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Report to Congressional Requesters

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NUCLEAR SAFETY

Uncertainties About the Implementation and Costs of the Nuclear Safety Convention

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The Honorable Jesse Helms
Chairman, Committee on Foreign
Relations
United States Senate

The Honorable Bob Graham
United States Senate

The 1986 explosion of the Chernobyl nuclear power reactor in Ukraine underscored the global importance of nuclear safety, as radioactive material was carried beyond the national boundaries of the Soviet Union to East and West European countries. In the aftermath of the Chernobyl accident, representatives of over 50 nations participated in the development of a Convention on Nuclear Safety, a multilateral treaty that seeks to increase the safety of civil nuclear power reactors. As of December 1996, the Convention had been signed by 65 countries, including the United States. The Secretary of Energy signed the Convention on behalf of the United States in September 1994. However, in order for the United States to become legally bound by the Convention, the U.S. Senate must ratify it. In May 1995, the administration transmitted the Convention to the Senate, but the Senate has yet to take action. (See app. I for a list of countries that have signed—or signed and ratified—the Convention.)

As requested, this report provides information on (1) how compliance with the Convention's terms and obligations will be reviewed by the ratifying countries (hereinafter, also called parties) and (2) the potential costs to the United States to participate in the Convention.

Results in Brief

The method to review compliance with the Convention on Nuclear Safety has not been finalized. The Convention does not impose sanctions for noncompliance but seeks to encourage compliance through peer pressure. The Convention relies on each ratifying country to prepare a self-assessment report of its nuclear power program. These reports will, in turn, be reviewed by other member countries at periodic meetings to determine how each country is complying with the Convention. The level of detail to be included in these reports has not been finalized, nor has the process by which countries will critically review these reports been fully determined.

As the method is currently envisioned, groups composed of five or six countries would form the core of the review process. The countries with the greatest number of operating nuclear reactors—the United States, France, Japan, the United Kingdom, and Russia—would participate in separate review groups made up primarily of several other countries with operating reactors. Although U.S. government officials did not originally favor the country-grouping approach, they believe the United States will have adequate opportunities to review the safety programs of all countries through other mechanisms established by the Convention.

The costs associated with the United States' participation in the Convention have not been fully determined. The Nuclear Regulatory Commission, the Department of State, and the Department of Energy have estimated that it could cost as much as $1.1 million to (1) participate in planning meetings to develop the Convention's policies and procedures; (2) prepare the first U.S. self-assessment report; (3) review other countries' reports; and (4) participate in the first review meeting, which will probably be held in April 1999. These costs are made up primarily of U.S. government-related salaries and benefits. Other costs—a portion of which the United States will incur—associated with the International Atomic Energy Agency's administration of the Convention are less certain but could range up to $10.3 million through the first review meeting, according to a 1993 estimate. Nuclear Regulatory Commission officials believe, however, that the actual costs will be significantly less—about $1 million to administer the first review meeting. The costs for subsequent review meetings have not been estimated.

Background

The Convention on Nuclear Safety, which became effective for the ratifying countries on October 24, 1996,[1] seeks to achieve and maintain a high level of safety for all nations that operate civil nuclear power reactors. (According to the International Atomic Energy Agency [IAEA], as of December 31, 1995, 32 countries operated 437 nuclear power reactors.) The U.S. government views the Convention as one of the chief policy instruments to encourage Russia and other countries with reactors that do not meet Western safety standards to improve safety. The Convention calls on countries to take action to, among other things, (1) establish and maintain a legislative framework and independent regulatory body to govern the safety of nuclear installations; (2) establish procedures to ensure that technical aspects of safety, such as the siting, design, and

[1]Under the terms of the Convention, any country that ratifies the Convention subsequent to October 24, 1996, must wait 90 days to participate in it.

construction of nuclear power reactors, are adequately considered; and (3) ensure that an acceptable level of safety is maintained throughout the life of the installations by such things as giving a priority to safety, providing adequate financial resources, and establishing a quality assurance program.

