

June 1994

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Recommended Citation

Robert K. Temple, *Regulation of Nuclear Waste and Reactor Safety within the Commonwealth of Independent States: Toward a Workable Model*, 69 Chi.-Kent L. Rev. 1071 (1994).

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REGULATION OF NUCLEAR WASTE AND REACTOR SAFETY WITHIN THE COMMONWEALTH OF INDEPENDENT STATES: TOWARD A WORKABLE MODEL

ROBERT K. TEMPLE*

INTRODUCTION

The break up of the former Soviet Union has allowed public light to be shed on an international disaster: indiscriminate nuclear waste disposal. According to Russia's environmental minister Viktor Danilov-Daniliyan, nuclear waste and accidents have caused large parts of Russia to be "uninhabitable."¹ Russian scientists have classified fifteen percent of Russia as "ecologically unsafe" for humans.² The waste is the legacy of an era when the interests of the state were not restrained by environmental regulation, and is now the problem of fledgling republics which lack the economic resources or technology to contain it.³

Does an environmental cleanup problem mean curtailment of nuclear reactor operations in the former Soviet states? Presently, there are forty-four operating commercial power nuclear reactors in Russia, Ukraine and Kazakhstan, with a total of sixty-eight reactors slated for operation.⁴ While there has been public pressure to increase the safety of, or shut down the Chernobyl-style reactors, the Common-

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1. Steve Raymer, *Nuclear Pollution Plagues Former Soviet Union; Environment: A Map Marking Non-Military Explosions Shows Scope of "National Disaster,"* L.A. TIMES, Mar. 15, 1992, at A30.

2. David Hearst, *Portrait Revealed of a Russia that is Killing Itself,* GUARDIAN, Oct. 8, 1992, Home Page, at 20.

3. *Yeltsin Will Probably Attend Rio Earth Summit,* Reuters, Apr. 23, 1992, available in LEXIS, News Library, Wires File.

4. Slovakia, Lithuania, Romania and Slovenia would add another three operating reactors to this list, with a total of nine reactors scheduled for operation in those countries. *International Datafile: Nuclear Power Status Around the World,* IAEA BULL., Dec. 1993, at 60. Russia continues operation of VVER-style, or pressurized water reactors, RBMK-style, or light-water cooled, graphite moderated reactors, as well as some liquid metal fast-breeder reactors. Ukraine has three potentially operable RBMK-style reactors on the Chernobyl site, two which it continues to operate, and several VVER reactors. Kazakhstan has a liquid metal fast-breeder reactor, and plans for other reactors that will be discussed below. In addition, Lithuania's two operating graphite moderated reactors are from the latest RBMK generation, with the highest commercial

wealth of Independent States ("CIS") has a nuclear program that will continue well into the future.⁵ Kazakhstan's Ministry of Science announced their intention to build six nuclear power units, beginning in 1993, to meet the electrical energy needs of that republic.⁶

The significant nuclear waste problem in the former Soviet states, along with an active, on-going nuclear power program in what are now struggling independent republics prompts several questions, but the one of concern here is: what is the state of the law to safely and effectively govern nuclear waste and reactor safety? The Russian Federation in a declaration issued February 20, 1992 restructured the State Committee for Nuclear and Radiological Safety ("*Gosatomnadzor*"), giving the following organizational details:

The preamble lays down the principles to be observed by those responsible for the applications of nuclear energy: to establish efficient safety arrangements to ensure the protection of citizens, society and the State against the hazards of nuclear energy and ionizing radiation.

The *Gosatomnadzor* will be responsible for preparing national legislation governing the production and use of nuclear energy and materials and radioactive substances. It will be up to the *Gosatomnadzor* to organise and implement, at the national level, the regulation and control of nuclear activities both for peaceful and for military purposes. It will define the safety principles and criteria, standards and rules as well as other regulatory measures, in particular, by establishing a licensing system for such activities as well as an inspection system. . . .

Finally, the Declaration refers to the centralised system for the development and safety of the nuclear industry and nuclear applications which existed in the previous Soviet Union. It specifies that, given the present situation in the nuclear energy field and its possible adverse effects from the safety viewpoint, the *Gosatomnadzor* is prepared to cooperate with the bodies responsible for regulation and control of nuclear activities in the other States in order to estab-

capacity (net MWe) in the world. *World List of Nuclear Power Plants*, NUCLEAR NEWS, Mar. 1993, at 41-58.

5. Janet Guttsman, *Russia Economy Needs Nuclear Power, Like It or Not*, Reuters, Apr. 3, 1992, available in LEXIS, News Library, Wires File. The Soviet Union has been divided into the following republics: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kirghizia, Latvia, Lithuania, Moldavia, Russia, Tadjikistan, Turkmenia, Ukraine and Uzbekistan; although Estonia, Georgia, Latvia and Lithuania were not party to the Alma Ata Treaty creating the CIS. Molly W. Lien, *Red Star Trek: Seeking a Role for Constitutional Law in Soviet Disunion*, 30 STAN. J. INT'L L. 41, 42 n.3 (1994). On near and long-term plans for nuclear power in the CIS, see William C. Potter, *The Future of Nuclear Power and Nuclear Safety in the Former Soviet Union*, NUCLEAR NEWS, Mar. 1993, at 61. See also *Russia: More Detail on Effort to Resume Construction*, NUCLEAR NEWS, Mar. 1993, at 78, 78-79 (where one new VVER reactor was scheduled to come on-line in 1993, and two additional reactors by 1995).

6. S. Martynov, *Atom*, MOSCOW NEWS, Sept. 30, 1992, at 40.

lish a common policy for safe production and use of nuclear energy, nuclear materials and radioactive substances.⁷

The Russian offer to share resources comes at a time when each of the Independent States is responsible for regulating nuclear facilities within their borders.⁸ Ukraine has initially adopted reactor safety rules similar to those in Russia.⁹ Those republics without operating nuclear facilities are considering nuclear waste regulations, along with other environmental regulations.

This Note will focus on whether a centralized regulatory authority can provide effective oversight of reactor safety and cleanup of nuclear waste in the former Soviet Republics. The model developed here is structured around a central authority with certain powers retained by states.

For comparison, and in order to aid in the development of the regulatory model, the European Community ("EC") legislation for nuclear waste control will be reviewed in Part II of this Note. In the EC, truly autonomous states, similar to the CIS, attempt to act in concert for certain types of legislation. The balance between centralized control and state sovereignty will be considered, comparing state rights and EC authority.

Part III of this Note will review the relevant oversight assistance, authority, and treaties available from the international community. The goal of this Note is to provide a success path for dealing with the radioactive waste problems and reactor safety questions by noting the advantages a central authority may offer. This is also an opportunity to review practices and regulations that have been successful in other international settings. Essential for a viable solution is to consider the logistics of implementation: will the republics allow a centralized system to work? Are the republics willing to sacrifice their sovereignty to the degree necessary to assure safe reactor operation or containment and cleanup of nuclear waste?

In Part IV, the extent of the problems and the present legislative conditions of the CIS are described to assure any proposed solution

7. Nuclear Energy Agency, Org. for Economic Co-operation and Dev., *Russian Federation*, NUCLEAR L. BULL., June 1992, at 59, 59-60 [hereinafter *Russian Federation*].

8. Thus far, Lithuania has been the only country to allow Russia to help assure safety at a reactor plant. In autumn of 1991, the plant staff was 97% Russian nationals, and although a Lithuanian was symbolically appointed as plant manager, the operations staff relied on *Minatom* to manage plant operations. Potter, *supra* note 5, at 62.

9. Geneive Abdo, *Russia Tightens Safety Rules at Atom Plants*, Reuters, Mar. 4, 1992, available in LEXIS, News Library, Wires File.

will address the needs of the new nation-states. Part V then presents components of model solutions.

I. EUROPEAN COMMUNITY

A. Structural Overview

Twelve sovereign states make up the EC (formerly the European Economic Community), which was formed by the Treaty of Rome.¹⁰ The original objective of the community was to create an open commercial market for goods, services and capital.¹¹ This goal was broadened by the passage of the Single European Act ("SEA"), which came into force in 1987, creating a market free from internal barriers among EC members.¹²

The EC is comprised of four institutions (and supporting consultants): (1) the state-appointed Council of Ministers, (2) the Parliament, (3) the Commission, and (4) the Court.¹³ The Parliament passes advisory legislation recommended by member states and sub-organizations within the EC itself, but there is no executive branch to implement policy recommendations.¹⁴ Thus, the legislative and judicial arms, along with the EC states, are left to create and implement EC legislation. The Commission drafts legislation that is approved by the Council. The states then use this legislation to draft or modify national laws in order to comply with the EC rule.¹⁵ Through this local adoption, EC legislation is the catalyst for substantive change in the legal systems of other sovereign nations.

10. Daniel Suman, Comment, *Regulation of Ocean Dumping by the European Economic Community*, 18 *ECOLOGY L.Q.* 559, 573 n.86 (1991) (discussing the TREATY ESTABLISHING THE EUROPEAN ECONOMIC COMMUNITY [EEC TREATY] and the Barcelona Convention, EEC TREATY art. 228(2)). The present members of the EC include Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and the United Kingdom. *Id.* at 573 n.85. In a broad sense, the EC can actually be thought of as bringing together parties of the European Coal and Steel Community, Euratom (discussed below) and the EEC. See NEILL NUGENT, *THE GOVERNMENT AND POLITICS OF THE EUROPEAN COMMUNITY* 39-42 (1991).

11. Suman, *supra* note 10, at 573.

12. Linda Maher, *The Patent Environment: Domestic and European Community Frameworks for Biotechnology*, 33 *JURIMETRICS J.* 67, 101-02 (1992). Note that between the creation of the EC and the SEA, the European Communities Act of 1972 established the foundation for EC rule over sovereign nations by providing a "primacy of community laws over domestic law, while" states remain members. ALLAN R. BREWER-CARÍAS, *JUDICIAL REVIEW IN COMPARATIVE LAW* 24 (1989).

13. Maher, *supra* note 12, at 102. For an explanation on the interrelationship of these bodies, see FRANCIS JACOBS ET AL., *THE EUROPEAN PARLIAMENT* 258-61 (1990); CHRISTOPH SASSE ET AL., *DECISION MAKING IN THE EUROPEAN COMMUNITY* (1977).

14. Maher, *supra* note 12, at 102.

15. *Id.*

The Court acts as the judicial system to sort out differences between members, with the question of legal standing based on either EC membership or specific legislation passed by the EC.¹⁶ Sources of EC law include regulations, directives and rulings from the European Court of Justice ("EC Court"). The state courts have the responsibility to review state incorporation, implementation, and enforcement of EC environmental directives.¹⁷

Regulations are to be applied, by EC and state courts, generally to states, and are binding directly on any state which the regulation addresses.¹⁸ Directives are binding as to results on member states with the methods of meeting them left to the states.¹⁹ State courts may not have to adopt an EC directive under four exceptional circumstances: (1) if the legislation has not been adopted by the member states, (2) if the state's directive does not conform to the EC directive, (3) where a member state has exceeded its authority in applying a directive, or (4) if the state law is unclear as to whether it is consistent with a directive.²⁰

B. Overview of Euratom and Reactor Safety Initiatives

In the areas of nuclear safety and waste handling, both the presence and absence of directives is noteworthy. The EC created the European Atomic Energy Community ("Euratom") to make recommendations to ensure that basic health and safety standards of member states are met (creating the "nuclear common market").²¹ The Euratom Treaty establishes standards for joint research, promotes information exchange between member countries, is a source for licensing requirements and limits on information exchange, and sets standards for radiation safety for both the general public and occupa-

16. Article 173(2) of the EEC TREATY only permits third-party standing where there is a "direct and individual concern" to that party. For an extensive treatment of the structure, formation, and function of the EC Court, see David Stoelting, *The Jurisdictional Framework of the European Court of Justice*, 29 COLUM. J. TRANSNAT'L L. 193 (1991).

17. ECKARD REHBINDER & RICHARD STEWART, ENVIRONMENTAL PROTECTION POLICY: LEGAL INTEGRATION IN THE UNITED STATES AND THE EUROPEAN COMMUNITY 159 (1988). A member state or the commission may challenge the conformity of a state's environmental protection regulations to the EEC TREATY provisions under articles 30, 34, and 36, and a private party may challenge state action, as in violations of articles 30 or 36 in a national court. *Id.* at 175.

18. Stoelting, *supra* note 16, at 193 (citing EEC TREATY art. 189).

19. REHBINDER & STEWART, *supra* note 17, at 157-58 (citing EEC TREATY art. 189(3)).

20. *Id.* at 159. For more extensive treatment of directives for environmental law, see LUDWIG KRAMER, FOCUS ON EUROPEAN ENVIRONMENTAL LAW 156-78 (1992).

21. JAN WERTS, THE EUROPEAN COUNCIL 13 (1992).

tional radiation workers.²² Additional mandates included creation of an agency to track nuclear materials, coordinate suppliers, and limit delivery as provided by law, along with mining requirements and safeguards direction for EC members.²³

Euratom legislation in force was designed to promote the safe use of nuclear power and to prevent the misuse of nuclear materials, but Euratom has little authority on which to base community decisions relating to health and the environment, as very little in these areas is agreed upon by the entire community, and is subsequently ratified.²⁴ If a member of the community discharges nuclear waste that does not comply to Euratom standards, however, the affected party may initiate proceedings in the EC Court.²⁵

Initially, Euratom activities surrounding the safety design basis for plants was limited to consultation among members.²⁶ After several proposals, the present state of the law requires community consultation only before establishment or expansion of nuclear power plants.²⁷ A Euratom standard which was not adopted, however, was that Euratom be allowed to have consultants render an opinion on nuclear projects in member states.²⁸ France did not ratify this proposal, fearing that siting criteria adopted by the consulting group would

22. TREATY ESTABLISHING THE EUROPEAN ATOMIC ENERGY COMMUNITY [EURATOM TREATY] arts. 1-39. The basic safety standards were revised in 1980 (per Directive 80/836/Euratom), and are now under review for revision based on a new study from the International Commission on Radiation Protection, recognizing a lower threshold of potential harm from ionizing radiation. Nuclear Energy Agency, Org. for Economic Co-operation and Dev., *European Communities: Proposal for a Council Directive Laying Down Basic Safety Standards for Radiation Protection*, NUCLEAR L. BULL., Dec. 1993, at 74, 74-75.

23. EURATOM TREATY, *supra* note 22, arts. 52-91.

24. REHBINDER & STEWART, *supra* note 17, at 98.

25. *Id.* at 98-99 (citing Council Resolution of 22 July 1975 on the Technological Problems of Nuclear Safety, 1975 O.J. (C 185) 1). Infringement proceedings are initiated pursuant to EEC TREATY art. 169, or a member state can ask that another member's regulations receive a review under articles 30 and 36. Normally, on-going violations are first pursued by reporting the violating member to the Commission, and requesting the Commission issue an article 169 letter against the offending state. The Commission will draft the letter as an Opinion, requiring compliance. The Court of Justice can then provide a specific ruling on the issue if compliance is not forthcoming, or in the case of a single past violation. Maher, *supra* note 12, at 103. Although no member has yet resorted to the EC Court of Justice for a ruling on a nuclear waste matter, should the Court rule on such an issue, its ruling is binding under the EEC TREATY art. 189. Stoelting, *supra* note 16, at 194, 214.

26. REHBINDER & STEWART, *supra* note 17, at 99 (citing EURATOM TREATY, *supra* note 22, art. 37).

27. *Id.* at 100 (citing to Commission Regulation 1056/72, 1972 J.O. (L 120) 7, amended by Commission Regulation 1215/76, 1976 O.J. (L 140) 1). This is despite calls to harmonize the safety requirements for all EC plants. *Id.* at 99.

28. *Id.* (citing 1977 O.J. (C 31) 3).

be too restrictive, thus endangering its policy on energy independence and thereby its competitiveness.²⁹

Euratom has adopted many regulations that coordinate and standardize policies among the EC states, with graduated levels of approval that increase with the significance of the regulation. Euratom has passed regulation-type initiatives, environmental quality standards, and directives to coordinate state policies; directives require unanimous ratification before they are adopted in an enforceable manner.³⁰

C. Nuclear Waste Storage

For radioactive waste, the starting point for the EC was initially just consultation and information exchange among member states.³¹ Euratom established goals to find effective radioactive waste processing, storage and disposal methods.³² Euratom is committed to perfecting a handling and long-term storage method for irradiated nuclear fuel by identifying four projects open to Community joint activities: the German Asse salt mine, a pilot underground facility in Belgium, and underground validation facilities in both France and the United Kingdom.³³

29. *Id.* at 100. The ability of one country to reject legislation is the norm, rather than the exception. This is based in law where the matter is one of a state's "vital interests." The remaining, less vital, legislation also comes from unanimous decisions, rather than pure majority, by Council agreement. SASSE ET AL., *supra* note 13, at 88.

