THE PRACTICE OF PEER REVIEW IN THE INTERNATIONAL NUCLEAR SAFETY REGIME

MONICA J. WASHINGTON*

INTRODUCTION

Before the first artificial fissioning of a uranium atom, it was apparent to the scientific community that harnessing the atom's vast reservoir of energy, even for peaceful purposes, was not without its risks.[1] Today, five decades after splitting the atom and just over one decade since the April 1986 Chernobyl accident sent radioactive fallout across Eastern and Western Europe, an increasing number of states have come to recognize the tremendous transboundary risks that are inherent in the development of nuclear power. Accompanying this trend has been the search for appropriate and effective means to improve the safety of nuclear power plants worldwide.

A notable development in the international effort to promote domestic implementation of internationally recognized nuclear safety standards has been the use of peer review to evaluate the conditions and safety procedures of nuclear power plants. Peer review, as it is generally understood, involves the evaluation of proposals, projects, or other endeavors by committees of experts within a given specialization.[2] In the context of nuclear safety, peer review is manifested in two different forms. One paradigm, utilized by organizations such as the International Atomic Energy Agency (the Agency or IAEA), the World Association of Nuclear Operators (WANO), and the Institute of Nuclear Power Operations (INPO) in their safety review services,

* The author expresses her appreciation to the Center for International Studies of the New York University School of Law and, in particular, to Professors Thomas M. Franck and Paul C. Szasz for their support and guidance. A version of this Note will be published as a chapter in Administrative & Expert Monitoring, a forthcoming book edited by Paul C. Szasz.

1 Within six months of their discovery of the X-ray in 1895, experimenters in the laboratory of Wilhelm Konrad Roentgen experienced painful burn-like lesions on their hands. See Elizabeth S. Rolph, Nuclear Power and the Public Safety 15-16 (1979). The Curies and their assistants noticed similar slow-healing skin problems after their isolation of polonium, and, as we now know, Marie Curie died of radiation exposure. See Eve Curie, Madame Curie: A Biography 384 (Vincent Sheean trans., 1938) (describing cause of Curie's death).

2 See Effie J. Chan, Note, "The Brave New World" of *Daubert*: True Peer Review, Editorial Peer Review, and Scientific Validity, 70 N.Y.U. L. Rev. 100, 113-14 (1995) (describing different notions of "true peer review").

involves the technical, on-site review of nuclear installations by nuclear plant operators. The other, as embodied in the Convention on Nuclear Safety (the Convention),[3] is designed to monitor state compliance with the provisions of that treaty. Though procedurally distinct from the safety review services, the review process embodied in the Convention attempts to capture the nonconfrontational and collegial spirit of the safety reviews.

This Note examines the practice of peer review within the context of the nuclear safety regime with the aim of assessing its effectiveness as a compliance-monitoring and regime-building instrument. Through an exploration of the development of international norms regarding nuclear safety and an investigation of the two paradigms of peer review used within the regime, it considers how this collegial compliance mechanism, accompanied by peer pressure and public scrutiny, can be an effective means of encouraging adherence to certain internationally defined standards.

Part I of the Note sketches the legal and normative context of the nuclear safety regime and describes some of the obstacles to the international regulation of nuclear safety norms. Part II explores the two paradigms of peer review in greater detail, describing the mechanics of the review process, first in the safety services of the Agency and second as envisioned in the Convention. Part III considers the ability of each model to foster domestic implementation of nuclear safety standards and discusses aspects of the review process which may require refinement.

I
THE CONTEXT AND LEGAL NORMS OF NUCLEAR SAFETY

A. Background

While the April 1986 Chernobyl accident is credited with awakening the world to the tremendous global repercussions of nuclear accidents, in reality it merely energized a "large, but quiescent" movement to improve nuclear safety standards worldwide.[4] Nuclear

[3] Convention on Nuclear Safety, adopted on June 17, 1994, IAEA Doc. INFCIRC/449/Annex, 33 I.L.M. 1518 (entered into force Oct. 24, 1996) [hereinafter Convention on Nuclear Safety]. As of March 1997, 65 countries had signed the Convention, and 35 states had consented to be bound. See Convention on Nuclear Safety, Signatories and Parties (last modified Mar. 1997) <http://www.iaea.or.at>; see also U.S. Gen. Accounting Office, GAO/RCED-97-39, Nuclear Safety: Uncertainties About the Implementation and Costs of the Nuclear Safety Convention 14-15 (1997) [hereinafter G.A.O. Report] (listing 29 countries that had ratified Convention as of December 1996). See Appendix III for list of countries that have signed, or signed and ratified, the Convention as of March 1997.

[4] Jack Barkenbus, Nuclear Power Safety and the Role of International Organization, in Peace by Pieces—United Nations Agencies and Their Roles: A Reader and Selective

power technology, though a relatively efficient and reliable source of energy, is also a potential source of dangerous levels of radiation. Although under ordinary operating conditions only negligible amounts of radioactive materials escape from a reactor, more dangerous quantities of these materials can enter the atmosphere due to accidents or to the inadequate disposal of nuclear wastes. The international community has for some time recognized the dangers posed by the diversion of nuclear materials for nuclear weapons. Indeed, the administration of international nuclear safeguards (monitoring and preventing the diversion of nuclear materials) forms the cornerstone of the nuclear nonproliferation regime.[5] In contrast, it is only in the past decade and a half that states have made serious efforts to address the significant dangers to safety that are posed by the peaceful uses of nuclear power. Earlier efforts at regulating nuclear energy had limited impact on the development of international safety standards.

The 1946 Report on the International Control of Nuclear Energy, which came to be known as the Acheson-Lilienthal Report, embodied one of the earliest proposals for the international supervision of nu-

---

Bibliography 87, 91 (Robert N. Wells, Jr., ed., 1991). More accurately, the accident at the Three Mile Island (TMI) nuclear power installation first energized the movement against nuclear energy which in turn inspired the movement to improve safety standards. See generally Jim Falk, Global Fission: The Battle Over Nuclear Power 29-42 (1982) (discussing impact of TMI accident).

[5] See Treaty on the Non-Proliferation of Nuclear Weapons, opened for signature July 1, 1968, preamble, arts. II-III, 21 U.S.T. 483, 484, 487-89, 729 U.N.T.S. 161, 170, 171-72 (entered into force Mar. 5, 1970) [hereinafter NPT]. The objective of the international safeguards system is "to verify that nuclear material, equipment and installations are not used to 'further any military purpose.'" Hans Blix, Statement to the 40th Session of the General Conference of the International Atomic Energy Agency (Sept. 16, 1996) (visited Mar. 9, 1997) <http://www.iaea.or.at> (quoting Statute of the International Atomic Energy Agency, Oct. 26, 1956, 8 U.S.T. 1093, 276 U.N.T.S. 3, amended Jan. 31, 1963, 14 U.S.T. 135, 471 U.N.T.S. 334, amended June 1, 1973, 24 U.S.T. 1637 (entered into force July 29, 1957) [hereinafter IAEA Statute]). In conjunction with the NPT, IAEA safeguards verify fulfillment of the nonproliferation commitments made by nonnuclear weapon states that are parties to the NPT, "with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices." NPT, art. III.1, 21 U.S.T. at 487-88, 729 U.N.T.S. at 172. For recent commentary on the relationship between safeguards and the NPT, see generally Jan Priest, IAEA Safeguards and the NPT: Examining Interconnections 2, IAEA Bull. (Mar. 1995).

Safeguards also form the cornerstone of the Treaty for the Prohibition of Nuclear Weapons in Latin America, opened for signature Feb. 14, 1967, art. 13, 22 U.S.T. 762, 772, 634 U.N.T.S. 281, 340, and the South Pacific Nuclear Free Zone Treaty, opened for signature Aug. 6, 1985, art. 4, 24 I.L.M. 1442, 1445, usually in conjunction with NPT-based controls. See also Treaty on an African Nuclear Weapon Free Zone, opened for signature April 11, 1996, 35 I.L.M. 698. For commentary on the NPT safeguards system, see generally Lawrence Scheinman, The International Atomic Energy Agency and World Nuclear Order 147-71 (1987).

clear energy.[6] The Report called for the creation of a supranational authority that would effectively own and manage all "dangerous atomic activities" while leaving safe nuclear activities to the control of national and private bodies.[7] Later that year, Bernard Baruch, U.S. Representative to the United Nations Atomic Energy Commission, used the basic concept of the Report in his proposal for an International Atomic Development Authority entrusted with "all phases of the development and use of atomic energy."[8] The Soviet Union's subsequent rejection of the plan highlighted the tense political climate in 1946 and the existence of divergent perspectives on the regulation of nuclear power.[9]

Notwithstanding the reluctance to empower an international body with the regulation of nuclear energy, the years following the Baruch Plan saw progress in the area of safety, albeit at a fragmented and uneven pace. The establishment of three major international organizations in the nuclear field was of particular importance to the development of nuclear energy and to the advancement of international nuclear safety standards. The Agency, the European Atomic Energy Community (EURATOM),[10] and the Organization for European Cooperation's (OEEC's) European Nuclear Energy Agency

---

[6] See U.S. Dep't of State, The International Control of Atomic Energy: Growth of a Policy 34-35 (1946). The Report was "intended as a working paper for policy-making officials." Id. at 35.

The Acheson-Lilienthal Report was not the first manifestation of international action in the area of nuclear safety. The International Commission on Radiological Protection (ICRP) has been issuing recommendations on radiation protection since 1928. See Mohammed ElBaradei et al., International Law and Nuclear Energy: Overview of the Legal Framework 16, 17, IAEA Bull. (Sept. 1995).

[7] Scheinman, supra note 5, at 51.

[8] The Baruch Plan: Statement by the United States Representative (Baruch) to the United Nations Atomic Energy Commission (June 14, 1946), in 1 U.S. Dep't of State, Documents on Disarmament 1945-1959, at 7, 10 (1960).

[9] After rejecting the Baruch Plan, the Soviets presented their own proposal to prohibit atomic weapons and to destroy existing stocks of both manufactured and unfinished nuclear weapons. See Vanda Lamm, The Utilization of Nuclear Energy and International Law 38 (1984). This proposal was in turn rejected by the United States. See id. Lamm asserts that the Soviet Union was not against international control of atomic energy, but against "only the way of control proposed in the Baruch Plan." Id. at 39.

[10] Article 1 of the EURATOM Treaty sets the aims of the organization as "raising of the standard of living in Member States and . . . the development of commercial exchanges with other countries by the creation of conditions necessary for the speedy establishment and growth of nuclear industries." Treaty Establishing the European Atomic Energy Community (EURATOM), Mar. 25, 1957, art. 1, 298 U.N.T.S. 167, 172 (entered into force Jan. 1, 1958). See generally Michel Gaudet, EURATOM, in Progress in Nuclear Energy 140, 150-52 (Law and Admin. Series X, Herbert S. Marks ed., 1959) (describing EURATOM formation); Jürgen Grunwald, The Role of Euratom, in Nuclear Energy Law After Chernobyl 33 (Peter Cameron et al. eds., 1988) (describing origins and application of EURATOM treaty).

(OEEC-ENEA, now the OECD-NEA)[11] were all created within months of each other, in 1957 and 1958.[12] Of the three organizations, the Agency represents the largest group of countries and is therefore considered the primary organization in the field of nuclear safety and safeguards.[13]

The Agency is an autonomous intergovernmental organization within the United Nations system. Its mandate is embodied in the IAEA Statute,[14] which defines the Agency's dual objectives as seeking to "accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world [and to] ensure . . . that assistance provided by it . . . is not used in such a way as to further any military purpose."[15] The Agency has definite statutory authority to require and recommend the observance of health and safety measures and to promulgate safety standards in conjunction with some promotional activities and with safeguards.[16] For both the Agency's own operations and for other operations making use of materials, services,

---

[11] The Council of the Organization for European Economic Cooperation established the European Nuclear Energy Agency on December 20, 1957. See M.J. Bowman & D.J. Harris, Multilateral Treaties: Index and Current Status 225 (1984). The aims of the organization were, among others, to develop the nuclear industry and nuclear research in Europe, to institute international security control in order to prevent the diversion of nuclear materials for military purposes, and to create a legal regime applicable to the nuclear industry. See Pierre Huet, The O.E.E.C. European Nuclear Energy Agency, in Progress in Nuclear Energy 180, 184 (Law and Admin. Series X, Herbert S. Marks ed., 1959).

