.

- *Trade promotion.* Commerce officials said trade promotion activities have consisted of organizing trade missions, participating in trade policy discussions, organizing industry outreach events, and developing a joint trade promotion declaration to promote the development of civilian nuclear programs worldwide. Commerce officials told us they had organized one trade mission on behalf of the U.S. nuclear industry to Eastern Europe—a July 2010 trip to the Czech Republic, Poland, and Slovakia—and two U.S. nuclear trade promotion missions to IAEA. Commerce officials said they have also certified, supported, and participated in U.S. Chamber of Commerce- and non-U.S. government-organized trade missions. Commerce officials told us they are planning future trade missions to target additional countries, and that they will host a U.S. nuclear industry promotion event at the 2010 IAEA General Conference.<sup>19</sup> Commerce also participated in nuclear trade policy discussions with delegations visiting the United States from Japan, Lithuania, Mongolia, Poland, and Thailand. In addition, Commerce officials have organized two industry outreach events to increase engagement between U.S. government officials and industry representatives. According to Commerce, approximately 150 to 200 industry representatives attended these outreach events. Furthermore, Commerce and DOE have jointly developed and signed joint trade promotion declarations with Italy and Poland that encourage nuclear industry entities to seek opportunities to participate in the construction of nuclear power plants and the provision of related supporting infrastructure and services. The declarations include commitments by the partner countries that they will develop transparent procedures for awarding contracts within their nuclear energy industries and in a way that does not unduly favor companies from countries that may, according to Commerce officials, directly subsidize their nuclear industry.

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<sup>19</sup>IAEA's General Conference meets annually, typically in September, to consider and approve the agency's program and budget and to decide on other matters brought before it by the Board of Governors, the Director General, or member states. The IAEA's 53rd General Conference in 2009 included over 1,400 delegates from IAEA member states.

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We found that the Commerce initiative's strategy document has some limitations. We have reported in the past that it is important to align strategic goals with strategies for achieving those goals.<sup>20</sup> Specifically, we have noted that defining the mission and desired outcomes, measuring performance, and using performance information to identify performance gaps, are critical if agencies are to be accountable for achieving intended results.<sup>21</sup> However, the initiative's strategy document does not contain any of these steps or measures. Specifically, the strategy document has not identified or established key market opportunities and goals, does not have an implementation plan, and does not include metrics, benchmarks, or timelines to measure progress in meeting specific goals.<sup>22</sup> For example, although the strategy document includes future plans for each of the four major activities, these plans are vaguely outlined and do not set target dates for their completion. Furthermore, the strategy document does not identify or prioritize countries as targets for U.S. promotion efforts. Commerce officials acknowledged that, while they believe the initiative is aligned with Commerce and ITA goals, they were working to more clearly state timelines, desired outcomes, milestones, and success metrics for each initiative activity. Commerce officials also told us that one staff member is engaged in a market prioritization study, which has a planned issuance date of late 2010.

Commerce officials told us the initiative is being undertaken with limited resources and without dedicated funding. Specifically, at present, the initiative is being organized and run by one staff member working at 80 percent time and 2 staff members working at 75 percent and 50 percent, respectively. Commerce officials reported that the initiative is supported mainly through the budget of ITA's Office of Energy and Environmental Industries and other offices when funds are available.

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<sup>20</sup>See GAO, *Managing for Results: Critical Issues for Improving Federal Agencies' Strategic Plans*, [GAO/GGD-97-180](#) (Washington, D.C.: Sept. 16, 1997).

<sup>21</sup>See GAO, *Executive Guide: Effectively Implementing the Government Performance and Results Act*, [GAO/GGD-96-118](#), (Washington, D.C.: June 1996).

<sup>22</sup>GAO has reported that developing mechanisms to monitor, evaluate, and report on the results of an effort, and using strategic and annual performance plans to establish goals and strategies to reinforce agency accountability can enhance and sustain collaborative efforts by agencies. See GAO, *Results-Oriented Government: Practices that Can Enhance and Help Sustain Collaboration Among Agencies*, [GAO-06-15](#), (Washington, D.C.: Oct. 21, 2005).

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## Industry Representatives and U.S. and Foreign Government Officials Reported That the U.S. Nuclear Industry Faces Many Challenges Competing Globally

Officials from Commerce, State, and DOE, and foreign governments, as well as U.S. nuclear industry representatives told us there are multiple challenges for U.S. companies competing globally for nuclear trade. First, officials and industry representatives told us that the U.S. nuclear industry may not be well-positioned to secure the trade benefits facilitated by nuclear cooperation agreements and U.S. companies face increased international competition from foreign state-owned suppliers, which are heavily subsidized and supported by their governments. Second, officials and industry representatives told us that in their view U.S. industry is at a competitive disadvantage due to the lack of a global liability regime. In addition, U.S. agency and industry representatives and foreign government officials we interviewed identified challenges that U.S. companies face that, in their view, impede the U.S. nuclear industry's ability to compete globally.

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## U.S. Nuclear Industry May Not Be Well-Positioned to Secure Trade Benefits and U.S. Companies Face Competition from State-Owned Nuclear Firms

Officials from Commerce, State, and DOE, as well as U.S. industry told us they are concerned that the U.S. nuclear industry may not be well-positioned to secure the trade benefits facilitated by nuclear cooperation agreements due to a decline in domestic manufacturing capabilities, increased international competition, and U.S. industry's liability concerns. In January 2010, Commerce's ITA reported that the U.S. nuclear industry has atrophied, and according to U.S. government officials and nuclear industry representatives, may lack the capability to manufacture certain components and equipment needed to produce large civilian power reactors.<sup>23</sup> Further, a State Department official testified in May 2010 that it would be difficult for the United States to build its own nuclear reactor without importing a number of significant components. As we noted on page 17 of this report, the United States is a net importer of nuclear components and materials. While Commerce officials acknowledged that U.S. nuclear manufacturing capability has eroded, they said that the domestic supply chain is showing signs of revitalization. In particular, Commerce officials noted that while the number of facilities certified by the American Society of Mechanical Engineers (ASME) to produce commercial nuclear-grade components had fallen from 440 in the 1980s to 120 by the early 2000s, the number of facilities had increased to 255 as of mid-2008, which they took as evidence of potential recovery.

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<sup>23</sup>U.S. Department of Commerce, *2010 Energy Industry Assessment* (Washington, D.C., January 2010). However, the Commerce report noted that U.S. companies have participated in the world market, often as a minority partner, and invested in research and development for the next generation of reactors.

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Moreover, government and industry officials told us that the nature of the civilian nuclear power market has changed dramatically. According to the Nuclear Energy Institute (NEI), the main nuclear industry advocacy organization, U.S. reactor designs and U.S. reactor manufacturers and fuel suppliers had the dominant market share for several decades.<sup>24</sup> However, beginning in the 1970s, and steadily increasing since then, vendors of nuclear reactors in Europe and Asia developed their own reactor designs and capacity to manufacture components and fuel. By the 1980s, buyers of power reactors could choose among reactor suppliers from many countries, including Canada, France, Japan, and Russia. Russian officials told us its Ministry of Foreign Affairs is aggressively seeking to sign as many nuclear cooperation agreements as possible with an eye to expanding into new markets.