30. REHBINDER & STEWART, *supra* note 17, at 138-40. Maher lists the four EC devices, by type: Proposal, Regulation, Directive and Decision. Maher, *supra* note 12, at 102. A proposal is the presentation for consideration of a regulation or directive, while a regulation, once adopted, preempts national laws within the bounds of the regulation. *Id.* A directive is binding but only sometimes enforceable in national courts. *Id.* A decision is binding on both a nation's courts and the Court of Justice. *Id.*

31. REHBINDER & STEWART, *supra* note 17, at 100.

32. Council Decision 75/406, 1975 O.J. (L 178)(Euratom), 181 INT'L ENVTL. REP. 1001 (1978). This was another research and problem-definition document, without legislative demands of the member states.

33. Council Decision 89/664, 1989 O.J. (L 395)(Euratom), 181 INT'L ENVTL. REP. 1051, 1052 (1990). These additional commitments also call for studies and describe solutions, without creating mandates for the states. REHBINDER & STEWART, *supra* note 17, at 101. For all of their interest in tracking waste and special nuclear materials, the EC has never codified a classification system for radioactive waste, and the member states do not use the same system. G.D. BURHOLT & A. MARTIN, THE REGULATORY FRAMEWORK FOR STORAGE AND DISPOSAL OF RADIOACTIVE WASTE IN THE MEMBER STATES OF THE EUROPEAN COMMUNITY 4 (1988). The general classes that follow are based on the IAEA's classification of high-level waste, then calling all other materials low-level waste.

1. Low-Level Nuclear Waste

The only proposed radioactive waste directive relates to ocean dumping. Ocean dumping of radioactive waste was permitted by the United Kingdom, France, Germany, the Netherlands and Belgium.³⁴ By the 1980s, only the United Kingdom was continuing this practice by dumping low-level radioactive waste in the North Sea, as permitted by the London Convention.³⁵ In 1985, the United Kingdom remained a holdout in attempts to permanently restrict the ability of member states to dump low-level radioactive waste, even though they would agree to a year-by-year moratorium.³⁶

In 1992, the EC obtained a longer-term agreement from all its members, even though two States insisted on language that allows possible future resumption of ocean dumping.³⁷ Although there is a general prohibition on dumping waste at sea from Gibraltar to Northern Ireland (including low-level radioactive waste), both France and the United Kingdom insisted on language allowing resumption following a 15 year moratorium.³⁸

2. High-Level Nuclear Waste

A variety of recommendations and cooperative studies have come from the Commission.³⁹ Working groups have been established to address standards, practices and regulations, as well as improved communications methods in the event of incidents.⁴⁰ In the absence of specific directives, member states rely on state laws and treaties.

D. Liability

Legislative provisions for third-party liability in the event of a nuclear accident have been created in all EC countries having a nuclear power program.⁴¹ All EC members are party to the Paris Convention of 1960, as amended by the additional protocol of 1964, except for

34. Suman, *supra* note 10, at 596.

35. *Id.*

36. *Id.* at 596-97.

37. *EC Ministers Reach Accord, Albeit Limited, on Protection of the North Sea*, German Information Center, Oct. 2, 1992, available in LEXIS, World Library, CURNWS File.

38. *Id.*

39. REHBINDER & STEWART, *supra* note 17, at 100-01.

40. *Id.* at 101.

41. BURHOLT & MARTIN, *supra* note 33, at 9. For a review of civil liability in the EC, see Linda M. Sheehan, *The EEC's Proposed Directive on Civil Liability for Damage Caused by Waste: Taking Over When Prevention Fails*, 18 *ECOLOGY L. Q.* 405 (1991).

Ireland and Luxembourg.⁴² Some countries are party to a separate convention, the Vienna Convention, which was open for world participation.⁴³

The problem with the variety of conventions is that an operator who may be liable under one convention would not be liable under another, or the operator may not be liable to harmed members of countries who are not in accord on a single agreement.

A recently proposed EC Directive concerns civil liability for environmental harm or waste-related injury.⁴⁴ Based on the concepts of (1) the polluter pays and (2) encouraging preventive action, the directive would impose a no-fault standard on the waste creator, but it in turn could sue a third party for negligence if the release were the third party's fault.⁴⁵ This is the first legislation offered by the EC to place liability for environmental damage.⁴⁶

Several steps led to the Civil Liability Directive. In 1975, the EC passed a Council Directive on Waste,⁴⁷ a broad piece of legislation similar to the initial Euratom Acts. For example, the Council Directive on Waste defers to the national law definitions of waste, including

42. 2 NUCLEAR ENERGY AGENCY, ORG. FOR ECONOMIC CO-OPERATION AND DEV., NUCLEAR LEGISLATION: REGULATORY AND INSTITUTIONAL FRAMEWORK FOR NUCLEAR ACTIVITIES 207 (1984) [hereinafter 2 NUCLEAR LEGISLATION]. Belgium, Denmark, Finland, France, Germany (FRG), Greece, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Turkey, and the United Kingdom are party to the Paris Convention. Ireland and Luxembourg do not have commercial nuclear power plants. *Id.* The method of implementation changes in different states. As adopted in Germany, for example, the facility operator has unlimited liability in the event of an accident and must carry insurance for claims up to 500 million DM; the operator is further indemnified for claims up to 1000 million DM with the federal and state covering 75% and 25% of the risk respectively. BURHOLT & MARTIN, *supra* note 33, at 55. Beyond a concern for the welfare of its citizenry, because the state is partially indemnifying the operator, the state has a vested interest in the safe operation of facilities within the state.

43. The Vienna Convention on Civil Liability, *opened for signature* May 21, 1963, 2 I.L.M. 727. For an overview of the provisions of nuclear liability conventions, see Peter Riley, *The Legal Control of Nuclear Energy Between States*, 21 CAL. W. L. REV. 303 (1991).

44. BAKER & MCKENZIE, SINGLE EUR. MARKET REP. 15-11, July 1992 (citing Proposed Directive on Civil Liability for Damage Caused by Waste EUR. PARL. DOC. (COM 89) 282; 1989 O.J. (L 251) 3 and 1991 O.J. (L 192) 6).

45. *Id.* Compare this with civil action under the German Liability for Environmental Damages Act which also applies a strict liability standard, but victims under this act only need to prove probable cause, and requires the alleged tortfeasor to help the victim prepare her case. *Federal Republic of Germany: German Law and Government Structure*, 241 INT'L ENVTL. REP. 0101, 0107 (1991). The presumption of causation is based on the type of installation: if the installation is capable of causing the harm, then it is presumed to be the cause. BAKER & MCKENZIE, *supra* note 44, at 15-N14 to 15-N15.

46. *Id.*

47. Sheehan, *supra* note 41, at 405 (citing Council Directive on Waste, 1975 O.J. (L 194) 39). Deference to state law is typical of EC legislation in new areas of law. The following sections of the EEC TREATY have also been referenced as the basis for environmental legislation in the EC: the Preamble and arts. 2, 100, and 235.

both hazardous and nonhazardous waste.⁴⁸ This was followed in 1984 with regulations on hazardous waste shipments across state borders.⁴⁹ Finally, the call for the more specific and binding Civil Liability Directive followed a 1986 fire in a Swiss warehouse that caused chemical contamination of the Rhine River, which spread to France, West Germany and the Netherlands.⁵⁰ Thus far, although more stringent nuclear directives have been called for in Parliament,⁵¹ the Council has not been able to pass them.

E. Sovereignty

The individual states are the primary providers of specific regulations for nuclear regulation and waste handling within those states, and based on the overview of regulations thus far, the EC has only stepped in to provide limited guidelines in matters such as safety for both the public and workers. For this reason, interstate challenges by individuals against operation of facilities apply state laws within an EC framework, as is seen in the following two cases.

1. The Wackersdorf Decisions

One method originally planned for German high-level waste management was reprocessing.⁵² Wackersdorf, located about 130 kilometers from the German-Austrian border, was a private operation designed to perform this needed public service, as required by law without harmful effects to the public.⁵³ Initial legal steps toward es-

48. *Id.*

49. *Id.* at 406 n.7 (citing Council Directive on the Supervision and Control within the European Community of the Transfrontier Shipment of Hazardous Waste, 1984 O.J. (L 326) 31, amended by Council Directive, 1986 O.J. (L 181) 13). This was caused by barrels of dioxin-tainted waste vanishing from Italy, and appearing in a barn in San Quentin, France. *Id.*

50. *Id.*

51. REHBINDER & STEWART, *supra* note 17, at 100 (discussing European Parliament Resolutions 1980 O.J. (C 327) 15, 1977 O.J. (C 183) 1, and 1976 O.J. (C 28) 9).

52. Kurt Heller, *Border Installations: The Experience of Wackersdorf*, in NUCLEAR ENERGY LAW AFTER CHERNOBYL 83, 83 (Peter Cameron et al. eds., 1988) (discussing the 1976 amendment of § 9a of the German Atomic Energy Act). Fuel reprocessing is also an EC regulated activity, specifically under EURATOM TREATY, *supra* note 22, art. 78. See discussion, *supra* notes 21-40 and accompanying text. EURATOM TREATY, *supra* note 22, art. 78 provides that "[t]he Commission must approve the techniques to be used for the chemical processing of irradiated materials" but this is for safeguards purposes. EURATOM TREATY, *supra* note 22, art. 34 requires member states to get the Commission's permission to perform "dangerous experiments," but reprocessing fuel applies known technology and it would be difficult to challenge a plant installation under that section. Thus, the EC requirements for this type of installation are limited to monitoring releases, monitoring public and worker exposure, and tracking the location of all special nuclear materials.

53. Heller, *supra* note 52, at 83. The cost-benefit dynamics of reprocessing spent fuel over burial of waste include many factors, such as the market price of new fuel, the availability of

establishing the plant started in 1979, and in 1984, after public hearings, the Bavarian State government provided a site license for plant construction.⁵⁴ Federal administrative rules spurring site development were provided in 1985 and 1986 to meet the goals of nondependence on other nations for waste management, to avoid final storage of fuel as waste, and to quickly bring into service a plant which could accomplish these goals without harmful side effects.⁵⁵

Legal action was initiated in both Germany and Austria to try to block plant completion. Litigation in Bavarian Administrative Court resulted in a partial revocation of the Partial Construction Permit, restricted only to those parts of construction which did not require a license under the atomic energy laws (saying, in essence, the state authority had unlawfully licensed more than it was required to under the permit).⁵⁶

Meanwhile, the German Court held that foreign authorities were not bound by decisions in Germany (applying the public international law principle of territoriality). Also, where a foreigner brings action in a foreign court, even where that person has standing, for removal of a licensed facility in Germany, such judgment is unenforceable as a violation of German public policy.⁵⁷

Additional legal roadblocks for Wackersdorf operation, brought by an Austrian farmer, were dismissed by Austrian courts.⁵⁸ The Austrian farmer brought two causes of action before Austrian courts to try to halt construction of Wackersdorf: the first based on wrongful interference with possession, and the second on the right to protection from harmful discharges.⁵⁹ Note that Germany recognized the right

reprocessing facilities, and the availability of disposal sites for high-level waste and process by-products. As part of a high-level waste reduction plan, reprocessing fuel has been part of Germany's five step high-level waste management plan. THIRD REPORT TO THE U.S. CONGRESS AND THE U.S. SECRETARY OF ENERGY FROM THE NUCLEAR WASTE TECHNICAL REVIEW BOARD, May, 1991, at D-7 [hereinafter NUCLEAR WASTE TECHNICAL REVIEW BOARD].

54. Heller, *supra* note 52, at 85. The Partial Construction License was issued in accordance with Section 7 of the Atomic Energy Act. *Id.*

55. *Id.*; see also NUCLEAR WASTE TECHNICAL REVIEW BOARD, *supra* note 53.

56. Heller, *supra* note 52, at 86. For an overview of the licensing process in the Federal Republic of Germany, see NUCLEAR ENERGY AGENCY, ORG. FOR ECONOMIC CO-OPERATION AND DEV., LICENSING SYSTEMS AND INSPECTION OF NUCLEAR INSTALLATIONS 44-51 (1986).

57. Heller, *supra* note 52, at 88.

58. *Id.*

59. *Id.* at 90 (claim for interference brought under § 340 of the Austrian Civil Code, and claim for protection brought under §§ 364 and 364a). Section 364 provides that an owner may prevent harmful discharges onto his property when he does not encroach on the rights of a third party, and when he does not interfere with the furtherance of the public welfare. Section 364a limits this, however, when the discharge comes from a duly licensed installation, in which case the owner can only get compensatory damages if a harmful discharge occurs. *Id.*

of foreign nationals to participate in the public licensing proceedings of a site within its borders.⁶⁰

The political climate of Germany's neighbor certainly was not pro-nuclear as Austria banned completion of a nuclear power plant, which had started construction in 1971, by public referendum in 1978.⁶¹ Nevertheless, the Austrian courts decided against the farmer.⁶² Despite the plant being built in a neighboring country, both courts felt competent to hear the case, although an appellate court reviewing one of the cases felt any attempt to enforce an adverse judgment against the facility would be contrary to public policy.⁶³ The appellate court did not rule on whether, at a distance of 150 kilometers, the farmer was a neighbor of the facility entitled to protection.⁶⁴

2. The Oldenburg Decision

Here, the issue was whether a resident of the Netherlands, residing twenty-five kilometers from the proposed site of a German nuclear power plant, has rights that are affected by a license issued within Germany.⁶⁵ The lower court held that "extending the effects of the license to legal positions in the territories of foreign States would be an infringement of public international law rules."⁶⁶ The Federal Administrative Court canceled the Oldenburg Decision, and provided a new procedure to be followed.⁶⁷ It did not base the decision on whether a resident residing near a border was not substantially defined as an international citizen, but rather held that the case required application of the German Atomic Energy Act.⁶⁸

60. *Id.* at 88.

61. *Id.* at 86.

62. *Id.* at 91 (citing § 81 of the Austrian Code of Jurisdiction).

63. *Id.* at 91-92.

64. *Id.* at 95. Other neighbors were uneasy about the potentially long reach of the Austrian courts—namely, that the courts could reach across sovereign borders to close facilities. See *In Brief; Czechoslovak Daily on Austrian Decisions on Nuclear Plants*, BBC Summary of World Broadcasts, Apr. 22, 1988, available in LEXIS, News Library, ARCNWS File.

65. Nuclear Energy Agency, Org. for Economic Co-operation and Dev., *Federal Republic of Germany: Right of Residents of the European Economic Community to Bring an Action Against a Nuclear License—Decision of the Federal Administrative Court*, NUCLEAR L. BULL., Dec. 1987, at 23, 23-24 [hereinafter *Right of Action*].

66. *Id.* at 23. This judgment had been contested on the grounds that a citizen living so near the border had rights beyond those of other international citizens. *Id.*

67. *Id.*

68. *Id.* See NUCLEAR ENERGY AGENCY, ORG. FOR ECONOMIC CO-OPERATION AND DEV., NUCLEAR LEGISLATION: REGULATORY AND INSTITUTIONAL FRAMEWORK FOR NUCLEAR ACTIVITIES 108 (1983) (describing licensing condition for nuclear power plants under § 7 of the German Atomic Energy Act).

