

May 1993

NUCLEAR SAFETY

Progress Toward International Agreement to Improve Reactor Safety



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**Resources, Community, and
Economic Development Division**

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May 14, 1993

The Honorable Joseph I. Lieberman
Chairman, Subcommittee on Clean Air
and Nuclear Regulation
Committee on Environment and Public Works
United States Senate

The Honorable Bob Graham
United States Senate

Representatives of nearly one-half of the 114 member states of the International Atomic Energy Agency (IAEA), including the United States, have participated in the development of an international nuclear safety convention—a proposed multilateral treaty to improve civil nuclear power reactor safety. A preliminary draft of the convention has been developed (referred to as the draft convention for this report), but discussions are continuing, and when the final convention text will be completed and presented to IAEA member states for signature is uncertain.

This report responds to the former and current Chairman's request that we provide information on the development of the nuclear safety convention, including a discussion of (1) the draft convention's scope and objectives, (2) how the convention will be implemented and monitored, (3) the views of selected country representatives on what provisions should be included in the draft convention, and (4) the convention's potential benefits and limitations.

Results in Brief

The scope of the convention as currently drafted focuses on civil nuclear power reactors. Thus, other nuclear facilities, including those dealing with waste management, military activities, fuel cycle activities—such as reprocessing and/or enrichment plants—and research reactors, are not covered under the convention's provisions. For example, the draft convention would not cover the nuclear reprocessing facility at a military complex in Russia where an accident occurred in April 1993.

The objectives of the draft convention are written in general terms and call on countries to achieve and attain a high level of safety to prevent nuclear accidents. Because the convention's premise is that the regulation of nuclear safety is a national responsibility, safety goals would be achieved through countries' adherence to general safety principles, such as

establishing a legislative framework and an independent regulatory body to govern the safety of nuclear installations, rather than to binding detailed technical standards. The convention has been characterized as incentive-oriented, designed to encourage widespread support, particularly among countries operating Soviet-designed reactors that lack basic safety features.

The draft convention provides for a peer review process to monitor adherence to the provisions of the convention. Through this process—the details of which have not been determined—it is envisioned that country representatives would have an opportunity to review other countries' measures to improve safety and could exert peer pressure to affect changes.

Although the convention concept is supported by a diverse group of IAEA member state representatives, views differ regarding several issues. For example, the United States and 6 other country representatives told us that they favor a scope limited to civil nuclear power plants, while 16 country representatives told us that they support a broader convention covering, for example, radioactive waste facilities or reprocessing facilities in addition to power plants. One country did not provide a final position on the scope of the convention. Representatives from 21 of the 24 IAEA member states that we met with, including U.S. officials, told us that they favor a convention based on general safety principles and oppose an international enforcement mechanism because the safe operation and maintenance of nuclear reactors is a national responsibility. Most of these countries operate nuclear power plants. Representatives we spoke with from three countries—none of which operate civil nuclear power plants but do neighbor countries operating nuclear power plants—prefer binding technical standards and an international regulatory body to oversee the convention's implementation.

The majority of country representatives and some IAEA officials believe the convention is a positive step towards promoting and strengthening international nuclear safety and perhaps increasing public confidence in the nuclear power industry. However, a few other representatives and other IAEA officials were less optimistic. They noted that without establishing procedures for addressing existing problem reactors, including time frames for upgrading their safety, the convention will not improve nuclear safety. In addition, they told us that the convention could easily be considered weak and lacking in substance by nuclear power

opponents; thus, unless the convention addresses those reactors where perceived safety deficiencies exist, it is technically flawed.

Background

The development of the nuclear safety convention is one of a number of cooperative efforts being undertaken by the international community to improve nuclear safety. Financial and technical assistance from various bilateral and multilateral sources, such as the Commission of the European Communities, is under way to address some of the most urgent safety problems. The impetus for these efforts is based largely on the growing concern about the safety of the older Soviet-designed reactors in eastern Europe and the former Soviet Union. Many of these reactors are operating without basic safety features, such as emergency core cooling systems, protective structures to contain radioactive releases, and adequately trained personnel. In addition, many of these reactors are in countries that do not have independent or effective nuclear regulatory organizations.

The IAEA member state representatives developing the draft convention, known collectively as the working group, have met three times in Vienna, Austria, during the period May 1992 through January 1993. The Department of State heads the U.S. delegation to the working group, which also includes representatives from the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC). The group plans to meet again in May 1993. A State Department official told us that discussions have been complex and difficult because the convention concerns the sovereign rights of nations to regulate and manage important domestic industrial activities that will be affected by the provisions of the convention when adopted. As a result, according to the State Department official, a diplomatic conference will be necessary to negotiate the final terms of the convention.