Commerce noted that U.S. firms face formidable competition abroad from foreign companies that receive strong financial and political support through direct government ownership or subsidies. In addition, foreign governments may place greater emphasis on supporting bids through high-level advocacy or by providing customers additional services and expertise. For example, according to media reports, the President of France and President of South Korea recently traveled to UAE to advocate for their country's respective bids to build new reactors in the UAE. In addition, French officials told us that their government's philosophy on nuclear cooperation includes providing a package of regulatory, financial, and technical assistance to partner countries developing their civilian nuclear power program.

Commerce officials told us that some of the largest markets for nuclear goods and services, such as France, Russia, and South Korea, have significant barriers to entry for U.S. companies because of the presence of a state-owned competitor. According to Commerce, of the 61 civilian nuclear reactors outside the United States that began operating from 1994 through 2008, 18 reactors—almost 30 percent—went into operation in France, Russia, and South Korea—countries with their own state-owned nuclear companies.

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<sup>24</sup>NEI is responsible for establishing unified nuclear industry policy on all matters affecting the U.S. nuclear industry.

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## U.S. Companies Challenged By Lack of Global Liability Regime

U.S. government officials and industry representatives have reported that the lack of a comprehensive global liability regime hampers U.S. industry's ability to secure civilian nuclear contracts and places U.S. firms at a competitive disadvantage. Currently, there are two conventions applicable to liability for nuclear accidents; the United States is not a party to either one.<sup>25</sup> Participation in the conventions by other countries is also relatively limited. A third convention, CSC, has been developed to supplement the other two and, according to IAEA's International Expert Group on Nuclear Liability, it serves as an umbrella agreement to create a single global liability regime. The United States has ratified this convention, but it has not yet come into force. U.S. industry representatives told us that without a global liability regime in force that channels liability for accidents at a nuclear facility to the operator of that facility, they fear that they may be held liable as suppliers. By contrast, a U.S. industry representative told us that foreign companies that are state-owned may not face the same problem because they may be indemnified by their government. Furthermore, in the absence of a global liability regime, U.S. industry representatives told us that they cannot obtain insurance sufficient to cover their potential liabilities resulting from a potential nuclear reactor accident overseas. Industry representatives told us that if they export to a nation without strong domestic or international liability laws that channel responsibility to the operator of the civilian nuclear facility, their company could be sued into bankruptcy as a supplier. Representatives from several U.S. companies told us they do not export to countries without liability protection.

Commerce officials said that the U.S. nuclear industry faces significant challenges in competing to win contracts for new civilian nuclear power reactors outside the United States because of fierce competition from foreign companies that may receive stronger financial and political support from their governments, which creates an uneven playing field. One major U.S. nuclear industry company told us the French and South Korean nuclear industries benefit from high-level support in their foreign marketing activities, which can only give them an advantage compared to

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<sup>25</sup>These conventions are the Vienna Convention on Civil Liability for Nuclear Damage (Vienna Convention) and the Paris Convention on Third Party Liability in the Field of Nuclear Energy (Paris Convention). The Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention of 21 September 1988 links these two conventions. According to State officials, the United States cannot become party to these other conventions because the U.S. nuclear liability regime does not require channeling of legal liability for nuclear damage to the facility operator, as these conventions require.

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U.S. companies. Many of the U.S. company representatives we spoke with, as well as representatives from the NEI, told us that unless the U.S. government develops a governmentwide strategy and greater commitment to its nuclear industry, the United States' ability to secure export benefits from nuclear cooperation agreements in the form of reactor and large component and equipment sales is uncertain. In addition, a representative from a major U.S. nuclear industry company told us that the company's future innovation depends on its ability to participate in the current global marketplace. The U.S. nuclear industry will not be able to sustain research and development programs of any size without participating fully in the global nuclear renaissance, according to this company.

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### Some U.S. Policies and Practices Are Viewed by Industry Officials and Foreign Governments as Impediments to U.S. Nuclear Exports

U.S. industry representatives and foreign government officials we interviewed identified certain U.S. government policies and practices that, in their view, impede the U.S. nuclear industry's ability to compete globally for nuclear trade. In particular, industry representatives told us that DOE's regulations governing the Part 810 authorization process place U.S. companies at a competitive disadvantage.<sup>26</sup> In May 2010, a representative from NEI stated that the current Part 810 rules have the unintended effect of standing in the way of cooperative programs and information exchange.<sup>27</sup> U.S. nuclear industry representatives told us that DOE's regulations governing DOE's process to authorize U.S. company representatives to engage in the production of special nuclear material outside the United States and implement its Atomic Energy Act responsibilities lack clarity and are outdated. In particular, these representatives told us that DOE's Part 810 authorization regulations are vaguely defined and that DOE interprets its authority to include transfers

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<sup>26</sup>DOE is responsible for authorizing activities that may directly or indirectly assist in the production of special nuclear material outside of the United States. According to DOE documents, such activities include design information for technology and consulting services related to the production of special nuclear material.

<sup>27</sup>Hearing on the Future of U.S.-International Nuclear Cooperation, House Committee on Foreign Affairs, Subcommittee on Terrorism, Nonproliferation, and Trade, May 6, 2010.

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of technology and technical assistance too broadly.<sup>28</sup> DOE has not published any guidelines to clarify the 810 authorization process for civilian nuclear exporters; however, DOE officials said they regularly hold meetings and give presentations at agency and industry events to explain Part 810 regulations. A DOE document states that the agency makes a broad and comprehensive interpretation of the regulation to include the provision of technology in the form of assistance or services to any nuclear power program outside the United States.<sup>29</sup> In addition, Part 810 regulations require a specific authorization to engage directly or indirectly in the production of special nuclear material in 77 countries listed in 10 C.F.R. § 810.8; however, DOE officials acknowledged that the list was out of date. For example, countries with which the United States currently has nuclear cooperation agreements—such as Kazakhstan, Ukraine, and the UAE—are still listed.

Officials from several U.S. companies told us that nuclear firms in other countries do not face this additional step to authorize the transferring of technology and technical information. DOE officials said that the Part 810 authorization regulations are outdated and cumbersome and that they were working on revising the regulations to make them more clear and efficient, but could not estimate when revised regulations would be completed.

Finally, in one instance, U.S. government practices had the unintended consequence of negatively affecting another country's decision to work with U.S. companies. A senior foreign country official told us that the U.S.

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<sup>28</sup>According to 10 C.F.R. Part 810, DOE requires a "specific" Part 810 authorization to provide sensitive nuclear technology for an activity in any foreign country, or to engage in or provide assistance or training in, among other things, designing, constructing, fabricating, operating, or maintaining facilities for the enrichment or reprocessing of sensitive nuclear material, the production of heavy water, and production reactors. DOE in Section 810.3 defines a production reactor as a nuclear reactor specially designed or used primarily for the production of plutonium or uranium-233. Furthermore, U.S. law places additional requirements on transfers to India pursuant to the Henry J. Hyde United States-India Peaceful Atomic Energy Cooperation Act.

<sup>29</sup>DOE considers technology to cover technical assistance and technical data for the purposes of 810 authorizations. Technical assistance may take forms such as instruction, skills, training, working knowledge, consulting services, or any other assistance as determined by the Secretary of Energy. Technical assistance may involve transfer of technical data. Technical data may take forms such as blueprints; plans; diagrams; models; formulae; engineering designs, specifications, manuals, and instructions written or recorded on other media or devices such as, disk, tape, read-only memories, and computational methodologies, algorithms, and computer codes.

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government's inability to work cooperatively had influenced that country's decision to purchase civilian nuclear power reactor fuel from a non-U.S. supplier. The senior official expressed frustration that the United States did not treat the country more as a business partner. A June 2010 unclassified State communication summarizing our interview noted that the senior foreign country official stated that because buying fuel from the United States was not very "client friendly," the partner country's nuclear power plants chose U.S. competitors to supply their fuel.