The Department of State, the Department of Energy (DOE), and the Nuclear Regulatory Commission (NRC) have participated in the development and implementation of the Convention.[2] NRC, in its capacity as the U.S. civilian nuclear regulatory authority, will play a central role in implementing U.S. obligations under the Convention. The Convention establishes IAEA as the Convention's secretariat primarily to (1) convene and prepare for the meetings and (2) transmit reports and information to member countries.

Process to Review Compliance Has Not Been Finalized

The method to review countries' compliance with the Convention has not been finalized. The Convention relies on the ratifying countries to prepare reports (self-assessments of their nuclear power programs) that are expected to describe how they are complying with the Convention. However, the reports' level of detail and specifics and the process for examining the reports have not been fully determined. Although U.S. and IAEA officials believe the Convention will encourage openness about countries' safety programs, it is uncertain how much information will be made available to the public.

Peer Review Process Is Central to the Convention's Success

The Convention does not impose sanctions for noncompliance but seeks to encourage compliance through peer pressure. To determine compliance with the terms of the Convention, countries are required to meet periodically to review one another's safety programs.[3] State, DOE, and NRC officials have stated that this peer review process is central to the Convention's success, noting that it will enable the countries' safety practices to be brought before the "bar of world public opinion."

The Convention does not specify the form and content of the peer review process but calls on the parties to (1) submit self-assessment reports of the measures they have taken to implement the Convention and (2) hold

[2]See our report entitled Nuclear Safety: Progress Toward International Agreement to Improve Reactor Safety (GAO/RCED-93-153, May 14, 1993) for more information about the development of the Convention.

[3]The Convention requires that the first meeting of the parties to review the self-assessment reports occur within 30 months of the Convention's entry into force, which means not later than April 24, 1999. Subsequent meetings are to be held at intervals not to exceed 3 years.

meetings to review these reports. Representatives of over 40 countries, including the United States, have met on several occasions over the past 2 years to develop options for implementing the peer review process. The United States has chaired these sessions. In June 1996, the representatives agreed on a model to implement the peer review process, but final decisions will not be made until all of the ratifying countries meet no later than April 1997, as required by the Convention.[4]

As the process is currently envisioned, the five countries with the most operating nuclear reactors—the United States, France, Japan, the United Kingdom, and Russia—would participate in separate groups made up of several other countries that have ratified the Convention. The remaining countries are placed in each group on the basis of the number of reactors in each country, as shown in table 1. Within this group setting, all countries would critically examine and review how each country is complying with the Convention. IAEA officials told us that the country-review groups form the core of the peer review process.

Table 1: Possible Grouping of Countries for the Peer Review Process

	Countries (number of reactors)						
Group							
A	United States (109)	Republic of Korea (11)	India (10)	China (3)	Argentina (2)	Armenia (1)	Italy (0)
B	France (56)	Sweden (12)	Spain (9)	Slovak Republic (4)	Lithuania (2)	Slovenia (1)	Romania (0)
C	Japan (51)	Ukraine (16)	Belgium (7)	Hungary (4)	Mexico (2)	Pakistan (1)	Cuba (0)
D	United Kingdom (35)	Germany (20)	Bulgaria (6)	Finland (4)	The Netherlands (2)	Kazakhstan (1)	Philippines (0)
E	Russia (29)	Canada (21)	Switzerland (5)	Czech Republic (4)	South Africa (2)	Brazil (1)	

Note: Numbers in parentheses show the total number of reactors operating in the country as of December 31, 1995. The table assumes that all of the countries had ratified the Convention.

Source: June 1996 Meeting of the Signatory Countries to the Convention on Nuclear Safety and IAEA.

[4]Because the Convention provides that a country must wait 90 days after ratification, the United States would not be entitled to participate in the April 1997 meeting unless it ratified the Convention by January 24, 1997. NRC officials told us that it is likely that some form of informal participation could be arranged, however, if the United States ratified before the April meeting.