Scope and Objectives of the Draft Convention

The scope of the convention, as currently drafted, applies only to civil nuclear power plants. Thus, other nuclear facilities, including those dealing with waste management, military activities, and fuel cycle activities—such as reprocessing and/or enrichment plants—and research reactors, are not covered by the terms of the convention. The convention as it currently exists would not cover, for example, the nuclear reprocessing facility at a military complex in Russia where an accident occurred in April 1993.

The objectives of the draft convention are written in general rather than detailed, technical, and prescriptive terms. For example, the convention calls on countries to take all appropriate measures to (1) protect people and the environment from the harmful effects of radiation and (2) prevent the occurrence of nuclear accidents. The convention proposes that countries cooperate to reach these objectives and achieve and maintain a high level of nuclear safety. The convention does not seek to impose penalties for noncompliance.

The convention has been described as incentive-oriented, designed to maximize the number of countries that will support and sign it. A State Department official said that a major reason for developing an incentive-type convention was to make it acceptable and useful to countries with problem reactors, particularly the former Soviet Union and eastern European nations. According to U.S. officials, the main purpose of the convention is to get these countries, as well as developing nations, to make commitments to improve their reactors and develop a safety culture.¹ The U.S. officials believe that these countries probably would not sign a prescriptive or stringent convention that they could not comply with.

The draft convention states that overall responsibility for nuclear safety rests with the country where a nuclear installation is located. Therefore, the convention seeks to achieve its objectives through countries' adhering to general safety principles rather than to binding technical standards. These principles, or safety fundamentals, embodied in the draft convention represent international consensus by experts on basic safety concepts for the regulation and operation of nuclear installations. The principles comprise the most general level of guidelines in the hierarchy of IAEA's nuclear safety series publications.²

The principles, in part, call on each country to take the following actions:

- Establish and maintain a legislative framework and independent regulatory body to govern the safety of nuclear installations through regulations, licensing, inspection, and enforcement.
- Establish procedures to ensure that technical aspects of nuclear reactor safety are adequately considered and continuously evaluated throughout

¹Safety culture implies individual and organizational awareness of and commitment to the importance of safety. It also refers to the personal dedication and accountability of all individuals engaged in any activity that has a bearing on the safety of nuclear power plants.

²IAEA's safety series also includes more detailed standards, guides, and practices. In total, these guidelines provide a reference for developing national safety regulations in certain cases.

the life of the installation. These technical aspects include siting, design and construction, and operation and maintenance. For example, countries would be required to establish procedures to evaluate the impact of a nuclear installation's site selection on the environment and ensure that the design of the installation provides for levels of protection against the release of radioactive materials.

- Establish a safety management system to ensure that an acceptable level of safety is maintained throughout the life of the installation. This is to be achieved by giving priority to safety, establishing a quality assurance program, ensuring that staff are adequately trained, performing periodic safety assessments, and establishing an emergency preparedness plan.

Convention to Be Implemented by Peer Review Process

As currently drafted, the convention would be implemented by periodic meetings of the signatory countries—a peer review process. Although the details of this process have not been determined by the working group, the draft convention contains proposals that the meetings will (1) establish the structure, content, and time frames for status reports to be submitted by the signatory countries; (2) review and assess how the countries are meeting the convention's obligations; and (3) carry out advisory functions to achieve and maintain a high level of nuclear power plant safety.

These meetings are an essential element of the convention and should provide a forum for reviewing countries' measures to improve safety. At a February 1993 IAEA general conference meeting, the U.S. representative noted that the convention should establish a mandatory process for exerting peer pressure on countries with weak nuclear safety programs to substantially improve them.

The role of IAEA—an agency that promotes improvements in nuclear power reactor safety—in implementing the convention has not been agreed upon, but it is unlikely that the agency will have any enforcement or regulatory responsibility. As drafted, the convention proposes that IAEA serve as the Secretariat to the meeting of the parties. In this capacity, IAEA would (1) convene, prepare, and service the meetings; (2) transmit reports and information to member countries; and (3) perform other duties and provide support services and technical expertise as requested. Most of the country officials, including the U.S. delegation, believe that IAEA also can play a useful, nonregulatory role in implementing the convention, such as technical adviser.