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## Conclusions

NRC, DOE, and Commerce are making efforts to collect some information regarding nuclear exports. However, agencies' efforts are piecemeal, and no federal agency collects or tracks information on exports to fully assess the amount and value of exports facilitated by U.S. nuclear cooperation agreements. We believe that the lack of an integrated governmentwide approach that links the potential growth of such agreements and the growing worldwide nuclear market to a well-defined strategy to support and promote U.S. nuclear exports is negatively affecting U.S. nuclear industry's ability to compete globally. Given that hundreds of new civilian nuclear power reactors are expected to be constructed in foreign countries in the coming decades, the lack of a reliable U.S. government assessment of the U.S. nuclear industry's exports and competitive position may impede the ability of the industry to make a meaningful contribution to the President's goal of doubling national exports in 5 years. Moreover, the absence of a comprehensive strategy to support the U.S. nuclear industry may result in the relevant agencies, in particular Commerce, not being equipped to provide targeted and informed support to U.S. industry to help it compete for sales of civilian nuclear power reactors overseas. While a comprehensive strategy is not a panacea to improve the competitiveness of the declining U.S. nuclear industry—ultimately U.S. industry must provide quality products and services at a competitive price—such a strategy, as well as improved industry data collection, could be an important step in helping promote our nuclear industry.

Further, Commerce's 2-year effort to develop an export promotion strategy document has produced limited results. While the outline of such a strategy appears to be envisioned by Commerce in its Civil Nuclear Trade Initiative, the initiative has yet to identify key market opportunities for U.S. industry, establish goals, and develop an implementation plan with timelines and metrics to measure progress toward these goals. The absence of such information in its strategy means that Commerce and other agencies may not be devoting their resources to the markets and activities that show the greatest promise for U.S. companies. Furthermore,



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while the formation of the TPCC Civil Nuclear Trade Working Group as part of the initiative is a positive step, we are concerned that the group has heard from only three U.S. nuclear exporting firms and not from smaller firms that supply nuclear materials and services.

There may be opportunities to provide more immediate support to assist the U.S. nuclear industry's efforts to become more competitive globally. Representatives from U.S. nuclear companies stated that they face an outdated and unclear DOE Part 810 authorization process that impedes their ability to quickly provide potential customers with the types of technology, information, and technical assistance needed to compete for potential sales. Industry officials also said that they lack guidance in interpreting the DOE Part 810 process, which causes confusion in the Part 810 application process. Furthermore, the lack of an updated 810.8 list of countries may create an unnecessary hurdle for a U.S. company in obtaining permission to provide potential customers with the types of technology and design information that they may require in selecting a vendor for a new civilian reactor.

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## Recommendations for Executive Action

To help federal agencies gain a better understanding of how—and the extent to which—nuclear cooperation agreements impact exports to other countries, we recommend that the Secretary of Commerce, working with the Secretaries of Energy and State and the Chairman of the Nuclear Regulatory Commission, take the following three actions:

- identify what additional nuclear export data and information may be necessary to better quantify the export benefits associated with these agreements;
- review, with an eye toward strengthening, Commerce's existing nuclear export promotion strategy document to, among other things, identify key market opportunities for U.S. nuclear industry, and develop key goals and an implementation plan for achieving these goals; and
- consider ways for the TPCC Civil Nuclear Trade Working Group to obtain a more comprehensive range of U.S. industry views.

We are also making one recommendation to the Secretary of Energy. Specifically, we recommend that, while considering the broader revisions to the Part 810 regulations as planned, the Secretary of Energy

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- review the current Part 810 authorization process; develop guidelines to help clarify the types of technology, information, and technical assistance that require a Part 810 authorization; and consider whether some countries should be removed from the Part 810.8 list to facilitate U.S. exports to countries with which the United States has a nuclear cooperation agreement in force.

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## Agency Comments and Our Evaluation

We provided a draft of this report to the Secretaries of Commerce, Energy, State, and the Chairman of the NRC for comment. Commerce and DOE provided written comments on the draft report, which are presented along with our responses in appendixes III and IV, respectively. State provided technical comments, which we incorporated as appropriate. NRC reviewed our draft but did not provide comments.

Commerce agreed with two of our three recommendations. Specifically, Commerce agreed with our recommendations to (1) identify what additional export data may be necessary to better quantify exports, and (2) review Commerce's existing export strategy document to identify key market opportunities for U.S. nuclear industry, and develop key goals and an implementation plan for achieving these goals. Commerce disagreed with our recommendation that it consider ways for the TPCC Civil Nuclear Trade Working Group to obtain a more comprehensive range of U.S. industry views. In addition, Commerce disagreed with our finding that its Civil Nuclear Trade Initiative has made limited progress and stated that its Initiative has a well-defined strategy.

In our view, our recommendation to consider ways for the TPCC Civil Nuclear Trade Working Group to obtain a more comprehensive range of U.S. industry views has a sound basis. As our report notes, only three companies have briefed the TPCC Civil Nuclear Trade Working Group, and five other companies have requested the opportunity to do so. In its comments Commerce provided new information not provided during our review, which among other things, stated that CINTAC—a nuclear industry advisory group formed to obtain industry advice on enhancing U.S. nuclear industry competitiveness—had briefed the TPCC Civil Nuclear Trade Working Group multiple times. We believe interaction between the TPCC Civil Nuclear Trade Working Group and the CINTAC industry advisory group is a positive development. However, as our report notes, the CINTAC industry advisory group's charter expired in September 2010, requiring a new charter and appointment of new members. Commerce's comments did not indicate that CINTAC's charter has been

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renewed, which casts doubt on the ability of CINTAC to keep the TPCC Civil Nuclear Trade Working Group apprised of market developments. In addition, in its comments, Commerce stated that it organized regular briefings and meetings, which Commerce described as informal, for industry and U.S. government trade officials to discuss, among other things, Jordanian, Indian, British, and Brazilian nuclear market overviews; the Convention on Supplementary Compensation; and small modular reactors. Because Commerce describes these briefings as informal, we believe they do not represent the kind of sustained, regular interaction to coordinate interagency efforts related to civil nuclear trade that the TPCC Civil Nuclear Trade Working Group was designed to provide. We are making this recommendation because Commerce needs to strengthen interagency coordination efforts to promote nuclear trade. Moreover, as our report notes, many of these U.S. company representatives we spoke with, as well as representatives from the Nuclear Energy Institute, told us that unless the U.S. government develops a governmentwide strategy and greater commitment to its nuclear industry, the United States' ability to secure export benefits from nuclear cooperation agreements in the form of reactors, large components, and equipment sales is uncertain.

Although Commerce disagreed with our finding that its Civil Nuclear Trade Initiative has produced limited progress, we believe our characterization is factually accurate. Our report assesses the progress that Commerce has made for each of the initiative's four major activities, as presented by Commerce officials to us in June 2010 and discussed several times throughout our review. For example, a key element of the initiative is the nuclear industry advisory committee CINTAC, which as we reported did not hold its first meeting until more than 16 months after it was chartered, and its charter has since expired. Furthermore, the initiative's stakeholder resources consist of information generally available on the Internet, participation in export control seminars, and briefings to U.S. companies. Moreover, Commerce has organized one nuclear-related trade mission and a limited number of other industry outreach events. In addition, we found that Commerce's strategy document for the initiative has some limitations, including that it does not identify key market opportunities and goals; have an implementation plan; nor includes metrics, benchmarks, or timelines to measure progress in meeting specific goals. We, therefore, disagree with Commerce's comment that the initiative has a well-defined strategy to meet its intended objectives and continue to believe that the initiative, as represented in the documents and information developed by Commerce officials, thus far, does not represent a comprehensive or well-defined strategy.