The OECD-NEA includes all the European member countries of the OECD and Australia, Canada, Japan, New Zealand, and the United States. See F. Weehuizen, Periodic Safety Review of Nuclear Power Plants in NEA-Member Countries at ii, NEA/NRA/DOC(91)1 (Sept. 1991). More than three-quarters of the world's 430-plus nuclear reactors (80% of all operating capacity) are found in OECD countries. See International Datafile 53, IAEA Bull. (Sept. 1995) (reporting status of nuclear power units around world in 1995); Hans Blix, The IAEA Programme on Nuclear Power for the Future, Address to the 8th International Conference on Emerging Nuclear Energy Systems at Obninsk, Russia (June 24, 1996) (visited Feb. 10, 1997) <http://www.iaea.or.at> (same).

[12] The creation of these organizations coincided with the nuclear reactor accidents at Windscale in the United Kingdom and Kyshtym in Russia. See B.A. Thomas, Streamlining the IAEA Safety Services: How to Enhance Quality of the IAEA Contribution to Safe Production of Electricity 3 (1995) (unpublished manuscript, on file with the *New York University Law Review*).

[13] See Patrick Reyners & Enery Lellouche, Regulation and Control by the International Organisations in the Context of a Nuclear Accident: The International Atomic Energy Agency and the OECD Nuclear Energy Agency, in Nuclear Energy Law After Chernobyl 1, 2 (Peter Cameron et al. eds., 1988). As of January 1997, the Agency had a membership of 124 states. See Profile of the IAEA (visited Mar. 9, 1997) <http://www.iaea.or.at>.

[14] See IAEA Statute, supra note 5. The IAEA Statute is a treaty to which any state may adhere with the approval of a majority of the current Agency members. See id. art. IV.

[15] Id. art. II.

[16] See id. arts. XII.A.2, III.A.6, and IX.I.3.

equipment, facilities, and information made available through the Agency or at its request, compliance with Agency standards is mandatory.[17] The Agency applies its standards pursuant to agreements with countries that receive assistance.[18] With the exception of these two situations, the Agency has no power to impose its standards on any operation. States, however, are free to decide whether to adopt any or all of the Agency's standards by incorporating them into national regulatory legislation or through other means.[19]

Although the IAEA Statute delineates a number of situations in which the Agency can legally exercise safety controls (through Agency-assisted projects or pursuant to bilateral or multilateral agreements),[20] it has largely refrained from doing so. Instead, by establishing and encouraging the development of basic safety criteria, the Agency safety program focuses primarily on norm making and the harmonization of safety-related policies.[21] During the early years of the Agency, the promulgation of safety standards was the principal safety-related activity it performed.[22] The Health and Safety Document, first approved in March 1960, outlined the circumstances under which the Agency could impose health and safety controls in its projects.[23] According to this document, the Agency could conclude agreements with states that required certain safety control features, such as periodic and special reports to the Agency, and could also dispatch safety inspectors to nuclear facilities under certain circumstances.[24] Though a few agreements of this type were concluded, no uninvited safety inspections ever took place.[25] When the Agency revised the Health and Safety Document in 1976, it replaced provisions regarding "inspections" with references to "safety missions."[26] Gen-

17 See id. arts. XI, XII; see also ElBaradei, supra note 6, at 17 (noting that "IAEA safety standards are mandatory with regard to nuclear activities undertaken with IAEA assistance, but where such assistance is not provided the standards are recommendatory").

18 See IAEA Statute, supra note 5, art. XI.F.

19 See ElBaradei, supra note 6, at 25 (noting that "[m]any States have accepted [Agency] standards as a basis for their national legislation").

20 See IAEA Statute, supra note 5, art. III.6.

21 See Harmonization of Safety-Related Policies, IAEA Doc. GC(39)/INF/8, Attachment Part A (Sept. 4, 1995) (visited Mar. 1, 1997) <http://www.iaea.or.at>.

22 See Paul C. Szasz, The IAEA and Nuclear Safety, 1 Rev. of Eur. Community and Int'l Envtl. L. 165, 168 (1992).

23 See The Agency's Health and Safety Measures, IAEA Doc. INFCIRC/18 (May 31, 1960); see also Paul C. Szasz, The Law and Practices of the International Atomic Energy Agency 664-67, IAEA Legal Series No. 7 (1970) (summarizing provisions of Health and Safety Document).

24 See The Agency's Health and Safety Measures, supra note 23, at 6-8.

25 See Szasz, supra note 23, at 168.

26 See id. at 170-71; see also The Agency's Safety Standards and Measures 13, IAEA Doc. INFCIRC/18/Rev.1 (Apr. 1976).

erally, these missions are performed only by invitation.[27] Although Agency-initiated safety missions were contemplated in the 1976 document, not one has ever occurred.[28]

In 1974, the Agency initiated the Nuclear Safety Standards Program (NUSS) to provide a frame of reference for safety measures taken at the national level.[29] The program produced five separate Codes of Practice in the areas of governmental organization, siting, design, operation, and quality assurance.[30] The Codes outline basic assessment and safe operation guidelines for states pursuing a nuclear power program.[31] As with its other activities, the Agency intended this initiative to complement the efforts of national authorities and operating organizations but not to impose standards upon them.[32]

In 1985, the Agency Director General established the International Nuclear Safety Advisory Group (INSAG).[33] INSAG was intended to serve as a forum for the exchange of safety-related information, to identify safety issues of international significance, and to draw conclusions on the basis of worldwide experience, nuclear safety research results, and operational feedback.[34] INSAG's mandate did not mention the necessity of forging a common nuclear safety philosophy—yet another reminder of the strong autarkic tendencies that characterized efforts to regulate nuclear power during this period.[35]

B. Momentum in the Wake of Three Mile Island and Chernobyl

In the past two decades, states have reluctantly but increasingly come to view safety as an international concern. This change in per-

---

27 See Szasz, supra note 22, at 171.

28 See id.

29 See Establishment of International Safety Standards, para. 5, IAEA Doc. GC(40)/INF/5, Attachment Part B (Aug. 30, 1996) (visited Feb. 7, 1997) <http://www.iaea.or.at>.

30 See id.

31 The Codes' basic requirements include: 1) an adequate supply of trained personnel at each nuclear plant and regulatory agency; 2) the ability to conduct a careful and detailed safety evaluation of a nuclear power plant project from its inception and at all stages throughout its life; and 3) the ability to conduct an appropriate quality assurance program including control and inspection. See ElBaradei, supra note 6, at 17. The Codes of Practice have been subsequently revised and are supplemented by more than 60 Safety Guides detailing their implementation. See id. See generally E. Iansiti, The Development and Implementation of International Nuclear Safety Standards 34, IAEA Bull. (Sept. 1995) (describing development of safety standards through NUSS program).

32 See Reyners & Lellouche, supra note 13, at 5.

33 See Encouraging the Development of Common Basic Safety Standards, para. 2, IAEA Doc. GC(39)/INF/8, Attachment Part A, Annex A-1 (Sept. 4, 1995).

34 See id.

35 See Barkenbus, supra note 4, at 100 (discussing socioeconomic and practical problems hindering development of common safety standards).

spective can be linked to the end of the Cold War, greater contact between the West and Eastern European states, and the expansion of nuclear power technology in some countries. However, the nuclear reactor accidents at Three Mile Island (TMI) in March 1979[36] and at Chernobyl in April 1986[37] are, arguably, the two most significant causes of fundamental rethinking in the area of nuclear safety.[38] This rethinking led to four significant developments in the years following TMI and Chernobyl.

First, amid intense public reaction following the Chernobyl accident, two conventions were submitted to the General Conference of the Agency immediately prior to its thirtieth regular session in September 1986.[39] The conventions cover early notification and emergency response procedures in the event of nuclear accidents.[40] Within hours of their approval by acclamation, fifty-one countries signed the conventions.[41] Interestingly, some years earlier the Agency had convened experts to recommend similar procedures for mutual emer-

---

36 For a narrative of the TMI accident and an assessment of its environmental and socioeconomic impacts, see generally 1 U.S. Nuclear Regulatory Comm'n Special Inquiry Group, Three Mile Island: A Report to the Commissioners and to the Public (1980).

37 In the case of Chernobyl, radioactivity from the damaged reactor, located at what was then approximately 250 miles from the closest international border, spread far into Europe. See Joop van der Pligt, Nuclear Energy and the Public 122-23 (1992) (describing spread of radioactive material from Chernobyl accident). For a reconstruction of the series of events leading up to, during, and after the Chernobyl accident, see generally Chernobyl, Nuclear Engineering Int'l, Oct. 1986, at 2.

38 The statements of UN Member States during a UN Conference in April 1987 signaled the changing perceptions of safety. India recognized that "[a] nuclear incident anywhere in the world has the potential for global repercussions. . . . International cooperation in this area is essential." Report of the United Nations Conference for the Promotion of International Co-operation in the Peaceful Uses of Nuclear Energy 76, A/Conf.108/7 (1987). The USSR requested that "[t]he IAEA . . . give special emphasis in its nuclear-related activity to the development of nuclear power reactors with a higher level of safety." Id. at 77.

39 In May 1986, the Board of Governors of the Agency, noting "the evident need for greater co-operation in nuclear safety," decided to establish groups of governmental experts "to draft on an urgent basis, international agreements" regarding early notification of nuclear accidents and coordination for emergency response and assistance. Odette Jankowitsch, The Convention on Nuclear Safety, Nuclear L. Bull., Dec. 1994, at 9, 10.

40 See Convention on Early Notification of a Nuclear Accident, opened for signature Sept. 26, 1986, IAEA Doc. INFCIRC/335, 25 I.L.M. 1370 (entered into force Oct. 27, 1986); Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, opened for signature Sept. 26, 1986, IAEA Doc. INFCIRC/336, 25 I.L.M. 1377 (entered into force Feb. 26, 1987). For a discussion of the text and drafting history of these conventions, see A.O. Adede, The IAEA Notification and Assistance Conventions in Case of a Nuclear Accident: Landmarks in the Multilateral Treaty-Making Process (1987); Michael S. Horn, Recent Developments, 28 Harv. Int'l L.J. 558 (1987).

41 See Scheinman, supra note 5, at 6.

gency assistance in the event of nuclear accidents[42] and guidelines for the reporting of events and the exchange of information in the case of such accidents.[43] At that time, however, the international community was not ready to accept legally binding instruments on those subjects.

A second consequence of the TMI and Chernobyl accidents was the expansion of the Agency mandate vis-à-vis nuclear safety.[44] After the accidents many understood that while the safety guidelines produced by the Agency were useful to countries with nascent nuclear programs, they were of little assistance to countries with considerable experience with nuclear power operations.[45] For this reason, following TMI, the Agency established a sophisticated data collection system that drew upon national reports of incidents and malfunctions at operating nuclear power plants all over the world.[46] In 1981 the Agency developed and implemented an expanded emergency assistance program, and in 1982 it initiated the Operational Safety Advisory Review Team (OSART) program to support nuclear regulatory authorities and to provide assistance in the area of operational practices.[47] Following the Chernobyl incident, the number of requests for OSART reviews increased dramatically.[48] Regard for the Agency's safety program definitely was enhanced when the Agency's Director General and the Director of Nuclear Safety were the first foreign experts invited by the Soviets to assess the damage at Chernobyl.[49] Later, in August 1986, the Soviets selected the Agency as the most

---

[42] See Guidelines for Mutual Emergency Assistance Arrangements in Connection with Nuclear Accident or Radiological Emergency, IAEA Doc. INFCIRC/310 (Jan. 1984) (visited Mar. 1, 1997) <http://www.iaea.or.at>.

