

May 1986

# NUCLEAR NONPROLIFERATION

## DOE Has Insufficient Control Over Nuclear Technology Exports



129934  
035492





United States  
General Accounting Office  
Washington, D.C. 20548

Resources, Community, and  
Economic Development Division

B-221179

May 1, 1986

The Honorable Edward J. Markey  
Chairman, Subcommittee on Energy  
Conservation and Power  
Committee on Energy and Commerce  
House of Representatives

The Honorable William Proxmire  
United States Senate

This report responds to your letter dated December 13, 1984, requesting that we review the adequacy of the Department of Energy's program for controlling assistance to foreign atomic energy programs, including assistance involving sensitive nuclear technology.

Unless you publicly announce its contents earlier, we plan no further distribution of the report until 30 days from the date of the report. At that time, we will send copies to the Departments of Commerce, Defense, Energy, and State; the Arms Control and Disarmament Agency; and the Nuclear Regulatory Commission. In addition, we will send copies to other interested parties and make copies available to others upon request.

A large, stylized handwritten signature in black ink, appearing to read 'J. Dexter Peach'.

J. Dexter Peach  
Director

---

# Executive Summary

---

In 1974 India detonated a nuclear device using materials obtained from its civilian nuclear facilities. Since then, the United States has strengthened controls over exports of nuclear technology and hardware in an effort to curb the spread of nuclear weapons.

Concerned over the effectiveness of these controls, the Chairman, Subcommittee on Energy Conservation and Power, House Committee on Energy and Commerce, and Senator William Proxmire asked GAO to evaluate the controls administered by the Department of Energy (DOE).

---

## Background

The Atomic Energy Act and the Nuclear Non-Proliferation Act of 1978 place primary responsibility for controlling nuclear exports with the Nuclear Regulatory Commission and DOE. The Commission regulates the export of nuclear facilities, such as reactors; major equipment for such facilities; and nuclear materials, such as reactor fuel. It cannot license exports unless recipient countries meet nonproliferation standards set out in the 1978 act. Two examples of these standards are a country's acceptance of international safeguards on its nuclear facilities and the existence of an agreement for cooperation providing the framework for U.S. nuclear assistance to a country.

The acts also require persons or companies intending to export nuclear technology—such as information, engineering services, and certain equipment—to obtain the authorization of the Secretary of Energy. The Secretary can authorize an export only upon determining that it would not be detrimental to U.S. interests and with the concurrence of the Department of State. The 1978 act did not specify standards for approval as it did for the Commission. Instead, it directed the Secretary to quickly establish any necessary standards.

In addition, the 1978 act created a special category of technology requiring the Secretary's specific authorization called sensitive nuclear technology. This is technology that is important to civilian nuclear facilities providing the most direct links to nuclear weapons proliferation. Unlike other technology regulated by DOE, sensitive nuclear technology may be exported only if the recipient country agrees to certain conditions regarding its use.

---

## Results in Brief

- DOE has not established objective standards for specifically authorizing exports. It approves exports on the basis of nonproliferation, political, and economic considerations. Because DOE gives considerable weight to

political and economic factors, a significant inconsistency exists in DOE and Commission export controls.

- DOE has also authorized exports without review for sensitive nuclear technology and on the basis of factors not contained in the 1978 act.
  - Reports containing significant information about nuclear facilities and operations have been exported, under a general authorization, without DOE review. This occurred because DOE does not require advance review of reports that, although based on publicly available information, contain new analyses and are not publicly available.
- 

## Principal Findings

---

### Specific Authorizations

Technology exports subject to DOE approval can have as much proliferation significance as material and equipment exports. Rather than adopting nonproliferation standards, however, DOE weighs six factors in making export decisions. Four factors are similar to Commission standards. The other two address the availability of the technology from other sources and U.S. political, economic, or security interests. DOE believes that flexibility in weighing its factors enables it to help the United States influence foreign nuclear programs and may lead countries to accept nonproliferation controls. From 1980 through 1985, DOE authorized 47 exports largely on the basis of political and economic, rather than nonproliferation, factors.

GAO is concerned that DOE's disproportionate weighting of political and economic factors does not provide the level of nonproliferation assurances desired by the Congress when it passed the 1978 act. GAO believes that now, after 8 years of experience with the act, DOE should be able to develop more objective criteria that will still allow flexibility but will better meet the nonproliferation goals of the act. (See ch. 3.)

---

### Sensitive Nuclear Technology

From 1978 until 1983 DOE did not have procedures for identifying technology that is important to sensitive nuclear facilities. On 11 occasions during this period, private firms and DOE, through its exchanges of technical information with foreign countries, provided equipment and information to sensitive nuclear facilities. For 8 of these cases, DOE did not determine if the exports contained sensitive nuclear technology.

---

---

Since 1983 DOE has made determinations on 12 proposed exports to sensitive nuclear facilities. In four proposals it identified and did not permit sensitive nuclear technology to be exported. In the other eight cases, DOE determined that no sensitive nuclear technology was involved. DOE made these determinations, however, on the basis of factors that are not included in the 1978 act. For example, in 1983 it determined that information on reprocessing—a method of extracting plutonium from used reactor fuel—to be transferred to the United Kingdom was not sensitive nuclear technology because that country already possessed reprocessing capabilities. The 1978 act, however, limits the determination of sensitive nuclear technology to its importance to sensitive facilities, not to recipient countries. DOE needs standards for identifying sensitive nuclear technology that are consistent with the 1978 act. (See ch. 4.)

---

## General Authorizations

DOE's regulations contain a general authorization to export information that is publicly available. Because these exports do not require advance review, DOE does not know how many have occurred. However, GAO identified seven reports exported under the general authorization that, although based on publicly available information, contained new analyses and were not publicly available. Further, they provided information on sensitive nuclear facilities. Because these reports were not publicly available, DOE should have reviewed them and either approved or disapproved their export. (See ch. 2.)

---

## Recommendations

GAO recommends that the Secretary of Energy

- establish objective nonproliferation standards on which to base specific authorization decisions and describe how political and economic factors will be weighed as part of the authorization process,
- develop criteria consistent with the 1978 act for identifying sensitive nuclear technology, and
- limit general authorization of information exports to that which is readily available to the public.

GAO is also recommending other improvements in DOE's procedures for controlling exports.

---

**Matter for  
Congressional  
Consideration**

GAO made similar recommendations for DOE to establish objective export authorization standards in 1980, but DOE did not act on those recommendations. If GAO's recommendation is again rejected, the Congress should consider whether the dissimilarity between DOE's and the Commission's approaches to nonproliferation decisions—especially the weight given to economic and political considerations by DOE—adequately achieves the objectives of the act.

---

**Agency Comments**

GAO discussed the report's material with DOE officials responsible for export control. They said that corrective actions have been initiated on GAO's findings except that they have no plans to establish objective standards for making authorization decisions. GAO did not request official agency comments on this report.

---

# Contents

---

<b>Executive Summary</b>		<b>2</b>
<hr/>		
<b>Chapter 1</b>		<b>10</b>
<b>Introduction</b>	U.S. Reliance on Political Commitments and Export Controls	12
	DOE Controls Over U.S. Assistance to Foreign Atomic Energy Programs	14
	Objectives, Scope, and Methodology	17
<hr/>		
<b>Chapter 2</b>		<b>22</b>
<b>Assistance Provided as Publicly Available Information Needs Greater DOE Control</b>	DOE Broadly Interprets What Is Publicly Available Information	22
	Information Transferred Was Not Publicly Available in Published Form	23
	Conclusions	28
	Recommendation to the Secretary of Energy	29
<hr/>		
<b>Chapter 3</b>		<b>30</b>
<b>Nonproliferation Standards Should Be Established for Authorizing Assistance to Restricted Countries</b>	DOE Requirements for Specific Authorizations	30
	No Standards for Authorizing Assistance to Restricted Countries	32
	Political and Economic Factors Are Considered in Authorizations to Restricted Countries	35
	Conclusions	43
	Recommendation to the Secretary of Energy	45
	Matter for Consideration by the Congress	45
<hr/>		
<b>Chapter 4</b>		<b>48</b>
<b>DOE Needs Better Criteria and Procedures for Identifying Sensitive Nuclear Technology</b>	Requirements for Authorization of Sensitive Nuclear Activities	48
	Insufficient Efforts to Identify SNT Before 1983	50
	Lack of Criteria and Independence Hampers Current SNT Reviews	52
	Conclusions	61
	Recommendations to the Secretary of Energy	62



<b>Chapter 5</b>		<b>64</b>
<b>DOE Needs to Strengthen the General Administration of Its Export Regulations</b>	<ul style="list-style-type: none"> <li>Difficulties in Ensuring Compliance With the Regulations <span style="float: right;">64</span></li> <li>Insufficient Reporting Requirements <span style="float: right;">67</span></li> <li>Information on Authorized Activities Not Routinely Disseminated <span style="float: right;">68</span></li> <li>Inadequate Record Keeping <span style="float: right;">70</span></li> <li>Conclusions <span style="float: right;">71</span></li> <li>Recommendations to the Secretary of Energy <span style="float: right;">72</span></li> </ul>	
<hr/>		
<b>Appendixes</b>	<ul style="list-style-type: none"> <li>Appendix I: Nonsensitive Assistance to Restricted Countries Authorized by the Secretary of Energy, 1980-1985 <span style="float: right;">74</span></li> <li>Appendix II: U.S. Assistance Related to Foreign Sensitive Nuclear Facilities, 1980-1985 <span style="float: right;">77</span></li> </ul>	
<hr/>		
<b>Tables</b>	<ul style="list-style-type: none"> <li>Table 1.1: Federal Control of Nuclear Exports <span style="float: right;">14</span></li> <li>Table 1.2: Applicability and Scope of General and Specific Authorizations <span style="float: right;">16</span></li> <li>Table 2.1: Generally Authorized Assistance to Restricted Countries or for Sensitive Facilities, 1980-1985 <span style="float: right;">24</span></li> <li>Table 3.1: Countries Requiring Specific Authorization for Nonsensitive Nuclear Technology <span style="float: right;">32</span></li> <li>Table 3.2: Activities With Restricted Countries Authorized by the Secretary of Energy, 1980-1985 <span style="float: right;">35</span></li> <li>Table 3.3: Proliferation Status of Restricted Countries Receiving U.S. Nuclear Technology <span style="float: right;">39</span></li> <li>Table 4.1: U.S. Assistance to Foreign Countries in the Development of Sensitive Nuclear Facilities <span style="float: right;">49</span></li> <li>Table 4.2: Activities Not Reviewed for SNT <span style="float: right;">51</span></li> <li>Table 4.3: Proposed Activities Identified by DOE as Containing SNT <span style="float: right;">53</span></li> </ul>	
<hr/>		
<b>Figures</b>	<ul style="list-style-type: none"> <li>Figure 1.1: Relationship of the Commercial Nuclear Fuel Cycle to the Production of Special Nuclear Material <span style="float: right;">11</span></li> </ul>	

---

**Abbreviations**

ACDA	Arms Control and Disarmament Agency
CFR	Code of Federal Regulations
DOE	Department of Energy
GAO	General Accounting Office
HTGR	high-temperature gas-cooled reactor
IAEA	International Atomic Energy Agency
LMFBR	Liquid Metal Fast Breeder Reactor
NE	DOE Office of Nuclear Energy
NNPA	Nuclear Non-Proliferation Act of 1978
NPT	Nuclear Non-Proliferation Treaty
NRC	Nuclear Regulatory Commission
RCED	Resources, Community, and Economic Development Division
SNEC	Subgroup on Nuclear Export Coordination
SNT	sensitive nuclear technology



# Introduction

---

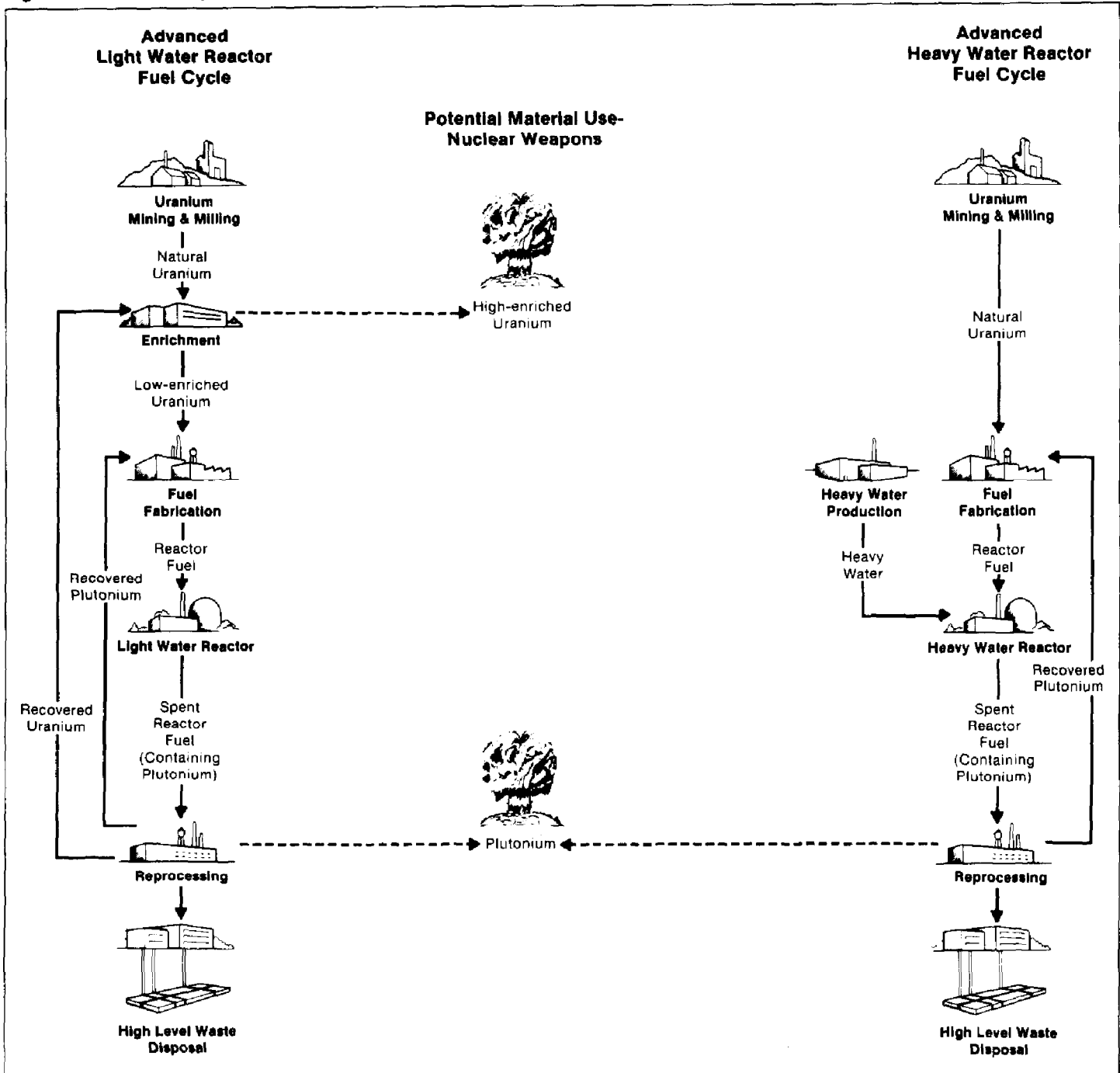
The potential proliferation of nuclear weapons is a major concern facing our nation. Currently six countries—China, France, Great Britain, India, the Soviet Union, and the United States—have acknowledged detonating a nuclear explosive device. However, many other nations have the basic technological skills and the economic resources necessary to develop nuclear weapons, and as discussed in the Congressional Research Service's August 1985 Nuclear Proliferation Factbook, a number of these nations are perceived as attempting to do so through research, purchases of technology, or surreptitious activities.

A key factor in the production of nuclear weapons is obtaining the means to generate "special nuclear material"—enriched uranium or plutonium—required for a nuclear explosive device. Controlling this capability is complicated by the widespread use of nuclear power reactors, which employ facilities and engineering concepts similar to those required in a nuclear weapons program. For example, the fuel for a nuclear power reactor is generally uranium that has been enriched (or processed) to increase the concentration of the material needed to sustain a chain reaction.<sup>1</sup> Plants that enrich uranium for nuclear reactor fuel can also be used to enrich uranium for nuclear weapons purposes. Further, nuclear reactors generate plutonium as a by-product of the nuclear chain reaction. The spent (used) fuel removed from reactors contains a mixture of unused uranium, plutonium, and highly radioactive waste products. Because plutonium can be substituted for uranium in commercial reactor fuels, systems have been developed to extract it and the unused uranium from the spent fuel. Figure 1.1 depicts an advanced version of the commercial nuclear fuel cycle and its relation to the production of nuclear weapons material.

