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OCEAN INCINERATION OF HAZARDOUS WASTE

BY WILLIAM L. ANDREEN

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OCEAN INCINERATION OF HAZARDOUS WASTE

BY WILLIAM L. ANDREEN

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I. INTRODUCTION

While land-based incineration has long been used to treat liquid organic hazardous waste, incineration at sea on board specially equipped vessels is a fairly recent development. This new technology was first employed in Europe during the early 1970s and was introduced in the United States in 1974.¹

Ocean incineration operations have generally taken place on double hulled double bottomed ships that have several independent compartments where the waste is stored prior to incineration. These ships use high temperature liquid injection incinerators mounted on the stern of the vessel.² Ocean incinerators lack air pollution control systems for two reasons: absence of nearby human population centers and the expectation that acidic emissions will be buffered by the sea.³

Since 1972, ocean incineration has been a routine method for disposing of hazardous waste in Europe. A total of 650,000 metric tons of waste, in fact, have been incinerated in the North Sea during some 320

1. See Office of Policy, Planning and Evaluation, U.S Environmental Protection Agency, Assessment of Incineration as a Treatment Method for Liquid Organic Hazardous Wastes 11,23 (1985) [hereinafter OPPE Report].

2. See Proposed EPA Ocean Incineration Regulations, 50 Fed. Reg. 8,222 (1985) [hereinafter Proposed Ocean Incineration Regulations].

3. See OPPE Report, supra note 1, at 11.

voyages. In the United States, on the other hand, only four series of burns were conducted between 1974 and 1982, all aboard the ship Vulcanus I. Three of those operations were in the Gulf of Mexico and one in the Pacific.⁴

According to the United States Environmental Protection Agency (EPA), about 264 million metric tons of solid and liquid hazardous waste were generated in the United States in 1981.⁵ That is the equivalent of more than one metric ton of hazardous waste per person in the country. This monumental amount of hazardous waste must be disposed of in an environmentally sound fashion, and incineration technology may present one partial solution to our disposal dilemma.

The EPA expects that demand for incineration of liquid hazardous waste will grow significantly as other disposal alternatives are more stringently regulated under the Resource Conservation and Recovery Act of 1976, as amended.⁶ Demand should also expand as the pace of cleanups under the Comprehensive Environmental Response, Compensation, and Liability Act (commonly known as Superfund),⁷ accelerates and as the new Superfund policy favoring treatment over land disposal (50 Fed. Reg. 45,933 (1985)) is implemented. As a consequence of these and other factors, the EPA fears that a general shortage will arise in the commercial capacity to incinerate liquid hazardous waste on land. It estimates that three incinerator ships would double existing land-based commercial capacity.⁸

Originally, the federal government believed that one advantage of ocean incineration as opposed to land-based incineration was that public opposition to its operation would be negligible. After all, ocean incineration would take place far from populated areas. The government's belief, as it turns out, was rather naive.⁹

Public opposition to ocean incineration has been broader and more intense than opposition to land-based incineration. Frequently raised concerns include the risk of spills from routine activities and catastrophic accidents, uncertainties about the incineration process, and the risk to the marine environment from air pollutants.¹⁰

4. *See id.* at 17,25,78.

5. *See id.* at 13.

6. 42 U.S.C. §§ 6901-6991(i) (1982 & Supp. III 1985).

7. 42 U.S.C. §§ 9601-9657 (1982 & Supp. III 1985).

8. *See* OPPE Report, *supra* note 1, at 14.

9. *See* Zurer, *Incineration of Hazardous Wastes at Sea: Going Nowhere Fast*, Chem & Engineering News, Dec. 9, 1985, at 24.

10. *See* OPPE Report, *supra* note 1, at 94-95.

II. REGULATORY APPROACH TO OCEAN INCINERATION

The legal regime governing the incineration of hazardous substances at sea is complex. It involves the application of both domestic and international sources of law.

A. THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972

The Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA)¹¹ forms the basis for the federal regulation of dumping of all types of materials at sea. The Act prohibits, in effect, all ocean dumping except as authorized by a permit.¹² No permits, however, may be issued for the ocean dumping of radiological, chemical, and biological warfare agents and high-level radioactive wastes.¹³ The EPA is authorized to review permit applications for the dumping of all other materials, except dredged materials, which the Army Corps of Engineers regulates.¹⁴

The EPA is authorized to issue permits, after notice and opportunity for public hearings, when it determines that such dumping will not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities.¹⁵ To guide this decision process, MPRSA directs the EPA to establish criteria for reviewing permit applications. The criteria must consider nine statutory factors which include the need for the dumping and the effect of the dumping on human health, fish and wildlife, beaches, and marine ecosystems.¹⁶ These criteria must also be considered by the EPA when it designates recommended sites for ocean dumping.¹⁷

B. THE CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER

On October 30, 1972, one week after MPRSA became law, the United Kingdom convened an international conference to consider global controls on ocean dumping. Eighty countries participated in the conference and completed their negotiations in November 1972. The resulting agreement, the Convention on the Prevention of Marine Pollution

11. 33 U.S.C. §§ 1401-1445 (1982).