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Furthermore, Commerce agreed with our recommendation that it review its strategy document for the initiative, to, among other things, identify key market opportunities for U.S. nuclear industry to develop key goals and an implementation plan for achieving these goals.

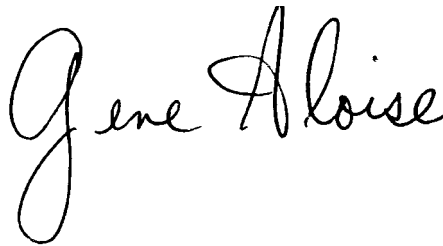
In its written comments, DOE generally agreed with our report and stated that it agreed with the recommendation that DOE revise its Part 810 regulations. However, DOE stated that the Part 810 question was not formally raised with DOE officials, nor were DOE officials made aware of specific industry problems during the course of our review. DOE is incorrect on this point. Specifically, on August 11, 2010, we met with DOE officials to discuss a draft of the report and review preliminary findings regarding Part 810, including specific concerns that the U.S. nuclear industry representatives had shared with us. We specifically discussed these concerns with DOE officials at that meeting. During that meeting, DOE officials acknowledged that the Part 810.8 list was out of date and acknowledged that DOE has not published any guidelines to clarify the 810 authorization process for civilian nuclear exporters. In addition, DOE officials told us that industry representatives had expressed concerns with the Part 810 authorization process to DOE for several years, and that DOE intended to revise its regulations to make them more clear and efficient.

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We will send copies of this report to the appropriate congressional committees; Secretaries of Commerce, Energy, and State; Chairman of the Nuclear Regulatory Commission; and other interested parties. The report also will be available at no charge on the GAO Web site at <http://www.gao.gov>.

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If you or your staff members have any questions about this report, please contact me at (202) 512-3841 or [aloise@gao.gov](mailto:aloise@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix V.

A handwritten signature in black ink that reads "Gene Aloise". The signature is written in a cursive style with a large, looped initial "G".

Gene Aloise  
Director, Natural Resources and Environment

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# Appendix I: Objectives, Scope, and Methodology

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We addressed the following questions during our review: (1) quantify the amount and value of U.S. nuclear exports facilitated by these agreements; (2) assess U.S. government efforts to support the U.S. nuclear industry's ability to compete for sales made possible by nuclear cooperation agreements between the United States and other countries; and (3) examine U.S. nuclear industry challenges to exporting as identified by industry representatives and U.S. and foreign government officials.

To quantify the amount and value of U.S. nuclear exports, we reviewed and assessed data collection efforts by the Department of Commerce (Commerce), the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), the Department of State (State), and other U.S. agencies including the International Trade Commission, Customs and Border Protection, and the Office of the United States Trade Representative. To determine the volume of U.S. nuclear material and number and amount of nuclear reactor component and equipment exports facilitated by nuclear cooperation agreements, we obtained and reviewed data on U.S. exports of low-enriched uranium, highly enriched uranium, and plutonium, from DOE and NRC's Nuclear Materials Management and Safeguards System (NMMSS), Commerce's Bureau of the Census, and reviewed NRC records on specific licenses for material exports. To determine the value of U.S. exports of nuclear material, nuclear reactors, major components and equipment, and minor reactor parts, and to determine the United States' relative share of global exports of these commodities, we obtained and analyzed United Nations Commodity Trade Statistics Database (U.N. Comtrade) data to estimate the value of U.S. exports using other countries' reported U.S. import data. For nuclear reactors, major components and equipment, and minor parts, we analyzed data only under that specific category in the Harmonized System. We considered the trade of all sensitive nuclear material and minor reactor parts transferred to a country with which the United States has a nuclear cooperation agreement to be facilitated by agreement, regardless of whether a nuclear cooperation agreement would be needed. To assess the reliability of the data from U.N. Comtrade, we reviewed the United Nations records of data evaluation and related documentation and determined that the data were sufficiently reliable to estimate exports of nuclear material, nuclear reactors, major components and equipment, and minor reactor parts from 1994 through 2008, the most recent year for which complete data were available. Because the United States has a trilateral project and supply agreement with Mexico and the International Atomic Energy Agency (IAEA), which was entered into pursuant to the United States' nuclear cooperation agreement with IAEA, we included Mexico in our analysis. It was outside the scope of this review to account for the value of

technical and engineering services in the United States that facilitate the export of nuclear materials, including uranium mining, enrichment, and fuel fabrication services. It was also outside the scope of this review to account for the full scope of facilities, components, and equipment related to the full nuclear fuel cycle. To determine with which countries the United States has nuclear cooperation agreements, we obtained and reviewed the texts of U.S. nuclear cooperation agreements from the United Nations Treaty Collection database. We interviewed DOE, NRC, State, and Commerce officials regarding the results of our data analysis.

To assess U.S. government efforts to support the U.S. nuclear industry's ability to compete for sales made possible by nuclear cooperation agreements between the United States and other countries, we interviewed Commerce, State, DOE, and NRC officials to identify key U.S. nuclear export initiatives and activities, and discussed coordination, evaluation, and outcomes of these efforts. Specifically, we reviewed and evaluated Commerce's Civil Nuclear Trade Initiative. We reviewed U.S. government regulations including DOE's 10 C.F.R. Part 810 and NRC's 10 C.F.R. Part 110 that govern the process for obtaining authorizations for U.S. persons to engage in the production of special nuclear material in foreign countries, or licenses to export nuclear material and equipment respectively. We reviewed NRC export license data to identify suppliers of U.S. nuclear material, nuclear reactors, and key components and equipment in the last 16 years and found there were three such companies—two other license holders were merged into another license holder.

To examine challenges to the U.S. nuclear industry identified by industry representatives and U.S. and foreign government officials, we conducted interviews with a nonprobability sample of seven U.S. and foreign nuclear industry companies and industry representatives with significant business interests in the United States, including companies that obtained NRC specific licenses to authorize the export of nuclear reactors or major components from 1994 through 2008. Specifically, we interviewed representatives from AREVA, Curtiss Wright Corporation, GE Hitachi Nuclear Energy, The Babcock & Wilcox Company, USEC, Inc., and Westinghouse, as well as with officials from trade organizations including the Nuclear Energy Institute. We interviewed foreign government officials regarding U.S. government efforts to promote U.S. nuclear technology, equipment, fuel, and fuel services. Because these industry representative interviews offer opinions regarding the U.S. government's efforts to promote U.S. civilian nuclear industry exports and major challenges they face, they cannot be generalized to the entire universe of civilian nuclear

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exporters. We also interviewed DOE, NRC, State, and Commerce officials regarding challenges they view with regard to the U.S. nuclear industry's ability to compete for sales made possible by nuclear cooperation agreements going forward.

We conducted our work from August 2009 through November 2010 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.