---

<sup>1</sup> The majority of reactors in commercial use are so-called "light water" reactors that require low-enriched fuel. However, "heavy water" reactors use deuterium (D<sub>2</sub>O) instead of water in the reactor and can operate on natural uranium. For these reactors, enriched fuel is not required.

Figure 1.1: Relationship of the Commercial Nuclear Fuel Cycle to the Production of Special Nuclear Material



Despite the relationship between commercial nuclear power and nuclear weapons production, the United States and other advanced nuclear nations initially believed that the special nuclear material needed for weapons would, for technical and economic reasons, be obtained only from facilities dedicated to a nuclear weapons program. However, India's explosion of a nuclear device in 1974 changed this belief. The device used in this explosion contained special nuclear material obtained from a civilian reactor built and operated in part with indirect assistance from the United States as well as other nuclear exporting nations.

## U.S. Reliance on Political Commitments and Export Controls

Although the risk of proliferation is inherent in commercial nuclear power, the United States has maintained a policy of promoting the peaceful domestic and foreign uses of nuclear energy since the enactment of the Atomic Energy Act of 1954 (42 U.S.C. 2011). During the 1960's, the United States was the predominant supplier of nuclear fuel and reactors throughout the free world. Since then, a number of countries—particularly western European nations—have undertaken a larger role in nuclear commerce. Although the United States is no longer the predominant supplier, it remains a major supplier of nuclear fuel, equipment, and technology.

As a major supplier for foreign nuclear power programs, the United States could inadvertently contribute to increased proliferation of nuclear weapons through its export activities. To reduce this proliferation risk, the United States for many years has relied on foreign political commitments and government controls to ensure that U.S. assistance to foreign nuclear programs is not diverted to nuclear weapons-related activities.

With respect to political commitments, the United States relies on government-to-government agreements, nuclear facility safeguards administered by an international organization, and international treaties to ensure that foreign countries undertake only peaceful nuclear activities. Each of these is discussed below.

- **Agreements for cooperation.** These are intergovernmental agreements negotiated between the United States and other nations or groups of nations. The agreements provide the basic framework for U.S. nuclear assistance and the specific safeguards and controls to be applied to nuclear exports. For example, most agreements require guarantees that material and equipment exported will not be used for the development of any nuclear explosive device.

- The International Atomic Energy Agency (IAEA). An autonomous organization of the United Nations established in 1957, the IAEA administers a system of international safeguards with the objective of timely detection, and hence deterrence, of illicit diversion of nuclear materials from peaceful nuclear activities. To accomplish these objectives, the IAEA attempts to account for all nuclear materials at nuclear reactors and other nuclear facilities using as safeguards on-site inspections, remote surveillance, and material containment measures. The IAEA currently has over 100 member nations.
- The Nuclear Non-Proliferation Treaty (NPT). Under the specific provisions of the NPT, which went into effect in 1970, each nonnuclear weapon state<sup>2</sup> agrees not to manufacture or otherwise acquire nuclear weapons and to accept IAEA safeguards on its nuclear facilities. In return, all parties to the NPT agree to facilitate cooperation in the peaceful uses of nuclear energy. The NPT has been ratified by 124 countries.
- The Treaty of Tlatelolco (formally titled the Treaty for the Prohibition of Nuclear Weapons in Latin America). Under this treaty, 23 Latin American nations have agreed not to manufacture or acquire nuclear weapons and not to permit such weapons to be stored or deployed in their territories. Additionally, each nation is required by the treaty to place IAEA safeguards on its nuclear activities.

While there is considerable international support for these nonproliferation agreements, treaties, and organizations, 35 nations have not ratified a nonproliferation treaty or agreed to conduct all of their nuclear activities under IAEA safeguards. According to the Congressional Research Service's Nuclear Proliferation Factbook, some of these nations have acquired significant nuclear capability and are developing unsafeguarded facilities that are capable of producing weapons-grade nuclear material.

India's nuclear explosion caused a shift in emphasis in U.S. nonproliferation strategy. Before the explosion, the United States relied primarily on political commitments to restrain nuclear proliferation. After the explosion, the Congress and the Executive Branch focused on restricting the capabilities of nations to produce nuclear weapons. The most significant result of this shift in emphasis was the Nuclear Non-Proliferation Act of 1978 (NNPA). In passing the act, the Congress found that the proliferation of nuclear weapons posed a grave threat to the security of the

<sup>2</sup> Under the NPT, there are only five nuclear weapons states: China, France, Great Britain, the Soviet Union, and the United States.

United States and that there was an urgent and imperative need to prevent proliferation; consequently it established as the act's overall objective the efficient and effective control over the proliferation of nuclear explosive capability. In this regard, the act substantially revised the terms and conditions for U.S. nuclear cooperation with other nations. It also committed the United States to a broad range of unilateral and international initiatives for curbing the proliferation risks of nuclear power. Among them were stronger domestic controls over nuclear-related exports.

Domestic controls over nuclear-related exports are intended to ensure that U.S. exports of nuclear fuel, equipment, and technology are not used to assist a foreign nuclear weapons program. The primary responsibilities for administering nuclear export controls are divided among the Nuclear Regulatory Commission (NRC), the Department of Commerce, the Department of Energy (DOE), and the Department of State as shown in table 1.1.

**Table 1.1: Federal Control of Nuclear Exports**

Item	Responsible agency
Nuclear materials:	NRC
—Special nuclear material (primarily enriched uranium and plutonium)	
—Source material (natural uranium)	
—By-product material	
Complete nuclear facilities and specially designed equipment	NRC
Nuclear components, items, and substances	NRC
Dual-use components (applications in both nuclear and nonnuclear facilities)	Commerce and DOE
Nuclear technical services and technology transfer	DOE <sup>a</sup>

<sup>a</sup>DOE has primary responsibility, but State must concur in DOE authorizations. In addition, Commerce requires validated export licenses for the export of certain technology and information, particularly related to sensitive nuclear facilities.

## DOE Controls Over U.S. Assistance to Foreign Atomic Energy Programs

Section 57(b) of the Atomic Energy Act assigns DOE its basic authority and responsibility for controlling U.S. involvement in foreign nuclear programs. The act states:

“It shall be unlawful for any person to directly or indirectly engage in the production of any special nuclear material outside the United States except (1) as specifically authorized under an agreement for cooperation...or (2) upon authorization by the Secretary of Energy after a determination that such activity will not be inimical to the interest of the United States....”



Agreements for cooperation negotiated to date, however, have not specifically authorized any person to assist in the production of special nuclear material. Consequently, all such assistance must instead be authorized by the Secretary as directed by the act.

To implement the above requirement, DOE established regulations (Title 10 of the Code of Federal Regulations [CFR], Part 810) governing unclassified U.S. activities in foreign atomic energy programs. The regulations cover several types of assistance including

- technology transfers, such as nuclear facility designs and equipment-manufacturing technology;
- equipment intended for use in nuclear facilities but not controlled by NRC, such as process control instrumentation, lasers for enrichment research, and reactor simulators for operator training;
- assistance in operations and maintenance of nuclear facilities, including design and engineering services, construction management, and quality control/assurance services;
- training given to foreigners on nuclear-related matters (not including college courses); and
- assistance to foreign nuclear programs provided by overseas licensees of U.S. firms.

According to sections 141 and 144 of the act, activities involving classified nuclear information (termed "Restricted Data" by the act) cannot be exchanged with other nations unless authorized by the President.

The act requires the Secretary of Energy to make a determination that an activity will not be "inimical," or detrimental, to the interest of the United States before authorizing the export of assistance related to the production of special nuclear material. DOE's regulations set forth the policy and procedures for implementation of this authority. To ease the administrative burden, the Secretary does not require exporters to request authorizations for every proposed export. Its regulations contain a general authorization permitting, without prior review and approval, activities with little or no nonproliferation or national security significance. For example, the general authorization allows any person to provide publicly available published information without prior review and approval by the Secretary.

Other types of assistance that DOE considers relatively nonsensitive, such as power reactor technology, are also generally authorized unless

they are intended for certain countries. DOE has identified certain countries viewed as a proliferation or national security risk because they (1) have not ratified a nonproliferation treaty or (2) are located in areas of volatility or sensitivity. DOE's regulations list these countries and require that proposed assistance to any of their nuclear facilities beyond publicly available information must be specifically authorized by the Secretary. In this report, these countries are referred to as restricted countries.

Proposed assistance to enrichment, reprocessing, and heavy water production facilities and to plutonium fuel fabrication facilities beyond publicly available information requires specific authorization by the Secretary before the technology can be exported to any country, including nuclear weapons nations. In addition, DOE's regulations incorporate by reference the requirements of the Atomic Energy Act (as amended by the NNPA). These include the requirement that if proposed assistance to a sensitive foreign nuclear facility involves sensitive nuclear technology (SNT), additional assurances must be obtained from the recipient country regarding the nuclear materials or equipment produced from the use of the exported technology. Table 1.2 summarizes DOE's export control requirements in order of ascending proliferation importance.

**Table 1.2: Applicability and Scope of General and Specific Authorizations**

Type of activity	Restricted countries	Nonrestricted countries
Transferring technical information that is available to the public in published form	General authorization	General authorization
Providing assistance to "nonsensitive" foreign nuclear activities (e.g., uranium mining and milling, power and research reactors)	Specific authorization	General authorization
Providing assistance to "sensitive" foreign nuclear facilities (i.e., reprocessing, enrichment, heavy water production, plutonium fuel fabrication)	Specific authorization; assurances required on transfers of SNT	Specific authorization; assurances required on transfers of SNT

DOE's Office of International Security Affairs, Assistant Secretary for Defense Programs, reviews and processes requests for specific authorizations submitted by companies and individuals. With the assistance of technical staff from other DOE offices and national laboratories, it may also perform a technical review of the proposed export to determine its proliferation significance. Finally, the office performs a policy review to determine the proliferation credentials of the recipient country with regard to the assistance it will receive and any other factors that may

bear upon the interests of the United States. On the basis of these reviews, the office initially determines whether the activity should be authorized. If this determination is favorable, it prepares a written analysis recommending that the Secretary of Energy approve the export. If the office cannot make a favorable determination on an activity, it either recommends that the Secretary disapprove the activity or, in most cases, notifies the applicant of its initial unfavorable determination. Applicants may appeal an unfavorable determination made by the Office of International Security Affairs and request that the Secretary make the final determination on whether the activity can be conducted.

Before the Secretary can specifically authorize an export, five agencies that, along with DOE, make up the Subgroup on Nuclear Export Coordination (SNEC)—the Departments of State, Defense, and Commerce; the Arms Control and Disarmament Agency (ACDA); and NRC—are afforded an opportunity to comment on the initial favorable determination. State must concur with DOE's tentative favorable determination before the Secretary can authorize the export. The views of the other four agencies are advisory.

However, if an export is permissible under DOE's general authorization, none of the five other agencies are involved under DOE's regulations, although some may have responsibilities under other provisions of law.

---

## Objectives, Scope, and Methodology

The Chairman, Subcommittee on Energy Conservation and Power, House Committee on Energy and Commerce, and Senator William Proxmire asked us, in a joint letter dated December 13, 1984, to review DOE's controls over the export of nuclear technology. To accomplish this objective, we reviewed DOE's implementation of its regulatory procedures from 1980 through 1985 in three areas:

- granting general authorizations for assistance involving publicly available information (see ch. 2);
- granting specific authorizations for assistance involving restricted countries (see ch. 3); and
- identifying assistance involving SNT (see ch. 4).

In addition, we reviewed administrative policies and procedures that are applicable to all three areas (see ch. 5).

In addressing this objective, we focused our work on evaluating the implementation of DOE's controls over nuclear technology exports and

assessing the conformance of these controls with the requirements and intent of the Atomic Energy Act and the NNPA. We did not attempt to determine if any exports increased the potential for the proliferation of nuclear weapons or to assess how the exported technology and assistance has been used by the recipient countries. Determinations and assessments of the increased nuclear weapons proliferation threat resulting from this assistance are inherently difficult as detailed knowledge of the various countries' nuclear activities and intentions would be required. In addition, opinions are diverse on the proliferation significance of commercial nuclear technology.

To obtain an overall perspective, we discussed DOE's regulation of unclassified export activities with officials in DOE's Offices of International Security Affairs and General Counsel. We discussed with them the objectives of the regulations, the history of the program and the relationship of the regulations to the governing legislation, a February 1983 revision to the regulations, and other general matters. We reviewed related documents and files describing past activities and obtained information on the 148 requests for specific authorization submitted to DOE during the 6 years covered in our review. Of these 148 requests, 125 involved assistance to restricted countries, and 30 involved sensitive nuclear facilities (7 requests involved both restricted countries and sensitive facilities).

To address the general authorization area, we discussed with DOE regulatory officials the intent of the regulations and DOE's knowledge of assistance provided to foreign countries under this authorization. We reviewed relevant DOE documents and files that provided information on 19 generally authorized activities identified to DOE by various U.S. firms and individuals. We also discussed the general authorization and the assistance provided with officials of the other SNEC agencies. In addition, we compared DOE's general authorization regulations, and the way DOE officials interpret them, to export regulations of the Departments of Commerce and State.

From DOE documents identifying generally authorized assistance, we identified 11 examples that initially appeared to require specific authorization. We wrote to the companies that conducted 10 of these assistance activities to obtain copies of the documents provided to foreign countries (copies of the documents provided under the eleventh activity were available at DOE). To determine whether the assistance was appropriately performed under the general authorization, we assessed each document we obtained, using advisory guidance DOE has provided to

various companies. We also had officials at the other SNEC agencies review the documents and give us their views on the significance of the assistance and the appropriateness of providing it under the general authorization.

To address the specific authorization area, we discussed with DOE officials their procedures for reviewing requests for authorization involving exports of technology to restricted countries. We examined available documents relating to these authorization requests and listings provided by DOE of the 125 requests of this type that it had received in the 6 years covered in our review. Of these 125 requests, DOE had authorized 47 and denied 38. Eighteen others had been withdrawn, and 22 were pending.

We attempted to review DOE's files on each authorized activity, but as noted in the limitations on our work discussed below, some files were not available or were incomplete. Nevertheless, we examined 44 files to identify DOE's reasons for authorizing these activities. Further, we examined the files of the 38 disapproved activities to identify DOE's bases for disapproval. We also discussed these types of activities with officials of the other SNEC agencies to obtain their perspectives. We reviewed, where available, relevant records on these agencies' reviews of the activities to be authorized.

To address the SNT area, we discussed with DOE program officials the significance of SNT. We obtained a DOE listing of 30 activities that had been authorized, or for which authorizations had been requested, related to sensitive nuclear facilities. Of these 30 requests, 11 had been authorized, 7 denied, 10 withdrawn, and 2 were pending. In addition, because SNT requirements apply to DOE cooperative activities with foreign countries, we obtained a list of these DOE activities. We also discussed the intent of the SNT provision with officials from DOE's Office of the General Counsel and reviewed three studies on the applicability of SNT to various export activities performed for DOE by outside firms.

We reviewed records of the 29 private sector and 8 DOE activities that occurred between 1980 and 1985 and could have involved SNT.<sup>3</sup> We reviewed DOE's files on each activity to ascertain whether DOE had determined that it involved SNT. We discussed certain cases in detail with DOE officials to understand the rationale for their SNT determinations. We

---

<sup>3</sup> One of the 30 activities related to sensitive nuclear facilities deals with plutonium fuel fabrication, which requires specific authorization under DOE's regulation but is not included in the legislative definition of SNT. Consequently, it cannot involve the transfer of SNT and is not included in the activities that we reviewed.

also obtained the views of officials from the other SNEC agencies on SNT and on DOE's interpretation of SNT. In conjunction, we discussed with them certain activities that DOE has authorized and obtained information on the input of these agencies on DOE's SNT determinations related to its own cooperative activities.

As we reviewed records and discussed all of these matters with DOE and other officials, we noted areas where potential weaknesses exist in DOE's general administration of its regulations. We discussed each area with DOE regulatory officials and with officials of other SNEC agencies as appropriate.

At the request of the Subcommittee on Energy Conservation and Power, House Committee on Energy and Commerce, we did not obtain official agency comments on this report. Nevertheless, we discussed the matters presented in the report with officials within DOE's Offices of the Assistant Secretary for Defense Programs and General Counsel and made changes where appropriate.

Our work was conducted from June through December 1985. Our work was performed in accordance with generally accepted government auditing standards.