Since the Atomic Energy Act has as its objectives the preservation of life, health and property against the risks of nuclear energy, these objectives require interpretation of the Act in such a manner as to assure that the international obligations of the Act are met.⁶⁹ The Court felt the protection offered by the Act should be offered no matter on which side of the border the affected person resided.⁷⁰ The Court emphasized that residents of European Community States were protected under the Act, as the legislative history indicated that German membership in the European Atomic Energy Community played a substantial part in the special relationship under which protection, and a right of action, may be offered.⁷¹

F. Significant EC Cooperative Achievements

It is worthy to note a few policy areas where European unity has been achieved, the level of national cooperation with those common policies, and to compare them with the Euratom experience. The EC's Common Agricultural Policy has centered on trying to achieve a singular approach to agricultural surpluses and to limit nationalistic farm spending.⁷² After more than eighteen years of conflict and disagreement, that goal is coming close to being met.⁷³ The most recent breakdown in price supports received significant protest from French farmers, providing another challenge as to whether maintenance of the common market is to be held paramount.⁷⁴

The EC Economic and Monetary Union is the cornerstone of achieving a Europe "united in their essential interests."⁷⁵ The common European Monetary System ("EMS") was intended to enhance monetary stability in Europe (both with exchange rates and inflation), to improve coordination within the EC to create economic growth, and to be a stabilizing force on world economic markets.⁷⁶ Although efforts in 1992 came close to achieving that goal, the United Kingdom ("UK") and Germany remain holdouts to achieving the last step of

69. *Right of Action*, *supra* note 65, at 23-24.

70. *Id.* at 24.

71. *Id.*

72. See WERTS, *supra* note 21, at 220-21. Art. 39 of the Treaty of Rome lists the underlying purposes of the EC Common Agricultural Policy: ensuring a fair standard of living for the farming community, stabilizing markets, guaranteeing supplies at reasonable markets, and increasing productivity through technology.

73. *Id.*

74. Alex Brummer & Mark Tran, *US Digs Heels in Over Farm Trade*, *GUARDIAN*, Sept. 28, 1993, Home Page, at 1.

75. WERTS, *supra* note 21, at 35.

76. *Id.* at 245-46.

issuing a common EC monetary unit.⁷⁷ The UK resisted EC priorities for monetary policy while Germany, with its economic outlook complicated by absorption of East Germany and higher than normal growth (and interest) rate, refused to subjugate its economic goals in favor of a supranational bank.⁷⁸

A common policy achievement within the EC was in marine pollution.⁷⁹ Another success was EC adoption of the Montreal Protocol limits for the reduction of chlorofluorocarbons.⁸⁰ These are contrasted with a failure to achieve a Common Fisheries Policy because of UK concerns about their market being flooded with cheap fish caught off the Canadian coast, if the market were opened.⁸¹ Economic protection of state interests remains preminent to attempts to achieve common policies.

G. *Conclusions about the EC*

Where the EC has chosen to act, the autonomous states have voluntarily given up their right to sovereignty in significant, but limited areas. The EC has created unified guidelines for public exposure, an oversight inspection agency, and all EC members are parties to the same liability convention in the event of an accident. Thus EC members have taken initial steps to protect the public, and have bound themselves to a uniform convention on liability.⁸²

In striking a balance between central supranational control and state sovereignty, the scale still tips in favor of the latter for two reasons. First, no legislation is passed with a mere majority consent, by law or convention. It takes a unanimous vote to subrogate EC interests for state interests. Second, if a state can call an interest a "vital state" interest, the state maintains legal supremacy over the EC.

77. Robert Kuttner, *Why Europe Didn't Take the Last Step Toward Union*, BUS. WK., Aug. 23, 1993, at 10.

78. *Id.*

79. WERTS, *supra* note 21, at 262. The EC concern, spurred by the grounding of the Amoco Cadiz, was primarily with off-coast oil spills, and the EC agreed in spirit to prevent and combat such spills and to promote standards to support these goals within international bodies. *Id.*

80. Markus Jachtenfuchs, *The European Community and the Protection of the Ozone Layer*, 28 J. COMMON MKT. STUD. 261, 261 (1990).

81. WERTS, *supra* note 21, at 260-61.

82. *See, e.g., Commission Statement on German Unification*, BULL. EUR. COMMUNITIES, Supp. 4/90, at 99 (1990). As part of German unification (Federal Republic of Germany or West Germany and the German Democratic Republic or GDR), Germany is in the unique position of having applied its regulatory structure, following unification, to former Eastern bloc facilities. Unification treaties initially called for compliance with European Community Standards for radiation protection, by either upgrading installations or closing those facilities which could not be brought into compliance. The GDR had to immediately comply with EURATOM TREATY arts. 33, 35, 36, and 37 at the time of unification, and reveal all material problems at their plants. *Id.*

Although calls have been made to change from this present political reality for the common good of the EC, the States limit relinquishment of sovereign control of interests they maintain are vital, which others could opine are not.⁸³ The biggest resistance to centralized control comes, not surprisingly, where national economic interests are at stake.

Even though Euratom's powers (EC's supranational authority for nuclear issues) are limited, the existence of such a coalition may have a greater impact. There is mutual respect among states shown in state decisions that acknowledge both the sovereignty of sister-states and a willingness to assure that common interests of the community are not blocked by state lines. This mutual respect comes from the recognition that states are operating as part of a community. So even where power is not given up to a supranational authority, the existence of the authority and the community helps establish a basis for cooperation and a sense of obligation among participating nations.

EC commitments also show how a normative carryover can occur because states have jointly chosen a course of action. For example, within the agreements reached for the EMS, none designated or created a central bank, yet the FRG Bundesbank has acted as a lender of last resort.⁸⁴ Here, a state took an action jointly that it would not have taken unilaterally, for the sake of stable exchange rates (which creates a stable, predictable industrial market in Europe).⁸⁵ A state can also take action in support of a joint obligation that would otherwise be too domestically unpopular to perform.⁸⁶ That is because States will try to act consistently, in their domestic affairs and in their conduct generally, with the international commitments they make.

II. INTERNATIONAL COMMUNITY

A. Assistance Agencies for Nuclear Operations or Waste Cleanup⁸⁷

Agencies and treaties from the international community described here will be used in the model developed in Part V. Groups

83. SASSE ET AL., *supra* note 13, at 264-66.

84. John Baker & Martin Kolinsky, *The State and Integration, in THE CONDITION OF STATES* 116 (Cornelia Navari ed., 1991). Germany, with its strong Deutschmark, can stabilize currency in weaker economies, like that of Italy, with a positive carry-over effect throughout Europe. *Id.*

85. *Id.*

86. This is the technique of criticism diffusion by blaming the joint pact for voluntary state action. *Id.*

87. The agencies and organizations singled out here are the tip of the assistance iceberg. Obvious omissions from the discussion below include CERN, the European research arm, the British Nuclear Structures research group, and INPO, the U.S. Institute of Nuclear Operations,

which realistically would be adopted or used in a non-adversarial manner by the CIS are included, but this list is not meant to exclude any others which could help improve the margin of safety of reactor operations, or cleanup radioactive waste. Although many other groups can act in an oversight or compliance-assurance capacity, the true solution to these problems requires maximum cooperation among the parties to the agreements.

Several international agencies provide guidance and technical assistance to assure safe operation of nuclear power plants as well as to assure the safety and health of the world's population. Some of these are divisions of the United Nations, such as the International Atomic Energy Agency ("IAEA") and the World Health Organization ("WHO"), that have acted in the past along with other UN groups such as the United Nations Scientific Committee on the Effects of Atomic Radiation ("UNSCEAR").

Additional non-governmental organizations ("NGOs") have been important contributors during the post-Chernobyl assessment and assistance efforts in the CIS.⁸⁸ These include the World Association of Nuclear Operators ("WANO"), the Organization for Economic Co-operation and Development Nuclear Energy Agency ("OECD/NEA"), and the International Commission on Radiological Protection ("ICRP").

The IAEA was formed by the UN General Assembly in 1957. Its charter seeks to assure that atomic energy contributes to world peace, health, and prosperity, and to provide assistance, so long as no military application is made from its assistance.⁸⁹ The IAEA helps developing countries with their nuclear power programs, providing

all of which provided aid and advice to the former Soviet Union following Chernobyl, as well as a variety of government agencies from countries worldwide. Those groups included here are examples of international assistance to the CIS and are not intended to reflect the limits of potential sources of assistance.

88. For a thorough discussion of the significant role NGOs play in creating change in international laws, see A. Dan Tarlock, *The Role of Non-Governmental Organizations in the Development of International Environmental Law*, 68 CHI.-KENT L. REV. 61 (1992). The significant omissions from the NGOs suggested here include Greenpeace, the Green Party, and other environmental activist groups. Their omission does not mean they are not part of the solution, as, on the contrary, part of the credit for the major political change creating the CIS has been pressure from these groups. See Potter, *supra* note 5, at 61. However, these groups are not part of the coalition that would be called on to implement the changes suggested here, as these groups desire an end to the nuclear program in the CIS. *Id.*

89. 1 THE EUROPA WORLD YEAR BOOK 1992, at 61 (1992) [hereinafter YEAR BOOK]. The IAEA Statute was passed in 1956 and came into force July, 29, 1957. 20 YEARS INTERNATIONAL ATOMIC ENERGY AGENCY: 1957-1977, at 5 (1978).

technical assistance, site assessment visits, and radioactive waste management advice.⁹⁰

The IAEA provides a significant contribution toward nuclear safety by maintaining an incident reporting system, to assure that neighboring countries receive timely reports of incidents, which fall into distinct reporting levels with over 60 significant criteria.⁹¹ The IAEA is also charged with maintaining international safeguards for nuclear operations.⁹² This includes making site inspections to signatories of international agreements related to safeguards, and other inspections as required by the U.N. General Assembly.⁹³

Despite the IAEA's mission, and the assistance it has already provided following Chernobyl, Ukraine's Minister for Environmental Protection does not believe enough has been done.⁹⁴ He believes the IAEA has taken the position of "disinterested observers or [they] even oppose attempts to heal the nuclear wound on the body of our country."⁹⁵ Thus the IAEA is not perceived by all interested officials as supporting the goal of waste cleanup.

The WHO has as its goal the attainment of the highest health levels for all the world's people.⁹⁶ In their United Nations public health monitoring and advisory role, the WHO is worried about environmental pollution, including radioactive waste.⁹⁷ The WHO's objectives include tracking radioactive exposure for radiation workers and the public at large.⁹⁸ They also make recommendations for the

90. YEAR BOOK, *supra* note 89, at 61.

91. *Id.* at 61-62. By standardizing reporting criteria, neighboring countries can better appreciate the level of emergency created by a reactor accident, and know whether it is necessary to shelter or evacuate their people.

92. *Id.* at 62.

93. *Id.* North Korea signed the Non-Proliferation of Nuclear Weapons Treaty (NPT), and had therefore authorized IAEA inspections to assure nuclear material is not used for other than peaceful purposes. North Koreans denied IAEA members access to their site at Yongbyon, claiming it could not be inspected as it was not on the IAEA's published list of plants to be inspected, and also claimed it was a military base rather than a nuclear installation. *North Korea: IAEA Not Allowed to See Suspected Nuclear Site*, NUCLEAR NEWS, Mar. 1993, at 77-78. The IAEA also performed safeguards inspections in Iraq, and found Iraq had violated provisions of the U.N. Security Council's mandates for information on weapons of mass destruction. YEAR BOOK, *supra* note 89, at 62.

94. Yuriy Kostenko, *Ten Tonnes of Radioactive Death*, reprinted in *Ukraine: Ukrainian Minister on Chernobyl Project; Criticizes IAEA*, BBC Monitoring Service, Aug. 6, 1993, available in WESTLAW, INT-NEWS Database.

95. *Id.* Kostenko also says the IAEA is of the opinion that Ukraine does not need assistance to help it out of its ecological problems, and that they are merely trying to profiteer from their plight.

96. YEAR BOOK, *supra* note 89, at 85.

97. *Id.* at 86.

98. See WORLD HEALTH ORG., NUCLEAR POWER: MANAGEMENT OF HIGH LEVEL RADIOACTIVE WASTE 1 (1982). A recent WHO-sponsored study concluded no increase in leukemia

long-term safe storage of radioactive waste materials, because of the adverse health consequences associated with improper storage.⁹⁹

UNSCEAR summarizes and evaluates reports made by U.N. member states and agencies.¹⁰⁰ UNSCEAR is based in Vienna and holds annual conferences where scientists help to evaluate data from, for example, the International Chernobyl Project.¹⁰¹ UNSCEAR distinguishes itself from the IAEA, because while the IAEA's mandate is to "promote peaceful use of nuclear energy," UNSCEAR's mission is to study "the dangers."¹⁰²

WANO is an industry group supported by member utility operators from around the globe.¹⁰³ Their projects include peer-review visits, where experienced operators from sister plants can observe practices, suggest improvements, and publicize good practices to other operators.¹⁰⁴

OECD's activities can be traced to 1960, while OECD/NEA started in 1972 as the European Nuclear Energy Agency, which has expanded membership to include Australia, Canada, Japan and the United States.¹⁰⁵ They are specifically interested in "furthering the development of nuclear power as a safe, environmentally acceptable and economic energy source."¹⁰⁶ OECD/NEA has cooperative agreements to closely collaborate with the IAEA and Euratom because all three groups have similar roots: nuclear weapons non-proliferation.¹⁰⁷

The ICRP is an international radiation standards setting agency.¹⁰⁸ Recommendations from the ICRP are the basis for the lat-

has been found as a result of Chernobyl seven years after the accident. *Late News in Brief*, NUCLEAR NEWS, June 1993, at 22.

99. WORLD HEALTH ORG., *supra* note 98, at 1.

100. William Branigin, *Once Created, Agencies Refuse to Just Fade Away; Many Offices Hanging on Despite Seeming Obsolescence*, WASH. POST, Sept. 20, 1992, at A27.

101. *Id.*

102. *Id.*

103. E. Michael Blake et al., *Reviewing 50 Years of Nuclear History*, NUCLEAR NEWS, Jan. 1993, at 56, 68.

104. *Id.* A recent report documents results of an exchange visit between nuclear plant operators from Georgia Power's Hatch Plant and Rosenergoatom's Smolensk Atomic Energy Station. See Amy Sproles, *The Hatch-Smolensk exchange*, NUCLEAR NEWS, Mar. 1993, at 35.

105. Nuclear Energy Agency, Org. for Economic Co-operation and Dev., *Foreword*, in NUCLEAR L. BULL., June 1992, at i. Member states include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States, with Yugoslavia having special member status. OECD came into being in 1960 by the Paris Convention, which came into force September 30, 1961, creating the OEEC European Nuclear Energy Agency. *Id.*

106. *Id.*

107. Riley, *supra* note 43, at 308.

108. *NRPB Wants Radon Action Level Halved*, NUCLEAR NEWS, Mar. 1990, at 56.

est proposed revisions of EC radiation standards, which the Commission says reflect the "most advanced knowledge" on these issues.¹⁰⁹ The ICRP has four standing committees, which include invited scientific experts from around the world, and establishes work programs in areas of international concerns.¹¹⁰

B. *International Treaties*

1. IAEA Notification and Assistance Treaties

Following Chernobyl, the IAEA went to work on the information roadblocks that exacerbated the Chernobyl disaster. Lack of information from the Soviet Union prevented other countries, and citizens within the Soviet Union, from taking the appropriate rapid protective action necessary to avoid the fallout downwind from the Chernobyl plume.¹¹¹ Lack of openness about the accident delayed getting needed resources to the site which could have aided in mitigating and monitoring the effects of the accident. Finally, lack of standardized reporting methods and criteria meant that a person in a different country with an understanding of different nuclear technology, even with notice of a significant nuclear event, would not understand the severity of the accident.¹¹²

The first such agreement, Early Notification of a Nuclear Accident ("The Early Notification Agreement") required prompt notification of other IAEA member states, and neighboring states where the accident has or may result in a radioactive release.¹¹³ The Early Notification Agreement then outlines the type of information the IAEA is charged with providing to other states.¹¹⁴

109. *EC Commission: Energy Plans for 1993*, Europe Information Service, Jan. 22, 1993, available in LEXIS, Energy Library, ALLNWS File.

110. *New Chairman of ICRP Named*, INSIDE N.R.C., Jan. 11, 1993, at 16.

111. See GRIGORIY MEDVEDEV, *CHERNOBYL NOTEBOOK* 31-54 (1989).

112. The Guidelines on Reportable Events were actually published in 1984. A. O. ADEDE, *THE IAEA NOTIFICATION AND ASSISTANCE CONVENTIONS IN CASE OF A NUCLEAR ACCIDENT* 183 (1987). The post-Chernobyl conference was an opportunity to emphasize the use of standardized criteria for reporting events. These created a series of classification levels, such as in-progress radiological releases, potential release, or no potential for release, so all member nations hearing the report could take action appropriate to the severity of the event.