NRC officials have expressed some concern about the potential grouping of countries. In their view, this approach may not provide the most meaningful, professionally technical review. For example, the United States, which spent about $89 million through March 1996 to improve the safety of Soviet-designed reactors, would not be in the same review group as Russia or Ukraine, countries that operate the majority of these reactors. In addition to its ongoing safety assistance program, the United States also has significant technical expertise and years of practical experience working to improve the safety of these reactors and improve these countries' civilian nuclear regulatory capabilities.

The United States had earlier supported a different approach in which each country's self-assessment would be reviewed by separate subject matter committees. This review would be based on three main elements of the Convention: (1) governmental organization; (2) siting, design, and construction; and (3) operations. The U.S.-favored approach was replaced by the country-grouping model proposed by France and the United Kingdom. Representatives of these countries maintained that the smaller groups of countries would allow for a more thorough and unified review of a country's report than would a functional review of part of a country's report, as initially envisioned by the United States.

The Convention states that each country shall have a reasonable opportunity to discuss and seek clarification of the reports of any other party at the review meeting. As a result, NRC and IAEA officials believe that regardless of how the countries are ultimately grouped, the United States will have ample opportunity to review and comment on the self-assessment reports of all countries.[5] For example, according to NRC and IAEA officials, countries may be permitted to participate in other groups' meetings as observers and discuss their concerns in supplemental meetings. Countries are also expected to have opportunities to comment on the self-assessment reports at general sessions held during the review meeting.

The detail and specifics of the self-assessment reports—which serve as the basis for the meeting of the parties—have not been finalized. These reports are expected to describe how the parties are complying with the Convention. Because of the differences in countries' nuclear safety

[5]According to the June 1996 "Draft Guidelines Regarding the Review Process Under the Convention on Nuclear Safety," the self-assessment reports of all countries will be submitted to IAEA 6 months prior to the first review meeting. Each country may send questions and comments on any report to the coordinators of the relevant groups up to 2 months before the first meeting. The coordinators would then distribute the comments to all parties to the Convention.

programs and available resources, NRC officials anticipate an unevenness in the quality and detail of the reports. In their view, this unevenness could affect the level of review and analysis. U.S. officials also stated that the countries with a significant number of nuclear installations may produce a generic rather than a plant-specific report.

Public Access to Convention's Proceedings Is Unclear

The public dissemination of information about the countries' progress in meeting the Convention's obligations can play a key role in influencing compliance, according to some experts familiar with international agreements that rely primarily on peer review. Although U.S. and IAEA officials believe the Convention will encourage greater openness about many countries' safety records and programs, it is uncertain how much information resulting from the periodic meetings will be made available to the public. According to NRC officials, the countries can limit the distribution of their reports. These officials noted, however, that the United States plans to make its report available to the public.

Although the Convention provides for the public distribution of a report summarizing the issues discussed and decisions reached during the review meeting, preliminary information indicates that this report is unlikely to identify any country by name. IAEA officials told us that they do not expect this report to provide detailed information about the key issues addressed during the review meeting.

According to IAEA, the Convention explicitly prohibits nongovernmental organizations from participating in the meetings. NRC officials told us however that these organizations, such as public advocacy or industry groups, might participate as members of their national delegation or be called upon to review and comment on self-assessment reports. U.S. nuclear industry representatives told us that they would like to assist in developing the U.S. report and participate in the meeting of the parties. NRC officials acknowledged that the Convention does not specifically provide for the kind of openness they would prefer, but they believe that over time, more information will be made available to the public through the Convention process.