---

### Limitations on the Scope of Our Work

We encountered two limitations on the planned scope of our work. One limitation related to the completeness of DOE files on requests for specific authorizations for the period 1980 through 1983. We encountered difficulties in locating all the files we needed, and many of those that we did obtain were incomplete. Consequently, we were not able to completely assess DOE's decision-making process on these activities. This issue is discussed in more detail in chapter 5.

The other limitation related to activities conducted under the general authorization contained in DOE's regulations. In our efforts to evaluate this issue, we found it necessary to contact private firms to obtain copies of information they had provided under this authorization. One firm—Bechtel National, Inc., of San Francisco, California—did not provide us the information we needed to evaluate the activities they had performed under this authorization. In October 1985 we requested copies of documents that the company had provided to Japan under the general authorization, and in November 1985 Bechtel's Vice President, Marketing and Business Development, Advanced Technology Division, told us that the requested documents were the property of its clients

and could not be released without the clients' permission. Although the firm agreed to seek permission to provide us with these documents, in a January 16, 1986, letter, the company notified us that it would be unable to provide the documents. This is discussed in more detail in chapter 2.

The subject documents all involved assistance to sensitive foreign nuclear facilities. Although not having them did not preclude us from drawing conclusions on DOE's export controls under its general authorization, not having them prevented us from assessing whether the information contained in the documents was significant enough to warrant review under DOE's specific authorization procedures.

# Assistance Provided as Publicly Available Information Needs Greater DOE Control

DOE generally authorizes the transfer of publicly available information to foreign nuclear programs. Similar provisions exist in the export regulations of the Departments of Commerce and State. Compared to these agencies, however, DOE interprets its regulations broadly. Commerce and State limit their general authorization to documents available to the public free or at nominal cost from libraries or other sources. DOE, on the other hand, allows firms to develop and provide documents to foreign countries that are specially produced at substantial cost and that are not generally available themselves to the public but are based on publicly available information. The limited available data on DOE's general authorization experience indicate that assistance has been provided, such as reprocessing plant design assistance, that should have had prior DOE review under its specific authorization procedures.

## DOE Broadly Interprets What Is Publicly Available Information

Export regulations of DOE and the Departments of Commerce and State provide a general authorization for the transfer of publicly available information to foreign sources. In implementing this part of its export regulations, however, DOE has allowed the transfer of documents that are not publicly available but are "based on" publicly available information. The other two agencies have defined publicly available information in comparatively narrow terms.

DOE's regulations state that the general authorization covering publicly available information is "limited to the furnishing of information which is available to the public in published form." Neither DOE review of the information to be furnished nor notification to DOE of the activity is required. Similarly, Commerce's Export Administration Regulations (15 CFR), which govern the majority of exports from the United States, provide a general license for the export of publicly available technical data. In addition, the State Department controls the export of arms and munitions. The Department's International Traffic in Arms Regulations (22 CFR 121-130) allow the uncontrolled transfer of technical data that are in the public domain.

Both the Commerce and State regulations define the information that can be transferred without prior specific approval. Commerce defines this information as

"Publications that may be purchased without restrictions at a nominal cost or obtained without cost or are readily available at libraries open to the public."



The regulations further state that the term "nominal cost" is intended to reflect only the cost of preparing and distributing a publication and not the intrinsic value of the technical data it contains. If these costs are sufficient to preclude general availability of the technical data to the public, the general license is not applicable.

State's regulations provide that information in the public domain is not subject to its export licensing requirements. The regulations define information in the public domain as information that is both published and generally accessible or available to the public (1) at newsstands and bookstores, (2) through subscriptions available without restriction, or (3) at public libraries.

Unlike Commerce and State, DOE has never clearly defined in its regulations what constitutes publicly available information. At the time that DOE issued a proposed rule in September 1982 prior to its latest (February 1983) change in its regulations, DOE stated that it was "considering additional guidance concerning the term 'information available to the public in published form.'" As of March 1986, however, DOE had not developed such guidance.

In practice, DOE, in comparison to Commerce and State, is broadly interpreting what is or is not publicly available information. According to DOE records and DOE regulatory officials, DOE is allowing new publications that are not available to the public at nominal cost to be provided to foreign countries under its general authorization if they are based on publicly available information. Although DOE has advised firms providing new documents to foreign countries not to convey proprietary information unavailable in published form or any evaluations, conclusions, or recommendations, DOE does not review the documents for such information or material.

---

## Information Transferred Was Not Publicly Available in Published Form

Like Commerce and State, DOE does not require reporting on publicly available information provided to foreign countries under the general authorization. In addition, advance DOE review and approval of such transfers are not required. Therefore, DOE has little information available to it on the nature and extent of information transferred to foreign sources under its general authorization. Occasionally, however, persons or companies make inquiries or seek clarification of DOE's general authorization regulation. We identified 19 instances in which U.S. firms brought to DOE's attention their planned transfers of information to foreign sources under the general authorization. Of these, 11 involved the

planned transfer of new studies or reports, based on publicly available information, to restricted countries or to countries not on the restricted list but involving sensitive nuclear facilities.

We reviewed DOE's files on the latter cases. According to representatives of the companies involved, four transfers never occurred. As shown in table 2.1, the remaining seven activities involved providing assistance to a nuclear power plant in China—a restricted country—and assistance related to developing reprocessing plants in Japan and South Korea.

**Table 2.1: Generally Authorized Assistance to Restricted Countries or for Sensitive Facilities, 1980-1985**

Activity	Country	Company
<b>Assistance to restricted country</b>		
Engineering services for a nuclear power plant	China	Sargent and Lundy
<b>Assistance to sensitive facilities</b>		
Participate in the review of the conceptual design of a reprocessing plant	Japan	Bechtel
Study on the evolution of reprocessing plant equipment and design in the United States	Japan	Bechtel
Study of reprocessing plant instrument systems	Japan	Bechtel
Study on the design and operation of a critical component to a reprocessing plant (solvent extraction pulse columns)	Japan	Bechtel
Report on analytical lab systems necessary to support operation of a reprocessing plant	Japan	International Energy Associates, Limited
Conceptual development of a more proliferation-resistant reprocessing method (coprocessing)	S. Korea	Battelle Columbus

Under DOE's export regulations, assistance to restricted countries or related to sensitive facilities, such as reprocessing plants, requires the prior specific authorization of the Secretary unless the assistance is limited to transfer of technical information that is available to the public in published form. We found, however, that in the seven cases listed in table 2.1, the studies and reports transferred under DOE's general authorization were not available to the public in published form. In addition, the high cost of the publications precludes their general availability, and contrary to DOE advisory guidance, two of the three reports we obtained and reviewed contained conclusions, evaluations, and recommendations. Finally, although the reports were provided to foreign countries under the general authorization, they constituted assistance to

these countries that was potentially significant enough to have warranted prior DOE review under its specific authorization procedures.

---

### Documents Were Not Publicly Available

According to DOE regulatory officials, each of the seven documents provided under the general authorization was a new study being performed and issued specifically to the client country. In no instance was the document available to the public when the assistance was provided. In fact, we found that, as of December 1985, five of the documents are considered proprietary and are still not publicly available. Specifically,

- The four Bechtel studies were not available for public review. The company told us that as a matter of business practice they do not release documents that were developed for their clients. We requested copies of the reports from Bechtel in order to review the information provided, but the company declined to provide them.
- International Energy Associates, Limited, provided us with the study it had performed; however, company officials told us that they consider the report a proprietary document because it represented a substantial effort for their client.
- The two remaining studies were made available to us without restriction but were not publicly available when the companies provided them to foreign countries. One company attempted to address the publicly available criterion at the time it sent its report to the recipient country by sending it to DOE with instructions to place the document in DOE's public document room. DOE returned the report without making it publicly available. Nevertheless, to make it publicly available, the firm placed the document in the public library of a professional society 2 months after it was provided to the foreign country. We pointed out in a previous report<sup>1</sup> that this is a loophole that had been used earlier by another firm to circumvent the specific authorization process by making new documents publicly available and therefore generally authorized.

---

### Some Documents Had More Than Nominal Cost

Cost is one criterion for determining if data are publicly available. The Export Administration Regulations state that if a document has a cost sufficiently high to prevent it from being available to the public, it cannot be exported under Commerce's general license.

---

<sup>1</sup> Evaluation of Selected Features of U.S. Nuclear Non-Proliferation Law and Policy (EMD-81-9, Nov. 18, 1980).

Data on the amount that the firms received for the documents they provided under the general authorization were not provided to DOE. However, DOE regulatory officials stated that in at least one instance the amount the company received was several million dollars and that others likely had costs that would place their acquisition out of the public's reach.

---

**Documents Contained  
Conclusions, Evaluations,  
and Recommendations**

DOE had advised firms not to include conclusions, evaluations, and recommendations in new reports and studies transferred to foreign countries under its general authorization. As discussed previously, we were not permitted to examine four of the seven documents to ascertain whether they had complied with this guidance. However, such information was included in two of the three documents that we did review. One document on coprocessing (a more proliferation-resistant form of reprocessing) contained new analyses based on various reprocessing computer codes and also contained data on how this form of reprocessing affects the use of the produced material in a nuclear weapon. One other document provided information on possible problems and solutions to the design of portions of a Chinese nuclear power plant. Some of the information provided was based on publicly available documents related to U.S. nuclear power reactors; however, much of the information, as stated in the document, was based on the company's experience and on industry practices and was not attributed to published documents. Further, this document contained recommendations for improving the plant design.

---

**Assistance Provided Is  
Potentially Significant**

Because these seven activities were carried out under DOE's general authorization, no specific review and authorization controls were performed by DOE before the activities occurred.<sup>2</sup> However, the activities that were carried out appear to be of such significance that specific authorization may have been warranted. For example, two of the activities have direct parallels to other activities requiring specific authorization, as discussed below.

- The Bechtel study for Japan of the design and operation of solvent extraction pulse columns, a critical reprocessing plant component, is similar to a 1983 activity involving assistance in the design and study of pilot-scale pulse columns in Canada. This assistance to Canada was also

---

<sup>2</sup> DOE did review one generally authorized activity before it was transferred to the recipient country. The circumstances surrounding this activity are discussed in more detail in chapter 4.

based on publicly available information, yet required the specific authorization of the Secretary because it involved the specific application of this published information to Canadian processes and equipment.

- The Sargent and Lundy study for China involved the review of a nuclear power plant's auxiliary building design and the training of Chinese nationals in U.S. facilities. Similar activities for China that required specific authorization included a review of reactor building design documents in 1985, seven authorizations for engineering and design services in 1985, and two authorizations for training of Chinese nationals at U.S. facilities in 1981 and 1982. DOE required specific authorization in these instances because, as stated in DOE documents, the Atomic Energy Act prohibits these activities except as authorized by the Secretary. Under DOE's regulations, the Secretary has not provided approval for training and other activities for a restricted country under a general authorization.

We discussed the seven activities conducted under the general authorization with officials from the other SNEC agencies. Representatives of all these agencies agreed that the activities that have been conducted appear to provide significant assistance to foreign nuclear programs. Further, officials from NRC, ACDA, and State who reviewed the three reports we obtained, as well as the subjects of the four reports we could not obtain, stated that the information provided could benefit a nuclear program. According to these officials, the knowledge and experience of U.S. firms in this area is valuable, and the firms' knowledge of what information is relevant and important to a subject facility can greatly assist a foreign country's efforts to develop a nuclear capability. They stated that the six activities related to reprocessing provided under the general authorization appeared to be the most significant. In this regard, officials from all three agencies stated that the reprocessing studies to Japan, because of their subject matter, appeared significant enough that they should have had prior DOE and SNEC agency review under specific authorization procedures. Officials from ACDA also stated that the coprocessing study for South Korea was significant and should have been handled under DOE's specific authorization procedures.

They also said that there appeared to be little difference between these activities and others requiring prior DOE review and specific authorization by the Secretary of Energy. Officials from NRC and ACDA stated that because of DOE's broad interpretation of publicly available information and the applicability of its general authorization to all countries, activities similar to the seven examples could also be performed, without

prior federal review and approval, for countries that are poor proliferation risks. They added that the identified activities conducted so far set a precedent and that the regulations need to be changed to ensure that such activities do not occur without federal oversight.

DOE regulatory officials agreed that weakness exists with the agency's publicly available information provision of the general authorization. In this regard, they stated that they have begun the initial steps to narrow the publicly available provision to allow general authorization only of published documents available for the cost of reproduction or readily available at libraries. They added that this proposed revision to the regulations is under internal review but they could not estimate when the revision would be available for public comment.

---

## Conclusions

Because of the broad language of Subsection 57(b) of the Atomic Energy Act, any activity dealing with nuclear power plants or the nuclear fuel cycle could require the specific authorization of the Secretary. The general authorization provision in DOE's regulation is meant to allow nuclear-related activities that are not significant to the production of special nuclear material to be conducted without prior DOE review. The existence of such a general authorization in DOE's export regulation is consistent with the export regulations of Commerce and State and appears to be a valid method of reducing the administrative burdens of the regulation.

However, DOE's broad interpretation of what constitutes publicly available information in its general authorization allows U.S. companies to develop and provide to foreign countries proprietary documents that not only include previously published information but also incorporate the experience and special knowledge of the firms. This potentially significant assistance can then be provided to restricted countries or for sensitive facilities without oversight by DOE. This is inconsistent with export regulations of Commerce and State and, in our view, is ineffective implementation of the Atomic Energy Act and the NNPA. These acts contemplate federal review and approval of proposed significant and sensitive export activities to ensure that they are not detrimental to the interests of the United States. New documents to foreign countries that are based on publicly available information, but which also incorporate special knowledge and expertise of U.S. firms, allow companies to bring their special knowledge and expertise to bear and consequently provide important information and/or significant assistance to recipient countries' nuclear programs. Such activities involving restricted countries or

sensitive facilities are the type of activity that the Secretary should review in advance and either specifically authorize or deny.

DOE's interpretation of its general authorization also weakens inter-agency federal control over U.S. nuclear assistance to foreign countries. Under DOE's broad interpretation, activities of potential significance can be performed for restricted countries or sensitive facilities without consultation and/or concurrence of other interested federal agencies listed in the statute. Further, this interpretation provides U.S. firms and individuals too much discretion to determine what information can or cannot be provided without the specific authorization of the Secretary of Energy.

To better ensure effective regulation of transfers of publicly available information to foreign sources, DOE needs to narrow the interpretation of publicly available information in a manner similar to Departments of Commerce and State export regulations. The proposed approach of the DOE regulatory staff, as we understand it, would do this. It would allow only documents that are truly publicly available to be exported under the general authorization and would require that new documents "based on" publicly available information be reviewed by DOE under its specific authorization procedures.

---

## Recommendation to the Secretary of Energy

To better ensure federal control over the U.S. assistance provided to foreign atomic energy programs, we recommend that the Secretary of Energy revise the general authorization provision of DOE's regulations to (1) allow only previously published documents readily available to the public for the cost of reproduction to be provided under the general authorization and (2) require that any new documents, even if based on publicly available information, be submitted to DOE for specific authorization if they are being sent to restricted countries or involve sensitive facilities.

# Nonproliferation Standards Should Be Established for Authorizing Assistance to Restricted Countries

For the most part, DOE considers certain exports of assistance to foreign nuclear programs, such as exports of power reactor technology, to be relatively nonsensitive. For many countries, therefore, these types of exports are generally authorized. Because nonsensitive nuclear technology can indirectly aid development of nuclear weapons capability, however, the specific authorization of the Secretary is required for exports to restricted countries. Further, DOE requires that all assistance to sensitive facilities in any country be specifically authorized.

The NNPA directed DOE to establish any necessary standards and criteria for making authorization decisions. DOE has established categories for which a general authorization is adequate. However, DOE has established six "factors" for consideration in assessing whether proposed export activities are detrimental to the interest of the United States for the purpose of specific authorizations. In contrast to NRC's export regulations, DOE's authorizations need not be based on specific nonproliferation criteria. As a result, authorizations are granted not only on the basis of nonproliferation reviews but also because of political and economic factors, and exports have been authorized to restricted countries without obtaining firm nonproliferation assurances. DOE should revise its regulations to establish clear nonproliferation standards upon which to base its authorizations. In addition, the Congress may wish to consider establishing nonproliferation standards through legislation.