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# Appendix II: List of Partners with Which the United States Has a Nuclear Cooperation Agreement

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As of January 1, 2010, bilateral Agreements for Cooperation were in force with the following partners:

- Argentina
- Australia<sup>1</sup>
- Bangladesh
- Brazil
- Canada
- China
- Colombia
- European Atomic Energy Community (EURATOM)
- Egypt
- India
- Indonesia
- International Atomic Energy Agency (IAEA)
- Japan
- Kazakhstan
- Morocco
- Norway
- Peru
- South Korea

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<sup>1</sup>The United States has an additional agreement with Australia for cooperation for the Separation of Isotopes by Laser Excitation (SILEX) technology for uranium enrichment.

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**Appendix II: List of Partners with Which the  
United States Has a Nuclear Cooperation  
Agreement**

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- South Africa
- Switzerland
- Taiwan<sup>2</sup>
- Thailand
- Turkey
- Ukraine
- United Arab Emirates

In addition, the United States has a trilateral project and supply agreement with Mexico and the IAEA.

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<sup>2</sup>Pursuant to Section 6 of the Taiwan Relations Act (Title 22 U.S. Code section 3301 *et seq.*) and Executive Order 12143 (44 F.R. 37191), all agreements concluded with the Taiwan authorities prior to January 1, 1979, are administered on a nongovernmental basis by the American Institute in Taiwan, a nonprofit District of Columbia corporation, and constitute neither recognition of Taiwan authorities nor the continuation of any official relationship with Taiwan.

# Appendix III: Comments from the Department of Commerce

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



UNITED STATES DEPARTMENT OF COMMERCE  
The Under Secretary for International Trade  
Washington, D.C. 20230

OCT 21 2010

Mr. Glen Aloise  
Director, Natural Resources and Environment  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, DC 20548

Dear Mr. Aloise:

Thank you for the opportunity to comment on the draft Government Accountability Office (GAO) report titled "*Nuclear Commerce: Government-Wide Strategy Could Help Increase Commercial Benefits from U.S. Nuclear Cooperation Agreements with Other Countries.*" In general, we agree with most of your recommendations. We are pleased that the GAO acknowledged the role Commerce's Civil Nuclear Trade Initiative can play in realizing U.S. commercial benefits from the global expansion of nuclear power. I have enclosed comments relevant to Commerce's efforts referenced in the draft report.

The Obama Administration intends to continue its efforts to support the safe and secure expansion of nuclear power for peaceful purposes and promote U.S. nuclear industry leadership worldwide. We have achieved some success and are committed to making further progress.

Sincerely,

A handwritten signature in black ink that reads "Francisco J. Sanchez".

Francisco J. Sanchez

Enclosure



**Department of Commerce Technical Comments on**  
*Nuclear Commerce: Government-Wide Strategy Could Help Increase Commercial Benefits from U.S. Nuclear Cooperation Agreements with Other Countries*  
GAO-11-36 Draft Report  
October 14, 2010

See comment 1.

- **Highlights Page, second paragraph:** Please include the complete objective of the U.S. Department of Commerce's Civil Nuclear Trade Initiative (CNTI): "Identify the U.S. civil nuclear industry's most pressing trade policy challenges and most promising commercial opportunities and coordinate public and private sector efforts to address them in a way that supports the industry's endeavors to rebuild its manufacturing base."

See comment 2.

As indicated in staff discussions with GAO and in our previous written submissions, including the above, we believe that the CNTI has made substantial progress since its launch two years ago. In our view, reference to "limited progress" does not accurately depict activities to date.

See comment 3.

We believe CNTI has a well-defined strategy to meet its intended objectives, which includes the following:

- (1) Refocus the U.S. Government (USG) efforts on civil nuclear trade as well as nuclear nonproliferation, rather than exclusively on nuclear nonproliferation as was the focus for the past thirty years.
- (2) Develop a leadership role for the International Trade Administration (ITA) within the USG and with U.S. industry on commercial nuclear issues. Before the CNTI was launched in 2008, ITA did not have any presence within the USG or with the U.S. nuclear industry on promoting nuclear trade.
- (3) Establish formal and informal mechanisms to ensure the U.S. civil nuclear industry and USG are informing and advising one another on commercial and policy issues surrounding the global expansion of nuclear power.
- (4) Using information from USG agencies and the U.S. nuclear industry, identify the most significant trade barriers that are holding U.S. companies back from benefiting from the global resurgence of nuclear power and develop and implement strategies to eliminate those barriers. Conversely, identify the best prospect markets for U.S. civil nuclear technology and services and prioritize ITA's nuclear trade policy and promotion activities to reflect those rankings.
- (5) Provide resources to stakeholders that will advance their understanding of, and ability to compete in, the evolving international civil nuclear market.

See comment 4.

While it is correct that there have been only three companies so far that have formally briefed the Trade Promotion Coordinating Committee's interagency working group on civil nuclear trade, there have been numerous occasions where we have organized company-interagency briefings. For example, the 17 U.S. nuclear companies that made up the Civil Nuclear Trade Advisory Committee (CINTAC) under its inaugural charter briefed the interagency civil nuclear trade working group multiple times (in both open

See comment 5.

and closed sessions). Informally, we organize regular briefings and meetings for industry and USG officials to discuss relevant nuclear trade issues. Briefings have covered such topics as Jordanian, Indian, British, and Brazilian nuclear market overviews; the Nuclear Regulatory Commission's International Regulatory Development Program; the International Atomic Energy Agency's (IAEA) Convention on Supplementary Compensation for Nuclear Damage (CSC); and small modular reactors.

Additionally, since 2008, ITA has organized, with interagency support, two major industry outreach events, each attended by approximately 150-200 industry representatives. Both of these events aimed to increase engagement between government and industry on topics of mutual interest such as trade promotion, export financing, export controls, manufacturing, labor, and supply chain constraints, nuclear cooperation agreements, and indemnification in the case of nuclear accident.

See comment 6.

We recognize that a comprehensive document with goals, an implementation plan, and metrics for measuring CNTI progress is needed, and we are in the process of writing such a document. It is incorrect, however, to assume that in the absence of such a formal, public document, we have not set goals, crafted an implementation plan, or established how we measure success. We have, in fact, incorporated these important components of program management in our CNTI work. We have also worked to ensure that the CNTI's program of work is consistent with, and supports the achievement of, ITA's long-term strategic goals, including: (1) advancing U.S. international and commercial strategic interests; (2) enhancing U.S. competitiveness in domestic and international markets; (3) broadening and deepening the U.S. exporter base; and (4) identifying and resolving unfair trade practices.

See comment 7.

Using the five goals of the CNTI strategy identified in the first paragraph of this response, we would like to highlight aspects of our strategy and implementation plan for achieving those goals and how we measure success.

See comment 8.

*Goal (1) Refocusing the USG interagency on civil nuclear trade as well as nuclear nonproliferation rather than exclusively on nuclear nonproliferation:* The strategy and implementation plan is to ensure that the commercial consequences for the U.S. nuclear industry is a topic on the agenda at key interagency nuclear meetings and that ITA staff participate in such discussions to make the case for considering commercial issues. Further, our strategy is to encourage government agencies that did not support nuclear projects, (e.g., U.S. Trade Development Agency and Overseas Private Investment Corporation), to do so, and those that do support nuclear projects (e.g., EXIM Bank), to do more. Also worth noting here is that before the CNTI, nuclear trade issues were not given the proper attention that they are now given at U.S. Trade Representative (USTR). Success is measured by ITA being consulted on all issues that could affect the competitiveness of the industry and by agencies becoming more responsive to industry's needs. For example, USTDA has reversed its no-nuclear policy and has actively been organizing civil nuclear reverse trade missions with ITA's support. In another success, USTR has become more engaged on nuclear trade issues, such as actively seeking input

See comment 7.

from civil nuclear companies for information to include in the 2011 National Trade Estimate Report on Foreign Trade Barriers.