113. *Id.* This convention was adopted on September 26, 1986, and entered into force October 27, 1986, and 39 parties have ratified their consent to this treaty as of late 1992. A good source for an overview of liabilities treaties is NUCLEAR ENERGY AGENCY, *ORG. FOR ECONOMIC CO-OPERATION AND DEV., THIRD PARTY LIABILITY* (1990) [hereinafter *THIRD PARTY LIABILITY*].

114. ADEDE, *supra* note 112, at 160-61. In addition, this is passed onto members, and relevant organizations, so expectations are made clear to future potential senders and recipients as to what information should be forthcoming.

The Convention on Assistance in the Event of a Nuclear Accident or Radiological Emergency was designed to coordinate offers of assistance and requests for aid, through the IAEA, to designated state organizations.¹¹⁵ In the event assistance is offered, the agreement then standardizes considerations for the requestor and the offeror.¹¹⁶ This assures that appropriate assistance, both quantity and expertise, is provided to combat the type of accident which occurred.

2. Liability

The last revision of the Vienna Accord from the IAEA is the latest attempt to reconcile different international treaties on third party liability.¹¹⁷ One key element of this accord is the elimination of proof of operator fault in order for a claimant to obtain a damage award.¹¹⁸ The other purpose of this accord was to assure that members of different conventions were not isolating themselves, due to a member of the original Vienna convention not having a treaty-based cause of action for civil liability against a member of the Paris convention.¹¹⁹ The Vienna Accord is awaiting ratification by several members.¹²⁰

115. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, *opened for signature* Sept. 26, 1986, 25 I.L.M. 1377 (entered into force Feb. 26, 1987). It has been ratified by 34 parties. INT'L ATOMIC ENERGY ASS'N, BILATERAL, REGIONAL AND MULTILATERAL AGREEMENTS RELATING TO COOPERATION IN THE FIELD OF NUCLEAR SAFETY 520 (1990). It should be noted that 31 countries refused to be bonded by the dispute resolution methods provided. Those countries are: Algeria, Bulgaria, Byelorussia Soviet Socialist Republic (now Belarus), China, Cuba, Czechoslovakia, Democratic People's Republic of Korea, Egypt, France, German Democratic Republic and Federal Republic of Germany (now Germany), Greece, Hungary, India, Indonesia, Iraq, Ireland, Israel, Malaysia, Monaco, Mongolia, Norway, Poland, South Africa, Thailand, Turkey, Ukrainian Soviet Socialist Republic (now Ukraine), United Arab Emirates, Union of Soviet Socialist Republics, United States and Viet Nam. *Id.* at 521-43.

116. ADEDE, *supra* note 112, at 169-72. This includes whether the aid is cost-free, medical aid versus equipment and personnel, and liability for loss or damage of equipment or personnel. *Id.*

117. *Accord on Nuclear Liability Comes into Force*, Reuters, Apr. 27, 1992, available in LEXIS, News Library, Wires File. The new treaty, the Vienna Protocol, brings the Vienna Convention of 1963 into line with the Paris Convention of 1960. The Vienna Protocol was originally adopted on September 2, 1988, and entered into force on April 27, 1992, after it was signed by Denmark, Italy, the Netherlands, Norway, and Sweden. THIRD PARTY LIABILITY, *supra* note 113, at 17.

118. *Accord on Nuclear Liability Comes into Force*, *supra* note 117.

119. *Nuclear: Civil Liability Protocol Enters into Force*, Europe Information Service, May 8, 1992, available in LEXIS, Energy Library, ALLNWS File.

120. *Accord on Nuclear Liability Comes into Force*, *supra* note 117.

3. Nuclear Non-Proliferation Treaties Today

The latest post-START round of Non-Proliferation Agreements with CIS members has centered on eliminating weapons of mass destruction. After Belarus agreed to rid itself of nuclear weapons, the United States entered into a new Non-Proliferation Treaty with that republic in late 1992.¹²¹ The implementing agreements for this treaty include provisions for environmental restoration of the former weapons handling facilities.¹²² The U.S. Department of Defense is providing up to \$25 million (U.S.) for "all material, training and services provided pursuant to this agreement. . . ."¹²³

4. Funds from G-7

The G-7 have pledged funds for nuclear waste cleanup and has expressed interest in improving reactor safety within the CIS.¹²⁴ To help coordinate assistance to the CIS from the G-7, the G-7 have agreed to create an embassy-level organization.¹²⁵ This coordinating arm is to set up base in Moscow in late 1993.¹²⁶

121. Agreement Concerning Emergency Response and the Prevention of Proliferation of Weapons of Mass Destruction, Oct. 22, 1992, U.S.-Belarus, 32 I.L.M. 275. This was encouragement for joining with the other weapons-holding states to rid themselves of nuclear arms, as occurred in the Agreement of Alma Ata. *State Commonwealth Born in Alma Ata*, CURRENT DIG. SOVIET PRESS, Jan. 22, 1992, available in LEXIS, World Library, CDSF File.

122. Agreement Concerning the Environmental Restoration of Former Strategic Rocket Forces Facilities and Sites to Promote the Prevention of Proliferation of Weapons of Mass Destruction, July 22, 1993, U.S.-Belarus, 32 I.L.M. 1688.

123. *Id.* at art. III. A variety of other pledges have been made as rewards for destruction of the CIS nuclear arsenal. For example, U.S. aid to Kazakhstan was increased by \$91 million (U.S.) to a total of \$396 million (U.S.) after President Nursultan promised to join the Nuclear Non-Proliferation Treaty. *Clinton Raises U.S. Aid to Kazakhs to \$396 Million*, Reuters, Feb. 14, 1994, available in LEXIS, News Library, Wires File. President Clinton also offered \$85 million to help Kazakhstan dismantle their nuclear weapons. *Id.* Kazakhstan then signed an agreement with the Japanese, where Japan committed to divide \$100 million (U.S.) among the four nuclear weapons-holding republics, to help them rid themselves of the weapons. *Kazakhstan: Kazakhstan Signs Agreement with Japan on Elimination of Nuclear Weapons*, BBC Monitoring Service, March 12, 1994, available in WESTLAW, INT-NEWS-C Database. Ukraine has also joined the weapons for cash program, having agreed to accept \$235 million (U.S.) in U.S. aid to dismantle their missiles and clean up the missile silos (\$185 million), to convert some defense industry to civilian use (\$40 million) and for security and control for the nuclear weapons while they are in Ukraine. *Ukraine: U.S. Gives Ukraine \$100 Million to Scrap Warheads*, Reuter General News, Mar. 21, 1994, available in WESTLAW, INT-NEWS Database.

124. *Nuclear Aid to Eastern Europe Has Reached \$375 Million*, NUCLEAR NEWS, Jan. 1993, at 91. G-7, or the Group of Seven Industrialized Nations, includes Canada, France, Germany, Great Britain, Italy, Japan, and the United States. The addition of Russia as a partial member has caused the coining of the phrase, "G-7-plus-one." *International Economics, Russia Given Expanded Role with G-7 as Non-Member Political Participant*, BNA Daily Report for Executives, June 24, 1994, available in LEXIS, News Library, CURNWS File.

125. *G-7 to Set Up Russia Aid Office in Sept.*, JIJI Press, Aug. 11, 1993, available in LEXIS, News Library, Wires File.

126. *Id.*

C. Summary of International Community Assistance

Many agencies and many nations have started working hard to resolve problems in the CIS each see as important. Interagency and interstate coordination is in its infancy, despite the wide variety of resources offered. International agencies and agreements exist that can help guide safe reactor operation and waste cleanup, but they are not self-implementing. Finally, most funds have gone to dismantle the nuclear weapons threat, with the greatest results achieved thus far in Belarus, but with some commitment from all four nuclear weapons-holding nations to comply with weapons reduction plans.

III. STATE OF THE FORMER UNION

A. Nuclear Waste

The attitude toward the harmful potential for nuclear waste was voiced by the director of the Energy Physics Institute, who said in 1984, "[t]he waste from nuclear power engineering, which is potentially very hazardous, is so compact that it can be stored at places isolated from the external environment."¹²⁷ Actions, however, speak louder than words. According to Andrei Zolotkov, a radiation safety engineer of the Murmansk Shipping Company, ships continued to dump reactor cores in the Arctic Ocean through 1991.¹²⁸ One estimate of resulting contamination levels exceeds one billion curies, although Russians have only disclosed dumping 2.5 million curies of radioactive material, including expended reactor cores, at sea.¹²⁹

At a nuclear weapons complex in the Siberian steppes, the human toll is more evident.¹³⁰ At a lake on the steppes' site, according to American physicist Thomas Cochran, a discharge pipe is emitting ra-

127. A. Sakharov, *Preface to MEDVEDEV*, *supra* note 111, at 2.

128. Patrick E. Tyler, *Soviets' Secret Nuclear Dumping Causes Worry for Arctic Waters*, N.Y. TIMES, May 4, 1992, at A1. The Russian government's Committee of Nuclear Waste Disposal at Sea, formed in response to these claims, confirmed that 17 reactors from seacraft had been disposed of in the Arctic. *Ship Reactor Disposal in Arctic Confirmed*, NUCLEAR NEWS, Mar. 1993, at 79, 79.

129. *Report Tallies Vessels, Waste Dumped in Arctic*, NUCLEAR NEWS, Dec. 1993, at 62, 62; William J. Broad, *Russians Describe Extent of Dumping Nuclear Waste*, N.Y. TIMES, Apr. 27, 1993, at A1; Paul Hoversten, *Panel to Probe Nuclear Pollution of Arctic Ocean*, USA TODAY, Aug. 15, 1992, at 3A. A curie is a common unit of radioactivity, equalling 3.7×10^{12} disintegrations per second. See 10 C.F.R. § 20.5 (1993).

130. Earl Lane & Daniel Sheehan, *Russia's Chilling Secret: Radioactivity Takes Its Deadly Toll near a Nuclear Arms Complex*, NEWSDAY, Mar. 17, 1992, Discovery, at 57. The U.S. Federal weapons production facilities are also known ecological and radiological disaster zones, which in years past have been beyond the reach of laws applied to states and the public. The state of the law was discussed in the American Bar Association's Nineteen Annual Conference on the Environment. Mark C. Schroeder et al., *Regulation of Nuclear Materials: Should National Defense*

diation levels high enough to be lethal if exposed for one hour.¹³¹ Russian scientists estimate there are at least 500,000 tons of radioactive solid waste buried around the site, and because burial registration did not start until 1980, the location of specific burial sites is unknown.¹³² Because of reported work practices on the weapons site—dumping in streams supplying local villages—an estimated 437,000 people have received harmful doses of radiation from the site.¹³³ Over twenty-five tons of plutonium is still stored at the site, intended for power and submarine propulsion reactors.¹³⁴ Also stored there are 400 million cubic meters of liquid nuclear wastes containing an estimated 600 million curies of radioactive materials.¹³⁵ The extensively contaminated ground waters from this site feed three Siberian rivers (the Iset, Irtysh and Ob) which drain into and will contaminate the Arctic Ocean.¹³⁶ Waste contamination in ground water respects no borders.¹³⁷

B. Peace Bombs

From the 1960s through the 1980s, the Soviet Union reportedly set off 126 nonmilitary nuclear explosions.¹³⁸ In the drive to maintain superpower status, these explosions were created to serve a variety of industrial purposes. Below-ground explosions were detonated for seismic testing, enhanced oil and gas recovery, and to create subterranean caverns for toxic waste storage.¹³⁹ Above-ground explosions were set off as part of dam construction projects and open pit mining of coal and diamonds.¹⁴⁰ A corporation was even reportedly set up with its mission to contract with foreign governments who wished to pay hard currency to have their dangerous wastes destroyed: the So-

and Other National Policies Override State Standards?, in *FEDERAL VERSUS STATE ENVIRONMENTAL PROTECTION STANDARDS* 6-13 (1991).

131. Lane & Sheehan, *supra* note 130, at 57.

132. *Id.*

133. *Id.*

134. Daniel Sneider, *Baker Focuses On Atomic Waste in Visit to Urals*, *CHRISTIAN SCI. MONITOR*, Feb. 13, 1992, *The World*, at 1.

135. *Id.*; Hoversten, *supra* note 129.

136. Sneider, *supra* note 134, at 1.

137. EDITORS OF *HARV. L. REV.*, *TRENDS IN INTERNATIONAL ENVIRONMENTAL LAW* 9 (1992) [hereinafter *TRENDS IN INTERNATIONAL ENVIRONMENTAL LAW*]. This concept is so fundamental, however, it is difficult to attribute it to a single source.

138. Steve Raymer, *Nuclear "Hot Spots" Dot Russia*, *HOUS. CHRON.*, Mar. 2, 1992, *Discovery*, at 6.

139. *Id.*

140. *Id.*

viet government would be the willing provider of commercial nuclear explosions.¹⁴¹

The explosions left extensive contamination from the by-products of the nuclear chain reactions. Twenty-six explosions were set off along the Volga River basin and at least seven in salt domes near the Caspian Sea.¹⁴² Not only can river-borne waste be carried to the sea, but over time the salt domes push lower layers of salt towards the earth's (river's) surface, and with it the radioactive contamination caused by the explosions.¹⁴³

C. Chernobyl

About fifty tons of fuel from the Chernobyl Unit 4 Reactor were dispersed into the atmosphere when the reactor exploded.¹⁴⁴ An additional seventy tons of fuel were deposited in the immediate area surrounding the site.¹⁴⁵ About fifty tons of fuel remained in the vicinity of the reactor itself, later to be enclosed in a concrete sarcophagus.¹⁴⁶ Of the fifty million curies of long-lived radioactive fallout

141. Peter Zheutlin, *Dangerous Deal, the Nuclear Entrepreneurs*, HOUS. CHRON., Dec. 3, 1991, at A15.

142. Steve Raymer, *Nuclear Horrors in Russia, "Peaceful" Bombs Leave Fatal Legacy*, ATLANTA CONST., Jan. 31, 1992, at A1.

143. Clair Shipman, *Former Soviet Union Pays Consequences of Nuclear Use*, Cable News Network, Feb. 15, 1993, available in LEXIS, News Library, CURNWS File.

144. MEDVEDEV, *supra* note 111, at 22. Some background is given here on the reactor and the events leading to the explosion at Chernobyl Unit 4. The RBMK reactor core is 14 meters in circumference by 7 meters high. *Id.* at 9. The reactor is housed in a warehouse-like structure, with no sealed barrier other than the reactor itself between the fuel and the environment; containment is provided only around piping leaving and entering the reactor. The reactor is filled with fuel bundles in isolated tubes surrounded by graphite. *Id.* at 9-10. Channels in the graphite allow for insertion of neutron-absorbing control rods, which are inserted to shut down the nuclear chain reaction and withdrawn to increase the reactor's power. *Id.* at 10. A minimum number of control rods must remain fully inserted at all times to assure the remaining rods can adequately control the fuel in the reactor. *Id.* The neutron-absorbing control rods contain boron, but also have a graphite end-follower to displace water when the control rod is not fully inserted. *Id.* at 16. Water channels pass through the core, removing the heat produced by the reactor, and producing steam for the electricity-generating turbines. The presence of water also helps to slow the nuclear chain reaction, by preventing some neutrons from reaching adjacent fuel bundles. Should this water become overheated and form steam, the effect in this reactor type is to increase the number of neutrons available for the nuclear chain reaction. An experiment to check the affects of a loss of site power resulted in staging the initial conditions needed for the accident. *Id.* at 9. To assure the experiment was not interrupted, safety systems were overridden. *Id.* at 11. To meet a last minute change in grid-power needs, an excessive number of control rods were withdrawn. *Id.* at 16. Then when the experiment was started, operators failed to recognize they had created the conditions needed to form steam in the reactor water channels when there were not enough control rods inserted to shut the reactor down. *Id.* at 19. Operators tried to rapidly shut down the reactor and actually increased reactor power to accident levels because of the rapid insertion of the graphite end-followers into the core. *Id.* at 20. The rapidly increasing self-sustaining chain reaction lead to the explosion. *Id.* at 20-22.

145. *Id.* at 22.