[43] See Guidelines on Reportable Events, Integrated Planning and Information Exchange in a Transboundary Release of Radioactive Materials, IAEA Doc. INFCIRC/321 (Jan. 1985) (visited Mar. 1, 1997) <http://www.iaea.or.at>.

[44] Cf. International Co-operation on the Safety of Nuclear Power Plants Within the Framework of the International Atomic Agency, IAEA Doc. INFCIRC/270 (June 1979) (reproducing letters from Federal Minister for Research and Development of Federal Republic of Germany, Resident Representative of Brazil, and Minister for Foreign Affairs of Sweden, calling for Agency to give more emphasis to its mandate in area of safety).

[45] See Thomas, supra note 12, at 13.

[46] The Incident Reporting System (IAEA-IRS) is operated in conjunction with the OECD-NEA. See Ferdinand L. Franzen, Reviewing the Operational Safety of Nuclear Power Plants 13, 15, IAEA Bull. No. 4 (1987).

[47] The mechanics of the OSART program are discussed infra in Part II.B.

[48] See Scheinman, supra note 5, at 104. The Agency conducted 13 OSART missions between 1983 and 1986. See Morris Rosen, New Directions in Nuclear Safety 13, 14, IAEA Bull. (Autumn 1986). In 1987, the Agency conducted 10 OSART missions and, before the end of the year, received 12 to 15 additional requests for 1988. See Franzen, supra note 46, at 14. After Chernobyl, the Agency conducted at least one OSART mission per month. See Pierre Tanguy, Three Decades of Nuclear Safety 51, 57, IAEA Bull. No. 2 (1988).

[49] See Jankowitsch, supra note 39, at 10.

suitable forum in which to present a detailed briefing of the accident.[50] Given the Soviet Union's previous reluctance to cooperate with the Agency, these gestures signaled a new chapter in international nuclear safety.

A third effect of the 1979 and 1986 catastrophes was the extensive "political fallout" across the globe.[51] The loss of public confidence was a major blow to the nuclear power industry. In the wake of the Chernobyl accident, the Soviet Union closed two nuclear plants in Armenia after the earthquake there, discontinued construction of several other plants, and abandoned a number of potential plant sites.[52] Despite the growing antinuclear opposition, the Soviets and other Eastern bloc states later announced their intention to proceed with the development of nuclear power with only modest safety adjustments to their Chernobyl-type reactors.[53] Although the Chernobyl accident involved a reactor type that would never have been licensed in the West due to its innate safety defects, many Western governments slowed or stopped development of nuclear reactors. In the United States, nuclear power utilities canceled or indefinitely deferred plans to construct more than one hundred nuclear power plants, and no new reactors have been ordered since 1978.[54] In addition, the Netherlands abruptly discontinued its plans to construct two new nuclear reactors, and the governments of Austria, Denmark, and Ireland renounced nuclear power entirely.[55]

The intense public disapproval of nuclear power also led to a fourth change—nuclear operators began to rethink their resistance to external regulation.[56] Many in the nuclear industry believed that until governments could provide adequate assurances of protection from Chernobyl-like accidents, public opposition to nuclear power would continue to stifle growth in the industry.[57] In turn, their willingness to

---

50 See id.

51 See generally Stanley M. Nealey et al., Public Opinion and Nuclear Energy (1983) (analyzing public attitudes toward nuclear power shortly after TMI accident).

52 See Hans Blix, Nuclear Safety, Environment and Non-Proliferation, Address to the Austrian League of the United Nations in Vienna (Mar. 8, 1990) (visited Mar. 9, 1997) <http://www.iaea.or.at>.

53 See Barkenbus, supra note 4, at 91-93.

54 See Controlling the Atom in the 21st Century at xi (David P. O'Very et al. eds., 1994).

55 See Blix, supra note 52.

56 See Richard Goldsmith, Regulatory Reform and the Revival of Nuclear Power, 20 Hofstra L. Rev. 159, 182 (1991) (criticizing post-Chernobyl reform efforts in United States for failure to include meaningful public participation).

57 See id. at 159-60 (explaining that public demanded "proof" that accident like Chernobyl could not happen in United States and that nuclear industry and government attempted to satisfy public with assurances regarding adequacy of nuclear regulation in United States).

promote domestic reform efforts increased.[58] Some now hope that the credibility of national regulation will be reinforced by the application of international norms and the participation of international entities.[59]

In sum, international momentum in the wake of the accidents at TMI and Chernobyl manifested itself in four important ways: precedent setting multilateral conventions, an expanded role for the Agency, greater public concern for nuclear safety standards, and greater interest, on the part of nuclear power operators, in the regulation of nuclear installations.

C. *Obstacles to International Regulation of Peaceful Nuclear Power Technology*

Despite heightened awareness that the safety concerns of one country are the safety concerns of all, states continue to resist significant intrusions upon their sovereignty in the area of nuclear safety.[60] Their resistance is fueled by four main factors, consisting of absence of suitable models for the application of international safety standards, misgivings about international, as opposed to domestic, safety standards, design differences in nuclear power plants, and divergent priorities with respect to environmental protection and economic development.

The first major obstacle to international regulation of nuclear power—lack of an adequate legal framework for the application of international safety standards—is in many ways due to the fact that the primary control function of the Agency has been to maintain safeguards against the diversion of nuclear materials towards military purposes.[61] The Agency's historically more activist approach to

---

[58] See id. at 159.

[59] See Thomas, supra note 12, at 10 (discussing need for Agency safety services).

[60] One must remember that, like other international organizations involved in the regulation of state activities, the Agency has traditionally been highly respectful of state sovereignty. Although the IAEA Statute sets out broad mandates, these are subject to the proviso that the Agency is to carry out its activities "with due observance of the sovereign rights of States." IAEA Statute, supra note 5, art. III.D. Member States' obligations under the IAEA Statute are minimal. Generally, the Agency can go only where and when it is invited, and then only to the extent permitted by the state concerned. See id. arts. III.A.5, III.A.6 (noting that Agency safety standards (and safeguards) are applied "at the request of the parties, to operations under any bilateral or multilateral arrangements, or, at the request of a State, to any of that State's activities in the field of atomic energy").

[61] The safeguards system has been in operation since the 1960s, and it applies to all national projects that are assisted by the Agency or by suppliers that require Agency safeguards. Since 1970, safeguards also have been applied to all nuclear activities of non-nuclear weapon parties to the NPT and to similar regional conventions. See NPT, supra note 5, art. III.1, 21 U.S.T. at 487-88, 729 U.N.T.S. at 172. See generally supra note 5.

safeguards than to safety stems from a number of different factors. First, because of the implications for national security, the international community recognized early on that safeguards addressed a problem of international importance.[62] Safety, on the other hand, was thought to be primarily a domestic concern.[63] Second, safety involves an entirely different legal basis for action.[64] Most Agency safeguards, e.g., those relating to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), are based on a multilateral international treaty to which most states are parties.[65] However, no regional or worldwide equivalent to the NPT exists for safety controls.[66] Instead, safety controls are exercised either as a result of national legislation, as conditions for the granting, amendment, extension, or renewal of operating

---

All safeguards are applied under agreements that states conclude with the Agency. See Jan Priest, supra note 5, at 10 (explaining that although "IAEA Statute provides the basic *authority* for the application of safeguards, . . . legal obligations to invoke safeguards are found . . . in instruments through which States make legally binding commitments"). These agreements provide for Agency inspectors to visit nuclear facilities to verify records kept by states' authorities on the location of nuclear material under their control. See IAEA Statute, supra note 5, art. XII. The inspectors monitor Agency-installed instruments and surveillance equipment and confirm inventories of fuel or spent fuel and then prepare detailed reports for the state concerned and for the Agency. See id.

62 See Szasz, supra note 22, at 170 (noting that "after a quite controversial start, a solid majority of [Agency] members . . . considered that safeguards addressed an issue of proper international concern").

63 See id. (explaining that attitude began to change after TMI accident because until that time few significant safety-related events had any transboundary implications).

64 Mohammed ElBaradei notes that

> [s]afeguards are *technical* means of verifying compliance with *legal* obligations relevant to the peaceful uses of nuclear energy. . . .
>
> . . . .
>
> The actual application of safeguards requires a contractual agreement between the IAEA and the State in which the system will operate, whether the application of the system is the result of a voluntary undertaking by the State, or is in fulfilment [sic] of a legal obligation under a bilateral or multilateral agreement.

ElBaradei, supra note 6, at 22 (emphasis added). In contrast, the Agency's published safety standards are mandatory only with regard to those nuclear activities to which the Agency provides assistance; in all other situations, the standards are recommendatory. See id. at 17. See generally Agreements Registered with the International Atomic Energy Agency, IAEA Legal Series No. 3 (9th ed. 1985) (listing agreements between states and Agency).

65 See supra notes 5, 61.

66 There do exist a number of bilateral and regional agreements regarding nuclear cooperation, the exchange of technical information, notification, and mutual assistance in the event of nuclear accidents and radiological emergencies. These agreements, however, do not create any institutionalized role for the Agency to exercise safety controls. See generally Bilateral, Regional and Multilateral Agreements Relating to Co-operation in the Field of Nuclear Safety, IAEA Legal Series No. 15 (1990) (reproducing such treaties).

licenses, or as requirements imposed by national regulatory bodies.[67] In this context, not only do issues of sovereignty present formidable obstacles to regulation by an international body, but so do industry factors, such as the desire for confidentiality, which vary from country to country.

In its early years, the Agency was concerned with the possibility that its involvement in implementing safety measures would expose it to moral, if not legal, liability in the event of an accident.[68] Even for Agency projects, it had weak leverage to enforce its standards (short of threatening sanctions) once its assistance had been provided. These perceptions soon developed into institutional habits:

> Over the years, the Board's and the Secretariat's views as to the Agency's health and safety responsibilities with respect to projects . . . mellowed ever further. In general it [was] felt, at least with reference to the small reactors that have been the subject of Agency projects . . . that the Governments' interests in safe operation [was] a sufficient surety, which [did not need to] be reinforced through the application of strict controls by the Agency.[69]

Underlying all of the Agency's hesitations is a concern about whether it can properly serve two masters, that is, whether it can simultaneously promote the peaceful use of nuclear energy worldwide and still promote safety in nuclear power plants.[70] In this regard it is important to note that the potentially high monetary costs of implementing safety controls is often at odds with the promotion of nuclear power. Safety measures such as remote location, containment buildings, and lock-up features can multiply the capital requirements for a

---

[67] See, e.g., Weehuizen, supra note 11, at 12-13 (describing domestic statutory bases for periodic safety review in NEA countries).

[68] See Szasz, supra note 23, at 689.

[69] Id.

[70] In a recent report, the American Bar Association commented that "[n]uclear safety might require a specialized institution, an International Nuclear Safety Agency, which might either be an independent organization, or be a joint subsidiary organ of the [World Health Organization and the International Labor Organization], or possibly be attached to the proposed International Energy Agency." A.B.A. Section of International Law and Practice Standing Committee on World Order Under Law Report to the House of Delegates, reprinted in 30 Int'l Law. 665, 675 (1996).

Notably, the Agency has recently split its former Department of Energy and Safety into two separate departments, the Department of Nuclear Energy and the Department of Nuclear Safety. See Briefly Noted, IAEA Newsbriefs, Jan./Feb. 1996 (visited Mar. 9, 1997) <http://www.iaea.or.at>. The Convention on Nuclear Safety expressly commands that parties establish separate national legislative and regulatory frameworks governing nuclear safety and "ensure an effective separation" between that regulatory body and those "concerned with the promotion or utilization of nuclear energy." See Convention on Nuclear Safety, supra note 3, art. 8, INFCIRC/449/Annex at 4, 33 I.L.M. at 1520.

nuclear facility.[71] Thus, states considering whether to embark on a nuclear power program may be dissuaded from doing so by additional expenses that may affect their competitiveness.