## DOE Requirements for Specific Authorizations

Except for nuclear material and equipment exports licensed by NRC, DOE is charged with reviewing and either authorizing or denying any activity that assists directly or indirectly in the production of special nuclear material. For sensitive facilities—uranium enrichment, reprocessing, heavy water production, and plutonium fuel fabrication—DOE requires specific authorization of any export regardless of the recipient country. DOE considers the other areas of the nuclear fuel cycle—nuclear power reactors, uranium mining and milling, and fabrication of low-enriched reactor fuel—as relatively nonsensitive. Power reactor technology is not considered sensitive because special nuclear material produced in reactors is not readily accessible in spent reactor fuel and because the fuel is in the form of countable assemblies that are relatively easy to safeguard and control. The other fuel cycle areas are too indirectly related to the production of special nuclear materials to be considered sensitive.

Nevertheless, the possibility exists that a foreign country could extract weapons material from spent reactor fuel and divert the material to a nuclear weapons program. In fact, the United States has shown that



---

**Chapter 3**  
**Nonproliferation Standards Should Be**  
**Established for Authorizing Assistance to**  
**Restricted Countries**

---

spent reactor fuel could be used in a nuclear device. As we discussed in a previous report,<sup>1</sup> the United States announced in 1977 that a successful nuclear test had been conducted with "reactor-grade" plutonium, thus demonstrating that plutonium from spent nuclear fuel is usable for weapons. Moreover, some forms of nonsensitive assistance could also be useful at indigenously developed facilities dedicated to the production of weapons material. Thus, the transfer of nonsensitive nuclear technology could assist a foreign nuclear weapons program. DOE's export regulations, therefore, require the Secretary's specific authorization for export of nonsensitive nuclear assistance to the restricted countries listed in its regulations. Until 1983 these countries were limited to 19 primarily communist nations. However, in February 1983 DOE added 43 countries that (1) had not signed the NPT or the Treaty of Tlatelolco or (2) were in geographic areas of particular volatility or sensitivity. These countries are listed in table 3.1.

---

<sup>1</sup> Quick and Secret Construction of Plutonium Reprocessing Plants: A Way to Nuclear Weapons Proliferation? (EMD-78-104, Oct. 6, 1978).

**Chapter 3  
Nonproliferation Standards Should Be  
Established for Authorizing Assistance to  
Restricted Countries**

**Table 3.1: Countries Requiring Specific Authorization for Nonsensitive Nuclear Technology**

<b>Prior to February 1983</b>	<b>Added to regulation in February 1983</b>	
Albania	Afghanistan	Malawi
Bulgaria	Algeria	Mauritania
Cambodia <sup>a</sup>	Andorra	Mozambique
China	Angola	Niger
Cuba	Antigua and Barbuda	Oman
Czechoslovakia	Argentina	Pakistan
East Germany	Bahrain	Qatar
Estonia	Belize	Saint Vincent and the Grenadines
Hungary	Bhutan	
Laos	Brazil	
Latvia	Burma	Sao Tome and Principe
Lithuania	Chile	
North Korea	Comoros	Saudi Arabia
Outer Mongolia	Djibouti	Seychelles
Poland	Dominica	Solomon Islands
Romania	Equatorial Guinea	South Africa
Southern Rhodesia <sup>b</sup>	Guyana	Syria
Soviet Union	India	Tanzania
Vietnam	Iran	United Arab Emirates
	Iraq	
	Israel	Vanuatu
	Kiribati	Yemen
	Kuwait	Zambia
	Libya	

<sup>a</sup>Now Kampuchea

<sup>b</sup>Now Zimbabwe

**No Standards for Authorizing Assistance to Restricted Countries**

The Atomic Energy Act requires that the Secretary of Energy must determine that a proposed export is not detrimental to the interests of the United States before authorizing any export that could be used to produce special nuclear material outside the United States. The act does not provide the Secretary with criteria or guidance for making this determination; however, the NNPA stated that an immediate effort should be undertaken to establish quickly any necessary standards and criteria, including the nature of any required assurances or evidentiary showings, for making these determinations.

While such standards and criteria are generally useful for making objective decisions, they could be particularly useful for authorizing assistance to restricted countries. These countries, for the most part, have not agreed to political assurances that they will not develop nuclear

weapons, and some nations—in particular Argentina, India, Israel, and South Africa—are operating nuclear facilities that are not monitored under international safeguards. The nuclear weapons intentions of these nations are therefore not fully known, and the capability may exist in these nations, or is being developed, to produce special nuclear material. Consequently, standards and criteria for authorizing assistance to such countries may provide a safety net to ensure that inappropriate assistance is not authorized.

Rather than establish standards and criteria for making specific authorization determinations, DOE has established six “factors” used in reviewing applications for exports of nuclear technical services and transfers of technology. The factors do not serve as standards—that is, DOE’s regulations do not specify how they will be applied in making authorization determinations—and no single factor or combination of factors must be met in order for the Secretary to grant a specific authorization. The factors are

- whether the United States has an agreement for cooperation with the country;
- whether the country is a party to the NPT or a full party to the Treaty of Tlatelolco;
- whether the country accepts IAEA safeguards on all its peaceful nuclear activities (referred to hereafter as “full-scope safeguards”);
- whether the country will accept IAEA safeguards on the project for which the export is intended (referred to hereafter as “facility safeguards”);
- the relative significance of the export and availability of comparable assistance from other sources; and
- any other factor that may bear upon the political, economic, or security interests of the United States.

In contrast to the factors for consideration used in DOE’s specific authorization process, NRC has nonproliferation standards that, by law, must be met before it can license the export of nuclear facilities and their components. Exports of nuclear components are governed by Section 109 of the Atomic Energy Act, which states that no exports of nuclear components can be made unless (1) IAEA safeguards will be applied; (2) the export will not be used in, for research on, or for the development of any nuclear explosive device; and (3) the export will not be retransferred to any other nation without prior U.S. approval.

Exports of nuclear facilities are subject to more stringent conditions. Section 103 of the Atomic Energy Act precludes facility exports unless an agreement for cooperation is in place. Section 127 of the act also requires that, in addition to the conditions imposed on component exports, adequate physical security measures must be maintained. Finally, section 128 of the act further precludes exports of nuclear facilities to a nonnuclear-weapons state unless the recipient state maintains full-scope safeguards.

If NRC determines that proposed exports do not meet one of these standards, the exports cannot be effected unless the President determines that failure to approve an export would be seriously prejudicial to the achievement of U.S. nonproliferation objectives or would otherwise jeopardize the common defense and security.

From a nonproliferation viewpoint, assistance in the form of nuclear technical services or transfer of technology requiring the specific authorization of the Secretary of Energy can be as significant as the export of nuclear facilities and equipment regulated by NRC. Types of assistance authorized by the Secretary of Energy include the technology necessary to manufacture nuclear facilities and equipment; the knowledge and expertise necessary to design, construct, operate, and maintain such facilities; and any nuclear-related equipment not licensed by NRC (NRC licenses nuclear power reactor equipment related only to the reactor and the primary reactor cooling system). Thus, while NRC regulates the export of nuclear facility hardware, DOE regulates the export of technology and equipment that can enable a foreign country to design, construct, and operate nuclear facilities.

In a November 1980 report,<sup>2</sup> we pointed out that, unlike NRC licensing of facility hardware exports, DOE's regulations and procedures for controlling assistance provided to foreign countries lacked determinative standards. We noted that the factors used by DOE in evaluating proposed assistance gave the executive branch considerable flexibility and discretion in determining how each factor will be weighed in reaching its decision on whether the assistance should be authorized and that this provided opportunities for arbitrary decisions. Therefore, we recommended that the Secretary of Energy take the lead in coordinating a comprehensive interagency review of all U.S. export controls to ensure that the United States approaches the control of nuclear-related exports in a consistent manner. In response, DOE stated that U.S. action on

---

<sup>2</sup> (EMD-81-9, Nov. 18, 1980).

requests for authorization pursuant to its regulations is very much a part of the delicate balance of incentives and controls necessary to obtain U.S. objectives. In the agency's view, the development of rigid criteria and procedures for such exports was not in the interest of sound decision making in the area of U.S. foreign policy. DOE concluded that its procedures for reviewing requests for specific authorizations are sufficient and questioned the desirability of a general review of U.S. export controls just 3 years after the NNPA had been enacted.

In rebutting DOE's response, we noted that in the past DOE had considered the transfer of some reactor manufacturing technology under its regulations more sensitive than the export of nuclear equipment and materials subject to strict nonproliferation standards required for exports licensed by NRC. We added that DOE's position did little to ensure that foreign countries would not purchase U.S. reactor manufacturing technology as a way of circumventing NNPA-required nonproliferation conditions imposed on exports of nuclear facilities, equipment, or materials.

### Political and Economic Factors Are Considered in Authorizations to Restricted Countries

During the period 1980 to 1985, the Secretary of Energy specifically authorized 46 nonsensitive activities, and 1 activity to a sensitive facility, to be conducted with 7 nations on DOE's restricted list. The large majority of authorizations—31 of the 47—was for engineering services, and 28 of these were to China and South Africa, as shown in table 3.2.

**Table 3.2: Activities With Restricted Countries Authorized by the Secretary of Energy, 1980-1985**

Country	Total	Activities			
		Training	Engineering services	Manufacturing technology	Equipment
Argentina <sup>a</sup>	2		1		1
Brazil	2		2		
China	24	4	15	3	2
East Germany	1				1
Romania	4			4	
Saudi Arabia	1	1			
South Africa	13		13		
<b>Total</b>	<b>47</b>	<b>5</b>	<b>31</b>	<b>7</b>	<b>4</b>

<sup>a</sup>One authorization for assistance to a sensitive facility in Argentina occurred in 1981, before Argentina became a restricted country. However, because Argentina posed the same proliferation risk before it was included as a restricted country as it did after it was included, we are including this authorization as one that provided assistance to a restricted country.

The five DOE authorizations for training allowed firms to provide basic nuclear reactor training. The engineering services authorized by DOE were for assistance in the construction, operation, decontamination, or maintenance of power reactors. The seven authorizations for export of manufacturing technology either allowed the export of technology for large power reactor components, such as steam generators and pumps, or, as in one authorization to China, permitted the establishment of a power reactor licensee relationship. Finally, three of the four authorizations involving equipment approved the export of equipment for producing milled uranium, permitted the export of reactor instrumentation, and allowed a foreign licensee of a U.S. firm to manufacture and supply nuclear reactor components to a restricted country. The fourth equipment authorization allowed the export of process control instrumentation to a sensitive heavy water production facility in Argentina. Appendix I provides further details on these activities.

DOE also denied 38 authorization requests for restricted countries during the same time period. These included disapproval of

- 22 requests by U.S. citizens to work at nuclear power reactors in South Africa,
- 5 requests to export equipment to nuclear facilities in India,
- 5 requests to export equipment and services to nuclear facilities in Pakistan,
- 3 requests to export heavy water plant equipment to Argentina,
- 2 requests to export equipment to the Soviet Union, and
- 1 request to export engineering services to Iran.

Of the six factors for consideration used by DOE, the one addressing the political, economic, or security interests of the United States was the controlling factor in DOE's decisions to authorize or deny assistance to restricted countries. Full records were available on 44 of the 47 authorized activities. Our review of these 44 cases and of the 38 activities that DOE denied showed that DOE cited four types of policy reasons in its authorization decisions:

- To support U.S. nonproliferation goals. In 38 of the 44 authorized activities, DOE determined that allowing the export would support nonproliferation goals, such as improving the likelihood that the recipient nation will accept full-scope safeguards. In these cases, DOE believed that failure to approve the assistance would limit nuclear dialogue between the United States and the recipient countries and, in some cases, that the

assistance would enhance U.S. understanding of the countries' nuclear program.

- To support U.S. economic or industrial goals. DOE cited increased opportunity for future sales of nuclear equipment and services as a basis for the approval of 21 activities to China and one to Saudi Arabia.
- To enhance political relationships with other countries. DOE cited this as a specific justification in three authorizations. For example, two of the authorizations involved the export of manufacturing technology for components of a heavy water power reactor to Romania to improve relations with that country and to assist Canada in its sales of heavy water reactors to Romania. In many other authorizations, the enhancement of the political relationship with the recipient country was not expressly stated but appeared to influence the authorization decision. For instance, in authorizing exports to Brazil DOE stated that denial of the assistance could adversely affect relationships with that country.
- To limit involvement with certain countries in fulfillment of foreign policy objectives. Twenty-five of 38 activities that DOE denied were disapproved because of foreign policy concerns. Twenty-two U.S. citizens were denied authorization in June 1985 to work at safeguarded nuclear power reactors in South Africa. According to DOE records, the activities involved were similar in nature and scope to activities authorized in September 1983; however, because of foreign policy considerations, these activities were not authorized. Two activities involving valves for nuclear power reactors and furnaces for uranium fuel fabrication to the Soviet Union were denied in 1982 because of administration policy to restrict trade with that country because of its involvement in Afghanistan. Finally, proposed assistance to Iran involving safety analysis services was disapproved in January 1984 because of U.S. policy not to provide assistance to Iran.

DOE regulatory officials acknowledged that policy considerations play a major role in these decisions. They pointed out that the Atomic Energy Act requires DOE to determine that proposed activities are not detrimental to the interests of the United States. In their view, the Congress wanted DOE to examine, on the basis of the existing system of international controls, more than just the proliferation aspects of proposed assistance to restricted countries. Otherwise, they said, the act would have simply required that assistance to foreign nuclear programs be limited to NPT signees, countries with full-scope safeguards, and/or countries with agreements for cooperation with the United States. The regulatory officials added that by broadly interpreting the act, DOE can provide limited assistance that can help the United States maintain a

nuclear dialogue and influence the nuclear programs of foreign countries. In the long run, they said, this may lead to acceptance of nonproliferation assurances and controls by foreign countries.

DOE's approach, however, does little to ensure that foreign countries will not purchase U.S. nuclear technology as a way of developing their nuclear programs while circumventing the conditions imposed by the NNPA on exports of facilities, equipment, and materials that are under NRC's jurisdiction. In this regard, our analysis of DOE's approved authorizations shows that authorized assistance does not have to meet any of the objective nonproliferation factors, as approved assistance to China was based on political and economic reasons and did not meet any of the objective factors. In addition, some of the authorizations related to significant manufacturing technology, equipment, and engineering services. Had this assistance involved facilities or equipment regulated by NRC, it could not have been exported under NRC's export control criteria. Further, two cases of assistance to sensitive heavy water facilities in Argentina—one that was approved and one that was initially recommended for approval by DOE staff but eventually denied—illustrate the effect of emphasizing political and economic factors compared to objective nonproliferation assurances.

---

**Assistance Authorized  
Without Objective  
Nonproliferation  
Assurances**

The first four factors for consideration in DOE's regulations address key nonproliferation controls or assurances. These factors—agreement for cooperation, party to a nonproliferation treaty, full-scope IAEA safeguards, and facility safeguards—can be objectively assessed, that is, either a foreign country meets or does not meet each factor. As shown in table 3.3, none of the 7 restricted countries receiving the 47 authorized exports meet all of the first 3 factors, which relate to the countries' overall nonproliferation status, and only East Germany and Romania are full parties to a nonproliferation treaty and/or maintain full-scope safeguards on their nuclear facilities.



**Chapter 3  
Nonproliferation Standards Should Be  
Established for Authorizing Assistance to  
Restricted Countries**

**Table 3.3: Proliferation Status of  
Restricted Countries Receiving U.S.  
Nuclear Technology**

<b>Nation</b>	<b>Agreement for cooperation</b>	<b>Party to a nonproliferation treaty</b>	<b>Full-scope safeguards</b>
Argentina	Yes	No <sup>a</sup>	No
Brazil	Yes	No <sup>a</sup>	No
China	No <sup>b</sup>	No	No
East Germany	No	Yes	Yes
Romania	No	Yes	Yes
Saudi Arabia	No	No	N/A <sup>c</sup>
South Africa	Yes	No	No

<sup>a</sup>These nations are not full parties to the Treaty of Tlatelolco.

<sup>b</sup>An agreement for cooperation with China was put into effect after the assistance to China was authorized.

<sup>c</sup>Saudi Arabia currently has no nuclear facilities.

The fourth objective nonproliferation factor—facility safeguards—relates to the nonproliferation controls on the facility for which the export is intended, and DOE has consistently applied this factor in its authorizations to restricted countries that are not nuclear weapons states. All assistance to these countries that DOE authorized was to safeguarded facilities (except in the case of the four authorizations to provide training, as there were no foreign facilities involved). In addition, we identified four proposed export activities—two to Argentina and two to India—that DOE denied because they were intended for unsafeguarded facilities.