146. *Id.* at 23; Mike Edwards, *Chernobyl*, NAT'L GEOGRAPHIC, Aug. 1994, at 100, 104.

released from the 1986 disaster, an estimated twenty million curies were deposited in the Ukraine, Byelorussia (now Belarus) and western Russia.¹⁴⁷ About 76,000 square kilometers were contaminated with cesium-137 to levels between one and five curies per square kilometer, and 28,100 square kilometers were contaminated above five curies per square kilometer, affecting some four million residents.¹⁴⁸

By 1991, Soviet authorities planned to have completed evacuation of 189,000 residents from the zones most severely affected.¹⁴⁹ It took until 1990 for surveys to be performed to determine that evacuation of 73,000 of these people was warranted.¹⁵⁰ Compulsory resettlement only occurred where exposure levels may be above five millisieverts.¹⁵¹ The basic aim was for members of the general population not to receive more than five millisieverts in 1991, and one millisievert per year thereafter, if permitted by economic and social conditions.¹⁵² In Russia, victims of the Chernobyl accident receive 300 rubles per month (about \$3.50 (U.S.) as of June 1992), or one-third the minimum monthly pay.¹⁵³

147. MURRAY FESHBACH & ALFRED FRIENDLY, JR., *ECOCIDE IN THE USSR: HEALTH AND NATURE UNDER SIEGE* 12 (1992).

148. Nuclear Energy Agency, Org. for Economic Co-operation and Dev., *Extracts From an Information Note on the Economic and Social Consequences of the Accident at the Chernobyl Nuclear Power Plant, Submitted by the Delegations of the Union of Soviet Socialist Republics, the Byelorussian Soviet Socialist Republic, and the Ukrainian Soviet Socialist Republic to the July 1990 Session of the Economic and Social Council of the United Nations*, NUCLEAR L. BULL., Dec. 1990, at 92, 92 [hereinafter *Economic and Social Consequences of Chernobyl*].

149. *Id.* at 97.

150. *Id.* at 95, 97.

151. Millisievert ("mSv"), where 1 mSv = 100 mRem ("Rem" stands for Roentgen Equivalent Man). Both Rem and Sv are expressions of dose equivalent, where an absorbed dose of ionizing radiation is adjusted for its damaging impact on one gram of human tissue. F. WILLIAM WALKER, ET AL., GENERAL ELECTRIC CO., *CHART OF THE NUCLIDES* 57 (13th ed. 1984). The general public is limited in the U.S. to a total accident dose of less than 25 Rem, following the passage of the plume in the Low Population Zone outside the affected plant. See 10 C.F.R. § 20.4 (1993); 10 C.F.R. § 100.11 (1993); 56 Fed. Reg. 23, 360 (1991); INTERNATIONAL ATOMIC ENERGY AGENCY, *THE INTERNATIONAL CHERNOBYL PROJECT: ASSESSMENT OF RADIOLOGICAL CONSEQUENCES AND EVALUATION OF PROTECTIVE MEASURES* 19 (1991) [hereinafter *INTERNATIONAL CHERNOBYL PROJECT*]. More specific radionuclide evacuation criteria included Cesium-137 levels exceeding 40 Ci/km², where cesium contamination is between 15 and 40 Ci/km², or strontium-90 levels above 3 Ci/km², or plutonium 239 or 240 levels above 0.1 Ci/km². Nuclear Energy Agency, Org. for Economic Co-operation and Dev., *General Legislation: Act on Social Protection of Citizens Suffering Damage Due to the Chernobyl Disaster (1991)*, NUCLEAR L. BULL., Dec. 1991, at 50, 51-52 [hereinafter *Social Protection*]; see also, Social Defence Law of the People Affected by Chernobyl Catastrophe in the Republic of Belarus, Feb. 22, 1991. For similar legislation in Ukraine, see UN CONFERENCE ON ENV'T'L DEV., *UKRAINE NATIONAL REPORT* 12 (1992) [hereinafter *UKRAINE NATIONAL REPORT*]; Nuclear Energy Agency, Org. for Economic Co-operation and Dev., *Legislation on Protection of the Public After the Chernobyl Accident (1991)*, NUCLEAR L. BULL., Dec. 1993, at 68.

152. *Social Protection*, *supra* note 151, at 51.

153. *Russia to Increase Compensation to Chernobyl Victims*, Reuters, June 18, 1992, available in LEXIS, News Library, Wires File.

Although the official initial death toll was thirty-one, Ukrainian officials have made unsubstantiated claims that between six and eight thousand people died as a result of Chernobyl.¹⁵⁴ The Ukrainian government has stated they desire to close the remaining operating units at the Chernobyl site in 1993.¹⁵⁵ However, Ukraine had a shortfall in electrical generating capacity and restarted two of the Chernobyl units to survive the 1992-93 winter, and has since suspended their shutdown commitment.¹⁵⁶

Sixteen RBMK (Chernobyl-style) reactors are located in Russia, Lithuania and Ukraine.¹⁵⁷ Although some safety improvements have been made, the most significant step needed to reduce public risk in the event of a reactor accident has yet to be taken: the building of reactor containments.¹⁵⁸ The new republics may have difficulty raising the tens of millions of dollars needed to erect containment structures that would meet western standards.¹⁵⁹

D. Reactor Safety

The IAEA sent a team of visiting experts to assess the condition of a site containing four VVER-440 type reactors in Bulgaria. Their assessment was summarized by finding the plants were "in very poor condition, with a number of safety-relevant deficiencies."¹⁶⁰ The same mid-1970s Soviet-designed vintage plants are presently in use in other Eastern European countries.¹⁶¹ Although this reactor design is more

154. Ron Popeski, *Chernobyl Staff Unhappy About Closure Plans*, Reuters, Aug. 14, 1992, available in LEXIS, News Library, Wires File. For a balanced view in light of "Chernobylphobia," see INTERNATIONAL CHERNOBYL PROJECT, *supra* note 151. The IAEA and WHO have found that the accident was not the source of wide-spread mortality for the population at large, rather the psychological damage is the lasting predominant health effect. *Id.* at 9, 23.

155. Popeski, *supra* note 154; see also UKRAINE NATIONAL REPORT, *supra* note 151 at 39-40.

156. *Ukraine to Restart Two Chernobyl Reactors*, Reuters, Oct. 1, 1992, available in LEXIS, News Library, Wires File. The deadline was made less certain when the Ukrainian parliament lifted the commitment to shutdown the Chernobyl units by the end of 1993. Natalia Feduschsak, *Chernobyl Safety Fears Grow as Ukraine Reverses Decision to Shut Nuclear Plant*, WALL ST. J., Mar. 4, 1994, at B5C. The IAEA estimated 25% of Ukraine's power in 1992 was from nuclear plants. *Nuclear Power Contributions in 1992*, NUCLEAR NEWS, June 1993, at 53.

157. *Safety Measures Needed for Chernobyl-Type Reactors*, Reuters, Apr. 10, 1992, available in LEXIS, News Library, Wires File.

158. Mark Trevelyan, *Western Experts to Test CIS Chernobyl-Type Plants*, Reuters, Mar. 6, 1992, available in LEXIS, News Library, Wires File.

159. *Id.*; see also *Upgrading E. Bloc Reactors Would Cost Blns—Expert*, Reuters, Mar. 24, 1992, available in LEXIS, News Library, Wires File (a Siemens AG expert estimated it would cost some 14 billion marks (DM) to upgrade East European Reactors to western standards).

160. Simon Rippon, *Comment from Europe: Just How Bad Are Those Early Reactors?*, NUCLEAR NEWS, Sept. 1991, at 74, 74.

161. *Id.*

inherently safe than RBMK reactors, the lack of an integrated containment, segregated wiring, and adequate emergency makeup systems means they fall short of western standards for reactor safety.¹⁶² There are three broad areas to discuss: maintenance, broadcasting requirements under an emergency plan, and continued operation of the RBMK, which precede a description of the present state of reactor safety and safety oversight.

1. Maintenance

A major concern with on-going safe operation of civilian nuclear power plants is continuing maintenance. Critical to that maintenance is a continuous supply of spare parts. Recall the lines for daily necessities that were common to everyday life in the USSR; why should access to critical parts for power plant operation be any different? According to Dr. William Potter, director of Russian Studies at the Monterey Institute of International Studies, “[t]hey are not able to provide even the former sloppy levels of maintenance and they can’t get spare parts, especially in the Ukraine.”¹⁶³

2. Broadcasting Problems—the Emergency Plan

Public relations also appears to be a problem, although, in the post-Chernobyl era, Russians are doing a better job of announcing reactor malfunctions. Following a leak from an RBMK reactor at Sosnovy Bor, the Russian Ministry for Atomic Energy’s head of information made the following reassuring remarks: “[w]e are perfectly aware of our shortcomings. . . . The quality of our construction is not good at times, but it does not have anything to do with the design of reactors.”¹⁶⁴ The Sosnovy Bor incident was caused by water-supply valve failure (feeding channels which were undergoing refueling), causing local overheating of fuel, with a resulting escape of radioactive

162. *Id.* Considerations for what makes one reactor design more inherently safe than another include factors such as reactor physics design, independently powered and housed safety systems available to mitigate the consequence of an accident, the amount of operator involvement required to prevent an accident (availability and capability of automatic systems), and the number and sufficiency of barriers between the nuclear fuel and the public. Although there is no absolute agreement among all nations as to what are minimum safety requirements, standards in the above-listed areas have been applied in Europe, Japan and the United States.

163. Alan Elsner, *Experts Say U.S. Ignored Soviet Reactor Safety*, Reuters, Mar. 24, 1992, available in LEXIS, News Library, Wires File. Dr. Potter has also noted that not only is parts availability low, but repairs are being delayed due to a lack of funds to purchase additional parts. Potter, *supra* note 5, at 65.

164. Janet Guttsman, *Russia Will Keep Chernobyl-Style Reactors Running*, Reuters, Mar. 26, 1992, available in LEXIS, News Library, Wires File.

gases.¹⁶⁵ In contrast to the Chernobyl accident, this incident (a radioactive leak to the atmosphere below hazardous levels) was quickly announced to the international community on the morning of its occurrence.¹⁶⁶

The improved communications with the international community and with their sister stations is reassuring, as the other stations can now assess the likelihood of a similar failure, and if parts are available, replace the defective water-supply valves at their plants. Added assurance of rapid notification of reactor incidents will come from a nuclear safety monitoring center being established in Finland to monitor nuclear plants in the former Soviet states, providing information to Germany, and all Nordic countries.¹⁶⁷

3. RBMK Reactors: Unsafe at any Speed?

Although the U.S. Nuclear Regulatory Commission ("NRC") has provided technical and logistical support to CIS republics to make improvements toward safe reactor operations, senior NRC officials may not provide future support for RBMK reactors.¹⁶⁸ It has been suggested that NRC officials believe the fundamental design is unsafe, and the NRC does not wish to be viewed as sanctioning their operation.¹⁶⁹

The suggestion that RBMK reactors are inherently unsafe has been challenged by Russian designers who claim that attempts to shutdown the reactors are politically motivated.¹⁷⁰ Responding to Ukrainian suggestions the reactors were unsafe, and therefore will be shutdown next year, Yuri M. Cherkashov countered that if the reactors were really unsafe, they should be shutdown immediately, not next year.¹⁷¹ However, conscious that there are some design flaws, post-Chernobyl improvements have been made to RBMKs, including

165. *Id.*; Marshall Elliot, *Western Leaders Disagree on Soviet Reactor Safety Plan*, Sci., July 17, 1992, at 319.

166. *Id.*

167. *Former Soviet Nuclear Stations to be Monitored from Finland*, Reuters, Aug. 25, 1992, available in LEXIS, News Library, Wires File.

168. *Ensuring Nuclear Safety in Russia, An International Concern*, SURVIVING TOGETHER, Spring 1992, at 21, 21.

169. *Id.*

170. E. Michael Blake, *Advice from Outsiders on Soviet-Design Reactors*, NUCLEAR NEWS, Jan. 1993, at 71, 71.

171. *Id.* Cherkashov is with ENTEK, the Russian research and development institute of power engineering.

changes in operations and fuel loading procedures to increase the margin of safety.¹⁷²

4. Initial Steps Toward Safe Reactors

To address international concern for its reactors, Russia has stated a goal: to modernize its operating nuclear power plants, with safety being the center focus of future nuclear energy development.¹⁷³ However, the Russian Ministry of Atomic Energy (“Minatom”) has been unclear about the sources of funding to meet the goals.¹⁷⁴ Russians and Ukrainians have requested and received visits from international assessment teams to assist them with safety assessments, plant operations, and the drafting of new legislation for nuclear waste handling.¹⁷⁵ Russia has also agreed to comply with the Vienna Conventions on Early Notification and Assistance.¹⁷⁶

Ukraine has also started to upgrade their reactors, based on U.S. NRC Regulatory Guide 1.70 and specific advice from IAEA operations review teams.¹⁷⁷ Initially, upgrades have been made to fire suppression systems and instruments and controls used for monitoring plant operations.¹⁷⁸

The IAEA has joined forces with the United Nations Development Programme (“UNDP”) to try to improve nuclear power plant safety in all the former Soviet States.¹⁷⁹ After initial meetings were held with representatives of the affected nations, the groups decided individual national solutions were needed for regulatory void and plant safety problems, because of the void left by the absence of the central support agencies in the old USSR, despite the apparent dupli-

172. *Id.* at 72. Post-Chernobyl modifications to fuel loading and limitations on number of control rods permitted to be withdrawn have assured core reactivity is less than 0.5, meaning the control rods present can easily control the reactor. In Chernobyl unit 4, core reactivity was greater than 2 when steam was present in the coolant channels.

173. Oleg Shchedrov, *Russia Puts Safety First in Nuclear Energy Sector*, Reuters, June 26, 1992, available in LEXIS, News Library, Wires File.

174. *Id.*

175. Letter from Citizen Ambassador Program, Nuclear Technology Delegation to Russia and Ukraine, to Robert Temple (Mar. 25, 1993) (copy on file with author) [hereinafter Letter].

176. See Peter Cameron, *The Vienna Convention on Early Notification and Assistance*, in NUCLEAR ENERGY LAW AFTER CHERNOBYL 19, 19, 29-30 (Peter Cameron et al. eds. 1988)(where the USSR committed to the treaty and special immediate notification arrangements were made with Finland). For more detail on these commitments, see ADEDE, *supra* note 112.

177. Blake, *supra* note 170, at 72. Regulatory Guide 1.70 covers the guidelines for safety reporting. See generally OFFICE OF STANDARDS AND DEV., U.S. NUCLEAR REG. COMM’N, REGULATORY GUIDE 1.70: STANDARD FORMAT AND CONTENT OF SAFETY ANALYSIS REPORTS FOR NUCLEAR POWER PLANTS (LWR ed. 1978).

178. *Id.*

179. Morris Rosen, *Strengthening Nuclear and Radiation Safety in Countries of the Former USSR*, IAEA BULL., Dec. 1993, at 34, 34-35.

cation of effort that would result.¹⁸⁰ Needs assessments, being performed by the joint task force for each country, are in their preliminary stages.¹⁸¹

5. Safety Oversight

The regulatory arms charged with assuring plant safety are having difficulty fulfilling that mandate, with one cause suggested to be low morale.¹⁸² Observers say low morale is caused by low pay for these government jobs, resulting in many leaving for the private sector. Former inspectors are often hired by the plants where they previously worked, at a higher salary, creating an obvious conflict of interest.¹⁸³ In addition, some have expressed the concern that the governments have placed a low priority on nuclear safety.¹⁸⁴

E. Nuclear Weapons

Although the weapons treaties are not central to this discussion, nuclear weapons handling (since it is radioactive material) and the waste created by weapons destruction or storage deserves consideration. Four members of the CIS originally acknowledged they were holding nuclear weapons: Russia, Belarus, Ukraine and Kazakhstan.¹⁸⁵

Although Ukraine, Belarus and Kazakhstan had previously agreed to send their weapons to Russia for destruction, Ukraine suspended further shipments after sending fifty-seven percent of their acknowledged tactical nuclear arsenal.¹⁸⁶ Economic difficulties caused

180. *Id.* at 35.

181. *Id.*

182. Potter, *supra* note 5, at 65.

183. *Id.*

184. *Id.*

185. Vasily Kononenko, *Outcome of Moscow Meeting of CIS Heads of State Inspires Moderate Optimism*, IZVESTIA, July 7, 1992, at 1-2, reprinted in CURRENT DIG. SOVIET PRESS, Aug. 5, 1992, at 24, 24.