A second obstacle to the international regulation of nuclear power, which is conceptually related to the above discussion, is nuclear power states' misgivings regarding the application of any international standards of safety to them. Some opponents to the application of international health and safety standards maintain that the responsibility for weighing the risks and benefits of different operating procedures should be left to national governments.[72] Some critics have argued that the safe use of nuclear energy depends upon economic, scientific, industrial, institutional, and legal factors that can vary widely among states.[73] These critics therefore maintain that only national governments can determine the level of safety standards for domestic nuclear power operations.[74] Another critic argues that because agreement on internationally enforced standards will only be possible at the level of the "lowest common denominator," these standards may be lower than those currently in force in some countries and thus could undermine the efforts of national regulatory regimes.[75]

A third obstacle to the international regulation of nuclear power is the divergence of nuclear power plant designs. Nuclear power has become a major energy source, generating approximately seventeen percent of the world's total electricity.[76] With the development of nuclear safety technology over the years, significant changes have been made in design standards and safety criteria. Today there exist considerable variations in the extent to which nuclear power plants have been upgraded in line with these advances.[77] Older nuclear power plants, therefore, may not conform with current safety standards, and upgrading them may not be practicable.[78] Defects in design, however,

---

71 See Szasz, supra note 22, at 168.

72 See Barkenbus, supra note 4, at 94-96 (discussing various approaches to nuclear energy and nuclear safety in countries that oppose application of international standards).

73 See id. (same).

74 See Szasz, supra note 22, at 168.

75 See Louise de la Fayette, International Environmental Law and the Problem of Nuclear Safety, 5 J. Envtl. L. 31, 33 (1993); see also Pierre Strohl, La Convention sur la Sûreté Nucléaire [The Convention on Nuclear Safety], 40 Annuaire Français de Droit International 804, 808 (1994) (noting that Agency guidelines are informal recommendations primarily used by less developed countries).

76 See Hans Blix, The IAEA, United Nations, and the New Global Nuclear Agenda 3, 6, IAEA Bull. (Sept. 1995); Nuclear Power Status in 1995, Briefly Noted, IAEA Doc. PR 96/8 (Apr. 19, 1996) (visited Mar. 9, 1997) <http://www.iaea.or.at>.

77 See Committee on Nuclear Regulatory Activities Task Force, Regulatory Approach to Maintaining the Safety Case for Ageing NPPs, at 5, NEA/SEN/NRA(93)10 (rev. 6 Oct. 28, 1993) (on file with the *New York University Law Review*).

78 See id. at 5-6.

can often be compensated for by adjustments in operational procedures. Furthermore, an operator within an older plant may judge that the danger of a particular instance of noncompliance with later standards is acceptably small.[79] The perception that any particular noncompliance with safety standards should be judged on its merits thus tends to inhibit the acceptance of uniform international standards of safety.[80]

Differences in national priorities with respect to nuclear risk, economic allocation, and economic growth present a fourth impediment to international regulation of safety standards. The objective of safety regulation is to approach total freedom from risk or danger. For many countries, however, this may be too high a price to pay. As noted above, the Chernobyl reactor was of a type that would never have passed the stricter licensing requirements of Western states. The former USSR, however, was far more concerned with solving its energy problems than with the possibility of a nuclear accident. Many of the former Soviet republics now face the same predicament and are opting for the same alternative.[81] Even within the West, safety standards differ in the extent to which they require overlap or redundancy to mitigate the effects of a major accident.[82] Moreover, it is hard to prove that one regulatory approach is safer than another, and the fact that United States and European nuclear reactors differ in construction, operation, and regulation makes the drafting and monitoring of uniform standards even more difficult.[83]

This overview of developments in the nuclear safety regime illuminates some of the obstacles and incentives to the regulation of international legal norms. On the one hand, nuclear power facilities and nuclear power states reluctantly have recognized that safety is an international concern. Transboundary fears, public aversion to nuclear power, and the expanding activities of the Agency have helped

---

79 See id. at 6.

80 See id. at 6-7.

81 For example, in energy starved Armenia, officials reopened Medzamor, a nuclear power plant that was shut down in 1989 because of safety concerns. See Tamara C. Gureghian, Comment, Medzamor: Weighing the Reopening of Armenia's Unstable Nuclear Power Plant and the Duties of the International Community, 5 Vill. Envtl. L.J. 163, 164-65 (1994). The plant was closed following an earthquake in 1988 that caused the death of at least 25,000 people and the destruction of 55 villages. See Steve LeVine, Safety Fears Fail to Deter Armenians on A-Plant, N.Y. Times, Oct. 24, 1995, at A6. The plant is modeled on a Soviet design which is considered by some to be the world's most dangerous. See id.

82 See Leonid Kabanov, Future Nuclear Power Plants: Harmonizing Safety Objectives 12, 13-14, IAEA Bull. (Dec. 1995) (discussing U.S. and European efforts to define safety objectives, including overlapping levels of safety protection).

83 See Barkenbus, supra note 4, at 94.

to shape this consensus. On the other hand, states continue to resist significant intrusion on their decisionmaking power in this realm. Concerns of sovereignty, respected by the traditional role of the Agency and accentuated by design differences and diverging national priorities, all make a "frontal assault" on state-based regulation highly unlikely.[84] Nevertheless, the environment is ripe for international assistance of state regulatory efforts. The next Part describes how the practice of peer review facilitates international cooperation in this area.

II
THE PRACTICE OF PEER REVIEW: THE AGENCY SAFETY REVIEW SERVICES AND THE CONVENTION ON NUCLEAR SAFETY

In the context of the obstacles and incentives to the regulation of nuclear safety standards, peer review has helped to build consensus on the need for cooperation in the field of nuclear safety. Countries have come to value expert advice on the safety of their reactors and on the adequacy of their safety improvements. Such reviews serve not only to strengthen domestic safety standards but also to bolster public confidence in them. This Part begins with a brief discussion of the concept of peer review and then turns to an investigation of peer review in the Agency safety services.[85] Finally, it considers the Convention and the model of peer evaluation envisioned within it.

A. The Concept of Peer Review

The practice of peer review arose in both the health care profession and the experimental sciences as a means of enforcing accepted scientific methods in various fields of research.[86] It is based on the

---

[84] Id. at 89.

[85] Peer review services are also offered by private associations such as the World Association of Nuclear Operators (WANO) and the Institute of Nuclear Power Operations (INPO).

[86] Peer review is believed to have been introduced in 1752 as a means of reviewing scientific manuscripts for publication. See David A. Kronick, Peer Review in 18th-Century Scientific Journalism, 263 JAMA 1321, 1321 (1990). In fact, peer review has served as an important element of self-regulation in the medical profession for several centuries. See James F. Flanagan, Rejecting a General Privilege for Self-Critical Analyses, 51 Geo. Wash. L. Rev. 551, 560-61 (1983). Review committees are typically composed of health care practitioners, selected from professional associations, who serve on a voluntary basis. Their function is akin to that of nonbinding arbitrators who give recommendations on matters such as the necessity of treatment, the quality of the service provided, and the reasonableness of the fee charged. See David Crump & Larry A. Maxwell, Comment, Health Care, Cost Containment, and the Antitrust Laws: A Legal and Economic Analysis of the *Pireno* Case, 56 S. Cal. L. Rev. 913, 915-16 (1983). Peer review has also been used in other fields,

premise that, while scientific methods may vary within a particular field, there are accepted criteria to evaluate experiment design and data interpretation to ensure impartiality; these criteria are best applied by other experts in the field.[87] At its most rudimentary level, peer review operates through the exchange of ideas and comments between researchers in the same laboratory.[88] In its broadest application, peer review brings together experts and scientists from across the globe via conferences, scholarly colloquia, and academic journals.[89]

Models of peer review vary across and within domains depending upon the nature of the activity, the size of the peer community, and the pervasiveness of group norms. Yet all models function in much the same way: first, a group of equals is delineated, and second, the cost of noncompliance or nonconformism is raised through peer pressure and public scrutiny. Thus, peer review operates as a mechanism of accountability within an institutionalized social system.

Collegiality in the evaluative process does not deprive peer review of effective incentive mechanisms. Indeed, the penalties imposed upon the lackadaisical researcher or practitioner can be quite high. The researcher who presents inadequate or inaccurate data before a peer review board may be subjected to great scorn by his colleagues.[90] This can very well mean that he will be passed over for promotions, grant awards, and election to honorary societies.[91] Thus, the severe repercussions of alienating one's scientific community effectively act as a constabulary in the field.

The paradigms of peer review used within the nuclear safety regime seek to capture the collegiality and moral pressure of the peer evaluation process. In so doing, both models create frameworks (one voluntary and service oriented, the other legal and compulsory) for standard setting, consensus building, and modest yet incremental inroads into autonomous state decisionmaking in the area of nuclear safety.

---

such as the arts, to allocate government resources and patronage. See Thomas O. McGarity, Peer Review in Awarding Federal Grants in the Arts and Sciences, 9 High Tech. L.J. 1, 2 (1994).

87 See Dan L. Burk, Research Misconduct: Deviance, Due Process, and the Disestablishment of Science, 3 Geo. Mason Indep. L. Rev. 305, 316 (1995).

88 See Chan, supra note 2, at 113.

89 See id.

90 See Burk, supra note 87, at 317.

91 See id.

B. *The Agency Safety Review Services*

Since the initiation of the Operational Safety Assessment Review Team (OSART)[92] program in the early 1980s, the Agency has expanded its nuclear safety services along the lines of facilitating peer reviews of the activities carried out by national authorities. Agency safety services making use of peer review include the Assessment of Safety Significant Events Team (ASSET),[93] Assessment of Safety Culture in Organizations Team (ASCOT),[94] International Peer Review Services for Probabilistic Safety Assessment (IPERS-PSA),[95] International Review of Irradiator Safety (IRIS) Service,[96] Integrated Safety Assessment of Research Reactors (INSARR),[97] Engineering Safety Review Services (ESRS),[98] and Radiation Protection Advisory Team (RAPAT).[99] It is important to emphasize that the purpose of these peer review services is not to verify compliance with safety standards but to assist states in the application of commonly accepted international practices. Nevertheless, by creating fora for the nonconfrontational exchange of safety related information and experience, these

---

92 Teams of technical experts conduct in-depth reviews of operational safety practices at individual nuclear power plants. See generally The Operational Safety Assessment Review Team (OSART) Services, IAEA Doc. GC(39)/INF/8, Attachment Part C, Annex C-1 (Sept. 4, 1995) (describing OSART services).

93 Teams of experts review safety problems, perform root cause analyses of safety related incidents, and provide self-assessment training at the request of national authorities. See generally ASSET Missions Since the 1994 Session of the General Conference, IAEA Doc. GC(39)/INF/8, Attachment Part C, Annex C-2 (Sept. 4, 1995) [hereinafter ASSET Missions] (describing ASSET services).

94 Experts evaluate "safety culture self-assessment" in nuclear power plants. The Assessment of Safety Culture in Organizations Team (ASCOT) Service, para. 1, IAEA Doc. GC(39)/INF/8, Attachment Part C, Annex C-8 (Sept. 4, 1995) [hereinafter Assessment of Safety Culture].

95 Teams of four to five consultants advise a facility on how to apply different phases of Probabilistic Safety Assessment (PSA) to evaluate plant design and operation safety. See Szasz, supra note 22, at 169-70.

96 Teams of experts conduct peer reviews of irradiation plant safety to encourage the sharing of safety related knowledge among plant operators and regulatory authorities. See The International Review of Irradiator Safety (IRIS) Service, IAEA Doc. GC(39)/INF/8, Attachment Part C, Annex C-6 (Sept. 4, 1995).

97 Teams of two to five experts carry out comprehensive, independent assessments of research reactors and associated experimental facilities. See The Integrated Safety Assessment of Research Reactors (INSARR) Service, para. 5, IAEA Doc. GC(39)/INF/8, Attachment Part C, Annex C-5 (Sept. 4, 1995).