DOE did not apply this standard, however, in September 1985 when the Secretary of Energy specifically authorized 19 activities involving unsafeguarded nuclear power reactors in China. These 19 activities involved provision of engineering services, manufacturing technology, and equipment related to these reactors. Although China did not meet any of the four objective factors, including facility safeguards, the Secretary of Energy authorized the proposed activities on the basis of a determination that China is considering the acceptance of IAEA safeguards and that the operation of these unsafeguarded reactors does not pose a direct proliferation threat since China is a nuclear weapons state.

**Significant Assistance Does  
Not Meet NRC Export  
Criteria**

Since 1980 DOE has authorized firms to transfer manufacturing technology for various reactor components, to export equipment that is not regulated by NRC, and to provide engineering and design services for nuclear power plants that, according to DOE documents, are necessary

for the successful completion and operation of the plants. According to NRC officials, from a proliferation standpoint, such activities may be as significant as the direct export of nuclear equipment and facilities from the United States.

Exports authorized by NRC must meet the criteria established by the Atomic Energy Act. These include assurances that the equipment will not be used for weapons purposes and that the equipment will not be retransferred without U.S. approval. Further, if the export involves facilities or major components, an agreement for cooperation must exist with the recipient country. However, exports authorized by DOE do not have to meet these criteria. As a result, significant assistance has been authorized by DOE that could not have been licensed under NRC export criteria for the following reasons.

- DOE does not require assurances that recipient countries would use exported assistance only for peaceful purposes or that the technology would not be retransferred to other countries or unsafeguarded facilities without U.S. consent. While such assurances may not be applicable to all assistance authorized by DOE, NRC officials stated that technology exports can have as much proliferation risk as equipment. They pointed out that the United States usually obtained rights to observe exported equipment to ensure that it is being used for peaceful purposes and is not retransferred, whereas such rights are not obtained for technology exports authorized by DOE. In this regard, DOE apparently was concerned about the potential for reexport in two instances involving Romania. In these cases it imposed a requirement on the companies providing the technology not to allow retransfer without U.S. consent. However, DOE did not obtain such assurances from the government of Romania, nor did it obtain assurances from other national governments in other cases involving restricted countries.
- DOE authorized a U.S. company to allow foreign licensees to provide nuclear power reactor main coolant pumps, steam generators, and fuel storage racks to East Germany. According to NRC officials, main coolant pumps are viewed as major plant components that cannot be exported from the United States unless there is an agreement for cooperation between the United States and the recipient country. No such agreement exists with East Germany.

Additionally, the policy regarding exports to various countries varies between NRC and DOE. NRC officials pointed out that, for policy reasons, they have not been able to obtain State Department approval for exports to Argentina and Brazil, even though DOE has been authorizing

assistance to these countries. According to these officials, they have been informed that this discrepancy exists because the statutory criteria for approving DOE authorizations is less stringent and because DOE authorizations are less sensitive. In this regard, they stated that, in their view, activities authorized by DOE are not less sensitive from a nonproliferation standpoint but because DOE, unlike NRC, does not make public its export decisions. (The issue of public disclosure of DOE authorization decisions is discussed in detail in chapter 5). Consequently, assistance authorized by DOE does not have to meet the same policy standards as does NRC.

---

**Exports to Argentina**  
**Highlight DOE's Reliance on**  
**Political and Economic**  
**Factors**

Although DOE considers political and economic factors important in making authorization decisions, its heavy reliance on these factors can result in arbitrary decisions. Two cases involving Argentina illustrate this point. In one instance, discussed below, DOE reversed a previous denial and authorized assistance to a sensitive facility in Argentina even though the nonproliferation status of the country had not changed. In the second instance, also discussed below, DOE relied on a policy review instead of a detailed examination of the export and had planned to authorize assistance intended for an unsafeguarded facility.

In 1980 DOE denied an authorization to the Foxboro Company to provide process control instrumentation to a heavy water production plant in Argentina.<sup>3</sup> DOE records show that its staff, after consulting with the SNEC, determined that the activity could not be authorized. The policy at that time was to persuade Argentina to sign and ratify a nonproliferation treaty and accept full-scope safeguards as a condition for exports to sensitive facilities. In fact, at that time the United States was critical of Switzerland, which was providing the heavy water plant to Argentina, without requiring full-scope safeguards.

In 1981 the company again requested a specific authorization, and at this time DOE authorized the export. According to DOE records, this assistance was authorized because the facility was safeguarded and because the equipment was available from other sources. DOE recognized that this was a reversal of previous policy regarding exports to Argentina but stated that this authorization may also help in the effort to get

---

<sup>3</sup> A discrepancy exists over the facility for which this proposed export was intended. DOE records on this activity are limited, but they indicate that in 1980 DOE believed that the export was intended for a safeguarded heavy water production plant. According to correspondence from the Foxboro Company to DOE in December 1985, this assistance was intended for an unsafeguarded pilot-scale heavy water production plant.

Argentina to accept full-scope safeguards. We found, however, no improvement in Argentina's nonproliferation status as a result of this assistance. Further, at the same time Argentina was constructing this safeguarded heavy water production plant, it was also building an unsafeguarded pilot-scale heavy water production plant. Consequently, assistance provided to the safeguarded facility may, albeit indirectly, assist in the country's efforts on the unsafeguarded plant.

Finally, we noted that subsequent proposed assistance to this plant was denied. In 1983 the company attempted to export spare parts for the process control system. However, while DOE had approved spare parts in its 1981 authorization, the Commerce export license for these spare parts had expired and, on the advice of the SNEC, Commerce would not extend the license.<sup>4</sup>

In another instance, DOE received an application in 1981 for the Spanish subsidiary of Masoneilan International, Inc., to provide process control valves for use in a heavy water plant in Argentina. In an October 1981 letter, DOE submitted its proposed approval of this assistance, on the basis of the same criteria as that used in the Foxboro export, to the SNEC agencies. DOE also cited that earlier export as a basis for approving this request. Further, DOE stated that expeditious action was needed or the sale would be lost to a foreign competitor.

However, DOE subsequently learned that the proposed assistance for which DOE staff had recommended approval was not intended for the safeguarded heavy water facility but was intended for the pilot heavy water production plant that was not under international safeguards. DOE records do not show how or when it discovered that this assistance was not intended for the safeguarded facility. DOE's file on this activity contained only the letter eventually disapproving the application. However, according to an ACDA official, the problem was discovered by an ACDA reviewer who noted a discrepancy between the equipment to be provided and the type of facility for which DOE thought it was intended. DOE then denied the export.

A DOE official agreed that ACDA did first note this problem but stated that it occurred because DOE was not fully informed of the intended destination by the applicant. He said that DOE never would have considered approving the export had the applicant made it clear that the equipment

---

<sup>4</sup> Commerce must license all nuclear equipment exports not under NRC jurisdiction, even if DOE grants an authorization.

was intended for an unsafeguarded facility. The official added that, had this export been authorized, the authorization would have stated that the export could go only to the safeguarded heavy water plant, which he believes would have precluded the company from sending the equipment to the unsafeguarded facility. Nevertheless, as pointed out by the ACDA official, DOE did not do an adequate job of assessing the proposed activity because of its overriding interest in the policy and economic factor.

In our view, this example points out good and bad points in DOE's authorization process. On the positive side, the checks provided by the SNEC agencies served to ensure that proper nonproliferation evaluations were made on assistance that DOE intended to authorize. However, it also shows that international political objectives and economic concerns can play too large a role in DOE's process for making authorization decisions.

---

## Conclusions

Assistance to foreign countries requiring the specific authorization of the Secretary of Energy can be as significant from a nonproliferation standpoint as the export of nuclear facilities and equipment regulated by NRC. For example, while the export of a nuclear power reactor provides a recipient country with the capability to produce plutonium (in spent reactor fuel), exports of nuclear power reactor design and engineering services and other reactor technology can provide a recipient country with the knowledge and expertise necessary to design, construct, and operate its own nuclear power reactors.

The NNPA stated that an immediate effort should be undertaken to quickly establish any necessary standards and criteria, including the nature of required assurances and evidentiary showings, for determining whether or not proposed assistance to foreign countries regulated by the Secretary is detrimental to the interests of the United States. DOE has chosen, however, to use six factors in making these determinations for specific authorizations in lieu of establishing standards and criteria. DOE does not treat any one or combination of these factors as a minimum condition for authorizing an activity. In contrast, NRC may not license the export of nuclear materials and equipment that it regulates unless assurances, safeguards, and physical security requirements specified in the NNPA have been met. For such assistance, the President may override an NRC decision not to license an export that does not meet all of these legal requirements upon a determination that not approving the export would prejudice U.S. nonproliferation objectives or jeopardize the common defense and security.

In 1980 we noted that, unlike the controls over NRC-licensed exports, DOE's approach to controlling export activities provided considerable discretion in evaluating proposed assistance and opportunities for arbitrary decisions. Therefore, we recommended that DOE spearhead a review of U.S. export controls to ensure their consistent application by all affected U.S. agencies. DOE questioned the desirability of such a review just 3 years after the NNPA had been enacted. It also pointed to the delicate balance of incentives and controls necessary to achieve U.S. objectives and the deleterious effect that rigid criteria would have on the conduct of foreign policy. After noting the sensitivity that DOE had ascribed to the export of some reactor manufacturing technology, we concluded that DOE's position did little to ensure that foreign countries would not purchase U.S. technology to circumvent the legally mandated conditions on exports of nuclear facilities, equipment, or materials.

Our evaluation of DOE's regulation of export activities during the period 1980 through 1985 reaffirms our earlier conclusions. Although four of DOE's six factors address nonproliferation assurances that can be objectively measured, such as whether a recipient country has signed a nonproliferation treaty or accepted full-scope safeguards, none of them necessarily have to be met for DOE to authorize an export. Moreover, political and economic considerations play a major role in DOE's authorization decisions. These considerations include encouraging recipient countries to accept nonproliferation controls, supporting economic or industrial goals, enhancing political relationships, and limiting involvement with certain countries in pursuit of foreign policy objectives.

We recognize that political and economic factors need to be taken into account in making decisions on these exports. However, we continue to be concerned that DOE's approach does not provide the level of nonproliferation assurances desired by the Congress when it passed the NNPA. Specifically,

- DOE's approach is not consistent with the purpose of the NNPA to ensure effective U.S. controls over exporting nuclear technology. Although the act did not establish standards for DOE as it did for NRC, it directed the Secretary of Energy to immediately establish any necessary standards, including the nature of required assurances and evidentiary showings. In making this distinction, the Congress may have recognized that certain activities authorized by DOE were not of major proliferation significance and, therefore, did not need to be subjected to all of the standards applicable to NRC-licensed exports. It does not appear to us, however, that the Congress would have required strict standards for NRC-licensed

exports but not have expected DOE to establish similar controls over assistance of equal importance to the construction and operation of nuclear facilities.

- The international political and economic factors carry disproportionate weight in making authorization decisions. Basing authorizations on these factors allows DOE to approve exports in the hope that recipient countries will eventually accept international nonproliferation standards, such as safeguards on all their nuclear facilities, or to encourage sales of U.S. nuclear services, without actually realizing improvements in the nonproliferation status of recipient countries. DOE's authorization of assistance to an Argentine heavy water production plant in 1981 after denying it in 1980 illustrates this point and shows the inconsistency that can occur in basing authorizations on these subjective factors.

We believe that now, after nearly 8 years experience under the NNPA, DOE should be in a good position to develop more objective criteria that will still allow flexibility but will better meet the nonproliferation goals of the act. In our view, DOE's procedures for specifically authorizing assistance to restricted countries' activities would be improved by developing nonproliferation standards that must be met by recipient countries before DOE will authorize assistance. Such standards, which would address the requirement of the Atomic Energy Act, could be based on the proliferation significance of proposed types of activities. This would help make clear to persons outside DOE the basic criteria that proposed exports have to meet. In addition, the standards could describe how policy and economic considerations are to be weighed in conjunction with objective nonproliferation standards.

---

### **Recommendation to the Secretary of Energy**

To establish a clear nonproliferation basis for specifically authorizing U.S. assistance to foreign atomic energy programs, we recommend that the Secretary establish objective standards and incorporate such standards in DOE's regulations. As a part of this effort, the Secretary should describe how political and/or economic factors will be weighed in conjunction with objective nonproliferation standards, such as facility safeguards.

---

### **Matter for Consideration by the Congress**

GAO made similar recommendations for DOE to establish objective export authorization standards in 1980, but DOE did not act on these recommendations. Should DOE again not act to establish standards for authorizing U.S. assistance to foreign nuclear programs, the Congress may wish to consider whether DOE-regulated exports should be subjected to export

---

**Chapter 3**  
**Nonproliferation Standards Should Be**  
**Established for Authorizing Assistance to**  
**Restricted Countries**

---

control standards similar to those currently required of NRC-licensed exports. In considering this matter, the Congress may wish to review the role of political and economic factors in reaching export regulation decisions.





# DOE Needs Better Criteria and Procedures for Identifying Sensitive Nuclear Technology

The NNPA requires that exports involving SNT must meet strict export requirements stated in the act. These requirements must be met by individuals and companies that apply for specific authorizations to export SNT and also by DOE in its nuclear activities involving the exchange of technical information with foreign governments. Between 1980 and 1985, private firms and DOE conducted 19 activities involving assistance to sensitive foreign nuclear facilities. Each of these activities potentially involved the transfer of SNT to foreign countries.

From 1978 until 1983, DOE did not have a regulation implementing the SNT provisions of the NNPA, and in that time frame 8 of 11 activities involving assistance to sensitive facilities were not subjected to documented SNT reviews. Since then, DOE has developed an SNT regulation and has reviewed all assistance related to sensitive facilities for potential transfers of SNT. Nevertheless, DOE has not established criteria for identifying SNT. As a result, DOE has made SNT determinations that are not founded on a consistent and logical basis, particularly in regard to foreign reprocessing assistance, and that are inconsistent with the provisions of the NNPA. Officials of other SNEC agencies share our views. A lack of independence in SNT decision making, particularly with regard to DOE's technical exchange activities, has contributed to these arbitrary decisions.

## Requirements for Authorization of Sensitive Nuclear Activities

The activities of greatest proliferation concern are those associated with nuclear facilities that enrich uranium, produce heavy water, or reprocess spent fuel. From a proliferation standpoint, these facilities represent sensitive steps in the commercial fuel cycle because they can provide the capability to fuel and operate unsafeguarded reactors, directly produce weapons-grade material, or convert reactor fuel into usable weapons material. However, the United States has traditionally followed a policy of promoting the peaceful domestic and foreign uses of nuclear energy. Therefore, U.S. assistance in these areas is not prohibited but is subject to the requirements of the Atomic Energy Act and the NNPA. In fact, in 1982 the President issued a policy directive allowing assistance in reprocessing technology to, and the use of related plutonium by, certain countries provided that all statutory requirements for providing this assistance are met. Private individuals or companies must obtain the specific authorization of the Secretary before providing any assistance to foreign countries in the development or use of these sensitive facilities.

According to DOE records, since 1980 U.S. companies and DOE have provided assistance to 7 foreign countries in the development of sensitive nuclear facilities. This assistance, provided under 19 separate activities, was primarily related to reprocessing, as shown in table 4.1.

**Table 4.1: U.S. Assistance to Foreign Countries in the Development of Sensitive Nuclear Facilities**

Country	Technology		
	Enrichment	Reprocessing	Heavy water production
Argentina			1
Canada			1
France	4	3 <sup>a</sup>	
Japan			5
Switzerland			1 <sup>a</sup>
United Kingdom			2
West Germany	1	3 <sup>a</sup>	
	<b>5</b>	<b>13</b>	<b>1</b>

<sup>a</sup>France, Switzerland, West Germany, and the United States were involved jointly on one activity involving reprocessing.

Eleven of the 19 activities were carried out by U.S. companies after they obtained the specific authorization of the Secretary. DOE conducted the other eight activities, all related to reprocessing research, as a part of technical exchange agreements with other countries. Appendix II provides details on the assistance provided and the recipient countries.

Of the seven countries receiving this assistance, six met high non-proliferation standards. Only Argentina, which received assistance in 1981 for a safeguarded heavy water production plant, is viewed by the United States as a potential proliferation risk, because it is a non-nuclear-weapons state that has not ratified either of the nonproliferation treaties or agreed to IAEA safeguards on all its nuclear facilities. Although Argentina was not a restricted country when this activity was authorized, DOE designated it as a restricted country in 1983.

In addition, DOE had documentation on six private company exports of publicly available information on reprocessing that were conducted under DOE's general authorization. These activities are discussed in chapter 2.