186. *Ukraine Stops Sending Nuclear Arms to Russia*, STAR TRIB. (Minneapolis), Mar. 13, 1992, at 1A. The agreement between Russia, Belarus, Ukraine and Kazakhstan was called "Declaration on Nuclear Arms," and was signed December 22, 1991. The parties committed to use nuclear weapons for the collective security of the CIS, and established a joint decision-making process for their use. The parties also committed not to be the first to use the weapons, and finally agreed to withdraw the weapons from Belarus, Kazakhstan and Ukraine by July 1, 1992 for disassembly in a central plant. Nuclear Energy Agency, Org. for Economic Co-operation and Dev., *Commonwealth of Independent States: Declaration on Nuclear Arms*, NUCLEAR L. BULL., June 1992, at 102. Centralized control of nuclear weapons in the CIS, however, is threatened because three republics, Ukraine, Turkmenistan, and Moldavia, of the original consortium of ten have withdrawn support for the Russian-controlled plan. Mark Trevelyan, *Three CIS States Refuse to Sign New Charter*, Press Ass'n, Jan. 23, 1993, available in LEXIS, News Library, Wires File. The original agreement to rid Ukraine, Belarus, and Kazakhstan of nuclear

Ukraine to tentatively agree to exchange the remaining weapons to Russia for fuel for Ukrainian reactors, in an agreement also granting Russia rights to the Black Sea Fleet in exchange for forgiveness of part of Ukraine's debts to Russia.¹⁸⁷ Both Russia and Kazakhstan have indicated they are committed to meeting the limits of the START treaty (Strategic Arms Reduction Treaty (1991) originally signed between the Soviet Union and the U.S.), which calls for nuclear non-proliferation and deep cuts in nuclear arsenals.¹⁸⁸ Belarus, meanwhile, has continued to adhere to their promise to rid themselves of weapons.¹⁸⁹

Presently, Russia is having difficulty storing the weapons it has, and it lacks sufficient capacity to store all the plutonium and highly enriched uranium from weapons disassembly.¹⁹⁰ Evidence of the difficulty in managing materials storage in the reprocessing setting was shown by the 1993 explosion and release from Tomsk.¹⁹¹

Officials from the Russian Atomic Energy Ministry and Russian Academy of Sciences suggested that the material removed from the weapons could be used to power commercial power plants, and that the volume recovered would be sufficient to power the world's nuclear power plants for twenty years.¹⁹² Some handling and reprocessing is still required to transform weapons-grade material to the lower enrichment fuel called for in commercial reactors.

weapons was signed in Lisbon, in May 1992. *Ukraine: Ukraine Foreign Minister Criticizes Russia on Arms*, Reuters, Aug. 10, 1993, available in LEXIS, News Library, Wires File.

187. *Fuel-for-Arms Agreement Announced in September*, NUCLEAR NEWS, Oct. 1993, at 47, 47. However, uncertainty exists for completion of weapons disposal, despite agreements, for two reasons: first, because of Ukraine's change in position, and second, because of the reported lack of safeguards controls for weapons material in the CIS. *Primetime Live: Loose Nukes* (ABC television broadcast, Oct. 14, 1993). In January 1994, however, President Kravchuk signed an agreement with President Clinton to accept \$1 billion (U.S.) to destroy their nuclear weapons. Matthew Campbell, *Ukrainian Militants Prepare for a Nuclear Showdown*, SUNDAY TIMES (London), Feb. 6, 1994, World News, at 14, 15.

188. *500,000 Kazakhs Said Affected by Nuclear Tests*, Reuters, May 21, 1992, available in LEXIS, News Library, Wires File. For tracking methods for weapons exchanges under START, see generally OFFICE OF TECHNOLOGY ASSESSMENT, VERIFICATION TECHNOLOGIES: MEASURES FOR MONITORING COMPLIANCE WITH THE START TREATY (1990).

189. Tim Zimmermann & Bruce B. Auster, *Ukraine and the Bomb*, U.S. NEWS & WORLD REP., Aug. 9, 1993, at 44, 44.

190. *Russia Plans to Build Plutonium Storage Unit*, Reuters, Apr. 9, 1992, available in LEXIS, News Library, Wires File.

191. Steve Erlanger, *Russian Officials Say Little Radiation Released in Nuclear Plant Accident*, N.Y. TIMES, Apr. 8, 1993, at A4. The explosion took place at a plutonium separation facility. *Id.*

192. *Russia Plans to Build Plutonium Storage Unit*, *supra* note 190.

Related to this, at least two reactors producing weapons-grade plutonium have been shut down in recent months.¹⁹³ The plants, located in Krasnoyarsk, will be sealed over during the next five years. Research from these old reactors will be used to help inspectors performing assessments at other older commercial reactors.¹⁹⁴

F. Scientific Uncertainty

Uncertainty exists for the nuclear waste problems on two levels.¹⁹⁵ First, what is the extent of the problem: the fallout, the radioactive material build-up, and the amount of contamination? Second, what is the real health risk, given the contamination levels? The first question presents a logistical nightmare—the need to quantitatively assess a problem that has received spotty documentation. The second question is one of interpretation given limited knowledge of actual chronic exposure.

1. Extent of the Problem

The quantitative assessments of Chernobyl took over four years to assemble, and research to determine the full extent of damage is still in progress.¹⁹⁶ The extensive destruction and fallout crossing international borders were factors which lent international attention and expertise to assessing the results of Chernobyl. The after-effects of Chernobyl are still not fully contained or understood.¹⁹⁷

There are several claims of more extensive problems hidden by the Soviet Union. Kazakhstan was the site for fourteen years of above-ground nuclear testing.¹⁹⁸ During this period, there was no monitoring of the population or analysis of the ecological impact of these tests.¹⁹⁹ In the Kazakh town of Shevchenko, renamed Aktas, contamination levels from a uranium processing plant are said to be

193. *Russia Shuts Down Plutonium-Producing Reactor*, Reuters, Sept. 29, 1992, available in LEXIS, News Library, Wires File.

194. *Id.*; *Russia Closes Oldest Military Reactor*, Reuters, June 30, 1992, available in LEXIS, News Library, Wires File.

195. For applications of scientific uncertainty to law, see, RONALD BRICKMAN ET AL., *CONTROLLING CHEMICALS: THE POLITICS OF REGULATION IN EUROPE AND THE UNITED STATES* 187-217 (1985).

196. *Economic and Social Consequences of Chernobyl*, *supra* note 148.

197. See, e.g., *Radiation Up After Fires in Chernobyl Area Agency*, Reuters, Aug. 6, 1992, available in LEXIS, News Library, Wires File (describing fires in southern Belarus causing an increase in airborne radioactive dust, after a summer with little rain).

198. David Ljunggren, *Kazakhstan City Battles Disastrous Pollution*, Reuters, July 9, 1993, available in LEXIS, News Library, Wires File; *Former Soviet Nuclear Stations to be Monitored from Finland*, *supra* note 167.

199. Ljunggren, *supra* note 198.

eighty times greater than acceptable levels.²⁰⁰ Kazakhstan continues having problems keeping up with new waste problems. Since Russia has become reluctant to take nuclear waste from outside its borders, spontaneous radioactive dumps have been turning up in the desert areas of Kazakhstan.²⁰¹

Uranium mines of Magadan, northern Russia, were carved out by Gulag workers between 1949 and 1954, and were left just as they were abandoned.²⁰² Although the locals fear radioactive contamination, the area has reportedly not been surveyed.²⁰³

Military complex records have not been opened for public screening, even though many military waste problems are on public lands.²⁰⁴ At least four examples of military waste problems on public lands have become public knowledge. Radioactive waste from a 1985 Soviet submarine disaster was found buried near Vladivostok.²⁰⁵ A waste tank exploded in 1957 contaminating a large area of land near Chelyabinsk.²⁰⁶ Also near Chelyabinsk, the partial evaporation of a lake used as a nuclear waste dumping area resulted in the permanent evacuation of area residents in 1967.²⁰⁷ Finally, nuclear waste dumped from the submarine works in Severodvinsk has been blamed by some for doubling of two types of cancer deaths from 1985-1990.²⁰⁸

The Chernobyl site has received sufficient attention that the IAEA has made a pronouncement about the limits of the long-term effects of that accident.²⁰⁹ Chernobyl was a major international incident which received world-wide resources and attention. In contrast, the same concern and resources have not been provided for the other contaminated sites, severely limiting the ability to assess contamination levels or recommend reasonable protective measures to the residents.²¹⁰

200. *French TV Says Nuclear Waste Dumped in Moscow*, Reuters, Aug. 19, 1992, available in LEXIS, News Library, Wires File; see also Mike Edwards, *A Broken Empire: Kazakhstan*, NAT'L GEOGRAPHIC, Mar. 1993, at 22, 23-36.

201. O. Stefashin, *Kazakhstan: Spontaneous Radioactive Dumps Begin to Appear*, Reuter Textline Novecon, Aug. 11, 1992, available in LEXIS, News Library, Wires File.

202. James Flannery, *A Helicopter Ride to a Gulag Hell Where Slaves Mined Uranium*, Reuters, May 29, 1992, available in LEXIS, News Library, Wires File.

203. *Id.*

204. FESHBACH & FRIENDLY, *supra* note 147, at 170-75.

205. *Id.* at 173.

206. *Id.* at 174.

207. *Id.* at 175.

208. *Id.* at 174.

209. See generally INTERNATIONAL CHERNOBYL PROJECT, *supra* note 151.

210. See Zoltan Annau, *Belarus: World Bank Environment Mission 3-4 (July 1992)* (unpublished second draft report). The U.S. Department of Energy is still in the discovery and planning stage of their weapons site cleanup, focusing resources on site characterization and developing

2. Health Risks

The second level of uncertainty is to what extent health risk exists with the varying levels of exposures people have received. International limits for exposure of occupational radiation workers have been lowered to two rems per year, while the limit set in the United States is five rems per year.²¹¹

There are several opinions as to the threshold harmful exposure limit for ionizing radiation. The study originally relied on for data was of Japanese survivors of the Hiroshima and Nagasaki bomb explosions.²¹² The application to chronic rather than acute radiation exposure has been greatly questioned.²¹³ Studies in the United States have fueled intense debates as to whether the cause of death of radiation workers was due to radiation or to other factors.²¹⁴ It is difficult to get analysts to agree on the proper statistical method to remove biasing factors (such as cigarette smoking) from studies which purport to indicate at what threshold workers experience an increase in cancer.²¹⁵ Until such biasing factors are isolated, it will be difficult to project the amount of harm that will result to members of the public exposed to uncontained waste.²¹⁶

G. Economics

Both Russia and Kazakhstan have indicated they wish to expand their civilian nuclear power programs.²¹⁷ However, neither country is party to an international agreement establishing nuclear third-party liability in the event of an accident, or has insurance to compensate victims in the event of an accident.²¹⁸ Other countries participating in

action plans to protect cleanup crews. OFFICE OF TECHNOLOGY ASSESSMENT, HAZARDS AHEAD: MANAGING CLEANUP WORKER HEALTH AND SAFETY AT THE NUCLEAR WEAPONS COMPLEX 2, 13 (1993).

211. Len Ackland, *Radiation Risks Revisited*, TECH. REV., Feb./Mar. 1993, at 56, 61. A new revision of the guiding U.S. government limits is set to take effect in 1994, which adds new rules for occupational exposure to radiation, per 10 C.F.R. § 20 (1993), assuring an integrated accounting of all exposures the worker receives.

212. *Id.* The latest study of this group, labeled BEIR V, was considered the most complete assembly of data on a group of exposed persons as it included a review of health records of over 41,000 exposed persons. *Id.* at 58.

213. *Id.* at 58-59.

214. *Id.* at 61.

215. *Id.*

216. *See id.* The radiation exposure risk debate is certainly secondary to identifying the sites, and removing people from areas of known deadly exposure levels.

217. *See* Potter, *supra* note 5, at 61; *Russia Closes Oldest Military Nuclear Reactor*, Reuters, June 30, 1992, available in LEXIS, News Library, Wires File.

218. *See* discussion of international treaties, like the Vienna Accord of 1988 or the Paris Convention of 1960, *supra* notes 111-126 and accompanying text.

insurance pools have had to meet international standards for reactor safeguards, maintenance, and personnel training, to meet minimum standards for insurability. Even though civil law imposes strict liability for hazardous activities,²¹⁹ there are no assurances that victims will be compensated for their losses, given the present economic state of the independent republics.

Economic chaos is the present state of affairs in most of the CIS. Inflation is spiraling out of control, with the Russian Ruble declining in value from about \$0.008 U.S. in July 1992 to less than \$0.001 in October 1993.²²⁰ Shortages still exist in the marketplace, and what can be produced cannot get distributed to the limited market that exists.²²¹ This has had two significant effects on the scientific elite: either causing them to leave the CIS, in search of higher salaries and stable employment, or to become entrepreneurs and sell their skills in the open market.²²² Wages in some specialty areas have dropped to subsistence levels.²²³

This economic climate will not ensure that the best nuclear minds remain in the CIS to help uncover and solve environmental and safety issues. Further, there are concerns that some nuclear scientists are being drawn to the highest bidders to apply their skills in such locations as Libya and North Korea.²²⁴ The loss of trained specialists and lack of spare parts has already become a safety concern, according to the head of Russia's State Committee for Civil Defense and Emergencies.²²⁵

The economic news is not all bad. As of December 1992, \$375 million (U.S.) in nuclear aid has been sent to Eastern Europe from a variety of sources, about two-thirds of which has come from the European Community.²²⁶ The EC has allocated an additional \$560 million in nuclear aid, with \$100 million specifically to meet reactor safety concerns.²²⁷ The G-7 leaders have indicated an interest in funding re-

219. See, e.g., W.B. SIMONS, *THE SOVIET CODES OF LAW* 387 (1980).

220. Mike Edwards, *A Broken Empire: Russia*, NAT'L GEOGRAPHIC, Mar. 1993, at 4, 13; Peter Galuszka et al., *What Yeltsin Must Do*, BUS. WK., Oct. 18, 1993, at 22, 23.

221. See Edwards, *supra* note 220, at 13-16.

222. Tim Beardsley, *Trends in Russian Science: Selling to Survive*, SCI. AM., Feb. 1993, at 92, 93-97.

223. *Id.*

224. Richard Saltus, *Soviet Atom Experts Add to West's Worries*, BOSTON GLOBE, Jan. 12, 1992, at 1.

225. Ralph Boulton, *Russia Alarmed by Loss of Nuclear Specialists*, Reuters, Mar. 25, 1992, available in LEXIS, News Library, Wires File.

226. *Nuclear Aid to Eastern Europe Has Reached \$375 Million*, *supra* note 124, at 91.

227. *Id.*

actor safety upgrades and to help shut down those reactors which they view as too dangerous to operate.²²⁸ Some cost estimates range from \$18 to \$24 billion (U.S.) to take care of unsafe reactors in the CIS.²²⁹ Decommissioning older units and replacing generating capacity with non-nuclear sources would cost \$18 billion (U.S.), while \$24 billion (U.S.) is an estimate of upgrade costs to bring these plants up to western standards.²³⁰

H. Regulatory Structure

The synopsis below discusses the four CIS countries that have announced specific nuclear or environmental programs (or plans for such programs) relating to managing nuclear waste: Russia, Ukraine, Kazakhstan and Belarus.²³¹ Before the breakup of the USSR, the Soviet and central regulatory agencies had established regulations which are still available in the absence of new state action.

1. Russia²³²

Minatom is responsible for power production as well as administrative control of fuel materials. The ministry acts as both a safety oversight arm (*Gosatomnadzor*) and as line management over day-to-day plant operations (*Rosenergoatom*).²³³ *Gosatomnadzor* was initially established to operate outside of *Minatom* authority in order to provide independent oversight of both civilian and military reactor

228. *Russia wants to Close Nuclear Plants by 2005*, Reuters, July 16, 1992, available in LEXIS, News Library, Wires File. The group of G-7 includes the United States, Japan, Germany, France, Britain, Canada, and Italy. *Id.* From the latest round of G-7 talks, aid pledged to Russia is reported to exceed \$40 billion (U.S.), and Japan is pursuing the issue of Russian nuclear waste dumping at sea. *G-7 to Set Up Russia Aid Office in Sept.*, *supra* note 125. G-7 pledges were \$700 million (U.S.) toward reactor safety upgrades in the CIS as of July, 1993. Victoria Pope & Julie Corwin, *Radiation in Russia*, U.S. NEWS & WORLD REP., Aug. 9, 1993, at 40, 41.