98 Interdisciplinary teams of experts advise on various engineering safety aspects of planned or existing nuclear power plants. See The Engineering Safety Review Service (ESRS), para. 1, IAEA Doc. GC(39)/INF/8, Attachment Part C, Annex C-3 (Sept. 4, 1995).

99 Teams of experts assess national radiation protection services and their infrastructures at the request of governments. See Morris Rosen, Adequate Radiation Protection: A Lingering Problem 34, IAEA Bull. No. 4 (1987).

services have paved the way for more aggressive means of international cooperation and oversight in this area.

The actual mechanics of the review process are roughly the same in all Agency safety peer reviews. Initially, the government of a Member State makes an official request to the Agency concerning a particular nuclear facility in the state.[100] Next, a preparatory meeting with the regulatory body and plant management occurs,[101] followed by the recruitment of external experts, usually by the Agency staff member leading the mission.[102] Finally, technical preparation of the review mission begins.[103] In some cases the plant is expected first to carry out an in-depth self-assessment of its management and operational practices.[104] During the peer evaluation, expert missions conduct on-site evaluations of the nuclear facility and compare the domestic regulatory practices with the pertinent international guidelines, such as those disseminated by the Agency's Nuclear Safety Standards Program (NUSS) and other reputable safety programs.[105] These guidelines are then considered in small roundtable discussions between experts and plant operators.[106] After the mission, the review team submits a final report of its recommendations and findings.[107] The following discussion provides a closer examination of some of the phases in the review process.

The recruitment of an international team of experts is an important ingredient in the peer review process. Peer review teams include both Agency staff members and experts (senior regulatory officials or nuclear plant operators) with a typical membership of one-third Agency personnel and two-thirds non-Agency personnel.[108] The size of the team depends on the significance or complexity of the safety issue.[109] A typical OSART team, for example, has ten to twelve experts recruited from nuclear power plants, utilities, and regulatory authorities, as well as Agency staff members to ensure consistency

---

100 See ASSET Missions, supra note 93, para. 1 (describing requests for ASSET missions).

101 See Telephone Interview with Odette Jankowitsch, Senior Legal Officer, IAEA (Nov. 6, 1996).

102 See infra text accompanying notes 108-16.

103 See infra text accompanying notes 119-32.

104 See infra text accompanying notes 116-19. The recent trend for peer review of self-assessment is implemented in only some of the Agency safety services such as the ASSET and ASCOT missions. See ASSET Missions, supra note 93, para. 5; Assessment of Safety Culture, supra note 94, para. 6.

105 See supra text accompanying notes 29-32 and infra text accompanying notes 130-32.

106 See Interview with Odette Jankowitsch, supra note 101.

107 See ASSET Guidelines 127, IAEA-TECDOC-632 (rev. ed. 1991).

108 See Franzen, supra note 46, at 13.

109 See Interview with Odette Jankowitsch, supra note 101.

among reviews.[110] One of the Agency staff members serves as team leader of the mission, whose duties include coordination and liaison between plant management and the national regulatory authority as well as the training of team members.[111]

The actual selection of experts for the review teams is an informal process. Although geographic distribution is not a crucial factor because the pool of experts is so small, experts are still recruited from all parts of the world in order to ensure that the composition of the review team reflects an international perspective.[112] An important selection consideration is whether an expert has had experience with the reactor type in question.[113] In the case of OSART missions, each expert typically has at least ten years of experience working in or with nuclear power plants.[114] Because the pool of candidates is so restricted, most of the experts know each other, or know of each other, through meetings and seminars at the Agency and OECD, and as a result, no nominated expert has ever been refused by the state concerned.[115]

In some instances, before the arrival of the team of experts, the participating nuclear power plant will perform a self-assessment of its plant safety performance and operating practices.[116] Depending on the type of review, questions asked in a self-assessment report may include: (1) What happened? (identification of safety issues that caused the events); (2) What might happen? (identification of safety issues that might cause future events); (3) What is the significance of the event? (identification of the outlook for the safe production of electricity); (4) Why did it happen? (identification of direct causes); (5) Why was it not prevented? (identification of root causes); (6) What corrective actions can be taken to eliminate the safety issue?; and (7) What actions can be taken to improve the timely detection

110 See Franzen, supra note 46, at 13.

111 See id. at 13-14.

112 See Interview with Odette Jankowitsch, supra note 101 (stressing that informal process was necessary since, within this area of expertise, "it is not a big world").

113 See id.

114 See Franzen, supra note 46, at 13.

115 See Interview with Odette Jankowitsch, supra note 101.

116 See, e.g., Report of the ASSET Peer Review of the Forsmark Nuclear Power Plant Self-Assessment of Operational Safety Performance, IAEA/ASSET/95/Z/04 (1995) (on file with the *New York University Law Review*) (outlining peer review report on nuclear plant self-assessment); Report of the Self-Assessment of Operational Safety Performance by Forsmark NPP Sweden According to the ASSET, IAEA/NENS/ASSET/95/Z/05 (1995) (on file with the *New York University Law Review*) (outlining self-assessment report by nuclear plant).

and prevent the recurrence of the safety issue?[117] The Agency has simplified the assessment techniques and in some cases has prepared standard outlines for conducting the self-assessment and the peer review.[118]

Some states have criticized the review process as being too burdensome because the missions often require extensive preparatory work, some of which is unrelated to the technical improvement of plant performance.[119] These preparatory steps include the following: translation of documents into English, practical arrangements for hosting a review team, determining the length of the visits, and deciding the number of plant counterparts involved.[120] Critics also question the cost-sharing basis by which reviews are funded.[121] Industrial countries often pay the full cost of review visits; developing countries pay only local expenses.[122] These considerations may have caused some Member States to request fewer missions than they would have if the process were less onerous.[123]

Depending on the type of safety service, the actual review process takes between one and three weeks.[124] The team members first familiarize themselves with the plant conditions by studying plant documents, examining operating results, and observing and interviewing personnel on work preparation and execution.[125] Throughout the mission, each expert provides regular reports of his observations and conclusions.[126] Progress reports and technical notes are compiled daily. These summaries form the basis for discussion at the final meeting with the plant operators.[127]

---

117 See Thomas, supra note 12, at 9. In ASSET reviews, plant operators carry out their own analysis according to the procedures of the ASSET Users Manual and produce a self-assessment report, which is submitted to an international ASSET mission for peer review. See Safety of Nuclear Installations, 1994 IAEA Annual Report (visited Mar. 9, 1997) <http://www.iaea.or.at>.

118 See, e.g., sources cited supra note 116.

119 See Thomas, supra note 12, at 25 (delineating some criticisms of OSART/ASCOT reviews).

120 See id.

121 See id. (noting that some question "cost/benefit" of peer review); Rendering of Safety-Related Services, para. 1, IAEA Doc. GC(40)/INF/5, Attachment Part C, Annex C-5 (Aug. 30, 1996) (visited Mar. 9, 1997) <http://www.iaea.or.at> (explaining "cost-sharing" as Member States providing experts without cost to recipient countries; recipient countries covering local accommodation and travel costs; and Agency paying for international travel costs of experts as well as percentage of their daily allowance).

122 See Blix, supra note 52.

123 See Thomas, supra note 12, at 25.

124 See id.

125 See Franzen, supra note 46, at 13.

126 See id.

127 See id.

Final reports include summaries highlighting the expert missions' conclusions and recommendations based on performance indicators. Some of the recommendations focus on the direct causes of the safety issues identified, while others focus on root causes.[128] On some occasions the review team advises that it would be imprudent for a particular reactor to continue operating unless safety improvements were ensured. The decision whether or not to operate a reactor, however, is left to the Member State.[129]

In the formulation of its report, each expert mission draws on guidelines derived from a hierarchy of Agency Safety Series publications and on the experience of the individual expert members.[130] The guidelines help the experts to ensure the consistency and comprehensiveness of their reviews.[131] After the final report is completed, it is submitted through official channels to the competent national authorities.[132]

It has been suggested that many of the recommendations made by peer review missions are not heeded by states, possibly because they may be less interested in the team's advice and recommendations than in receiving a clean bill of health.[133] One commentator argues that the Agency could enhance its success by refusing to begin an audit "without getting a commitment from the state that it will allow [the mission] . . . to come back in a year or two and examine how many of its recommendations have been implemented."[134] The Agency might also increase effectiveness by influencing public opinion in recalcitrant states through publication of the actions and inactions of poor per-

---

128 See id. at 28 (explaining that states would value direct and root cause analyses).

129 See Hans Blix, Statement to the 50th Session of the United Nations General Assembly (Nov. 1, 1995) (visited Mar. 9, 1997) <http://www.iaea.or.at>.

130 See Establishment of International Safety Standards, supra note 29, para. 8-17 (describing hierarchy and content of documents); Franzen, supra note 46, at 14 (explaining that written guidelines are based on Safety Series documents, national rules, and experience).

The IAEA Safety Series publications are divided into Safety Fundamentals, Safety Standards, Safety Guides, and Safety Practices. See Establishment of International Safety Standards, supra note 29, para. 8. Safety Fundamentals state the basic objectives and principles relevant to the safety of nuclear installations. See id. para. 10. Safety Standards list the basic requirements necessary to ensure safety for particular activities. See id. para. 12. Safety Guides provide specific recommendations on measures to ensure the observance of safety standards. See id. para. 15. Safety Practices Documents present examples and descriptions of methods used to implement both Safety Standards and Safety Guides. See id. para. 17.

131 See Franzen, supra note 46, at 14.

132 See id.

133 See Barkenbus, supra note 4, at 101.

134 Id. at 102-03.

formers.[135] Not surprisingly, these recommendations have been the subject of considerable controversy.

Two relatively recent developments that have contributed to the implementation of safety recommendations are the development of Agency databases and the publication of the "good practices" of plants. The database of OSART mission results (OSMIR) covers all missions and follow-up missions since January 1991.[136] The information in the database consists of background information on all plants visited, mission results, recommendations, and follow-up visit results, and is updated after each review.[137] The information is also summarized in the annual Nuclear Safety Review and disseminated in IAEA-TECDOCS.[138] Facilities receiving poor reviews may be more inclined to implement recommendations if their track record is accessible to the public. On the other hand, they also may simply refrain from requesting regulatory reviews.

Another interesting outgrowth of some safety services programs such as OSART is the publication of the "good practices" of plants.[139] During the course of their missions, OSART experts note the commendable practices of the nuclear plant they are visiting and communicate these practices to the plant.[140] Since 1988 these practices have also been systematically compiled so that plant operators and experts can take note of them.[141]

Through initiatives such as the development of databases of safety recommendations and the good practices program, the Agency safety services may be becoming more than a mere service to requesting states—they can now distinguish responsive from recalcitrant nuclear power plants. With the increase in peer review participation, those rejecting review audits may have to bear the onus when they are publicly questioned. Thus, there is considerable potential for the practice of voluntary peer review to have an evolving and significant international role in nuclear safety.

C. Peer Review in the Convention on Nuclear Safety

The Convention on Nuclear Safety was adopted by a Diplomatic Conference convened in Vienna from June 14-17, 1994, under the aus-

---

135 See id. at 103.

136 See The Operational Safety Review Team, supra note 92, para. 7.

137 See id. para. 8.

138 See, e.g., OSART Mission Highlights 1991-1992, IAEA-TECDOC-797 (1995).

139 See generally F. Calori & J. Dular, International Overview: Good Practices at Nuclear Power Plants 44, IAEA Bull. No. 2 (1992) (discussing OSART studies).