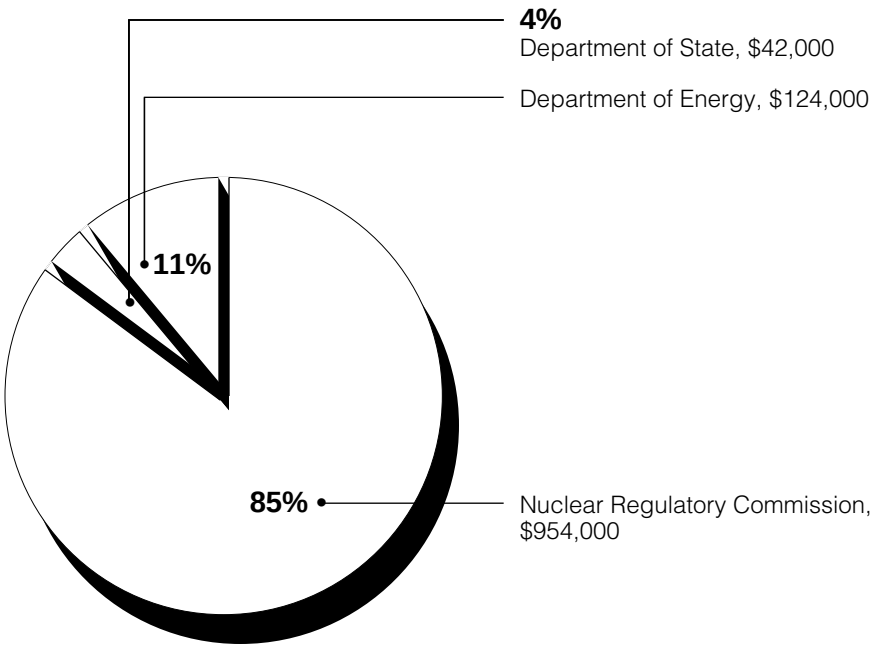
Costs to Implement the Convention Have Not Been Fully Determined

To prepare for and attend the first review meeting in 1999, the United States estimates it could spend as much as $1.1 million. As the Convention's secretariat, IAEA will also incur costs to administer these meetings. IAEA's costs, which the United States will partially fund, have not been fully identified but could range as high as about $10 million, according to a 1993 estimate. NRC officials told us that they believe IAEA's costs will be significantly less—about $1 million.

U.S. Costs to Implement the Convention

The United States estimates that it could spend between $700,000 and $1.1 million through fiscal year 1999 to prepare for and attend the first review meeting, which is expected to be held in April 1999. Additional costs to participate in subsequent review meetings, which are expected to be held every 3 years, have not been estimated. Officials from NRC, State, and DOE told us that the costs associated with the first review meeting are based on (1) participating in four planning meetings held between December 1994 and June 1996 to develop the Convention's draft policies and procedures, (2) preparing the first U.S. self-assessment report, (3) reviewing other countries' reports, and (4) participating in the April 1997 preparatory meeting and the first review meeting. The agencies' estimated costs include the existing and planned travel costs associated with attending meetings at IAEA headquarters in Vienna, Austria, and salary and benefit costs related to the time spent preparing for these meetings. Figure 1 shows the breakdown of estimated costs by agency through the first meeting of the parties.

Figure 1: U.S. Government's Estimated Costs to Implement the Convention on Nuclear Safety Through 1999



Note 1: These costs include $99,500 actually expended in fiscal years 1995 and 1996.

Note 2: These costs are based on a high range of costs projected, as discussed in app. II.

Sources: NRC, DOE, and State.

Salary and benefits constitute 94 percent of the agencies' costs; the remainder is for travel and per diem expenses. The salary and benefit costs result from the efforts of agency staff to prepare the first U.S. self-assessment report, review all other countries' reports as part of the peer review process, and participate in all aspects of the first review meeting. (See app. II for a breakdown of expenditures by each agency.)

Full Costs of IAEA Support Are Not Known

In late 1993, a working group that participated in the drafting of the Convention estimated that IAEA's costs could range from $10,800 to $10.3 million for the first review meeting. NRC officials told us that they believe that IAEA's actual costs will be significantly less—about $1 million to administer the first review meeting. The factors affecting IAEA's costs

primarily involve the number of languages used to conduct the meeting of the parties and the corresponding translation and interpretation services.[6] IAEA's costs to administer future review meetings have not been estimated.