229. *Eastern Europe's Nuclear Power*, ECONOMIST, July 24, 1993, at 19, 21.

230. *Id.* Sources report that World Bank and the International Energy Agency support a version of the former plan (gas-fired replacement of decommissioned nukes). Seth Shulman, *Risky Reactors*, TECH. REV., Aug./Sept. 1993, at 18, 19.

231. Included in this list are the three countries with operating reactors and the fourth, Belarus, has a severe cleanup problem left over from Chernobyl, but is considering nuclear reactors to meet its own electrical generating power needs.

232. According to the President of *Rosenergoatom* (the operator of Russia's electrical generating nuclear power plants) Yevgeny Ignatenko, "We don't even have a law on nuclear energy. It is currently being considered by the commissions of the Supreme Soviet." Yevgeny Reshetnikov et al., *Press Conference by the Atomic Ministry of RF (1) 15 January*, Official Kremlin Int'l News Broadcast, Jan. 15, 1993, available in LEXIS, News Library, Script File.

233. *Russian Federation*, *supra* note 7, at 59-60. See Clive Cookson, *A Bittersweet Celebration—Clive Cookson Examines Russia's Nuclear Expansion Programme, as It Turns 40 Today*, FIN. TIMES, June 24, 1994, at 16; Ann MacLachlan, *Cash-Strapped Minatom Holds on Anticipating Promised Relief*, NUCLEONICS WK., June 16, 1994, at 11.

programs in Russia.²³⁴ However, a recent presidential decree placed control of *Gosatomnadzor* under *Minatom*.²³⁵ Although concern has been expressed over the conflict of interest of having operations supervision and safety oversight under the same organization, attempts to legislate change have not yet been successful.²³⁶

Gosatomnadzor has recently drafted new legislation on radioactive waste handling, following materials from creation to burial.²³⁷ Part of the management plan included separation of *Gosatomnadzor* from *Minatom* to remove control of nuclear safety and waste handling from groups which have a poor track record of safety oversight.²³⁸ In addition, future legislation would be designed to be compatible with legislation from the Ministry of Ecology.²³⁹ This legislation was only in the outline stages in early 1993, and passage in its present form is considered unlikely.²⁴⁰ Thus, elements favoring single-agency control of both reactor safety and power production seem to have the ear of both President Yeltsin and other forces within the Supreme Soviet of Russia.

As noted earlier, the effectiveness of safety oversight can be called into question for reasons beyond the potential conflicts of interest in reporting schemes. Site inspectors working for *Gosatomnadzor* are poorly paid, with undersized staffs and internally confusing lines of authority.²⁴¹ Also, although laws have been proposed, no legislation governing nuclear safety has yet been passed.²⁴²

Broad environmental laws that impact the continued expansion of nuclear power exist in Russia. Presently, the law requires an environmental impact statement to be filed prior to issuance of major construction permits.²⁴³ A presidential decree was issued to waive such

234. LINDA LEHMAN, L. LEHMAN & ASSOC., INC., RUSSIAN LOW-LEVEL WASTE DISPOSAL PROGRAM 5 (1992) (copy on file with author).

235. *Id.*

236. *Id.* The Russian nuclear utility *Rosenergoatom* reports to the chain which includes *Minatom*, further confusing the separation of interests. See *Selin Lists Measures of NRC Success of Aid to Russia*, INSIDE N.R.C., June 13, 1994, at 20, available in LEXIS, News Library, CURNWS File.

237. *Id.* at 4.

238. *Id.*

239. *Id.*

240. *Id.*

241. Potter, *supra* note 5, at 65-66.

242. *Id.* at 66. A new atomic energy law, which was scheduled to be brought before parliament in January 1993, would require permission from local authorities to site any new nuclear projects. *Russia: More Detail on Effort to Resume Construction*, *supra* note 5, at 79.

243. See, e.g., Valery Vyzhutovich, *Private Capital Begins to Build Largest Port on the Baltic*, IZVESTIA, May 29, 1992, reprinted in CURRENT DIG. POST-SOVIET PRESS, June 30, 1993, at 21.

reports when construction is in either scarcely populated or poor areas of Siberia.²⁴⁴

The Committee on the Rational Use of Natural Resources proposed a new radiation safety law through its Subcommittee on Radiation Safety.²⁴⁵ Presented to the Russian Supreme Soviet in September 1992, it has yet to be passed.²⁴⁶

Other noteworthy organizations in the Russian nuclear scheme include the Russian State Federal Committee for the Supervision of the Safe Uses of Nuclear Energy, which provides both a technical and safety oversight at nuclear power stations, and the State Sanitary Supervision Committee, with the role of monitoring radiation releases to the general public and assuring releases are within government limits during normal and accident conditions.²⁴⁷

Even if agencies are created and laws are passed, can they be effective with a government under threat? Two coups have been attempted during the democratization of Russia.²⁴⁸ Vladimir Zhirinovskiy, a nationalist Russian leader, has suggested a third coup may be pending.²⁴⁹

2. Ukraine

Ukraine, as the site of Chernobyl Nuclear Power Station, quickly passed laws related to the status and protection of land and people affected by the accident.²⁵⁰ The Ministry of Environmental Protection was established, and the Ukraine Soviet is working on a package of legislation relating to protection of health of humans and protection of the ecosystems.²⁵¹ An additional commission was created just to track findings related to Chernobyl.²⁵²

244. Electronic Mail from C.E. Eli to Molly W. Lien (Sept. 11, 1993) (on file with author).

245. Potter, *supra* note 5, at 66 n.3.

246. *Id.*

247. This is according to the head of the Main (Energy) Directorate, Alexander Lapshin. Reshetnikov et al., *supra* note 232.

248. In August 1991, hardline communists attempted a coup of then President Mikhail Gorbachev. In October, 1993, hardliners, this time fighting economic reforms, tried to overthrow President Boris Yeltsin. *Russia: Chronology of Events Leading to Russia's Elections*, Reuter General News, Dec. 10, 1993, available in WESTLAW, INT-NEWS Database.

249. Ralph Boulton, *Russia: Coup in the Offing? Of Course, Says Zhirinovskiy*, Reuter General News, Mar. 29, 1994, available in WESTLAW, INT-NEWS Database.

250. UKRAINE NATIONAL REPORT, *supra* note 151, at 12.

251. *Id.* at 36. In response to deteriorating environmental conditions, due to unchecked industrial output in Ukraine, the Ministry of Environmental Protection is drafting sweeping legislation to establish minimum performance standards along with fines for violators. Daniel Gogek & Mary Hartnett, *Foreign Investment in Ukraine: New Laws, Opportunities and Issues*, 27 INT'L LAW. 189, 200 (1993).

252. *Id.*

In the area of nuclear safety, the Ukraine has established the State Committee on Nuclear and Radiation Safety (GANU). Ukraine legislators are trying to draft regulations to cover the full scope of nuclear operations and waste issues.²⁵³ As in Russia, the Ukrainians have yet to successfully pass any reactor safety legislation into law.²⁵⁴

A separate plant owners group local to Ukraine has been established, called *Ukratomenergoprom*.²⁵⁵ It has oversight authority for plant safety, emergency response, and plant supervisor training.²⁵⁶

3. Kazakhstan

The Kazakhstan Atomic Energy Agency has discussed coordinating refueling activities with Russia's *Minatom*.²⁵⁷ The Kazakh reactor is a breeder reactor that creates plutonium during continued reactor operation.²⁵⁸ To recover this plutonium, for other power plant or weapons use, requires fuel reprocessing equipment the Kazakhs have yet to acquire. The Atomic Energy Agency has extended the reactor license to 2003.²⁵⁹ As of mid-1993, Kazakhstan also has failed to pass any substantive reactor safety measures.²⁶⁰

4. Belarus

Belarus has no operating reactors, but it has a nuclear waste problem, largely attributed to the Chernobyl accident.²⁶¹ There is a Commission dedicated to the Chernobyl disaster problems with the same authority level as the Commission on Ecology and Rational Use of Natural Resources.²⁶² Both agencies report directly to the Supreme Soviet for the Republic of Belarus.²⁶³ The Commission on Chernobyl has been acting as an information collection and monitor-

253. UKRAINE NATIONAL REPORT, *supra* note 151, at 36-38.

254. Potter, *supra* note 5, at 66. A law in draft form on "Utilization of Atomic Energy and Radiation Protection" has been created by GANU, but not yet enacted by parliament. *Id.* at 66 n.3.

255. Potter, *supra* note 5, at 64; Letter, *supra* note 175.

256. Letter, *supra* note 175.

257. Potter, *supra* note 5, at 62.

258. *World List of Nuclear Power Plants*, *supra* note 4, at 47, 60.

259. Potter, *supra* note 5, at 62.

260. *Id.*

261. *World List of Nuclear Power Plants*, *supra* note 4. While they have no plants at present, the Supreme Soviet Chairman is a nuclear physicist by education (Stanislav Shuskevich) who has been holding talks, along with the vice president of the Belarussian Ecological Agency, on whether to build new nuclear reactors in Belarus. Potter, *supra* note 5, at 62.

262. THE STATE COMM. FOR ECOLOGY OF THE REPUBLIC OF BELARUS, GOVERNMENTAL REPORT OF THE STATE OF THE ENVIRONMENT IN THE REPUBLIC OF BELARUS 21 (1992).

263. *Id.*

ing agency thus far, while it continues to develop new ways of assessing and dealing with the scope of the disaster.²⁶⁴

I. Summary of the State of the Former Soviet Union

An extensive nuclear waste problem was created by the military-industrial complex of the former Soviet Union. The problem, as it was left, is a major threat to the health and welfare of the citizens of the CIS, and poses a threat to world health, as much of the waste is uncontained. The nuclear waste problem was created by indiscriminate dumping, intentional bombing, and reactor accidents. It is further complicated by the need to unwind the military industrial complex and disarm new nuclear powers, while maintaining the components in environmentally safe storage.

Reactor safety is also a concern. The problem is based on questionable design of older units, and from the present inability to safely maintain all operating nuclear units. The latter is caused by low parts availability and poor economic conditions, which begs the question: if people are operating on the most basic survival levels, are the reactors?

Although there appear to be changes in officials' attitudes and increased concern expressed for reactor safety and public safety, there is no assurance that an attitude change has reached the line operator. In addition, old power reactors remain on line to meet power-hungry, economically poor republics' needs, without needed safety upgrades. The present emphasis from oversight officials appears to be placed on maintaining generating capacity, rather than on assuring reactor safety.

Scientific uncertainty manifests itself primarily in the inability to quantify the problem. There are enough identified locations and well-documented studies to say that waste and reactor safety problems are significant, but prioritization is impossible without further quantifying the problems. It is difficult to determine the extent of the health concern which comes from identified and yet-to-be identified waste.

The problems, as extensive as they are, are receiving both internal and international concern and economic aid. But as a Bulgarian nuclear official illustrated, even though the aid from a variety of inter-

264. *See id.* at 9-10.

national agencies is appreciated, it can be overwhelming when the aid and advice is coming from a number of sources at once.²⁶⁵

IV. ELEMENTS OF A PROPOSED MODEL

A. *The Need for a Central Authority*

1. What are the lessons learned from Europe?

States voluntarily give up a degree of sovereignty for some common good, because the nations themselves see some greater benefit from the coalition. Limits to the benefits are reached when a perceived local interest becomes a higher economic priority than the community goal; this is typically labeled a vital state interest.

The EC acting through Euratom shows that a coalition of nations can have a synergistic effect in resource allocation, aids in creating a framework for cooperation on emerging issues, and acts as a stabilizing influence for sister states where no legislation exists. Even where the central authority lacks complete control, the partial submission to that authority influences legislation and judicial decisions favoring recognition of the rights and needs of neighboring states.

2. Faults with comparing the EC and the CIS

How can fledgling republics act like nations that have had stable governments for decades? The EC states are used to the democratic process, and to the give-and-take necessary to advance within an international scheme.

The EC has tremendous financial resources, and an industrial base with significant economic clout. The EC can afford to share resources for problem solving, because they have resources to share. The Baltic States in the CIS have significantly different priorities from the old industrial states or the impoverished Muslim states as to prevent shared priorities.²⁶⁶ Wealthier nations of the EC can also afford to underwrite projects for all of Europe, for the additional margin of safety it would bring to their own citizens.

265. Blake, *supra* note 170, at 71. Yanko Yanev, chairman of the Bulgarian Committee on the Use of Atomic Energy for Peaceful Purposes, made this concern clear by showing a figure of a stone block with the names of several organizations stacked on the stone, including IAEA, WANO, (discussed below) and Commission of the European Communities, the weight of which had flattened a nuclear plant operator. *Id.*

266. See ALVIN TOFFLER & HEIDI TOFFLER, *WAR AND ANTI-WAR: SURVIVAL AT THE DAWN OF THE TWENTY-FIRST CENTURY* 213-14 (1993).

3. *What can a central authority accomplish better with International Agencies?*

International resources are better geared to team with a central authority for effective problem resolution. Agencies and funds are available to assist nations willing to join in the cleanup. However, international groups have limited resources, and it is difficult for them to respond effectively to many voices with individual concerns. A central authority would be more effective at organizing the support the CIS actually needs.

A central authority can structure more specific solutions to meet the needs of their members, rather than the general approach taken by international agencies. A central authority can also be a focal point for prioritizing international resources already being allocated to the problems.

B. Dealing with the Full Scope of the Problem

To get the massive backing needed to resolve the extensive problems described here will require countries to agree on solutions that will yield measurable results in assuring reactor safety and nuclear waste cleanup. The ability to measure results allows establishment of concrete goals. With extensive problems, dividing the problems into discrete steps makes the insurmountable achievable. International resource donors would respond positively to their backing of efforts resulting in measurable achievements.

Achieving results requires not only political and technical solutions, but a holistic approach to these problems to create change.²⁶⁷ Workers, supervisors and regulators must reject the old accepted norms for "safe" operation. Worker and supervisor resocialization, an adjustment of safety culture, must be part of the solution.²⁶⁸ To get workers to follow procedures and respect rules, they must appreciate the significance of the rules and desire to follow them. This necessitates going to work on principal values of the people who are expected to work within the scope of the "new" rules,²⁶⁹ and this cannot be accomplished effectively through sanctions alone.²⁷⁰

267. GEOFFREY DE Q. WALKER, *THE RULE OF LAW* 44 (1988) (referring to what Thomas Kuhn had termed a "paradigm shift").

268. *See id.* at 350-51; Geoffrey Stevens & Masaya Yasui, *Nuclear Energy in the Soviet Union*, *NEA NEWSL.*, Spring 1991, at 10, 13.

269. WALKER, *supra* note 267, at 351.

270. *Id.*

Resocialization can be accomplished through training and exchange programs. Training must be provided to introduce new programs, and to tell people why they should stay within new guidelines. What actually causes change is (1) for people to see a program that works, then (2) for them to envision themselves performing the same way as those in the successful program did.²⁷¹

For example, if plant operators see other operators working within a different framework, who are happier, have an easier time accomplishing their work, and are able to accomplish more, then it is not hard to sell a new program. Thus the WANO exchange program has an added benefit beyond the information exchange suggested earlier.²⁷² What remains is to create the atmosphere that will allow workers to envision themselves in the new framework, and once again, a central authority coordinating off-site exchanges and on-site training from outside experts can help facilitate this.

1. Nuclear Waste

a. Identify the Extent of the Problem

Scientific uncertainty exists about the locations, quantity, and extent of the waste problem. So, the first stage will be identifying the size and scope of the problem. The IAEA, the WHO and UNSCEAR were all involved in assessing the impact of Chernobyl on Ukraine, Belarus and Russia. These groups, working with local governments, can also help identify and assess conditions at other known nuclear waste sites.

b. Set Safety Standards

The present state of uncertainty does not prevent initial passage of key safety or cleanup legislation necessary to assure minimally acceptable levels of safe operation. The Russians have shown they are interested in assuring the rest of the world that they follow universal safety standards.²⁷³ To garner international confidence in environmental management throughout the CIS, all republics should pass national legislation which follows existing internationally accepted

271. A variation on this is: a change in seeing, the way a situation is perceived, is required to change being, the way things are. STEPHEN R. COVEY, *THE SEVEN HABITS OF EFFECTIVE PEOPLE* 15-45 (1990).