Both the Director and Deputy Director of IAEA's Nuclear Safety Division believe the agency can play an active role by more fully utilizing the skills and expertise of the agency. They noted that in addition to the proposed Secretariat role, IAEA could facilitate the procedural meetings of the parties in a variety of ways. For example, IAEA could (1) prepare reports for the meetings, (2) analyze countries' status reports, (3) verify countries' progress in improving safety, (4) establish criteria to serve as a benchmark for measuring progress in meeting the convention's obligations, and (5) provide other technical assistance as required.

Country Representatives Expressed Differing Views on Nuclear Safety Convention

We interviewed representatives of 24 IAEA member state countries³—18 of which operate 87 percent of the world's civil nuclear power plants—to obtain their views on the convention's scope, whether they favored a convention based on detailed technical standards or general safety principles, if there should be a mechanism to ensure adherence to the convention, and the convention's potential benefits and limitations.

Mixed Views on Scope of Convention

Various views exist among country representatives over what facilities and elements of the nuclear fuel cycle should be included in the convention. All of the representatives we spoke with agreed that, at a minimum, the convention should cover civil nuclear power plants. However, the majority of these representatives told us that the final convention should not be limited to these installations. Of the 24 representatives, 16 favored a convention covering a wider range of facilities and most frequently cited the need to include radioactive waste disposal. Other facilities or elements mentioned were fuel reprocessing, transportation of nuclear material, military facilities, and research reactors. One country representative did not provide a final position on the scope of the convention.

Representatives told us that a nuclear accident, regardless of its source, is potentially dangerous. In their view, a convention addressing other sources of radiation would demonstrate the international community's recognition of the broader issues involving nuclear safety. Many of the representatives who support a broader scope for the final convention told us that their countries might be willing to accept a convention limited to nuclear power plants as a first step, with the understanding that additional nuclear facilities would be addressed in future conventions.

³We interviewed representatives from Argentina, Austria, Belgium, Brazil, Bulgaria, Canada, China, Cuba, Finland, France, Germany, Ireland, Italy, Japan, Republic of Korea, Mexico, Netherlands, Portugal, Romania, Russian Federation, Spain, Sweden, United Kingdom, and the United States.

Seven country representatives, including the United States, favor a scope limited to nuclear power reactors, in part because they pose the most serious risk. In addition, State Department and NRC officials told us that it was thought early agreement could be reached on a final text of the convention if it was limited to nuclear power reactors. In addition, an NRC official told us that the United States is committed to continuing the convention process and would be an active participant in any future safety conventions addressing other nuclear facilities.

Most Countries Favor General Principles Over Binding Standards

Of the 24 countries whose representatives we interviewed, including the United States, 21 support a convention based on general safety principles, not binding safety standards. With one exception, these countries have nuclear power plants in operation or under construction. Several member country representatives said that the general principles included in the draft convention are adequate to establish minimum acceptable standards of safety. Officials from the United States and several other countries noted that standards could infringe on national sovereignty or conflict with national laws and policies. A DOE official said that detailed standards are not well suited for development into international standards. He said that the diversity of plants in operation worldwide and of those planned for the future makes it difficult for a set of detailed standards to be applied broadly and still to provide recognition of individual reactor design requirements.

The representatives of the United States and other countries told us that it would be time-consuming and complex to translate safety standards into acceptable binding international language. Furthermore, the United States has maintained that international standards could commit the signatory countries to a less rigorous set of obligations than many national programs have adopted—a “lowest common denominator” approach to nuclear safety.

Representatives from three non-nuclear power countries, all of which neighbor countries with operating nuclear power reactors, told us that they favor a convention based on binding international technical safety standards. Officials from these countries said that detailed, prescriptive standards would provide firm obligations and serve as criteria for measuring progress made toward nuclear safety. Two of these countries' officials disagreed with the lowest common denominator argument made by the United States. The officials said that the Western nations already exceed the proposed international nuclear safety standards. Furthermore,

the officials believe that standards are necessary to bring countries with problem reactors up to minimum acceptable levels of safety.

While most countries do not favor a convention based on binding standards, working group delegates are debating the value of using standards as a reference to measure countries' progress toward improving safety. Various countries in the working group favor using international standards for this purpose. Furthermore, some representatives that were opposed to a convention based on technical standards supported the idea of using standards for the peer review process. The U.S. delegation was among several countries opposed to this idea, especially if the standards were to be assigned special recognition in the convention. The United States based its opposition, in part, on the belief that experience and expertise in operating nuclear reactors are the key to the peer review process, not standards. At the last working group meeting in January 1993, no agreement was reached on what role, if any, standards should play.