The Convention states that IAEA will bear the cost of administering the meeting of the parties. IAEA's cost of holding the meeting in Vienna is expected to be funded from IAEA's operating budget, which the United States supports through an annual 25-percent contribution. IAEA's 1997 and 1998 budget shows that IAEA plans to dedicate about $330,000 in 1997 and 1998 for Convention-related activities. According to an NRC official, IAEA, whose regular budget has been subject to a policy of "zero real growth" since 1985, may have difficulty financing the initial review meeting. As a result, this official said that additional financial assessments of participating countries may be warranted to provide the necessary funds for IAEA to administer the Convention. The need for additional financial assessments will have to be addressed during the April 1997 preparatory meeting. NRC officials told us they were concerned about IAEA's potential costs to administer the Convention and that the United States will seek to keep these costs to a minimum.

The Convention also permits participating countries to request, after receiving consensus approval from the other countries, additional support and administrative services from IAEA. IAEA's Deputy Director General for Nuclear Safety told us that it is likely that IAEA will receive requests for such assistance and would cover these costs from its regular budget.

NRC and DOE officials told us that they believe the Convention will not stimulate any significant requests for additional assistance to upgrade unsafe reactors. An NRC official told us that as a result of the meetings, there may be some reordering of assistance priorities, but he noted that requirements have already been identified over the past several years through regular multilateral and bilateral assistance channels. A DOE official noted that by the time the first meeting of the parties occurs in 1999, some Western assistance efforts should be winding down, and many safety upgrades will have already been made.[7]

[6]The lowest range of estimates, based on English as the primary language, was considered artificial, since a number of incidental expenses were not included. The high end of the estimates is based on the use of six languages—Arabic, Chinese, English, French, Russian, and Spanish.

[7]For more information on assistance efforts, see our reports entitled Nuclear Safety: Status of U.S. Assistance to Improve the Safety of Soviet-Designed Reactors (GAO/RCED-97-5) and Nuclear Safety: International Assistance Efforts to Make Soviet-Designed Reactors Safer (GAO/RCED-94-234).

IAEA's Deputy Director General for Nuclear Safety told us, however, that the Convention may uncover additional safety problems that require attention. As a result, the countries with the most acute safety problems may seek to use the Convention process as leverage to obtain additional nuclear safety assistance.

Agency Comments

We provided copies of a draft of this report to NRC for its review and comment. NRC obtained and consolidated additional comments from the departments of State and Energy. On December 23, 1996, we met with NRC officials, including the Director, Office of International Programs, and State's Director, Nuclear Energy Affairs, to discuss their comments. In general, these officials agreed with the facts and analysis presented. They gave us additional clarifying information, and we revised the text as appropriate. The officials noted that the Convention is fairly well developed because of the significant amount of work already done by various countries' representatives during several preliminary meetings. In their opinion, it is very important that the United States ratify the Convention before the April 1997 preparatory meeting in order to (1) shape the peer review process to create the most rigorous and systematic analysis of the self-assessment reports, (2) keep the implementation costs as low as possible, and (3) use the United States' diplomatic and political strength to make the Convention an integral component of a network of binding international legal instruments that enhance global safety.

We also provided IAEA with a copy of the draft report. In its comments, IAEA, including the Deputy Director General for Nuclear Safety, suggested some technical revisions to the text, which we incorporated as appropriate. IAEA noted that the April 1997 preparatory meeting will provide countries with the opportunity to decide on the review process and factors that will determine the costs to implement the Convention. IAEA also views the Convention as a major accomplishment that will assist in achieving and maintaining a high level of safety worldwide. In its view, the Convention will provide for a degree of openness about national safety programs that has not existed in the past.

Scope and Methodology

To obtain information on how the Convention will be reviewed for compliance, we examined relevant parts of the Convention and interviewed agency officials from the Department of State, DOE, and NRC and other officials knowledgeable about international agreements from

the Congressional Research Service, Georgetown University Law Center, and New York University. We also discussed the Convention with officials from IAEA, including the Director General, the Deputy Director General for Nuclear Safety, and the Senior Legal Officer. These matters were also discussed with officials from the U.S. Mission to the United Nations System Organizations, Vienna, Austria, and the Nuclear Energy Institute, Washington, D.C. We also reviewed relevant documentation provided by these agencies and officials.

To identify cost information, we obtained cost data from the Department of State, DOE, and NRC. We also obtained data developed by IAEA's Division of Nuclear Safety. We did not independently verify the accuracy of these data.