140 See id. at 45.

141 See id.

pices of the Agency.[142] The "first legal instrument to address directly the issue of safety of nuclear installations worldwide"[143] entered into force on October 24, 1996, with the ratification of twenty-seven states.[144]

The Convention, which applies to land-based civil nuclear plants,[145] reflects the lessons of the Chernobyl accident—safety must be at a high level everywhere. Nevertheless, highlighting the continued reluctance of states to assign nuclear safety regulation to any international authority, responsibility for the realization of the Convention's objectives is expressly assigned to states. Under the Convention, states are obligated to "establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations."[146] This framework must provide for "the establishment of applicable national safety requirements and regulations; . . . a system of licensing . . . and the prohibition of the operation of a nuclear installation without a license; . . . a system of regulatory inspection and assessment of nuclear installations . . . [; and] the enforcement of applicable regulations and of terms of licenses."[147]

Under the Convention each state must entrust the tasks of licensing, inspection, and enforcement to a regulatory body which must be separate from any body concerned with the promotion of nuclear energy.[148] States must also ensure that operators of nuclear installations are licensed, and they must hold these persons primarily responsible for the safety of their installations.[149] Further, states must provide sufficient financial and human resources to support the safety of nuclear installations.[150] Moreover, states are obliged to undertake com-

---

142 The agreement was opened for signature on September 20, 1994, during the 38th General Conference of the Agency. See Paul C. Szasz, Introductory Note, Convention on Nuclear Safety, 33 I.L.M. 1514, 1515 (1994); see also Convention on Nuclear Safety, supra note 3.

143 U.S. Signs Nuclear Plant Safety Pact; Treaty an Outgrowth of Chernobyl, Energy Rep., Sept. 26, 1994, available in 1994 WL 2491174 [hereinafter U.S. Signs Pact] (quoting Hans Blix, Director General of Agency).

144 See Nuclear Safety Convention Enters into Force, IAEA Doc. PR 96/22 (Oct. 24, 1996) (visited Mar. 9, 1997) <http://www.iaea.or.at>.

145 The Convention does not cover floating reactors or anything that is in the hands of the military. See Convention on Nuclear Safety, supra note 3, art. 2, INFCIRC/449/Annex at 2, 33 I.L.M. at 1519 (defining "nuclear installation"). For a discussion of the hazards of ship-borne reactor installations, see Harry Street & F.R. Frame, Law Relating to Nuclear Energy 174-76 (1966).

146 Convention on Nuclear Safety, supra note 3, art. 7.1, INFCIRC/449/Annex at 3, 33 I.L.M. at 1519.

147 See id. art. 7.2, INFCIRC/449/Annex at 3-4, 33 I.L.M. at 1519-20.

148 See id. art. 8, INFCIRC/449/Annex at 4, 33 I.L.M. at 1520.

149 See id. art. 9, INFCIRC/449/Annex at 4, 33 I.L.M. at 1520.

150 See id. art. 11, INFCIRC/449/Annex at 4, 33 I.L.M. at 1520.

prehensive safety assessment and verification activities throughout the lifetime of their nuclear installations, as well as to report and analyze safety events.[151] Finally, if the safety of a nuclear installation cannot be upgraded sufficiently, states are obliged to shut down the plant "as soon as practically possible."[152]

The Convention also sets out a number of general and specific safety considerations regarding radiation protection, emergency preparedness, siting, design, construction, and operation. States must take these considerations into account, but are not obliged to adopt any of the relevant Agency safety standards. They must only "take the appropriate steps" toward the imposition of safety standards.[153] Those states which fail to do so must explain to review committees "how the standards they did adopt protect safety as well or better than the Agency's standards."[154]

Selection of a compliance-monitoring mechanism for the Convention was somewhat problematic due to the conflicting goals of providing a respectable means of accountability and satisfying the dominant view that the safety of nuclear power plants is primarily a domestic matter. For the most part, those countries possessing few or no nuclear power plants favored mandatory international safety controls implemented by the Agency, while a second group, representing regulators, nuclear technicians, and states with large nuclear power programs, preferred an incentive-based approach.[155] These differences

---

151 See id. art. 14, INFCIRC/449/Annex at 5, 33 I.L.M. at 1520.

152 Id. art. 6, INFCIRC/449/Annex at 3, 33 I.L.M. at 1519. During the course of the drafting negotiations, language was softened to accommodate the contentions of some states that they could not afford to shut down any reactors without compensation. See U.S. Signs Pact, supra note 143.

153 Convention on Nuclear Safety, supra note 3, art. 17, INFCIRC/449/Annex at 6, 33 I.L.M. at 1521.

154 See Szasz, supra note 142, at 1516.

155 Apparently the reluctance of the more developed countries to codify obligations manifested itself at more than one point during the negotiations. According to Odette Jankowitsch, who served as Secretary to the Group of Experts on the Convention, there was intense debate as to the language of Article 1(i) and in preambular paragraph (i). She notes:

> Whilst it was generally agreed that international co-operation on nuclear safety should be promoted and that, ipso facto, the Convention would serve this purpose, two different views were held as to the need for a specific provision on the transfer of technology through technical co-operation. In the opinion of major OECD countries, such provision would create for Contracting Parties an obligation to provide assistance, the additional concern being that international co-operation in nuclear safety could be de-linked from adherence to binding nonproliferation commitments—notably the Non-Proliferation Treaty. In the opinion of most developing countries and China, assistance in upgrading nuclear safety through technical co-operation was an essential component of the Convention. The formulation of the objective of the Convention takes this

were bridged by the proposition that "enlightened self-interest of States in matters of nuclear safety would be stronger than any form of outside control devised under international law."[156] In other words, the interest of the parties in gaining the approval of their peers would encourage adherence to treaty norms; peer pressure and persuasion would substitute for compulsion. Though the words "peer review" do not appear in the text of the Convention, it is generally understood that the procedures established for monitoring compliance with the Convention's sixteen obligations reflect this paradigm.[157] For the most part, these procedures consist of national reports and review meetings.[158]

Details of the review process, such as the form and content of national reports, the structure and procedures of review meetings, and the nature of any recommendations on improved compliance, were intentionally left out of the treaty text. In the face of wide differences in plant design, location, operating philosophy, and legal and regulatory institutions among countries, Convention drafters emphasized expediency and broad-based agreement.[159] As a result, only these general requirements are clear: parties are required to submit national reports on the measures they take to implement their treaty obligations[160] and to hold review meetings to evaluate these reports.[161]

The text of the Convention does state that reports should address each obligation of the Convention "with specific references to—inter alia—legislation, procedures and design criteria."[162] Although preparation of the report is the responsibility of parties to the Convention, it is anticipated that they will take advantage of a "peer review mecha-

---

view into consideration without, however, creating a separate obligation for bilateral or multilateral assistance.

Jankowitsch, supra note 39, at 14.

156 Id. at 13.

157 See, e.g., id. at 16 (providing explanation of "Meetings of Contracting Parties" called for in Convention under title "Peer Review Mechanism").

158 See id. at 17-18.

159 See Pearl Marshall, Chances Dim for One Convention for International Safety, Nucleonics Wk., May 27, 1993, at 14, available in LEXIS, News Library, Arcnws File (discussing contentious issues raised in Convention preparatory meetings).

160 See Convention on Nuclear Safety, supra note 3, art. 5, INFCIRC/449/Annex at 3, 33 I.L.M. at 1519.

161 See id. art. 20, INFCIRC/449/Annex at 8, 33 I.L.M. at 1522.

162 Annex to the Final Act of the Diplomatic Conference: Some Clarification with Respect to Procedural and Financial Arrangements, National Reports and the Conduct of Review Meetings, Envisaged in the Convention on Nuclear Safety, Aug. 4, 1994, art. 2, IAEA Doc. INFCIRC/449/Add.1, Attachment Annex 1, 33 I.L.M. 1514, 1525 [hereinafter Convention Annex].

nism on the national level" in such preparation.[163] In writing their reports, states are also free to seek assistance from other countries or from international organizations such as the Agency.[164] If a country has not met a particular obligation, its national report should describe "what measures are being taken or planned to meet that obligation."[165]

The triennial review meetings of the contracting parties, for which the Agency is the secretariat, are intended to identify "problems, concerns, uncertainties, or omissions in national reports"[166] and to pinpoint opportunities for technical cooperation in safety areas.[167] In the meetings, each party will be "represented . . . by one delegate, and by such alternates . . . that it deems necessary."[168] In the election of chairs and officers, consideration will be given to the technical competence of the candidates as well as to their geographical distribution.[169] The meetings also may be attended by competent international organizations at the invitation of (a majority of) the parties. During the meetings, each party will have the opportunity to discuss the reports submitted by other parties and to seek clarification on particular matters included therein.[170] Moreover, subgroups of representatives may convene to review specific subjects of the reports, such as the safety of installations or emergency preparedness.[171] Following each review meeting of the contracting parties, a summary report addressing safety issues and general conclusions will be adopted by consensus and made available to the public.[172] These concluding reports are subject to the Convention's provisions against unauthorized disclosure of information.[173]

---

163 Jankowitsch, supra note 39, at 17 (internal quotation omitted).

164 See id. (labeling such action as "'peer review' in the narrower sense").

165 Convention Annex, supra note 162, art. 2, INFCIRC/449/Add.1 at 2, 33 I.L.M. at 1525.

166 Convention Annex, supra note 162, art. 3, INFCIRC/449/Add.1 at 2, 33 I.L.M. at 1525.

167 See id.

168 Convention on Nuclear Safety, supra note 3, art. 24.1, INFCIRC/449/Annex at 9, 33 I.L.M. at 1522.

169 See Convention Annex, supra note 162, art. 4.1, INFCIRC/449/Add.1 at 2, 33 I.L.M. at 1524.

170 See Convention on Nuclear Safety, supra note 3, art. 20.1, 20.3, INFCIRC/449/Annex at 8, 33 I.L.M. at 1522.

171 See id. art. 20.2 (allowing establishment of subgroups); Jankowitsch, supra note 39, at 18 (describing potential subject matter for subgroups).

172 See Convention on Nuclear Safety, supra note 3, art. 25, INFCIRC/449/Annex at 8, 33 I.L.M. at 1522.

173 See id. art. 27.1, INFCIRC/449/Annex at 10, 33 I.L.M. at 1523 (stating that protections extend to "(i) personal data; (ii) information protected by intellectual property rights

The first review meeting of the contracting parties will be held within two and one-half years after the Convention's entry into force.[174] Subsequent review meetings will take place at intervals no greater than once every three years,[175] and extraordinary meetings can be convened at any time at the request of any party if agreed to by a majority of the others.[176] In this way, states may call for urgent studies if they are concerned about the safety of a reactor in a neighboring country.[177]

Should a dispute arise within the context of interpreting or applying the Convention, parties agree to "consult within the framework of a meeting of the Contracting Parties with a view to resolving the disagreement."[178] The Convention does not provide for the referral of disputes to a permanent political or administrative body, to a court, or to the International Court of Justice. Thus, the Convention's dispute provision is meant to complement its overall "peer group" approach by calling for the amicable settlement of disputes without resort to mechanisms outside the Convention's framework.[179]

Beyond these general provisions, the Convention does not specify the procedural arrangements for peer review process. The task of defining more detailed provisions for implementing the review system was left to the Preparatory Meetings on the Implementation Activities of the Convention.[180] In June 1996, representatives drafted tentative plans for the review process. Under that model, the five countries with the largest number of nuclear reactors—the United States (109), France (56), Japan (51), the United Kingdom (35), and Russia (29)—will be placed in separate groups.[181] Other states that have ratified the Convention will be placed in each of these groups based on the

---

or by industrial or commercial confidentiality; and (iii) information relating to national security or to the physical protection of nuclear materials or nuclear installations").

174 See id. art. 21.2, INFCIRC/449/Annex at 8, 33 I.L.M. at 1522. Because the Convention entered into force October 24, 1996, the first review meeting is likely to take place in April 1999.