See comment 8.

*Goal (2) Developing a leadership role for ITA within the USG and with U.S. industry on commercial nuclear issues where ITA previously had no role:* The strategy and implementation plan includes having the Secretary of Commerce establish a Trade Promotion Coordinating Committee (TPCC) Civil Nuclear Trade Working Group, and inviting USG counterparts to identify a staff member to participate in this working group. The primary purpose of this group is not necessarily to receive individual company briefings. While such briefings are useful, the real utility of the group is to coordinate USG agency efforts in support of the U.S. nuclear industry. ITA chairs the working group and articulates the U.S. nuclear industry's priorities, based on ITA's regular interaction with the industry. The group communicates regularly over email and phone in addition to formal meetings. Specifically, the group seeks to identify which of the industry's greatest trade challenges and opportunities that the USG should, and can, best address in a coordinated fashion. The group has identified bringing into force the IAEA's CSC as its top priority, as industry has identified the lack of a global nuclear liability regime as one of its greatest barriers to entering new markets. The USG is currently encouraging key countries to ratify CSC. The strategy included a January 2010 U.S. interagency-industry mission to key countries to promote CSC as well as follow-up letters to key officials into those countries to encourage CSC ratification. Next steps include an early-2011 CSC promotion seminar in Asia. The strategy also includes inserting CSC language in bilateral commercial declarations signed with key countries as demonstrated by the joint declarations on commercial nuclear cooperation signed with Italy and Poland recently. While the group members communicate on a regular basis, it will begin holding formal monthly meetings given the increasing number of issues that need to be discussed. U.S. nuclear companies will be invited to brief the group for the first half of the two-hour meeting.

See comment 7.

The TPCC working group also identified leading and supporting civil nuclear trade missions as one of the best ways to address best prospect markets for industry. This resulted in a July 2010 interagency-supported civil nuclear trade mission to Poland, Czech Republic, and Slovakia, led by Under Secretary of Commerce Francisco Sánchez. These three countries were prioritized under the CNTI through formal criteria-based analyses, as best prospect markets given upcoming tenders and commercial developments. Success is measured by the active participation of the interagency community in working group discussions and activities to identify export opportunities and challenges and develop and implement commercial strategies, and also leverage existing commercial programs, to advance the global competitiveness of the U.S. civil nuclear industry, i.e., the CSC strategy and trade missions.

See comment 7.

See comment 9.

*Goal (3) Establishing formal and informal mechanisms to ensure the U.S. civil nuclear industry and USG are informing and advising one another on the commercial and policy issues surrounding the global expansion on nuclear power:* The strategy and implementation plan includes establishing a Civil Nuclear Trade Advisory Committee (CINTAC), which is made up of industry executives representing U.S. nuclear companies

See comment 7.

See comment 9.

See comment 8.

See comment 7.

See comment 8.

See comment 9.

across the supply chain. CINTAC advises the Secretary of Commerce and USG agencies, through the Secretary's role as chair of the TPCC Civil Nuclear Trade Working Group. In particular, CINTAC provides advice and recommendations on USG policies and programs affecting the competitiveness of the U.S. nuclear industry. CINTAC submitted its final recommendations in September 2010, and those recommendations will drive the work of CNTI. An informal mechanism was also established that includes organizing regular briefings by the USG for industry on best prospect markets, as well as USG initiatives and activities that are being developed and implemented to improve industry's ability to compete abroad. CNTI has built an industry database that currently includes over 350 industry representatives which is used for outreach purposes. Success is measured by the quality of industry recommendations and input into trade policy development, negotiations, and implementation.

*Goal (4) Using information from the USG and U.S. nuclear industry to identify the most significant trade barriers that are holding U.S. companies back from benefiting from the global resurgence of nuclear power, and developing and implementing strategies to eliminate those barriers. Conversely, identifying the best prospect markets for U.S. nuclear technology and services and prioritizing ITA's nuclear trade policy and promotion work to reflect those priorities:* The strategy and implementation plan includes polling industry on top trade barriers, discussing these identified issues within the interagency community, and methodically deciding the trade policy and promotion activities to undertake to ensure maximum effectiveness. Those actions included first-of-their-kind Joint Declarations on Commercial Nuclear Cooperation with both Italy and Poland that demonstrate high-level USG support for commercial nuclear cooperation. These Declarations are an attempt at leveling the playing field for U.S. companies as they compete against state-owned enterprises abroad that regularly enjoy high-level government support. Future Declarations are being explored in other key markets. The importance of other countries adopting U.S. nuclear codes and standards was also identified as a priority issue. In response, ITA organized a U.S.-Brazil Nuclear Codes and Standards Workshop in Brazil in August 2010, and is planning another one in Vietnam for 2011. Both countries were identified as best prospect markets for the U.S. nuclear industry by CNTI's original methodology. Official USG advocacy is also an important part of our trade promotion and policy work. Advocacy is coordinated out of ITA's Advocacy Center in coordination with the goals of the CNTI and with the support of the interagency community. Trade missions and the U.S. industry promotion program organized at the IAEA General Conference are also important components of our trade policy and promotion work. An additional civil nuclear trade mission is planned for September 2011. The measure of success is ultimately the number of contracts signed as a result of these programs and policies, recognizing the long lead-time for nuclear projects and the infancy of the CNTI. Other contributing factors to consider are the impact on the USG's ability to shape policies and regulations in foreign markets; for example, ensuring that codes and standards are consistent with our own so that U.S. businesses have a stronger foothold from which to be able to conduct business in these markets.

See comment 7.

See comment 7.

See comment 9.

See comment 9.

See comment 10.

See comment 1.

See comment 11.

See comment 12.

See comment 13.

See comment 14.

See comment 14.

*Goal (5) Providing resources to stakeholders that will advance their understanding of, and ability to compete in, the evolving international nuclear market:* The strategy and implementation plan included developing an on-line guide to assist U.S. nuclear companies navigate the often complex export controls process. This guide is being currently updated. The Department of Commerce, in partnership with the Nuclear Energy Institute and other USG agencies, organized an Export Controls Workshop in 2009 for U.S. industry new to exporting civil nuclear technology and services. A nuclear trade web portal is currently under development, which will serve as the virtual interface of CNTI and as a clearinghouse of information related to U.S. and international nuclear commerce targeted to both a U.S. and foreign audience. An original report on the competitiveness of the U.S. small modular reactor manufacturers will soon be published and plans are underway to continue publishing reports on timely topics. Additionally, efforts are underway to revise the criteria we developed for prioritizing best prospect markets, with the intention to share the criteria with industry and other U.S. Government agencies, and to continue to use the best prospects analysis to direct the work of CNTI. Improving the clarity and availability of nuclear trade data, as well as analyzing the U.S. economic benefits of present and future nuclear exports, are planned for 2011. Success here is measured by the quality, accuracy, and timeliness of information provided, which contribute to enhancing the global competitive position of U.S. industry.