Most Countries Oppose International Enforcement or Regulatory Body

Representatives of 21 countries, including the United States, told us that they are opposed to having an international organization, such as IAEA, enforce the convention. The same countries that favor general principles over technical standards oppose international enforcement for many of the same reasons. These countries are opposed to a regulatory body, primarily because they believe it would infringe upon their national sovereignty.

Several country representatives told us that countries with problem reactors would be discouraged from signing an enforcement-oriented convention. In their view, these countries should be part of the process if the convention is going to have a positive impact on improving international nuclear safety. Representatives from three non-nuclear power countries told us that enforcement and verification procedures are essential to ensure that countries are meeting their obligations. Furthermore, two of these countries favor mandatory international inspections, possibly by IAEA.

Potential Benefits and Limitations of the Proposed Nuclear Safety Convention

The nuclear safety convention concept enjoys broad support among a diverse group of countries. Although many member country representatives do not view the convention as a panacea or quick fix, the majority believe it is a positive step toward improving international nuclear safety. A U.S. government representative said that the

convention's primary benefits would be (1) promoting a nuclear safety culture and (2) obtaining improvements in nuclear reactors located in eastern Europe, the former Soviet Union, and developing countries. Various member country representatives said that, in addition to promoting a global safety culture, the convention could increase public awareness and confidence in nuclear safety. Some IAEA officials, who are assisting in the working group, believe the convention is a worthwhile effort because it will bring countries together to discuss safety issues as part of a systematic process.

A few primarily non-nuclear power countries, as well as some IAEA officials, believe that the proposed convention has serious limitations. One country representative said that the convention needs to change the status quo and improve the safety of problem reactors. However, in his view, the draft convention would not achieve this objective. A few member country officials noted that without establishing procedures for addressing existing problem reactors, including time frames for upgrading their safety, the convention would not improve nuclear safety. The Director of IAEA's Division of Nuclear Safety told us that the convention could easily be considered weak and lacking in substance by nuclear power opponents. The Deputy Director noted that unless the convention addresses those reactors where perceived safety deficiencies exist, it is technically flawed.

Observations

Development of the draft international nuclear safety convention has been complex and difficult. This is understandable, given the various perceptions and expectations of countries as to what a nuclear safety convention should contain and what it should accomplish. Agreement has not been reached on the substantive provisions regarding the scope and the level of technical detail of safety standards or principles to be adhered to by member countries.

The sovereign rights of participating countries could be affected by the final convention document. Although member states differ on the elements that the convention should contain, they share the common goal of wanting to improve nuclear power reactor safety through greater international cooperation. The member states also seem to agree that safety is an international responsibility because of the potential transboundary effects of radiation released from an accident.

It is premature to assess the impact of the nuclear safety convention, the success of which depends on many factors, including getting most of the

nations with nuclear power plants to sign onto the convention and adhere to its terms. However, some preliminary observations can be made at this time. The draft convention does not provide measurable criteria to gauge the safety improvements of the countries, particularly those with problem reactors. Using benchmark criteria in the peer review process could aid in assessing and monitoring progress in upgrading the safety of civil nuclear power plants. In addition, although it is clear that most member state representatives do not envision an enforcement role for IAEA, it is not clear what role IAEA will ultimately serve. IAEA's technical expertise and safety services could be used to facilitate the peer review process.

Agency Comments

We discussed the facts presented in this report with the State Department's Director, Office of Nuclear Technology and Safeguards; NRC's Deputy Director, Office of Nuclear Regulatory Research; DOE officials in the Office of the Assistant Secretary for Domestic and International Energy and in the Office of General Counsel; and the Counselor of Nuclear Policy, U.S. Mission to the United Nations System Organizations. We discussed the report with the following officials from IAEA's Division of Nuclear Safety: the Director, the Deputy Director, and the Head of the Safety Standards and Coordination Section. We also met with officials from IAEA's Legal Division.

In general, these officials agreed with the facts presented in this report and gave us additional clarifying information. We have revised the text as necessary. However, as requested, we did not obtain written agency comments on a draft of this report.

Scope and Methodology

To obtain a broad range of views on the nuclear safety convention, we judgmentally selected 24 IAEA member countries to include in our review. As of December 31, 1992, 18 of the 24 countries operated 87 percent of the world's nuclear power plants. Among this group of countries, we wanted to ensure that we solicited the views of representatives from both highly industrialized and less-developed countries. We obtained the views of some of those countries with Soviet-designed reactors, such as the Russian Federation and Bulgaria. We also sought views from two countries that do not currently operate civil nuclear power plants but are constructing them—Cuba and Romania.