175 See Convention on Nuclear Safety, supra note 3, art. 21.3, INFCIRC/449/Annex at 8, 33 I.L.M. at 1522.

176 See id. art. 23, INFCIRC/449/Annex at 9, 33 I.L.M. at 1522.

177 See U.S. Signs Pact, supra note 143.

178 Convention on Nuclear Safety, supra note 3, art. 29, INFCIRC/449/Annex at 11, 33 I.L.M. at 1523.

179 See Jankowitsch, supra note 39, at 18.

180 The first meeting was held March 8-10, 1995. See Report of the Chairman, Meeting on Preparations for the Implementation Activities of the Convention on Nuclear Safety (Mar. 10, 1995) (visited Mar. 9, 1997) <http://www.iaea.or.at>. The second meeting was held November 13-15, 1995. See Report of the Chairman, Second Meeting on Preparations for the Implementation Activities of the Convention on Nuclear Safety (Nov. 15, 1995) (on file with the *New York University Law Review*).

181 See G.A.O. Report, supra note 3, at 4.

number of reactors in their country.[182] Thus, a typical review group might contain one country with thirty or more nuclear power plants, three to four states with three or more installations, and two or more states with fewer than three installations.[183] It is expected that final decisions on the review process will be made in the April 1997 meeting of the parties.[184]

There remains some uncertainty as to the specific content and structure of national reports. The obligations of Convention Articles 7-9 seem to require "official documentation" to prove the existence of legislative and regulatory frameworks.[185] On the other hand, proof of compliance with Articles 10-16, regarding general safety considerations, might require a more "narrative description" of nuclear activities.[186] Finally, a more "technical, facility-specific" report might be more conducive to reporting on the obligations of Articles 17-19, regarding safety of installations.[187]

Regarding the duration and timing of safety reviews, two approaches have been considered. One envisions "a calendar of dense sessions" within each three-year interval.[188] Another approach contemplates "minimal preparatory activity and a big effort made at one . . . meeting."[189] There is also some question as to whether the findings of the review meetings will be disseminated at the end of the triennial period or whether reports will be issued periodically at the conclusion of each peer review meeting.[190]

An additional uncertainty involves the potential cost of the review process to contracting parties. Even if review meetings are limited in both frequency and duration, the preparation of national reports and the review of peer country reports could be very expensive.[191] Preliminary assessments made by the U.S. Nuclear Regula-

---

182 See id.

183 See id. Countries may be permitted to participate as observers in other review meetings. See id. at 5.

184 See id. at 4. As this issue went to press, the first preparatory meeting of parties was scheduled for April 21-25, 1997. See Hans Blix, Introductory Statement by IAEA Director General to the IAEA Board of Governors (Mar. 17, 1997) (visited Apr. 8, 1997) <http://www.iaea.or.at>.

185 See Mark Hibbs, Line Forms to Sign Safety Pact But Costs Uncertain, Could Be High, Nucleonics Wk., Sept. 15, 1994, at 7, available in LEXIS, News Library, Arcnws File (quoting Carl Stoiber, Director of International Affairs, U.S. Nuclear Regulatory Commission); see also supra notes 146-49 and accompanying text.

186 Hibbs, supra note 185, at 7 (quoting Stoiber).

187 Id. (quoting Stoiber).

188 Id. (quoting Stoiber).

189 Id. (quoting Stoiber).

190 See id.

191 See id. Stoiber also noted that "peer review . . . will be a potentially expensive and very complicated undertaking . . . . Every three years, these reports will have to be fi-

tory Commission indicate that preparation for the first review meeting in 1999 could cost the United States as much as $1.1 million.[192] Estimates of the Agency's cost to administer the first review meeting range from $10,800 to $10.3 million.[193] Though the cost of financing the meeting is supposed to be funded from the Agency's operating budget, additional financial support may be required from participating countries.[194]

Despite lingering concerns as to the implementation and cost of the Convention, there is less uncertainty about the benefits. Building on the strengths of the Agency in establishing nuclear safety standards and providing technical assistance and safety review services, the Convention is expected to bridge the gap between international safety norms and state practice.

III

"ENFORCEMENT" THROUGH COLLEGIALITY: COMPARISONS AND ASSESSMENTS OF THE TWO PARADIGMS OF PEER REVIEW

The review process embodied within the Convention and the more technical reviews used in the nuclear safety services of the Agency serve many of the same functions.[195] Both are designed to disseminate information on safety procedures and evolving technologies, to evaluate domestic nuclear power operations and facilities, and to build consensus on nuclear safety standards. At the same time, they give wide berth to national prerogatives regarding nuclear power. On the other hand, because of the procedural differences between the two paradigms, they are likely to be effective in different areas. The reviews of the Agency safety services are not primarily intended to be compliance-monitoring mechanisms but rather to be means of assisting nuclear operators with the application of commonly accepted international practices. The peer review embodied in the Convention focuses on states' behavior vis-à-vis the establishment of regulatory

---

nanced, and in addition, the national governments will have to review the reports filed by the others." Id.

192 See G.A.O. Report, supra note 3, at 7. Note that this high estimate reflects the large number of reactors currently operating in the United States—109 to be exact. See International Datafile 53, IAEA Bull. (Sept. 1995). Thus, the estimate far exceeds that which any other country is likely to pay.

193 See G.A.O. Report, supra note 3, at 8. The wide range in estimates stems from varying considerations of factors, such as the number of languages used to conduct the review meetings, translation and interpretation services, and provision of additional support and administrative services to requesting countries. See id. at 8-9.

194 See id. at 9.

195 See Appendix II for a schematic comparison of the peer review model in the Agency Safety Services and the review process in the Convention on Nuclear Safety.

frameworks consistent with their treaty obligations. Although the Convention does not create a narrowly binding international regime that compels parties to adhere to particular international standards, the system of incentives and accountability created by its model of peer review is likely to facilitate the gradual phasing in of standards promulgated by the Agency. Thus, in the end, the two models are likely to complement each other.

A. Confronting the Concerns of the Post-Chernobyl Period

The accidents at Three Mile Island and Chernobyl gave momentum to the movement for an international nuclear safety regime, though not enough to outdistance perceptions that nuclear safety is primarily a domestic concern. Traditional notions of state sovereignty buttressed by design differences between countries and divergences in national priorities make states reluctant to subordinate domestic regulation to an international regulatory framework. In this context, both the mandatory review process prescribed in the Convention and the Agency's voluntary reviews encourage states to incorporate international norms into national frameworks and to accept the advice and monitoring of peer states. In turn, states can learn from the successes and failures of other nuclear power states.

Traditional notions of domestic control over nuclear power have proved to be a significant obstacle to the implementation of uniform nuclear safety standards. In the mid-1980s, when the Agency announced the expansion of its peer review services, many states demurred. They were reluctant to support any intrusion into the regulatory regimes of sovereign states.[196] Since that time, technical peer reviews have become a more accepted and respected means of assisting countries with their regulatory efforts. States have largely welcomed the expert assistance of foreign operators to work out the best system of standards for their nuclear installations. Peer review in the safety services sidesteps concerns for state sovereignty by deflecting attention away from governments to installations. Politics is supplanted by technical considerations and international experts become quasi-ambassadors.[197] Across-the-table exchanges of regulatory experience allow countries to address safety problems in a nonconfrontational environment.

---

196 See Ann MacLachlan, IAEA Proposal for Peer Review of Regulators Has Cool Reception, Nucleonics Wk., Sept. 22, 1988, at 3, available in LEXIS, News Library, Arcnws File.

197 See generally L.J. Brinkhorst, Nuclear Safety and the European Community: Broadening Perspectives 41, IAEA Bull. No. 2 (1991) (describing cooperation between Agency and European Community in implementing international nuclear safety regime).

The Convention makes only slight advances into state regulatory regimes. It moves beyond recommending standards and providing optional safety services to actually obligating states to maintain a high level of safety.[198] The Agency is not given any supranational competence vis-à-vis state regulatory bodies. Instead the Convention seeks only to complement and often upgrade national regulations with international standards.[199] Such a position is in keeping with the view that, while nuclear safety is primarily the responsibility of countries that have nuclear installations, safety concerns are transnational. At the same time, the foundation has been laid for greater international cooperation in the field of nuclear safety.

Another early concern expressed during the expansion of Agency peer review services was that in-depth evaluations might inhibit the development of national standards that more appropriately match a country's needs or priorities.[200] The collegiality of the process, however, has prevented differences in design schemes, operational practices, systems of inspection, management, and regulatory methods from posing formidable obstacles to the review process. The whole idea of "peer" monitoring suggests that not only will evaluators possess greater knowledge of the standards required in practice for the operation of a nuclear installation, but also they will understand the various difficulties that can arise. This insight should encourage even nations with safety problems to accept reviews. Such receptiveness is illustrated in the technical reviews currently taking place in Central and Eastern Europe.[201]

---

198 See Hans Blix, The International Framework for Nuclear Power: Recent Developments, Address at the Opening Session, 4th Biennial General Meeting of WANO (Apr. 24, 1995) (visited Mar. 9, 1997) <http://www.iaea.or.at> (stating that Convention's aim is to "commit all states operating nuclear power plants to maintain a high level of safety").

199 Most likely states will adopt the Agency's standards rather than attempting to develop acceptable ones of their own.

200 See Mark Hibbs, Information Sharing First Priority, World Nuclear Regulators Say, Inside N.R.C., Nov. 21, 1988, at 10, available in LEXIS, News Library, Arcnws File (quoting panelists at international symposium of nuclear regulatory officials).

201 See Provision of Assistance Related to the Safety of Nuclear Power Plants in Countries of Eastern Europe and the Former Soviet Union, IAEA Doc. GC(39)/INF/8/Annex B-3, Attachment Part B (Sept. 4, 1995) (visited Mar. 9, 1997) <http://www.iaea.or.at> (describing Agency programs in region).

> In the past, the centralized political systems of countries [in Eastern Europe] did not recognize the need for strong independent regulatory oversight. With the emergence of new [democratic] States . . . the IAEA's assistance, co-ordinated through close co-operation with other intergovernmental bodies, is regarded as not only appropriate but essential.

E. Yaremy & K. Hide, A More Vigorous Approach to IAEA Safety Services 15, 16, IAEA Bull. No. 2 (1992). The need for extensive financial assistance has also compelled the Eastern European states to cooperate with international bodies.

Peer review gives substance to the loosely specified obligations of the Convention. Coupled with these broad norms, peer review allows for the creation and monitoring of binding commitments that can be implemented by countries with widely differing industrial, regulatory, and legal systems, at different stages of development, and even with different approaches to the development of nuclear power.[202]

Peer review can also help to raise public confidence in nuclear power. Public aversion to nuclear power is rooted in fears about the safety of nuclear power reactors. Assertions of the unique nature of the accidents at Three Mile Island and Chernobyl do not provide assurances that an individual reactor is safe. Moreover, even if the risk of a severe nuclear accident is small, such an accident can have devastating consequences, both in terms of fatalities and property losses.[203] In the eyes of many, the potential harm of even one accident far outweighs the expected benefit of nuclear power.

While public aversion is founded on fears of reactor safety, public opposition is less likely to focus on the safety of an individual reactor (which involves complex scientific assessments) than on the integrity and thoroughness of nuclear regulation.[204] The promulgation of international safety standards cannot restore public confidence if the public suspects that the standards are not being followed or applied. International peer review in the Agency safety services, as envisioned in the Convention, provides an objective basis for gauging the effectiveness of regulation as well as for creating incentives for states to establish and maintain comprehensive regulatory frameworks. Those states with sophisticated domestic organizations and citizens' groups in this field may even want to include them in a "national peer review" process that will be used to develop country reports for the Convention. Such an effort would go a long way towards legitimizing the regulatory process (and nuclear power) in the eyes of the public.

---

202 See Jankowitsch, supra note 39, at 19.

203 See Goldsmith, supra note 56, at 181 (discussing need for regulatory reform to assuage public fear of nuclear power). A study released in the 1970s by the U.S. Nuclear Regulatory Commission concluded that the chance of a serious nuclear accident was very small—one in 5000 per reactor per year ("reactor-year"). See U.S. Nuclear Regulatory Commission, NUREG-75/014, Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants (Oct. 1975) (draft version published by U.S. Atomic Energy Commission under document number WASH-1400, Aug. 1974). The probability of extreme core melts was one in one billion per reactor year. Such an accident, however, could cause as many as 3300 deaths, 45,000 early illnesses, and $14 billion in property damage. Id.