- Pages 10 and 11: Census Bureau should be consulted to confirm that the summary is correct. You should also note that nuclear services are not captured in any available data, but that services are an increasingly important and growing market segment for U.S. nuclear companies.
- Pages 17-21: Please incorporate the information on CNTI as described above in this response document, as appropriate.
- Page 20, paragraph 2: Please correct the statement regarding number of staff dedicated to CNTI to read, "...one staff member working at 80 percent time, and two staff members working at 75 percent and 50 percent respectively."
- Page 22, paragraph 3: Recommend deleting the statement, "In January 2010, Commerce's ITA reported that the U.S. nuclear industry has atrophied," or correcting it to read, "Commerce's ITA reported that the U.S. nuclear industry has atrophied over the last thirty years, yet has been showing positive signs of new growth." Note this point is also made on page 23, paragraph 1.
- Page 23, paragraph 1: Please add the word "potential" in front of "recovery" in last sentence, and add the following sentence: "In addition, Commerce officials noted that new nuclear manufacturing facilities are being built in the United States."
- Page 23, paragraph 3: Add "and political" between "financial support."
- Page 25, paragraph 2: Add "and political" between "financial support."



See comment 15.

See comments 9 and 4.

See comment 16.

- Page 28, paragraph 1: For clarity, we recommend that you de-link your analysis and conclusions on increasing commercial benefits from the growth of U.S. nuclear cooperation agreements, which are very specific and limited, and instead describe your analysis and conclusions in the context of a growing worldwide nuclear market. Also, it should be recognized that while a comprehensive strategy is important for ITA to support the U.S. nuclear industry, there are limits in terms of what ITA can do to support the industry, given ITA has no regulatory or statutory authority over the issues affecting the industry, nor does ITA have dedicated funding for its nuclear undertakings.
- Page 28, paragraph 2: It should be noted that the production of a strategy document has not been the focus of Commerce's CNTI for the past two years. The CNTI has identified key market opportunities and trade policy challenges for U.S. industry, established goals, implemented strategies to achieve those goals, and currently is assessing the progress toward those goals. A comprehensive strategy document is a good step in moving CNTI forward and we are therefore in the process of drafting such a document that will be released in 2011. Regarding the statement on the TPCC Civil Nuclear Trade Working Group, please refer to the information on this topic as described in the beginning of this response document for clarification on the purpose and role of the working group, and why it should not be evaluated in terms of how many individual, formal company briefings the group had.
- Page 29, last bullet: We recommend deleting this statement because as noted at the beginning of this response document, the TPCC Civil Nuclear Trade Working Group has obtained a broad range of U.S. industry views, including from second tier suppliers and small and medium-sized companies. One example is the multiple briefings the working group has received from the Civil Nuclear Trade Advisory Committee (CINTAC), which has 17 senior industry executives representing all sizes of companies from across the supply chain and located throughout the United States. If you prefer to keep the statement, then it should be clarified, as there is no "nuclear industry Trade Promotion Coordination Committee."

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The following are GAO's comments in response to the Department of Commerce's letter dated October 21, 2010.

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## GAO Comments

1. We modified the text on page 18 of the report to state that the initiative "aims to identify the U.S. civil nuclear industry's most pressing trade policy challenges and most promising commercial opportunities and coordinate public and private sector efforts to address them in a way that supports the industry's endeavors to rebuild its manufacturing base," in response to Commerce's comment. However, we left the original, more general phrasing on the Highlights page intact because it accurately reflects the primary objective of the initiative.
2. We disagree with Commerce's comment that its initiative has made substantial progress. Our report assesses the progress that Commerce has made for each of the initiative's four major activities. We continue to believe that, thus far, Commerce's initiative has made limited progress. In particular, as we note in our report, the TPCC Civil Nuclear Trade Working Group has only heard from three companies, and has not heard from another five that have expressed an interest in briefing it; CINTAC did not hold its first meeting until more than 16 months after it was chartered and its charter has since expired; the initiative's stakeholder resources consist of information generally available on the Internet, participation in export control seminars, and briefings to U.S. companies; and Commerce has organized one trade mission and a limited number of other industry outreach events.
3. We disagree with Commerce's comment that it has a well-defined strategy to meet intended objectives. We found that the Commerce initiative's strategy document has some limitations, in that the strategy document has not identified or established key market opportunities and goals; does not have an implementation plan; and does not include metrics, benchmarks, or timelines to measure progress in meeting specific goals. Commerce's written comments provide new and clarifying information regarding the key goals of the initiative, which we believe is a positive development. However, it has not provided new information regarding identifying key markets and an implementation plan.
4. Commerce presents new information that the CINTAC industry advisory group briefed the TPCC Civil Nuclear Trade Working Group multiple times. We believe interaction between the TPCC Civil Nuclear Trade Working Group and the CINTAC industry advisory group is a positive development. However, as our report noted, CINTAC's charter

expired in September 2010, requiring a new charter and appointment of new members. Commerce's comments did not indicate that CINTAC's charter has been renewed, which casts doubt on the ability of CINTAC to keep the TPCC Civil Nuclear Trade Working Group apprised of market developments. In addition, Commerce's comments stated that it has organized regular briefings and meetings for industry and U.S. government trade officials to discuss, among other things, Jordanian, Indian, British, and Brazilian nuclear market overviews; the CSC, and small modular reactors, and that these meetings are informal. Because Commerce describes these briefings as informal, we believe they do not represent the kind of sustained, regular interaction to coordinate interagency efforts related to civil nuclear trade that the TPCC Civil Nuclear Trade Working Group was designed to provide. We are making this recommendation because Commerce needs to strengthen interagency coordination efforts to promote nuclear trade. Moreover, as our report notes, many of these U.S. company representatives we spoke with, as well as representatives from the Nuclear Energy Institute, told us that unless the U.S. government develops a governmentwide strategy and greater commitment to its nuclear industry, the United States' ability to secure export benefits from nuclear cooperation agreements in the form of reactors, large components, and equipment sales is uncertain.

5. We added the following language to page 20 of the report: "In addition, Commerce officials have organized two industry outreach events to increase engagement between U.S. government officials and industry representatives. According to Commerce, approximately 150 to 200 industry representatives attended these outreach events."
6. See comment 3.
7. Commerce presented its five goals, which is a new characterization of its initiative. However, much of the information presented in this section detailing what Commerce calls "aspects" of its implementation plan contains information already included in our draft report. For example, we discuss CSC; the civil nuclear trade mission to Poland, the Czech Republic, and Slovakia; CINTAC; the joint declarations on commercial nuclear cooperation; and the export controls workshop on pages 24, 20, 18-19, 20, and 19 of our report, respectively. Therefore, we made no changes to the report in response to this comment.
8. In some cases, the information Commerce presents as "aspects" of its implementation under the newly constituted five goals for the Initiative is new information. For example, Commerce notes in August 2010 it

organized a U.S.-Brazil Nuclear Codes and Standards Workshop in Brazil, and another is planned for Vietnam in 2011. In other cases the new information provided by Commerce includes assertions that Commerce did not provide documents to support. For example, Commerce comments that the United States Trade and Development Agency has reversed a “no-nuclear” policy and has, according to Commerce, actively begun organizing reverse civil trade nuclear missions. In addition, Commerce comments that prior to the initiative, “nuclear issues were not given the proper attention that they are now given at USTR.” We did not modify the text in response to these comments.