We performed our review from October 1996 through December 1996 in accordance with generally accepted government auditing standards.

Copies of this report are being sent to the Secretaries of State and Energy, the Chairman of NRC, the Director of the Office of Management and Budget, and other interested parties. We will also make copies available to others on request.

Please call me at (202) 512-3600 if you or your staff have any questions. Major contributors to this report are listed in appendix III.

Allen Li
Associate Director, Energy, Resources,
and Science Issues

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Abbreviations

DOE	Department of Energy
GAO	U.S. General Accounting Office
IAEA	International Atomic Energy Agency
NRC	Nuclear Regulatory Commission

Countries That Had Signed or Signed and Ratified the Convention on Nuclear Safety as of December 1996

Country	Signed convention	Ratified convention	Number of operating civil nuclear power reactors[a]
Algeria	X		0
Argentina	X		2
Armenia	X		1
Australia	X		0
Austria	X		0
Bangladesh	X	X	0
Belgium	X		7
Brazil	X		1
Bulgaria	X	X	6
Canada	X	X	21
Chile	X		0
China	X	X	3
Croatia	X	X	0
Cuba	X		0
Czech Republic	X	X	4
Denmark	X		0
Egypt	X		0
Finland	X	X	4
France	X	X	56
Germany	X		20
Ghana	X		0
Greece	X		0
Hungary	X	X	4
Iceland	X		0
India	X		10
Indonesia	X		0
Ireland	X	X	0
Israel	X		0
Italy	X		0
Japan	X	X	51
Jordan	X		0
Kazakhstan[b]	X		1
Republic of Korea	X	X	11
Latvia		X	0
Lebanon	X	X	0
Lithuania	X	X	2

(continued)

Country	Signed convention	Ratified convention	Number of operating civil nuclear power reactors[a]
Luxembourg	X		0
Mali	X	X	0
Mexico	X	X	2
Monaco	X		0
Morocco	X		0
Netherlands	X	X	2
Nicaragua	X		0
Nigeria	X		0
Norway	X	X	0
Pakistan	X		1
Peru	X		0
Philippines	X		0
Poland	X	X	0
Portugal	X		0
Romania	X	X	0
Russia	X	X	29
Slovak Republic	X	X	4
Slovenia	X	X	1
South Africa	X		2
Spain	X	X	9
Sudan	X		0
Sweden	X	X	12
Switzerland	X	X	5
Syria	X		0
Tunisia	X		0
Turkey	X	X	0
Ukraine	X		16
United Kingdom	X	X	35
United States	X		109
Uruguay	X		0
Total	65	29	431

[a]Number of operating reactors as of December 31, 1995.

[b]The installation is a sodium-cooled fast breeder reactor.

Sources: Nuclear Regulatory Commission and International Atomic Energy Agency.

The Nuclear Regulatory Commission's, Department of State's, and Department of Energy's Estimated Costs to Implement the Convention

This appendix provides information on the costs that have been or may be incurred by the Nuclear Regulatory Commission (NRC), the Department of State, and the Department of Energy (DOE) in implementing the Convention on behalf of the United States. NRC, State, and DOE estimated together they could spend about $1.1 million in travel and salary and benefit costs to prepare for and participate in the first review meeting, which is scheduled to take place no later than April 1999. This amount—based on the number of NRC staff needed to prepare for and attend meetings—represents a higher-range estimate of a figure that could be as low as about $700,000.

Table II.1: NRC's, State's, and DOE's Estimated Costs to Implement the Convention

Element of cost	NRC	State	DOE	Total
Travel	$ 45,000	$12,000	$ 8,000	$ 65,000
Salary/benefits	909,000[a]	30,000	116,000	1,055,000
Total	**$954,000**	**$42,000**	**$124,000**	**$1,120,000**

Note: Actual costs incurred to date by these agencies total $99,500 for fiscal years 1995 and 1996.

[a]NRC's reported costs range from $450,000 to $909,000.

Sources: NRC, Department of State, and DOE.

Major Contributors to This Report

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