## Insufficient Efforts to Identify SNT Before 1983

Important assistance to sensitive foreign nuclear facilities is subject to requirements established in 1978 by the NNPA. As stated in subsection 4(a)(6) of that act:

"Sensitive nuclear technology means any information (including information incorporated in a production or utilization facility or important component part thereof) which is not available to the public and which is important to the design, construction, fabrication, operation or maintenance of a uranium enrichment or nuclear fuel reprocessing facility or a facility for the production of heavy water, but shall not include Restricted Data controlled pursuant to chapter 12 of the 1954 [Atomic Energy] Act;...."

The act placed controls on SNT comparable to those it placed on nuclear facilities licensed for export by NRC. Specifically, no SNT can be exported to any country—whether a nuclear-weapons country or a nonnuclear-weapons country—unless the recipient country agrees that any nuclear material produced or nuclear facility constructed through the use of such SNT will (1) be subject to IAEA facility safeguards, (2) not be used for any explosive device, (3) be protected by adequate physical security measures, (4) not be retransferred to another nation without prior approval of the United States, and (5) not be reprocessed or altered without prior U.S. approval. In addition, nonweapons countries must accept IAEA full-scope safeguards before they can receive SNT from the United States.

DOE technical exchange activities with foreign countries that involve SNT, as well as SNT assistance by private companies must meet the above SNT requirements. DOE regulatory officials stated that its Office of General Counsel has held that DOE must comply with the SNT requirements in the conduct of its technical exchange activities because the NNPA did not explicitly exempt DOE from its SNT requirements.

DOE did not have regulations implementing the SNT provisions of the NNPA until February 1983. Between January 1980 and February 1983, 11 activities involving enrichment, reprocessing, or heavy water production assistance to foreign countries were either specifically authorized by the Secretary or were being conducted by DOE as a part of technical exchange agreements with other countries. In 3 of the 11 instances, DOE made specific, documented determinations that they did not involve the transfer of SNT. Two of the three cases involved assisting in the repair of a reprocessing plant and demonstrating reprocessing technology for Japan. The third case involved providing equipment to a heavy water production plant in Argentina.

For the other eight activities, DOE made no documented assessment of the SNT implications of the assistance being provided. These activities—four private company activities specifically authorized by the Secretary and four DOE technical exchange activities—are described in table 4.2.

**Table 4.2: Activities Not Reviewed for SNT**

Activity	Country
<b>Specifically authorized</b>	
Lasers for uranium enrichment research (3 export authorizations involving 10 lasers)	France West Germany
Process control instrumentation for reprocessing plant	France
<b>DOE activities</b>	
Liquid Metal Fast Breeder Reactor (LMFBR) fuel cycle	West Germany
High-temperature gas-cooled (HTGR) fuel cycle	West Germany France Switzerland
LMFBR fuel cycle	Japan
Mechanical head-end shearing of LMFBR fuel	United Kingdom

Although the eight activities were not reviewed by DOE to determine if they contained SNT, documents related to these activities indicate that they may have provided significant assistance to sensitive nuclear facilities. Specifically,

- Three activities authorized by the Secretary in 1981 involved the export of lasers for uranium enrichment research to France and West Germany. Records relating to these exports show that one agency—ACDA—had stated in 1979 that these laser exports were an essential tool for research in the laser isotope separation method of enriching uranium and that laser exports “are generally recognized to have been a mistake.” DOE considered these lasers significant enough to require the recipient countries to ensure that they would protect the data obtained through the use of these lasers as Confidential/Restricted Data. This illustrates the significance of these activities, especially since direct export of information classified as Restricted Data is considered highly sensitive and can be authorized only by the President.
- One specific authorization allowed the export of \$10 million in process control equipment to a French reprocessing plant. Although DOE noted that the equipment was not specially designed for the reprocessing plant and was available from other sources, it also noted that the equipment provided more than incidental assistance to the plant. In addition, DOE recognized that U.S. policy was to not provide significant assistance to the establishment of new foreign reprocessing capability. Because the

assistance was to be provided to an existing reprocessing facility, however, DOE concluded that providing the assistance would not violate this policy.

- Four activities consisted of DOE reprocessing research with other countries. Although these activities may have provided significant information, we found no record of DOE reviews for SNT. For example, a 1979 technical exchange agreement with Japan provides for a 10-year exchange of scientists, equipment, materials, instruments, and information in LMFBR technology, including the reprocessing phase of this type of reactor's plutonium fuel cycle. In addition, a 1980 DOE agreement with the United Kingdom involves equipment crucial to preparing spent fuel for reprocessing. Although documents related to the agreement state that it does not contain SNT, we found no evidence of review for SNT by DOE's regulatory staff.

DOE regulatory officials told us that the assistance provided by private firms without DOE assessments for SNT was not significant enough to be considered SNT. They pointed out that the lasers were low-cost items, other sources for lasers existed outside the United States, and they were not used to enrich uranium. With regard to the assistance provided the French reprocessing plant, these officials stated that the equipment provided was not important to the operation of the plant and therefore was not SNT, because the plant could operate without this assistance. The regulatory officials could not comment on the SNT implications of the DOE technical exchange activities because they had not reviewed them.

## Lack of Criteria and Independence Hampers Current SNT Reviews

Since 1983 when DOE added SNT review requirements to its export control regulation, it has made SNT determinations on all specific authorization requests and DOE technical exchange activities involving sensitive nuclear facilities. It identified SNT in four cases and has not allowed it to be exported. In eight other instances, DOE has determined that SNT was not involved and allowed the activities to be conducted. Although this is an improvement over its earlier efforts, DOE has not developed criteria for identifying SNT. In addition, SNT decision making has been heavily influenced by the DOE organization responsible for nuclear energy research and development, including cooperative activities with foreign governments that potentially involve SNT assistance. In our opinion, DOE's negative SNT determinations are not in compliance with the requirements of the NNPA.

**DOE Now Reviews  
Proposed Activities for SNT**

DOE regulatory officials stated that the Department added SNT review requirements to its regulation in February 1983 to improve these reviews. As now stated in subsection 810.8(c) of the regulation,

“...if the proposed activity involves the export of ‘sensitive nuclear technology’...other requirements of law (section 127 and section 128 of the [Atomic Energy] Act) and the requirements of any international commitments to which the U.S. subscribes must be met.”

Since February 1983 DOE has identified four activities involving the proposed transfer of SNT. In none of these instances did DOE allow the SNT to be provided to foreign countries. As illustrated in table 4.3, DOE allowed a private firm to change the scope of one proposed activity and then perform it under the general authorization. DOE denied approval for one other activity and another one was withdrawn by the applicant. The remaining specific authorization request is pending.

**Table 4.3: Proposed Activities  
Identified by DOE as Containing SNT**

Proposed activity	SNT concerns	Resolution
Participation in review of a reprocessing plant's conceptual design	Activity is important to the plant design and is not available to the public	DOE allowed firm to revise scope of work to alleviate SNT concerns
Studies on the reliability and maintenance of reprocessing plant components and process	(No DOE file documenting SNT concerns)	Denied by DOE
Evaluation of reprocessing components, materials of construction, and operating experience	(No DOE file documenting SNT concerns)	Withdrawn by applicant
Fuel reprocessing services and technology	Activity is important to the plant design and is not available to the public	Export still listed as pending by DOE

DOE regulatory staff have also made documented SNT determinations on eight other activities they reviewed since February 1983. Four specific authorization requests involving assistance to sensitive nuclear facilities recommended for approval by the Secretary were determined not to involve SNT. The regulatory staff also now review DOE activities that may involve SNT. Four such activities have been identified since 1983. Finally, DOE established an internal committee in 1983 to review potential SNT activities referred to it by the regulatory staff. This committee, initially referred to as the SNT Committee and now known as the Export Control Working Group, consists of officials from various DOE offices, such as the Office of Nuclear Energy and the Office of International Affairs and Energy Emergencies.

## Lack of Criteria for Identifying SNT

The NNPA established three basic tests for identifying SNT. First, for an activity to be SNT, it must not include Restricted Data. The Atomic Energy Act does not permit the Secretary of Energy to authorize the export of Restricted Data. Second, the activity must not consist of the transfer of information that is available to the public. As discussed in chapter 2, publicly available information can be transmitted under the general authorization provided in DOE's regulations. Third, the activity must be important to the design, construction, fabrication, operation, or maintenance of an enrichment, reprocessing, or heavy water production facility. This test requires DOE to determine whether or not a proposed activity meets the "important to" threshold.

DOE's 1983 SNT regulation and review procedures represent improvement in the identification and control over the export of SNT. Nevertheless, DOE has not developed criteria for determining whether an activity meets the test of importance. According to DOE regulatory officials, efforts to define the term have met with little success. They pointed out that during 1982 and 1983 they initiated three studies of the legislative intent of the SNT legislation and attempted to develop consistent approaches for identifying SNT. Such approaches included developing a detailed list of SNT items or detailed parameters for identifying SNT. Since 1984 DOE has also been attempting to develop SNT guidelines. However, none of these efforts have yet been successful. According to these officials, it became apparent that detailed criteria would not be effective, particularly detailed listings of SNT activities, because such criteria may not sufficiently cover all sensitive activities while at the same time may unnecessarily restrict activities that are not particularly sensitive.

Consequently, DOE has been reviewing proposed activities for SNT on a case-by-case basis and making SNT determinations on the particulars of each activity. As a result, through experience DOE has used a number of different interpretations of "important to a facility." We identified four activities, described below, that provided significant assistance to sensitive foreign nuclear facilities but were not considered SNT by DOE. DOE made these determinations for the following reasons:

- Not important to the recipient country. DOE has been exchanging technical information with the United Kingdom in LMFBR spent fuel reprocessing since 1965. Under an exchange agreement, in 1983 DOE and the United Kingdom proposed an exchange of citizens from each country to observe and record data on reprocessing operations. This cooperative effort also involves the transfer of proprietary information on U.S.



reprocessing activities. DOE's SNT Committee determined that these activities did not involve SNT. The basis for this decision was that the information would not be important to the United Kingdom because it already has reprocessing capabilities. The committee acknowledged, however, that the information would be important—and therefore SNT—to countries without this capability.

- Not important because it relates to safety and economics. In 1983 DOE initiated the transfer of data related to LMFBR spent fuel reprocessing to Japan that would eliminate technical uncertainties in facilities for handling special nuclear material. The SNT Committee determined that this did not involve SNT because, among other reasons, it is relatively unimportant to the Japanese nuclear program because it involved improving the economics and safety of a reprocessing facility and therefore did not meet the importance test of the NNPA. However, related documents acknowledge that the information would be important to a country, such as Japan, with an advanced LMFBR program.
- Information will not be used directly in a sensitive facility. A U.S. company, Allied-General Nuclear Services, requested authorization to present a seminar on pulse column technology to Atomic Energy of Canada, Limited, and to review the design of a pilot-scale pulse column intended for experimental work. This critical component of a reprocessing facility separates plutonium from the uranium and waste products in spent fuel. DOE regulatory staff concluded that this proposed activity was not SNT because (1) Canada could build a pulse column without U.S. assistance, (2) the pilot-scale pulse column would not be a part of a reprocessing facility, and (3) the pulse column would not produce special nuclear material.
- Equipment not important to a sensitive facility. Another U.S. company, Plasma Kinetics, requested authorization to export a copper vapor laser to France for laser isotope separation studies related to uranium enrichment. The SNT Committee reviewed this proposed activity and determined that it did not involve SNT. Although the laser is important to research and development work on this method of enriching uranium, the committee decided that it does not “constitute equipment ‘important’ to an enrichment facility” because it cannot be used in such a facility but is simply a tool useful in a laboratory and is not capable of separating significant quantities of uranium from a nuclear weapons proliferation standpoint. Nevertheless, DOE required that all information pertaining to the use of this equipment or developed as a result of its use be protected as Confidential/Restricted Data.

DOE regulatory officials stated that the recipient country and the type of end-use facility involved have been major factors in DOE's SNT determinations. They pointed out that the NNPA requires DOE to determine what is "important to" sensitive facilities, defines those types of facilities, but is silent on the issue of recipient countries. Therefore, they consider it appropriate to take the identity of recipient countries into account in making SNT determinations on the basis of a realistic view of the SNT provision. The regulatory officials said that countries such as the United Kingdom have excellent nonproliferation credentials and already have the capability to produce special nuclear material; consequently, the incidental LMFBR reprocessing assistance the United States provided does not represent "important" assistance or an increase in the United Kingdom's capability of producing such material. The officials added, therefore, that activities that may be SNT for some countries may not be SNT for advanced nuclear nations such as the United Kingdom, Canada, and Japan.

DOE regulatory officials also stated that the controls over SNT required by the NNPA were intended to limit the further spread of the capability to produce special nuclear materials and that distinguishing among recipient countries in making SNT determinations takes this into consideration. Further, they said that foreign governments find the SNT conditions onerous and are unwilling to agree to the stringent nonproliferation assurances that the NNPA requires on sensitive facilities built using SNT from the United States. Consequently, they said, not considering recipient countries in SNT determinations would restrict U.S. cooperation with friendly foreign countries in these sensitive areas. In the view of these officials, this would limit any influence the United States may have on the development and use of sensitive nuclear facilities in these countries and would limit the knowledge that DOE and private firms gain from these countries in return for U.S. assistance.

Other SNEC agencies have disagreed with DOE's SNT determinations or the basis for its position, as discussed above. For example,

- State and ACDA expressed concern with DOE's position that reprocessing services and technology to be provided to West Germany does not involve SNT. Initially, DOE determined that this proposed activity would involve SNT, and the company then revised its proposed scope of work. DOE subsequently determined that SNT was no longer involved. State and ACDA, however, informed DOE that they had concerns over whether DOE was adequately addressing SNT. As a result, no final decision has been

made on whether this assistance involves SNT or if it should be authorized.

- NRC also was concerned with DOE's position that assistance to Canada on pilot-scale pulse columns did not involve SNT because it would not be used in a reprocessing facility. NRC notified DOE that it had concerns with DOE's SNT determination because (1) the stated objective of the Canadian program is the processing of spent reactor fuel from reactors of Canadian design, (2) the information being provided may ultimately be used in the design and construction of a reprocessing plant, and (3) the information is important because it deals with the selection of process equipment for a reprocessing plant. DOE did not agree with NRC's concerns and authorized this activity.

Officials we talked with at SNEC agencies all indicated that DOE's interpretation of what activities constitute SNT does not appear to be consistent with the intent of the Congress as reflected in the NNPA. They said that DOE's SNT determinations should be based more on technical analysis of the importance of proposed exports to the development of sensitive facilities than on either the nuclear capabilities and status of recipient countries or whether the export will be directly used in the production of special nuclear materials. They added that DOE needs both to develop a clear definition of SNT and criteria for identifying SNT and to consistently apply that criteria in its SNT reviews.

While we recognize that there is logic to DOE's position, particularly with respect to nuclear weapons countries and close allies, we do not find support for DOE's position in the NNPA and its legislative history. In defining SNT, neither the act nor its legislative history distinguished among countries, their nuclear weapons capabilities, or their non-proliferation credentials. The act requires DOE to determine if information to be provided to a foreign country is important to the design, construction, fabrication, operation, or maintenance of an enrichment, reprocessing, or heavy water production facility.

Although the act does not take recipient countries into account for the purpose of identifying SNT, it makes a clear distinction between countries with and without nuclear weapons capabilities regarding the controls that must be applied to SNT exports. The act requires controls comparable to those that it requires on nuclear facilities licensed for export by NRC. As is required for facilities licensed by NRC for export, recipient countries that do not possess nuclear weapons capabilities must accept IAEA full-scope safeguards before they can receive SNT from the United States. The act does not impose this condition on nuclear

weapons nations. In our opinion, therefore, the better view is that the NNPA requires DOE to make SNT determinations strictly on the basis of the technical importance of proposed assistance to sensitive nuclear facilities.

In discussing this issue further with DOE regulatory officials, they stated that they are once again trying to better define SNT and to develop guidelines for identifying SNT. These guidelines, they said, will place less emphasis on the country to receive the proposed export and more emphasis on the technical aspects of the export. They added that DOE is not, however, planning to add criteria for identifying SNT in its SNT regulation.

---

### Insufficient Independence in SNT Decision Making

DOE has placed the responsibility for regulating exports of nuclear technology in the Office of International Security Affairs, under its Assistant Secretary for Defense Programs. In DOE's organization, this Assistant Secretary has no responsibility, except for this regulatory role, related to civilian nuclear technology. Initial DOE decisions on specific authorization requests, and possible SNT applications, flow from the security affairs office through the Office of the Assistant Secretary for Defense Programs to the Secretary of Energy.