9. In its written comments, Commerce presented new information regarding how it intends to measure the performance of its strategy, after it has more fully developed the strategy document as we recommend and as the agency states it intends to do. Commerce’s efforts to provide some information regarding the performance measures should be included in a formal strategy document, as we recommend.
10. We requested data on exports from various Commerce officials on multiple occasions, which Commerce officials were unable to provide in full. Although Commerce officials did not make Census officials available at our meetings or final review, we developed our methodology with and had our results reviewed by economists in GAO’s Applied Research and Methods group. Our results were additionally reviewed by Commerce, Energy, State, and NRC officials. However, we did modify the text on pages 11-12 to note that we found there are no available data regarding exports of services, which according to Commerce officials is an increasingly important and growing market segment for the U.S. nuclear industry. We note that Commerce did not provide documents to support its assertion regarding the growth in the U.S. nuclear services market.
11. We modified the text on page 21 to reflect Commerce’s updated staffing figures, to show one staff member working at 80 percent time and 2 staff members working at 75 percent and 50 percent, respectively, on the initiative.
12. The source of the statement that Commerce seeks clarification for is the U.S. Department of Commerce’s 2010 Energy Industry Assessment (“2010 Assessment”), as noted in footnote 23. Commerce’s 2010 Assessment does not state that the U.S. nuclear industry is showing positive signs of growth. However, we modified the text on page 22 to

state that the report notes U.S. companies have participated in the world market, often as a minority partner, and invested in research and development for the next generation of reactors. We note on page 22 of the report that, according to Commerce officials, the number of facilities certified by the American Society of Mechanical Engineers (ASME) to produce commercial nuclear-grade components has risen from 120 by the early 2000s, to 255 as of mid-2008, which Commerce officials take as evidence of recovery.

13. We have modified the text on page 23 to note that Commerce officials believe the recent increase in the number of facilities certified by the American Society of Mechanical Engineers (ASME) to produce commercial nuclear-grade components is evidence of “potential recovery,” not “recovery,” as the report had previously stated.
14. We have modified the text on page 23 and 24 to state that Commerce officials said that U.S. firms face formidable competition abroad from foreign companies that may receive stronger financial and political support.
15. We modified the text to add the words “and the growing nuclear worldwide market” on page 27. Our report notes on page 21 the limited staff and funding available for the Commerce initiative, and also notes that the U.S. government relies on Commerce to promote U.S. nuclear industry exports.
16. We disagree with Commerce’s recommendation that we delete our third recommendation that it consider ways for the TPCC Civil Nuclear Trade Working Group to obtain a more comprehensive range of U.S. industry views. We believe it is important to keep this recommendation. As our report notes, thus far only three companies have briefed the TPCC Civil Nuclear Trade Working Group. However, in response to Commerce’s comments we modified the text to refer to the TPCC interagency nuclear trade coordination committee as the TPCC Civil Nuclear Working Group in the body of the report and in the third recommendation.

# Appendix IV: Comments from the Department of Energy

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



Department of Energy  
National Nuclear Security Administration  
Washington, DC 20585  
October 21, 2010



Mr. Gene Aloise  
Director  
Natural Resources and Environment  
Government Accountability Office  
Washington, DC 20548

Dear Mr. Aloise:

The National Nuclear Security Administration (NNSA) appreciates the opportunity to review the Government Accountability Office's (GAO) draft report, GAO-11-36, *NUCLEAR COMMERCE: Government-Wide Strategy Could Help Increase Commercial Benefits from U.S. Nuclear Cooperation Agreements with Other Countries*. We understand that GAO was asked to (1) quantify the amount and value of U.S. nuclear exports facilitated by these agreements from 1994 through 2008, (2) assess U.S. efforts to support the U.S. nuclear industry's ability to compete for sales facilitated by nuclear cooperation agreements, and (3) examine U.S. nuclear industry challenges to exporting as identified by industry representatives and U.S. and foreign government officials.

NNSA generally agrees with the report. While the auditors have done a thorough job, NNSA would like to offer the following comments to clarify points in the draft report.

See comment 1.

Page 1: The number of 123 Agreements does not include the SILEX Agreement in that total. If you include the SILEX Agreement, then there are 26 Agreements in force.

See comment 2.

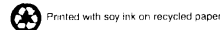
Page 6: The second sentence in the Background section states, "The Atomic Energy Act also requires these agreements to include guarantees from the partners that they will maintain safeguards over nuclear materials and equipment transferred and adequate physical security for all nuclear material transferred." This sentence leaves out all the other nonproliferation conditions required in Section 123, such as peaceful uses and no retransfer without prior consent. We recommend citing all such conditions or including a qualifier in the sentence as drafted to state that their reference is an illustrative list.

See comment 3.

Page 7: Second bullet should reaffirm the point noted above that the Department of Energy (DOE) has a statutory role in the negotiation of all 123 Agreements. You may want to reference that DOE's role stems from Section 57(b) of the Atomic Energy Act.

See comment 4.

Page 26: The GAO has cited industry officials as criticizing Part 810 as standing in the way of commerce without offering a counterview regarding the need for DOE to regulate such technology transfers. We believe that it should be noted



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**Appendix IV: Comments from the Department  
of Energy**

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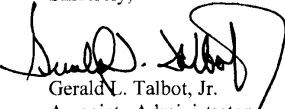
2

that the 810 question was not formally raised with DOE officials nor were DOE officials made aware of specific problems. If industry were to specify what the existing problems are, these could be reviewed to determine whether the issues can be corrected or process improved.

NNSA agrees with the recommendation that in revising the Part 810 regulations we should consider whether some countries should be removed from the Part 810.8 list to facilitate U.S. exports to countries with which the United States has a nuclear cooperation agreement in force.

If you have any questions related to this response, please contact JoAnne Parker, Director, Office of Internal Controls, at 202-586-1913.

Sincerely,



Gerald L. Talbot, Jr.  
Associate Administrator  
for Management and Administration

cc: Deputy Administrator for Defense Nuclear Nonproliferation

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The following are GAO's comments in response to the Department of Energy's letter dated October 21, 2010.

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## GAO Comments

1. We modified the text on page 1 to state the number of agreements to 26 and added clarifying language on pages 2 and 36 of the draft report.
2. We added the words "among other things" on page 5 of the text to clarify.
3. We modified the text on page 6 to state that DOE has a statutory role in negotiating nuclear cooperation agreements, and we moved existing language that DOE derives its authority from Section 57b of the Atomic Energy Act from a footnote on page 7 to the report body in response to this comment.
4. We disagree with DOE's comment that we did not formally raise the Part 810 question with DOE officials. Because we recognize the importance of the Part 810 regulations, which DOE promulgated pursuant to the authority granted to it by section 57b of the Atomic Energy Act and which aims to ensure that activities associated with the development or production of any special nuclear material outside the United States will not be inimical to U.S. interests, we felt that it was important for DOE to know about industry uncertainty with regard to the requirements of the regulations. On August 11, 2010, we met with DOE and shared preliminary findings regarding Part 810, including specific concerns that the U.S. nuclear industry representatives had shared with us. We discussed these concerns with DOE officials, and those officials acknowledged that the Part 810.8 list was out of date and that DOE has not published any guidelines to clarify the 810 authorization process for civilian nuclear exporters. In addition, DOE officials told us that industry representatives had expressed concerns with the Part 810 authorization process to DOE for several years, and that DOE intended to revise its regulations to make them more clear and efficient.



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# Appendix V: GAO Contact and Staff Acknowledgments

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## GAO Contact

Gene Aloise, (202) 512-3841, or [aloisee@gao.gov](mailto:aloisee@gao.gov)

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## Staff Acknowledgments

In addition to the individual named above, Glen Levis (Assistant Director), Antoinette Capaccio, Julia Coulter, Michael Hoffman, Michelle Munn, Alison O'Neill, and Ruth Schaap made key contributions to this report.

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