204 See Goldsmith, supra note 56, at 170 (discussing shifts in character of public opposition to nuclear power).

B. *Enhancing the Effectiveness of Peer Review as a Compliance Control Instrument*

Based on the analysis of the development of the nuclear safety regime as well as the comparison of the two models of peer review, this Note proposes a few recommendations that are aimed at enhancing the effectiveness of the Convention's review process.

The first recommendation regards the country reports. The Convention's national reporting process is bound to be complicated, time consuming, and expensive. Capabilities for self-evaluation in individual countries should not be taken for granted. The preparatory meetings should strive to simplify and to create consistency in the reporting process by establishing guidelines that are similar to the self-assessment guidelines used in the ASSET missions. Overall, these guidelines should be user-friendly and thorough. The Agency and other organizations interested in nuclear safety might adapt some of their safety review services in order to assist states in these processes.[205] It is important, however, that states take a primary role in compiling and analyzing the data to be included in the report. Parties to the Convention should also consider creating a fund or personnel support group to assist countries with their national reports.

Second, the peer review meetings of the Convention must be designed to capture the collegiality of the safety review services. In defining the size and composition of the Convention's review meetings, emphasis should be placed on creating and maintaining interpersonal connections among participants. State representatives should be appointed for extended periods and group discussion should take place in smaller, more intimate settings.[206]

Third, although the Convention's review meetings will not include on-site visits to particular plants like the Agency safety services, the value of on-site reviews might be retained if certain of the subgroups were allowed, prior to the triennial review meetings, to make visits to individual countries.[207] The resulting reports could then be presented, along with the country self-assessments, at the main triennial meeting.

---

[205] See Blix, supra note 198.

[206] See Joseph V. Rees, Hostages of Each Other: The Transformation of Nuclear Safety Since Three Mile Island 91-92 (1994) (explaining that "force of peer expectations works best in small face-to-face groups which stay together for long periods of time" and that "group solidarity (and therefore peer pressure) is most likely to flourish under intimate conditions").

[207] See supra notes 166-72 and accompanying text for discussion of the triennial review meeting and potential subgroups.

Fourth, some care must be taken to ensure that the summary reports of the Convention enhance compliance with treaty obligations. By definition, peer review involves critical analysis of colleagues, which can easily be beset by bias and animus. In the Convention, bias will most likely manifest itself in the "under enforcement" of safety norms. For a variety of reasons, experts may be tempted to overlook certain problems in the safety reports of peer countries. Experts may empathize too much with the difficulties of nuclear regulation, operation, and management, or they may hope for similar lenient treatment in their safety reviews. Reviewers may also be inclined to sanitize their public comments so as not to emphasize the dangers of nuclear energy. Parties should be aware that too much camaraderie in the review process could undermine the legitimacy of the Convention.

Finally, the review process can be enhanced by fostering an atmosphere of openness and transparency. There is no need for the review meetings to resemble court proceedings, and the final reports need not judge the efforts of individual states harshly. In order for the meetings to be effective, however, countries cannot simply compare notes. Hard conclusions must be reached and the parties should not refrain from naming names. In order to increase the likelihood of meaningful results, parties might consider prioritizing their findings so that countries without the resources to undertake all of the recommendations of the review meeting at least know where to begin.

CONCLUSION

From the beginning, the drafters of the Convention and Agency Member States realized that international norms regarding safety had not solidified to an extent that would support a stronger compliance-monitoring mechanism.[208] Peer review was intended to bridge the gap between consensus and implementation. This ostensibly weak but potentially influential measure may become more than a means for administrative oversight. It can change the context of state regulation of nuclear safety from one of immediacy and self-interest to one of reciprocity and accountability. As cooperation intensifies and international norms solidify, so too can the obligations of parties to the Convention.[209]

---

[208] See Odette Jankowitsch & Franz-Nikolaus Flakus, International Convention on Nuclear Safety: A Legal Milestone 36, 40, IAEA Bull. (Sept. 1994) (stating that Convention was conceived as "catalyst" for promoting continuing nuclear safety efforts).

[209] See Peter van Ham, Managing Non-Proliferation Regimes in the 1990s: Power, Politics, and Policies 37-38 (1994) (explaining that international cooperation is essential to check spread of nuclear weapons).

Within the nuclear safety regime, and quite possibly within other regimes sharing similar characteristics, modest and incremental inroads into autonomous national decisionmaking may be the most effective means of creating and maintaining state commitments. Not more than twenty years ago, states were unwilling to set high safety standards for their nuclear installations merely to appease the world community. Today, a significant number of nations have found it to their advantage to make legally binding commitments to nuclear safety. Within this evolutionary process, peer review, collegiality, and peer pressure become mechanisms not only for monitoring compliance but also for fostering interdependence, converging national interests, encouraging cooperation, and strengthening consensus—all essential to the development of robust and enduring international regimes.

APPENDIX I: ABBREVIATIONS

ASCOT	Assessment of Safety Culture Oversight Teams*
ASSET	Assessment of Safety Significant Events Team*
CNRA	Committee on Nuclear Regulatory Activities
ESRS	Engineering Safety Review Service*
EURATOM	European Atomic Energy Community
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ICRU	International Commission on Radiation Units and Measurement
INPO	Institute of Nuclear Power Operations
INSAG	International Nuclear Safety Advisory Group
INSARR	Integrated Safety Assessment of Research Reactors*
IPERS-PSA	International Peer Review Service for Probabilistic Safety Assessment*
IRIS	International Review of Irradiation Safety Service*
IRS	Incident Reporting System
NEA	Nuclear Energy Agency (of the Organization for Economic Cooperation and Development)
NRC	Nuclear Regulatory Commission (of the United States)
NUSS	Nuclear Safety Standards Programme
NUSSAG	Nuclear Safety Standards Advisory Group
OECD	Organization for Economic Cooperation and Development
OEEC	Organization for European Economic Cooperation (predecessor of the OECD)
OSART	Operational Safety Review Team*
RAPAT	Radiation Protection Advisory Team*
TMI	Three Mile Island
TRANSART	Transportation Advisory Review Team*
WANO	World Association of Nuclear Operators
WHO	World Health Organization
UN	United Nations
UNDP	United Nations Development Programme
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation

* An organ or activity of the International Atomic Energy Agency

APPENDIX II: SCHEMATIC COMPARISON OF PEER REVIEW MODELS IN THE AGENCY SAFETY SERVICES AND THE CONVENTION ON NUCLEAR SAFETY

	SAFETY REVIEW SERVICES	CONVENTION ON NUCLEAR SAFETY
OBJECTIVES	Use international experience to bolster national competence and expertise in nuclear safety. Assist states in the implementation of safety norms	Monitor compliance with treaty obligations
PARTICIPANTS	IAEA Member states	Parties to the Nuclear Safety Convention
COMPOSITION OF PEER REVIEW TEAMS	Senior officials from nuclear power plants, utilities, and regulatory authorities; Agency Staff	Senior officials from nuclear power plants, utilities, and regulatory authorities
NUMBER OF EVALUATORS	5-15	To be decided, but possibly a group as large as the minimum number of parties (5-10)
SELF-EVALUATION	Self-Assessment reports (ASSET; ASCOT)	National Reports
CONTENT OF SELF-EVALUATION	Plant operating procedures; root causes of safety significant events	Measures taken to comply with treaty obligations
DURATION OF REVIEWS	One week to three weeks	To be decided
SCHEDULE OF REVIEW MEETINGS	At the request of Member States	Triennially
LOCUS OF REVIEWS	On-site	Agency headquarters or location of Conference of Contracting Parties
FINAL REPORTS	Final reports written by the Agency team leader upon the conclusion of the mission; reports given towards the appropriate national authorities	Summary reports of general conclusions issued pursuant to the Conference of Parties; made available to the public
ROLE OF AGENCY	Organizing safety reviews: selection of experts, liaison between review teams and utility plant	Secretariat: convening meetings of the Parties and transmitting information among them

APPENDIX III: STATUS OF THE CONVENTION ON NUCLEAR SAFETY

(MARCH 1997)
65 signatories, 35 ratifications/acceptances/approvals

COUNTRY	DATE OF SIGNATURE	DATE OF RATIFICATION/ ACCEPTANCE/APPROVAL
Algeria	20 Sept. 1994	
Argentina	20 Oct. 1994	
Armenia	22 Sept. 1994	
Australia	20 Sept. 1994	24 Dec. 1996
Austria	20 Sept. 1994	
Bangladesh	21 Sept. 1995	21 Sept. 1995
Belgium*	20 Sept. 1994	13 Jan. 1997
Brazil	20 Sept. 1994	4 Mar. 1997
Bulgaria*	20 Sept. 1994	8 Nov. 1995
Canada*	20 Sept. 1994	12 Dec. 1995
Chile	20 Sept. 1994	20 Dec. 1996
China*	20 Sept. 1994	9 Apr. 1996
Croatia	10 Apr. 1995	18 Apr. 1996
Cuba	20 Sept. 1994	
Czech Republic*	20 Sept. 1994	18 Sept. 1995
Denmark	20 Sept. 1994	
Egypt	20 Sept. 1994	
Finland*	20 Sept. 1994	22 Jan. 1996
France*	20 Sept. 1994	13 Sept. 1995
Germany*	20 Sept. 1994	20 Jan. 1997
Ghana	6 July 1995	
Greece	1 Nov. 1994	
Hungary*	20 Sept. 1994	18 Mar. 1996
Iceland	21 Sept. 1995	
India	20 Sept. 1994	
Indonesia	20 Sept. 1994	
Ireland	20 Sept. 1994	11 July 1996
Israel	22 Sept. 1994	
Italy	27 Sept. 1994	
Japan*	12 May 1995	12 May 1995
Jordan	6 Dec. 1994	
Kazakstan	20 Sept. 1996	
Republic of Korea*	20 Sept. 1994	19 Sept. 1995
Latvia		25 Oct. 1996
Lebanon	7 Mar. 1995	5 June 1996
Lithuania*	22 Mar. 1995	12 June 1996
Luxembourg	20 Sept. 1994	
Mali	22 May 1995	13 May 1996
Mexico*	9 Nov. 1994	26 July 1996
Monaco	16 Sept. 1996	

Morocco	1 Dec. 1994	
Netherlands*	20 Sept. 1994	15 Oct. 1996
Nicaragua	23 Sept. 1994	
Nigeria	21 Sept. 1994	
Norway	29 Sept. 1994	29 Sept. 1994
Pakistan	20 Sept. 1994	
Peru	22 Sept. 1994	
Philippines	14 Oct. 1994	
Poland	14 June 1994	14 June 1994
Portugal	3 Oct. 1994	
Romania	20 Sept. 1994	1 June 1995
Russian Federation*	7 Mar. 1995	12 July 1996
Slovak Republic*	7 Mar. 1995	7 Mar. 1995
Slovenia*	20 Sept. 1994	20 Nov. 1996
South Africa*	20 Sept. 1994	24 Dec. 1996
Spain*	15 Nov. 1994	4 July 1995
Sudan	20 Sept. 1994	
Sweden*	20 Sept. 1994	11 Sept. 1995
Switzerland*	31 Oct. 1995	12 Sept. 1996
Syria	23 Sept. 1994	
Tunisia	20 Sept. 1994	
Turkey	8 Mar. 1995	8 Mar. 1995
Ukraine	20 Sept. 1994	
United Kingdom*	20 Sept. 1994	17 Jan. 1996
United States	20 Sept. 1994	
Uruguay	28 Feb. 1996	

* Ratifying/Accepting states which have at least one nuclear installation.
Sources: Convention on Nuclear Safety, Signatories and Parties (last modified Mar. 1997) <http://www.iaea.or.at>; U.S. Gen. Accounting Office, GAO/RCED-97-39, Nuclear Safety: Uncertainties About the Implementation and Costs of the Nuclear Safety Convention 14-15 (1997).