Although this organizational alignment appears to separate DOE's regulatory and civilian nuclear energy research and development responsibilities, its SNT review procedures provide a significant role for another DOE organization—the Assistant Secretary for Nuclear Energy (NE)—responsible for research and development of civilian nuclear energy programs and technical exchange activities with foreign countries. These officials are involved in the Export Control Working Group (formerly the SNT Review Committee) and are consulted by DOE's regulatory staff on a case-by-case basis to assess the technical significance of export activities. While this technical assistance is necessary and useful to evaluate proposed export activities, it appears to have gone beyond technical SNT reviews in some cases. The following three instances, two involving DOE's technical exchange activities and one involving an export of information to Japan, clearly show where the lack of clear separation of the regulatory and promotional functions made SNT decisions appear to be unduly influenced by the nuclear energy staff.

- DOE's LMFBR fuel reprocessing activity, conducted by NE, with the United Kingdom was reviewed by the SNT Committee in April 1983. As stated in a memorandum from the chairwoman of the committee, this activity

“would include the exchange of fast breeder reprocessing technology which would be sensitive nuclear technology.... What NE is trying to do is find a way that DOE can cooperate in this area without imposing the SNT assurances on the U.K....” In June 1983, however, the committee determined that the activity would not include SNT as long as DOE exchanged only published information. Officials from NE would not agree to that restriction. Consequently, in October 1983 the SNT Committee also allowed the transfer of certain unpublished information by stating that the information was not ‘important’ to the United Kingdom. Nevertheless, the committee required that the information not be retransferred to a third party without prior U.S. approval—one of the SNT export conditions required by the NNPA.

- DOE’s activity with Japan on fast breeder reactor fuel criticality data—also conducted by NE—was reviewed by the SNT Committee in May 1983 because DOE regulatory and General Counsel officials could not agree with the NE staff position that the activity did not involve SNT. The assistance at issue was verification of nuclear criticality calculations at DOE experimental facilities. Japan had agreed to pay \$6.3 million for the information. DOE regulatory officials tentatively considered the activity SNT because it applied to reprocessing and involved the transfer of unpublished information. The nuclear energy staff disagreed on the basis that the information would eventually be published and therefore would become publicly available. In addition, the nuclear energy staff maintained that the information was not ‘important’ because Japan could reprocess without it and it was not valuable enough for the United States to obtain it through expenditure of U.S. funds. The SNT Committee decided that this information was not SNT. Its basis for that determination generally paralleled the nuclear energy staff’s position, and it did not address the concerns of DOE’s regulatory staff.
- In August 1982 Bechtel National, Inc., notified DOE that it was planning to review a preliminary reprocessing plant design for Japan. On the basis of information provided by the company, DOE reviewed the planned activity and initially determined that it would involve SNT. A key factor in this determination was the expertise that Bechtel had obtained through reprocessing design activities in the United States and the significant assistance that such expertise could provide. Subsequently, according to a memorandum from the chairwoman of the SNT committee, six DOE officials—including three from NE—met in April 1983 to discuss how the sensitive nuclear technology determination could be reversed. In May 1983 Bechtel officials met with DOE on this issue. At the time these discussions were occurring, DOE learned that Bechtel was already reviewing the plant design. Although the company notified DOE that it was revising the scope of its work to eliminate the

SNT concerns, an analysis by the director of DOE's regulatory staff noted that the revised written scope of work may not reflect the actual work.

The SNT Committee ultimately determined that the activity, as described in the revised scope of work, no longer involved SNT. Nevertheless, DOE's regulatory staff wanted the company to request a specific authorization from the Secretary of Energy for the revised scope of work because it involved providing proprietary information to Japan—information that was not readily available to the public—and thus did not meet DOE general authorization requirements. According to DOE regulatory officials, the company received several million dollars for this review, and consequently the activity had to have value above that of simply providing published information. However, DOE's Deputy Assistant Secretary for Security Affairs determined, after discussion with two NE officials, that the activity could be performed without the specific authorization of the Secretary because the information being provided was publicly available.

One method of providing more independence over review of activities for SNT is review by the other SNEC agencies. According to DOE regulatory officials, DOE submits favorable initial determinations on specific authorization requests to SNEC agencies for comment. Any such determinations involving SNT would, therefore, be subject to SNEC agency reviews. They added, however, that activities that are not subject to specific authorization, such as generally authorized and DOE technical exchange activities, are not subject to interagency review. Therefore, these three activities were not sent to the SNEC agencies for review.

Officials at the SNEC agencies expressed concern over the independence of DOE's SNT decision making. They stated that although DOE regulatory officials attempt to objectively determine whether proposed activities involve SNT, DOE's mission of developing and promoting nuclear energy influences the agency's determinations. An official from State said that DOE's SNT analyses and decisions are not limited to the technical importance of proposed activities to sensitive foreign nuclear facilities but are oriented toward developing nuclear technology. An ACDA official stated that DOE's independence is particularly questionable in the reprocessing area. In the views of these officials, all assistance to sensitive foreign nuclear facilities proposed by private companies and DOE should be subjected to review by the SNEC agencies.

DOE regulatory officials stated that they have taken steps to ensure that their SNT decisions on DOE activities are appropriate. They said that they

are now referring all internal technical exchange activities potentially involving SNT to other SNEC agencies for review and are discussing these activities at SNEC meetings.

---

## Conclusions

Since 1980 the United States has provided significant technical assistance to foreign countries in the development and use of sensitive nuclear facilities. In DOE's view, none of this assistance involved the transfer of SNT. Between 1980 and February 1983, however, DOE did not make documented SNT determinations for 8 of 11 activities involving assistance to sensitive foreign nuclear facilities. Since then, DOE has reviewed all such proposed assistance—whether by private firms or by DOE—for SNT and has identified and documented four cases of proposed assistance involving SNT and eight other cases that, in its view, did not involve SNT.

However, the absence of (1) an SNT regulation and formal review procedures from 1978 until February 1983, (2) regulatory standards and criteria for assessing proposed activities for SNT, and (3) procedures ensuring that SNT determinations are made without undue influence by programmatic DOE organizations that could be proponents of the technology transfer raises questions about the agency's effectiveness in controlling the export of SNT. Without any criteria for determining what is or is not SNT, we cannot categorically conclude whether DOE has or has not permitted exports of assistance to sensitive nuclear facilities of the type that the Congress intended to be subjected to the SNT controls specified in the NNPA. Nevertheless, activities conducted with DOE approval have provided significant assistance to sensitive facilities. At its best, DOE's rationale for determining that proposed assistance did not involve SNT illustrates the need for criteria for identifying SNT and for the consistent, independent application of those criteria. At its worst, DOE's rationale appears, as the SNT committee chairwoman stated in one case, to reflect an effort to justify not finding SNT content and thus not holding the recipient country to the required NNPA assurances.

Clear and objective criteria are needed for determining if proposed activities contain SNT. We recognize that DOE has attempted, unsuccessfully, to develop criteria in the past and that uncertainty exists within the agency over how much consideration in SNT determinations, if any, can be given to factors such as the intended recipient country. Nevertheless, DOE needs to establish this criteria to provide a firm and objective basis for its SNT decisions. This is especially important given the President's June 1982 plutonium-use policy allowing U.S. assistance in

reprocessing as long as statutory conditions are met. In our view, the best way for DOE to develop SNT criteria is through amendment to its SNT regulation. In this way, DOE can obtain input from the other SNEC agencies, from the public, and from individuals and companies that may be directly affected.

DOE also needs greater independence in SNT decision making to prevent undue influence by the civilian nuclear energy research and development organization within the agency. We recognize that the technical expertise of DOE's nuclear energy staff may be essential to sound SNT decision making. The promotional views of this part of DOE, however, should not be allowed to unduly influence SNT determinations. We identified three instances in which regulatory decisions appeared unduly influenced by the nuclear energy staff. These instances are of particular concern because they involved DOE technical exchange activities and generally authorized activities that are not reviewed by SNEC agencies. To help ensure sound and objective SNT decision making, all initial DOE SNT determinations should be sent to the other SNEC agencies for review and comment. This requirement should be effected by amendment to existing interagency review procedures for SNEC.

---

## Recommendations to the Secretary of Energy

To conform DOE's procedures for identifying activities that involve the transfer of sensitive nuclear technology to the requirements of the NNPA and help ensure independence of the regulatory function, we recommend that the Secretary of Energy accomplish the following:

- Develop a clear interpretation of SNT and establish criteria to be used in evaluating proposed activities for SNT. The criteria should be developed using rule-making procedures and included in the agency's SNT regulation.
- Provide opportunities for SNEC agencies to review and comment on all proposed activities reviewed by DOE, including DOE's technical exchange activities, that involve providing assistance to sensitive foreign nuclear facilities. The interagency review procedures should be amended to reflect these opportunities.





# DOE Needs to Strengthen the General Administration of Its Export Regulations

The previous chapters discussed substantive limitations and weaknesses in DOE's regulations and procedures for granting general and specific authorizations and for reviewing proposed exports for SNT. This chapter discusses additional limitations and weaknesses in DOE's general administration of its regulations. Specifically,

- Ensuring compliance with the regulations has been difficult.
- The reporting requirements contained in the regulations for authorized activities are not sufficient.
- Information on authorized activities is not routinely disseminated to the public by DOE.
- DOE's record keeping has not been adequate.

DOE has improved its record keeping on assistance being provided to foreign nuclear programs. However, DOE needs to take actions to revise its procedures and regulations to resolve the other weaknesses.

## Difficulties in Ensuring Compliance With the Regulations

To effectively ensure that U.S. involvement in unclassified foreign atomic energy programs does not pose an unacceptable proliferation risk, such involvement must be made known to, evaluated by, and authorized by DOE. A key to achieving this objective is compliance with DOE's regulatory requirements for notifying DOE of proposed unclassified activities. The Congress, in establishing the requirement that the Secretary must authorize these activities, provided substantial penalties for willful violations. As stated in Section 222 of the Atomic Energy Act, willful violations of the provisions of section 57 with an intent to injure the United States are punishable by fines of up to \$20,000 or imprisonment for life, or both.

DOE relies primarily on firms and individuals to comply with its regulations and to seek required authorization from the Secretary. According to DOE regulatory officials, the applicability of the regulations is widely known in the nuclear community, and requests for authorization are generally sent directly to DOE before firms or individuals conduct activities with foreign countries. However, in some instances, export activities are referred to DOE by the Department of Commerce as a result of that department's review of applications for validated export licenses<sup>1</sup> or by the NRC when it receives a nuclear export license application that does not come under its purview. DOE officials believe that most activities

<sup>1</sup> A validated license is a document issued by the Department of Commerce authorizing a specific export.

that relate to the regulations are identified to DOE by the companies or by the other federal agencies.

Nevertheless, due in part to confusion over the applicability of the regulations, activities may be conducted without the knowledge of DOE and the necessary specific authorization of the Secretary. DOE regulatory officials said that they attempt to locate instances where activities are conducted without authorization through examination of publications and trade journals, discussions with industry officials, and monitoring of internal government data on international activities. From this effort, DOE has identified instances in which individuals and firms conducted, or planned to conduct, activities without obtaining specific authorization. For example,

- In October 1984 DOE learned that as many as 26 U.S. citizens were working as reactor operators, or were training reactor operators, at a South African nuclear power plant without DOE authorization. DOE then contacted these individuals about this potential violation of the regulations. In DOE's view, operating a reactor is engaging in the production of special nuclear material and therefore requires a prior specific authorization. According to DOE regulatory officials, most of these individuals claimed that they did not know of the regulations or that the regulations' requirements on "indirect assistance in the production of special nuclear material" applied to reactor operators or instructors. In response to DOE's efforts, these individuals submitted requests for the Secretary's authorization. The Secretary denied these authorization requests in June 1985.
- DOE learned in May 1984 that a U.S. firm had initiated negotiations with China to supply reactor-related equipment. In subsequent correspondence to DOE, the firm stated that it had previously contacted the U.S. embassy in China about export regulations and that the company did not believe that its activities fell within the scope of DOE's regulations. On the basis of its discussions with DOE, however, the firm submitted a request for specific authorization. The Secretary granted the necessary authorization in September 1985.
- In 1982 DOE became aware that a company was doing engineering work for China that DOE had not specifically authorized. DOE attempted to get the company to request specific authorization, but the company viewed the activity as permissible under DOE's general authorization. The company ultimately provided the engineering work it was conducting to China without the specific authorization DOE regulatory officials believed was required. Although DOE considered initiating action to prosecute the company under the provisions of the Atomic Energy Act, it did

not do so. However, it did instruct the company to submit requests for specific authorization for any future work.

We discussed compliance with the regulation with DOE regulatory officials and an official from its Office of General Counsel who stated that there may be other export activities being conducted which they do not know about. They stated that DOE is not an enforcement agency and that they cannot act as "policemen." These officials added that their resources for assuring compliance are limited and that they have to rely on other agencies, such as the State Department, for assistance. However, a State Department official stated that DOE's regulations for controlling these activities are probably not well known to cognizant State Department officials overseas. Further, DOE officials pointed out that there are ethical limitations on monitoring the activities in this area. As a result of the South African situation, for example, DOE requested assistance from other federal agencies in identifying U.S. workers in foreign nuclear facilities. However, according to DOE regulatory officials, the agencies could not provide such assistance because it was viewed as "spying on Americans."

Overall, DOE regulatory officials believe there is little problem with compliance with the regulations; nevertheless, because of the importance of this area, we remain concerned that all activities requiring the specific authorization of the Secretary may not be made known to DOE. Although the above discussion illustrates the practical limits on DOE's ability to ensure compliance with its regulations, more could be done to clear up areas of confusion regarding the applicability of the regulations and to make persons more aware of the regulatory requirements. These issues appear to have played a significant role in the activities identified by DOE as being conducted without proper authorization. Specifically, as also discussed in chapter 2, the distinction between generally authorized and specifically authorized activities needs to be made clear. In addition, as shown in the instance of U.S. reactor operators in South Africa, the activities that qualify as indirect assistance in the production of special nuclear material need to be clarified. Further, more awareness of the regulations is needed by (1) U.S. government personnel overseas, such as those at embassies, so that unauthorized activities can be quickly identified and (2) individuals working in unclassified areas of nuclear energy, such as reactor operators or other nuclear power plant personnel, who are more likely to be unaware of DOE's regulations and their applicability.

## Insufficient Reporting Requirements

DOE's regulations contain requirements for persons engaged in certain activities covered by the regulations to provide written reports on their activities. The reports are required to contain information on the individuals and firms involved in the activity, the location of the activity, and a description of the work performed. According to DOE regulatory officials, the reporting requirements are intended to provide DOE with information on the assistance being provided to foreign countries.

DOE's reporting requirements cover generally authorized activities relating to direct or indirect assistance in the design, construction, fabrication, or operation outside the United States of (1) a nuclear reactor; (2) a facility for the fabrication of uranium fuel; or (3) a facility for the production of zirconium, reactor-grade graphite, or reactor-grade beryllium.<sup>2</sup> However, the regulations specifically exclude any reporting requirements for activities that have been specifically authorized.

These limited reporting requirements hinder effective DOE monitoring of ongoing activities covered by its regulations. Specifically,

- DOE does not know the status of activities that have been specifically authorized. In many cases where a specific authorization is granted, the business activity has still to be negotiated, and at times the authorized activity is never actually performed. Because no reporting requirements exist, DOE does not know if the authorized activity was initiated and, if so, whether it was completed. This contrasts sharply with the export regulations of NRC and Commerce, which maintain such information by requiring that licenses be returned (1) if the export is not conducted, (2) when the export is completed, or (3) when the license expires.
- DOE knowledge of the U.S. assistance being conducted in the various countries is limited. As the agency responsible for authorizing technical assistance to foreign nuclear programs, DOE should possess adequate information on what assistance is currently being conducted. However, such information is not readily available to DOE. In this regard, the President recently barred any new U.S. assistance to South Africa's nuclear program,<sup>3</sup> but activities may still be ongoing under previous authorizations. For example, one activity authorized to South Africa in 1983 is to provide training and maintenance services for a 10-year period, but DOE has no current information as to whether these services are still being

<sup>2</sup> These materials are associated with fabrication of reactor fuel or construction of reactors.

<sup>3</sup> Executive Order 12532, "Prohibiting Trade and Certain Other Transactions Involving South Africa," dated Sept. 9, 1985.

conducted. Such knowledge is even more critical for DOE because it does not include expiration dates in its authorizations.