Finally, we met with representatives from four countries that do not currently have active civil nuclear power programs—Austria, Ireland, Italy,

and Portugal. We selected these countries to ensure that we included the views of non-nuclear power countries that neighbor countries operating civil nuclear power plants.

We met with officials from all of these countries to obtain their views on the draft convention. These officials included country representatives to IAEA, legal and technical experts, and other knowledgeable government officials. Whenever possible, we sought to verify foreign countries' positions by comparing their representatives' views with formal statements provided at IAEA general conferences and other available information. We provided officials from each country with a summary of information and requested that it be reviewed by other cognizant government representatives for accuracy and completeness. Representatives from all 23 foreign countries responded between December 1992 and March 1993. One country's positions were presented as preliminary and subject to further review.

To obtain the views of the U.S. government, we met with officials from the Departments of State and Energy and NRC. We also met with officials from the U.S. Mission to the United Nations System Organizations, Vienna, Austria; and the U.S. Mission to the European Communities, Brussels, Belgium. We obtained pertinent documents that detailed U.S. positions on the safety convention.

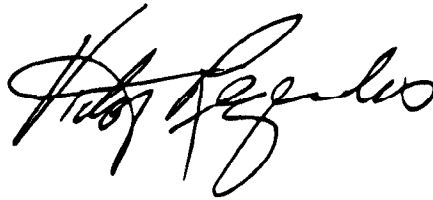
To help identify key elements and objectives of the convention, we attended the October 1992 and January 1993 sessions of the nuclear safety working group in Vienna, Austria. We reviewed pertinent convention-related reports prepared by IAEA and other relevant documentation prepared by the participating countries. We also obtained the views of officials and additional documentation from IAEA; the Paris, France, Center of the World Association of Nuclear Operators; the Nuclear Energy Agency of the Organization for Economic Cooperation and Development; and the Commission of the European Communities.

We performed our review between August 1992 and March 1993 in accordance with generally accepted government auditing standards.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we plan to send copies of this report to other interested congressional committees; the Secretaries of State and

Energy; and the Chairman, U.S. Nuclear Regulatory Commission. We will make copies available to others on request.

Please contact me at (202) 512-3841 if you or your staff have any questions. Major contributors to this report are listed in appendix II.



Victor S. Rezendes
Director, Energy
and Science Issues

Countries Attending the Nuclear Safety Convention Working Group

Country	Operating civil nuclear power reactors	Civil nuclear power reactors under construction	No operating civil nuclear power reactors
Algeria			X
Argentina	X	X	
Australia			X
Austria			X
Belgium	X		
Brazil	X	X	
Bulgaria	X		
Canada	X	X	
China	X	X	
Croatia ^a			X
Cuba		X	X
Czech Republic ^b	X	X	
Denmark			X
Egypt			X
Finland	X		
France	X	X	
Germany	X		
Greece			X
Holy See			X
Hungary	X		
India	X	X	
Indonesia			X
Iran		X	X
Ireland			X
Israel			X
Italy			X
Japan	X	X	
Republic of Korea	X	X	
Luxembourg			X
Malaysia			X
Mexico	X	X	
Netherlands	X		
Nigeria			X
Norway			X
Pakistan	X		
Peru			X

(continued)

**Appendix I
Countries Attending the Nuclear Safety
Convention Working Group**

Country	Operating civil nuclear power reactors	Civil nuclear power reactors under construction	No operating civil nuclear power reactors
Philippines			X
Poland			X
Portugal			X
Romania		X	X
Russian Federation	X	X	
Saudi Arabia			X
Slovak Republic ^b	X	X	
Slovenia ^a	X		
South Africa	X		
Spain	X		
Sweden	X		
Switzerland	X		
Thailand			X
Tunisia			X
Turkey			X
Ukraine	X	X	
United Kingdom	X	X	
United States	X	X	

Note: Not all countries listed attended all meetings of the working group.

^aYugoslavia attended the May 1992 meeting. Two former Yugoslavian republics of Slovenia and Croatia attended the later meetings.

^bCzechoslovakia attended the 1992 meetings. Following the dissolution of Czechoslovakia on December 31, 1992, the Czech and Slovak Republics attended the January 1993 meeting.

Source: IAEA, December 31, 1992.

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