272. See *supra* notes 103-04 and accompanying text.

273. Reshetnikov et al., *supra* note 232.

standards for radioactive release and exposure limits.²⁷⁴ The IAEA is offering their assistance for republics interested in adopting conforming standards.²⁷⁵

Local laws that agree with internationally accepted standards show more commitment to protect health and safety than any broader-based agreement. If laws follow internationally accepted models, they are easily followed (and to some degree implemented) by a central authority.²⁷⁶ However, either local control of these laws or local enforcement of centrally developed laws assures that violators could be faced with enforceable penalties for violating those laws. Laws designed to protect the health and safety of the public must have teeth, and they must then be enforced as written.

c. *Apply Resources to the Problems*

The republics have few economic resources. Their greatest resource, people, is available as dismantling of the military-industrial complex has displaced many knowledgeable weapons workers, scientists and technicians.²⁷⁷ These people are already qualified to assess, contain and decontaminate waste sites, or could easily be trained to perform these tasks. Not only would this help with a needed cleanup effort, it would reduce unemployment.

Funding for this type of effort could come from at least four sources outside the countries themselves. First, other national governments could offer a debt-for-nature cleanup exchange, that is, to forgive some international loan debt in exchange for measurable containment and cleanup of radioactive waste areas.²⁷⁸ Second, funds could come from directing international aid resources, in part, toward nuclear waste cleanup. As previously discussed, this is already in progress from the EC, the G-7, and individual countries.

274. Much legislation for the protection of the environment was written under the old Soviet regime, but was not enforced. See MARSHALL I. GOLDMAN, *THE SPOILS OF PROGRESS: ENVIRONMENTAL POLLUTION IN THE SOVIET UNION* 27 (1992).

275. See *IAEA Aid to Former USSR for Radiation Protection*, Europe Information Service, Oct. 1, 1993, available in LEXIS, World Library, CURNWS File.

276. There is no reason new laws cannot be more progressive than their in-place counterparts. Consider risk-based regulation, which means to set standards and therefore allocate resources based on calculated public risk as a more efficient scheme than trying to meet some impossible absolute, the uncertain standard of "safe." See American Nuclear Society, *A Position Statement of the American Nuclear Society: Risk-Based Regulation*, ANS News, Dec. 1993, at 1, 1.

277. See *supra* notes 217-30 and accompanying text.

278. See *TRENDS IN INTERNATIONAL ENVIRONMENTAL LAW*, *supra* note 137, at 100-01. World Wildlife Fund, as an example of an NGO performing a debt-for-nature swap, was willing to buy out national debt for environmental progress. *Id.*

Third, several countries within the CIS have natural resources and are bringing in outside assistance to develop those resources, a primary example being the oil reserves held by Russia and Kazakhstan.²⁷⁹ Instead of just taking cash in exchange for oil development and reserves, CIS republics could negotiate application of these companies' expertise in waste cleanup as partial payment of royalties.²⁸⁰ Fourth, the republics, either directly or through international relief organizations, could solicit donations to perform cleanup.²⁸¹

Centralized control of incoming funds for waste cleanup could help direct distribution to where proven needs are the greatest. This would be best accomplished if distribution of international funds were apolitical, therefore from an outside organization, with prioritization based on severity of the waste problem or the threat to humans.

Centralization would also standardize expectations for performance (in order to receive funds), and allow centralized data collection for monitoring of cleanup progress. Finally, any funds distributed should be done jointly with national programs within the republics. International aid would then back a concerted local effort, which in turn would help develop local attitudes that favor protecting the environment from future waste contamination.

Funds are not the only resource that needs centralized distribution. Centralization is also needed for equitable application of other resources to problems. Where voluntary organizations are available, they need input and advice on the best use of their resources.²⁸² Awareness of resources means more effective, non-redundant application of the next wave of assistance.

279. See *More Upstream Ventures Advance in Former U.S.S.R.*, OIL & GAS J., Sept. 13, 1993, at 27; *Caspian Shelf Consortium*, KAZAKHSTAN PETROLEUM REV. (Price Waterhouse World Petroleum Industry Group, Houston, Tex.), July 1993, at 1; *Texaco Signs First Russian Oil Deal*, Energy Daily, Mar. 5, 1993, available in LEXIS, Energy Library, ENGDLY file; Ed Lane, *U.S. Firms Call for Reform in Soviet Oil Sector*, Energy Daily, Jan. 29, 1993, available in LEXIS, Energy Library, ENGDLY File; *Occidental Begins Siberian Oil Exports*, Energy Daily, Nov. 2, 1992, available in LEXIS, Energy Library, ENGDLY File.

280. Exxon's expertise, for example, is not limited to hydrocarbon cleanup as they were in the nuclear fuels business until 1986. Daniel Shaw, *Local Companies Gain Piece of Growing Nuclear Market*, PUGET SOUND BUS. J., Dec. 16, 1991, § 1, at 10.

281. The CIS is not without assistance in soliciting donations, for visitors returning from the CIS have beat them to this. The chairman of WANO, Lord Marshall, following his visit to CIS reactor sites, suggested that members donate fire retardant paint, ultrasonic inspection equipment (for RBMK pressure tube inspection), and instruments that integrate controls to sister plants in the CIS. E. Michael Blake, *Stopping By on the Way Home*, NUCLEAR NEWS, June 1993, at 74, 74.

282. A commendable effort comes from EC use of resident teams for on-site safety assistance at power plants in Russia and Ukraine. *EC Experts Begin Safety Residencies at Power Plants*, NUCLEAR NEWS, Aug. 1993, at 64, 64.

2. Reactor Safety

During a recent conference workshop on improvements needed for Soviet-designed reactors, conducted during an American Nuclear Society/European Nuclear Society joint meeting, the attendees agreed on several priorities for reactor upgrade.²⁸³ These include: (1) the need to perform probabilistic risk assessments to determine the likelihood of certain accidents, and steps which can be taken to further reduce the potential for accident occurrence;²⁸⁴ (2) containments need to be created or improved for RBMK-style reactors and older VVER reactors;²⁸⁵ (3) operator training needs to be improved, and site-specific simulators are needed to allow operators to practice preventing or mitigating accidents;²⁸⁶ (4) fire detection and suppression systems need to be upgraded;²⁸⁷ and (5) create supra-national RBMK and VVER owners groups to better share problems and solutions.²⁸⁸

International groups provide several methods for sharing standards and expectations which are norms for safe reactor operation. International agreements and standards for reactor safety must be enforced within the CIS in order to assure an adequate margin of safety for continued reactor operation and to safeguard nuclear materials from terrorists.²⁸⁹ These requirements could be conditions on any provision of funds. Also, compliance with international agreements

283. Blake, *supra* note 170, at 72-73.

284. It is difficult to recommend solutions without better definition of the problem. A probabilistic risk/safety assessment would better help pinpoint the weaknesses in design and operations, and then specific solutions could be addressed to the areas of weakness.

285. Containments in these reactors vary from warehouse enclosures (non-existent) to some stronger structures (bubble-type capable of absorbing the energy from small loss-of-coolant accidents in older VVER plants). An immediate solution includes lining up ventilation to create a negative pressure on existing structures, to minimize potential for spread of small radiation releases. Blake, *supra* note 170, at 73.

286. *Id.* Training is also key to developing a culture that promotes safe reactor operations. Presently that culture is underdeveloped as demonstrated by (1) the poor reactor siting to date (most Soviet-built reactors are located within 10 kilometers of a tectonic fault); (2) poor plant construction; (3) failure to follow established operating procedures; and (4) a lack of prevention and defensive measures in the event of a casualty. Potter, *supra* note 5, at 65.

287. Blake, *supra* note 170, at 73. This includes shielding electrical cables (for fire protection and to minimize interference with sensitive monitoring) and replacement of combustible plant roofs.

288. *Id.* In the United States, owners groups include the reactor manufacturers (e.g. General Electric, Westinghouse), the utility-operators, and vendors. These groups monitor plant component malfunctions and share concerns, resources and solutions. This allows early identification of failures at one plant to be shared with others, so, following notification by the owners group, preemptive corrective actions can be taken at all plants of like design.

289. Presently, although security in both Ukraine and Kazakhstan is not up to IAEA safeguards standards levels of the Nuclear Non-Proliferation Treaty ("NPT"), Russia is continuing to ship fuel to these sites, in violation of its NPT agreement. Potter, *supra* note 5, at 66.

could include agreements to meet international standards on third-party liability.²⁹⁰

According to international reports funds have started to pour in, yet, in 1993, one Russian official claimed they have not seen one kopeck.²⁹¹ The G-7 nations have committed to make contributions for reactor safety upgrades; this effort is expected to need a minimum of \$700 million (U.S.), and the new money will join funds already contributed primarily by EC member nations.²⁹² Already there are plans to coordinate the expenditure of these funds, primarily on western products and services which can be used to upgrade the CIS plants.²⁹³ There is no agreement in place with the CIS as to what it is willing to upgrade, or what it believes needs to be done to make its plants safe. Some officials in the CIS believe their reactors are already safe.²⁹⁴

Therefore, coordination of funds disbursement needs to occur both to minimize redundancy and to assure prudent expenditures.²⁹⁵ For maximum benefit, agreed-upon goals need to be set for expenditures. Probably the best group to establish the needs side of this equation is a regional group of CIS reactor representatives working with IAEA and NGOs to perform risk assessments, then set common safety standards.

C. *To What Degree Must Sovereignty be Sacrificed?*

Is there any such thing as sovereignty with international environmental or safety issues? Yes, as the state has the ultimate power and burden to prevent pollution.²⁹⁶ But the question here is how to get central control of reactor safety and nuclear waste to work. Complete subrogation in these areas is unlikely, as states resist sacrificing their physical or political integrity to outside forces.²⁹⁷ Some CIS republics believe that allowing any supra-national control is a step back toward

290. The more operators understand continued operation is only permitted if they adhere to high standards, the more likely they are to strive to exceed those minimum standards. Also, operators must know they are economically tied to any failure to operate safely.

291. See *supra* note 265 and accompanying text; Reshetnikov et al., *supra* note 232.

292. Marlise Simons, *Major Powers Back a Fund For Soviet-Design Reactors*, N.Y. TIMES, Jan. 29, 1993, at A2.

293. *Id.*

294. *Reactor Upgrade Loans in Spring?*, NUCLEAR NEWS, Mar. 1993, at 74, 74-75.

295. Centralized control of incoming funds is already in progress. See Simons, *supra* note 292, at A2. However, the effort thus far does not show enough has been done to get buy-in by CIS personnel for the western concerns. As part of the holistic solution, more must be done than the technological fix.

296. TRENDS IN INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 137, at 15.

297. *Id.* at 82.

the old Soviet Union.²⁹⁸ The mood in some republics favors further decentralization, increasing local autonomy.²⁹⁹

Starting with international proposals: they could be forced on the money-hungry republics. Trade sanctions are one way to impose solutions, and the likely response would be the republics eventually signing on to some kind of agreement to avoid the sanctions.³⁰⁰ Money could be thrown at the problems without asking for buy-in. They might also be bribed to accept agreements,³⁰¹ but coerced agreements may not create lasting, substantive change.³⁰² Will countries which are still in a state of economic chaos be able to make any substantive guarantees?³⁰³ Despite the political and economic upheaval, these countries still maintain enough structure to keep a power grid and several reactors operating, so the present level of chaos is not an insurmountable block to a solution.

1. Ownership is the Key to Effective Problem-solving

International proposals that will help improve the CIS condition should be voluntarily entered into, and the agreements should be structured to support mutual interests, similar to the Early Notification agreements. They can include economic incentives, but not coercive incentives. They should be built jointly, not imposed unilaterally, for lasting effect. No matter the assistance offered or controls proposed, if the states are party to and promote the solutions as their own, they have a chance at success.

298. Vitaly Portnikov, *Yeltsin Won't Be Meeting with Kravchuck*, NEZAVISIMAYA GAZETA, Dec. 24, 1992, at 1, reprinted in CURRENT DIG. POST-SOVIET PRESS, Jan. 20, 1993, at 22; *The President of Moldova on his Attitude Toward the CIS*, IZVESTIA, Dec. 8, 1992, at 1, reprinted in CURRENT DIG. POST-SOVIET PRESS, Jan. 6, 1993, at 24. For example, central control over monetary policy in the EC has met resistance because, some feel, once the money comes under one control, central political control will soon follow. Pieter V. Van Themaat, *Some Preliminary Observations on the Intergovernmental Conferences: The Relations Between the Concepts of a Common Market, a Monetary Union, an Economic Union, a Political Union and Sovereignty*, 28 COMMON MKT. L. REV. 291, 300 (1991).

299. *Regionalism: What Does It Mean for Reform?*, CURRENT DIG. POST-SOVIET PRESS, Jan. 27, 1993, at 9 (finding the political mood in Russia was swinging toward giving regional policy a much larger role in political control).

300. See TRENDS IN INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 137, at 65 (discussing trade sanctions as an incentive that may not work to enforce the Montreal Protocol).

301. *Id.*

302. For example, was North Korea's participation in the NPT merely momentarily politically advantageous? It was suspected North Korea signed onto the IAEA accord in January 1992, to temporarily bow to Japanese requirements for trade normalization, rather than because of any substantive policy change. See Janet Snyder, *Japan, North Korea Far Apart on Normalization*, Reuters, Jan. 30, 1992, available in LEXIS, News Library, Wires File.

303. It has been asserted that the rule of law does not apply to impoverished nations or nations with significant health problems. WALKER, *supra* note 267, at 336.

What if a state won't voluntarily participate? It depends on the level of non-compliance within the hold-out state because one purpose of the central authority is to disseminate guidelines for what is safe (and the concern is a non-participant would be non-compliant). Some environmentally egregious acts can rise to the point where they would be considered crimes against humanity, in which case they are violations of international peremptory norms.³⁰⁴ However, the international community and states have relied on national law, and not international law to enforce those norms.³⁰⁵

Does non-participation of any single State prevent operation of the central authority? No, it would just force the international community to deal piecemeal with that State. No state can afford to become an isolated non-participant in light of the shared benefits. Therefore, the individual benefit derived from a central agency must outweigh the independent state approach to regulation and oversight.

2. What the CIS Atomic Energy Agency Can Accomplish

Does a centralized supra-national solution meet all the needs for CIS countries to cure problems with nuclear waste cleanup and reactor safety? No, but it does offer several advantages. As we have seen, central oversight groups help channel resources for distribution.³⁰⁶ Second, centralized coordination of some of the work and resources would be more cost-effective than each nation creating the support network needed for safety and cleanup oversight.³⁰⁷ Third, centralization assures shared solutions for common problems.

Regional solutions administered by a central authority can often provide better focus, understanding and results for unique regional problems.³⁰⁸ Also, if implementation and enforcement is on a regional level for problems with a regional character, as with the EC, it is possible to get compliance.³⁰⁹ The key to success of a regional

304. See LAURI HANNIKAINEN, PEREMPTORY NORMS (JUS COGENS) IN INTERNATIONAL LAW 301 (1988). Peremptory norms are accepted by the international community as a whole as the norm of general international law, often derived from existing law or custom, that cannot be modified without some new norm replacing the old one, and if violated, since they protect the overriding interests of all States, they are superior to individual national interests. *Id.* at 207-82.

305. *Id.* at 301.

306. TRENDS IN INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 137, at 75-76.

307. See *id.* at 76.

308. See *id.* at 118-20 (discussing the lack of IGO success on a state and international level, but having success in a regional framework).

309. See *id.* Even where the central authority is not granted absolute power, as with the EC, adopting a joint approach to problem-solving creates an atmosphere of cooperation and mutual respect among nations.

supra-national authority is agreement among all the nations to meet desired goals. Such agreement can be made by recognizing that greater benefits can be achieved through a central authority.

CONCLUSION

Central regional control would be effective in creating safety standards, acting as a sharing resource for CIS nuclear operators, coordinating cleanup efforts, and recommending local legislation. If the central authority is a sharing center not dominated by a single power, but a group working toward a common goal, it can overcome the resistance to the old central Soviet.

Changes that must be made need to occur at all levels, from top state regulators to field operators in plants, to assure that a holistic, long-lasting solution is achieved. A central authority can provide the continuity and direction needed to facilitate effective oversight of reactor safety and lasting solutions for nuclear waste cleanup problems in the CIS.