- Activities may not be performed in the manner that DOE approved. In some authorizations, DOE gives approval to conduct some proposed activities but not others. For example, DOE gave approval to a firm to conduct quality assurance services at safeguarded nuclear power plants in Argentina but advised the firm not to perform such activities for plants not under IAEA safeguards. However, once the authorization is given by DOE, it receives no feedback on the activity actually performed. While this type of reporting would provide no firm assurance that the activity is conducted as authorized, it would provide a method by which DOE could discover where inadvertent mistakes are made and, where DOE believes that its authorization limits have been willfully violated, provide documentation for possible later prosecution.

DOE regulatory officials acknowledged that the reporting requirements were a weakness in their regulations and that they intended to revise the regulations to resolve this weakness. As discussed previously, DOE officials stated that they have initiated the process for revising the regulations and have included a revision to the reporting requirements that will require annual reports from persons conducting specifically authorized activities. This revision to the regulations is currently under internal review; however, DOE officials could not estimate when the agency would publish the proposed revision for public comment.

---

## Information on Authorized Activities Not Routinely Disseminated

Public accountability is important in government activities. Nuclear export activities are routinely made known to the Congress and the public in some instances. NRC, in its export licensing activities, publishes information in the Federal Register on licensing requests it receives and provides opportunities for public hearings and written public comment on such requests. DOE publishes information in the Federal Register on any "subsequent arrangements," such as foreign retransfers of previously exported U.S. nuclear equipment and fuel. This disclosure is a requirement of the NNPA and is intended to provide some public accountability for those nuclear export activities.

However, DOE does not disseminate information on the number and types of activities authorized under its regulations, the country of destination for each activity, or the Secretary of Energy's rationale for authorizing the activities. According to DOE regulatory officials, no legislative requirement exists to provide such information; and in their view, harm could come to the companies involved in these activities should

this information be public. They stated that if information on authorized activities were published, proprietary business information could become known and the companies or individuals authorized to conduct the activities could then lose the business to competitors. Because of this, DOE regulatory officials stated that information on authorized activities has been treated as proprietary and has not been made publicly available.

However, officials from DOE's Office of the General Counsel stated that this information cannot be held as proprietary by DOE unless certain conditions are met. According to the General Counsel officials, information can be designated as confidential business and commercial information if competitive harm would likely occur to the firm if such information were disclosed. They pointed out that DOE's Freedom of Information Act regulation, 10 CFR 1004, establishes criteria for determining the propriety of disclosure. They interpreted these as providing that generally if an activity, or a contract for an activity, is public knowledge and the disclosure by DOE does not reveal a trade secret or privileged commercial information, grounds may not exist to withhold information from public disclosure as confidential.

In this regard, at our request attorneys in DOE's Office of the General Counsel examined the activities currently authorized to ascertain whether disclosure of the identities of the countries, companies, and activities involved would reveal confidential business information. On the basis of their review, they determined that most of the information was not exempt from disclosure. According to the staff, only those requests for authorization for activities that are still pending or that have been authorized but for which contract negotiations have not been completed, may involve confidential information exempt from public disclosure. They indicated, however, that the information in each case would have to be evaluated independently to determine whether confidential information is involved.

Because basic information on the activities authorized does not for the most part involve proprietary data, DOE needs to make such information on authorized activities publicly available. The need for public disclosure of authorized assistance to foreign nuclear programs is particularly important because such assistance is significant from a nonproliferation viewpoint and because, as discussed in previous chapters, problems exist that allow DOE to make subjective authorization decisions. Without

public disclosure, no independent accountability exists in DOE's subjective authorization decisions. We pointed out previously in a 1981 report<sup>4</sup> that DOE should (1) publish in the Federal Register notice of its approval of any proposed activity and (2) periodically report to the Congress, through the President's annual report to the Congress on government activities to prevent proliferation, information on the authorizations it has granted. While such actions were not taken in response to that report, we continue to believe that these actions should be taken to provide better public accountability of DOE's activities.

## Inadequate Record Keeping

Good management practice dictates that DOE maintain records supporting export authorization decisions. Such records provide the documentary support for compliance with U.S. laws, policies, and regulations; provide institutional knowledge essential to minimizing the negative effects of personnel turnover; and allow the results of the program to be analyzed and evaluated. This is quite important because of the significance of the activities involved and the criminal penalties for violations of the regulations. However, DOE records relating to its activities have not been adequately maintained.

As discussed in the limitations on our work in chapter 1, we attempted to perform a complete examination of the official DOE files relating to 80 requests for the Secretary of Energy's authorization. We found that the records for many of these authorization requests were not complete. Specifically,

- DOE could not locate files for three authorization requests (of which one was approved, one withdrawn, and one denied). Although program officials were able to provide us with some documents relating to these activities, official files with documentation to show what the application involved, the analysis conducted by DOE, and the basis for DOE's decision had either not been established by DOE or had been misplaced or lost.
- Twenty-four files that we reviewed were incomplete. In reviewing these files, we attempted to determine how DOE analyzed the applications. For these applications (of which 17 were approved, 4 denied, and 3 withdrawn), no record existed of either (1) the request for authorization from the firm or individual, (2) any DOE analysis of the activity, or (3) other documentation sufficient to support the determination reached by

<sup>4</sup> The Nuclear Non-Proliferation Act of 1978 Should Be Selectively Modified (OCG-81-2, May 21, 1981).



DOE. With regard to sufficient documentation, we were unable to determine from available documents DOE assertions that the assistance was available from other sources, providing the assistance would improve nonproliferation objectives, or denial of the assistance would have negative impacts on foreign relations.

- The files of six approved activities provided no record that they had been authorized by the Secretary of Energy. The Atomic Energy Act provides that the Secretary may authorize these activities. DOE was subsequently able to locate and provide us with documents showing that these six activities had been authorized by the Secretary.
- The files of eight approved activities relating to both sensitive and non-sensitive facilities contained no documentation of the assurances received from the recipient countries. In these instances the approval of the export was conditioned on obtaining various assurances to better ensure that the export or activity involved would not be reexported or used for purposes other than for which it was exported. DOE was subsequently able to obtain sufficient documentation to show that the assurances had been received.

We discussed the administrative procedures for maintaining records of the activities reviewed under the regulations with DOE regulatory officials. They agreed that past record-keeping practices were weak primarily because of heavy workloads, relatively low staffing, and high personnel turnover. In this regard, we noted that the majority of the documentation problems relate to activities submitted for DOE review in the 1980 and 1983 time period. These officials added that they are in the process of consolidating the responsibility for these records and initiating better documentation practices to improve their administrative practices.

---

## Conclusions

The limitations and weaknesses in DOE's general administration of its regulations pose additional concerns over the effectiveness of the regulations. The difficulties in enforcing the regulation and the limited reporting required of persons conducting authorized activities may be weakening DOE's controls over these activities. Although the limitations themselves prevent us from determining whether companies are complying with DOE's regulations, the potential for noncompliance exists. The discovery of U.S. power plant operators in South Africa, for example, shows that activities can be conducted without DOE knowledge.

Further, the lack of routine dissemination of information and the past problems with DOE record keeping raise difficulties in evaluating the regulations' effectiveness. Without knowledge of the activities authorized, it is not possible for anyone outside the SNEC to independently assess on a timely basis the appropriateness of the authorized activities and the effectiveness of DOE in meeting objectives of the Congress in controlling these activities. Additionally, without adequate records on the activities it has reviewed and authorized, clear, complete knowledge of authorized activities and the rationale for DOE's authorization decisions cannot be obtained by the interested public or by new DOE regulatory officials with a clear need to acquire institutional knowledge.

DOE has taken action to improve its record keeping practices. DOE also needs to specifically identify in its regulations those activities that may qualify as indirect assistance, thereby reducing any confusion over activities that must be specifically authorized. Further, DOE needs to increase awareness—particularly among those individuals involved in commercial nuclear power and overseas federal agencies knowledgeable of foreign nuclear activities—of its export control regulations.

In addition, DOE needs to revise its reporting requirements to provide additional and timely dissemination of information on authorized activities. In this regard, DOE should include such requirements that will enable DOE to know the current status of all authorized activities.

Finally, DOE needs procedures that provide a better public accounting of authorizations granted under the regulations. For example, DOE could publish information on authorized activities in the Federal Register and/or the President's annual nonproliferation report to the Congress. Such procedures would be consistent with nuclear export activities licensed by NRC and the "subsequent arrangements" authorized by DOE.

## Recommendations to the Secretary of Energy

To improve DOE's general administration of its regulations, we recommend that the Secretary of Energy

- clarify the regulations to clearly detail what activities qualify as indirect assistance requiring authorization and undertake efforts to increase the awareness of the regulations in both the private and public sectors, to preclude inadvertent violations of the regulations;
- revise the reporting requirements of the regulations to require persons granted specific authorizations to provide DOE updates of the status of

---

**Chapter 5**  
**DOE Needs to Strengthen the General**  
**Administration of Its Export Regulations**

---

their activities when they are completed or if they are not conducted;  
and

- establish procedures requiring DOE to provide routine and timely dissemination of data on activities authorized by the Department.

# Nonsensitive Assistance to Restricted Countries Authorized by the Secretary of Energy, 1980-1985

Country	Activity	Date authorized	Company
Argentina			
	<b>Engineering services—</b> Quality assurance services at nuclear power plant	Jan. 1985	Ebasco Services, International
	<b>Equipment—</b> Process control equipment for a heavy water production plant	May 1981	The Foxboro Company
Brazil			
	<b>Engineering services—</b> Technical and consulting services to nuclear power plant	Feb. 1984	NUS Corp.
	Technical and consulting services to nuclear power plant	Jan. 1985	Bechtel National Inc.
China			
	<b>Training—</b> In core fuel management training program	July 1980	NUS Corp.
	Nuclear power reactor fuel training for Chinese national	June 1981	Exxon Nuclear
	Nuclear power reactor training for two Chinese nationals	Mar. 1982	Westinghouse
	Training on design and operation of boiling water reactors	Sept. 1985	General Electric
	<b>Engineering services—</b> Assist in the erection, operation, and maintenance of uranium mines and ore processing plants	May 1981	Fluor Mining and Metals
	Technical review of plant siting, systems and components, and safety analyses and quality assurance services	Sept. 1985	Westinghouse
	Power plant architect/engineering services	Sept. 1985	Ebasco Services, International
	Power plant engineering and design services, procurement and construction management	Sept. 1985	Gibbs-Hill/Quadrex
	Power plant engineering and design services, procurement and construction management	Sept. 1985	United Engineers
	Power plant engineering and design services, project management, and construction and operation services	Sept. 1985	Stone and Webster
	Power plant project planning and requirements analysis, procurement, design, and training	Sept. 1985	Quadrex International
	Power plant consulting, engineering, procurement, and construction services	Sept. 1985	Bechtel National Inc.

**Appendix I**  
**Nonsensitive Assistance to Restricted**  
**Countries Authorized by the Secretary of**  
**Energy, 1960-1985**

	Power plant consulting and engineering services	Sept. 1985	Sargent and Lundy
	Consulting services for power plant planning and construction	Sept. 1985	NUS Corp.
	Engineering and design services for power plant nuclear island	Sept. 1985	Sargent and Lundy
	Power plant engineering design, construction, and general services	Sept. 1985	Sargent and Lundy
	Review reactor building design concepts and documents	Sept. 1985	Ebasco Services
	Power plant licensing, construction, operation, and maintenance support	Sept. 1985	Gilbert/ Commonwealth
	Power plant design, consulting, procurement, construction, project management, and operation support services	Sept. 1985	Bechtel National Inc.
	<b>Manufacturing technology—</b> Process control instrumentation technology transfer	Sept. 1985	The Foxboro Company
	Transfer manufacturing technology and establish power reactor licensee relationship	Sept. 1985	Westinghouse
	Transfer manufacturing technology for containment building penetrations	Sept. 1985	Conax Buffalo
	<b>Equipment—</b> Portable uranium mill	May 1981	Dravo Corporation
	Instrumentation relating to reactor primary system	Sept. 1985	Westinghouse
East Germany	<b>Equipment—</b> Main coolant pumps, steam generators, and fuel storage racks manufactured by foreign licensee using U.S. technology	Aug. 1981	(potentially confidential business information)
Romania	<b>Manufacturing technology—</b> Transfer of heavy water reactor heat transport pump technology	Dec. 1980	Byron Jackson
	Transfer of manufacturing technology for heavy water reactor steam generators	July 1981	Combustion Engineering
	Transfer of heavy water reactor heat and ion exchanger and pressurizer technology	Nov. 1981	Babcock and Wilcox
	Transfer of manufacturing technology for heavy water reactor pumps and valves	July 1984	(miscellaneous U.S. companies)

**Appendix I  
Nonsensitive Assistance to Restricted  
Countries Authorized by the Secretary of  
Energy, 1980-1985**

<b>Saudi Arabia</b>			
	<b>Training—</b> Generic training on nuclear power plants for 10 Saudi college students	May 1985	General Electric
<b>South Africa</b>			
	<b>Engineering services—</b> Power plant licensing, maintenance, training, and other assistance	Sept. 1983	Stone and Webster
	Power plant maintenance training program and on-site service assistance	Sept. 1983	Westinghouse
	Radioactive decontamination goods and services	Sept. 1983	Quadrex International
	Power plant maintenance services	Sept. 1983	Bechtel National Inc.
	Power plant maintenance planning, plant inspection and testing, and start-up scheduling procedures	Sept. 1983	Fluor Corp.
	Assist in power plant licensing and regulatory matters	Sept. 1983	Technology for Energy Corp.
	Power plant maintenance services	Sept. 1983	Babcock and Wilcox
	Engineering work related to power plant licensing and safety	Sept. 1983	(private individual)
	Power plant maintenance services related to scheduled plant outages	Sept. 1983	Stone and Webster
	Consulting services for evaluation and testing of initial power plant start-up	Sept. 1983	Babcock and Wilcox
	Consulting services for all aspects of reactor operation	Sept. 1983	Bechtel National Inc.
	Power plant maintenance and training services	Sept. 1983	Gilbert/Commonwealth
	Consulting services involving all phases of plant licensing, construction, commissioning, and operation	April 1984	(private individual)

# U.S. Assistance Related to Foreign Sensitive Nuclear Facilities, 1980 - 1985

<b>Activity</b>	<b>Year</b>	<b>Country</b>	<b>Company</b>
<b>Specifically authorized</b>			
<b>Enrichment</b>			
Tunable diode lasers (2) for laser isotope separation research	1981	France	Laser Analytics
Tunable diode lasers (5) for laser isotope separation research	1981	France	Laser Analytics
10-watt copper vapor laser for laser isotope separation research	1983	France	Plasma Kinetics
Equipment to support 10-watt copper vapor laser	1984	France	Plasma Kinetics
Tunable diode lasers (3) for laser isotope separation research	1981	W. Germany	Spectra Physics
<b>Reprocessing</b>			
Seminar on pulse columns and review of pilot-scale plant design	1983	Canada	Allied- General
Computerized instrumentation units (3) for reprocessing plant waste treatment system	1981	France	The Foxboro Company
Operation of Barnwell reprocessing plant using natural uranium to demonstrate safeguards	1982	Japan	Allied- General
Assist in weld repairing of a leak at reprocessing plant	1982	Japan	Bechtel National, Inc.
Consulting services for decontamination of distribution room at reprocessing plant	1983	Japan	UNC Nuclear
<b>Heavy water production</b>			
Process control instrumentation for a heavy water plant	1981	Argentina	The Foxboro Company
<b>DOE reprocessing activities</b>			
Liquid Metal Fast Breeder Reactor (LMFBR) fuel cycle	1976-1986	W. Germany	N/A
High-temperature gas-cooled reactor (HTGR) fuel cycle	1977-1987	W. Germany France Switzerland	N/A
LMFBR fuel cycle	1979-1989	Japan	N/A
Mechanical head-end shearing of LMFBR	1980-1985	United Kingdom	N/A
Nuclear criticality data development	1983-1986	Japan	N/A

---

**Appendix II**  
**U.S. Assistance Related to Foreign Sensitive**  
**Nuclear Facilities, 1980 - 1985**

---

<b>Activity</b>	<b>Year</b>	<b>Country</b>	<b>Company</b>
Dissolution of fuel	1983- 1986	United Kingdom	N/A
HTGR spent fuel treatment development	1983- 1984	W. Germany	N/A
Nuclear criticality safety information	1985- 1986	France	N/A

---



---

Requests for copies of GAO reports should be sent to:

U.S. General Accounting Office  
Post Office Box 6015  
Gaithersburg, Maryland 20877

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are \$2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.

---

United States  
General Accounting Office  
Washington, D.C. 20548

Official Business  
Penalty for Private Use \$300

First-Class Mail  
Postage & Fees Paid  
GAO  
Permit No. G100

---