12. 33 U.S.C. § 1411 (1982).

13. 33 U.S.C. § 1412(a) (1982).

14. 33 U.S.C. §§ 1412(a), 1413(a) (1982).

15. 33 U.S.C. § 1412(a)(1982).

16. *Id.*

17. 33 U.S.C. § 1412(c) (1982).

by Dumping of Wastes and Other Matter (London Dumping Convention),¹⁸ was opened for signature on December 29, 1972.¹⁹ The United States ratified the Convention in 1973, and the Convention entered into force on August 30, 1975.²⁰ Some fifty-three countries have now ratified or acceded to the Convention.²¹

The London Dumping Convention is directed against the dumping of waste or other matter likely to degrade or pollute the marine environment. The Convention established a three tiered characterization of waste. The first category of waste includes high-level radioactive waste, biological and chemical warfare materials, organohalogen compounds, mercury, and cadmium. This category of waste may not be dumped at all. The prohibition, however, does not apply to substances that are "rapidly rendered harmless" by chemical or biological marine processes.²² The second category of waste includes arsenic, lead, copper, zinc, cyanides, and certain pesticides. These substances may only be dumped pursuant to a special permit from the contracting country.²³ The third category of waste consists of all waste not listed in the first or second categories. Although the disposal of materials within this category requires merely a general permit, consideration must be given to the composition of the substance and the characteristics of the dumping site.²⁴

Since the London Dumping Convention went into effect, the contracting parties have adopted regulations and technical guidelines for ocean incineration. The regulations and guidelines establish various technical standards such as destruction efficiency, operating conditions, and monitoring parameters.²⁵

C. EPA OCEAN DUMPING REGULATIONS

The EPA initially believed that it lacked authority to regulate ocean incineration because MPRSA did not directly address the issue of air-

18. Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter, Dec. 29, 1972, 26 U.S.T. 2403, T.I.A.S. No. 8165, 11 I.L.M. 1291 [hereinafter London Dumping Convention].

19. See Leitzell, *The Ocean Dumping Convention—A Hopeful Beginning*, 10 San Diego L. Rev. 502, 504 (1973).

20. See Bakalian, Regulation and Control of United States Ocean Dumping: A Decade of Progress, An Appraisal for the Future, 8 HARV. ENV'T'L L. REV. 193, 227-228 (1984).

21. See Proposed Ocean Incineration Regulations, *supra* note 2, at 8, 228.

22. London Dumping Convention, *supra* note 18, at art. IV, annex I.

23. *Id.* at art. IV, and II.

24. *Id.* at art. IV, annex III.

25. See Proposed Ocean Incineration Regulations, *supra* note 2, at 8,228-8,230.

borne pollutants. However, after reconsideration, the EPA extended its jurisdiction to ocean incineration in 1974 calling incinerator ships indirect ocean dumpers. The agency concluded that failure to regulate this emerging technology would frustrate the purposes of MPRSA as well as the London Dumping Convention.²⁶

The EPA's current Ocean Dumping Regulations establish categories of ocean permits, requirements for permit applications, the procedures for the issuance of permits, the general content of permits, and the criteria for the evaluation of permit applications.²⁷ These regulations, however, do not provide specific technical criteria for ocean incineration.²⁸ As a consequence, the EPA has issued permits for ocean incineration using administrative and technical criteria from both the Ocean Dumping Regulations and the London Dumping Convention.²⁹

Permits for ocean incineration are issued only as research permits or as interim permits until criteria are promulgated to control incineration specifically.³⁰ However, special permits may be issued where studies have been conducted on the waste, the incineration method, the ship, and the site, and the site has been designated for ocean incineration by the EPA.³¹ Research permits may be issued for up to 18 months when it is determined that the scientific merit of a project outweighs the potential environmental damage.³² Authority to issue interim permits expired in 1978.³³ Special permits have a maximum life of three years and must satisfy the criteria set out in 40 C.F.R. Pts. 227-228 (1986).³⁴

The EPA's criteria for analyzing permit applications absolutely prohibits the dumping of high-level radioactive waste, materials used in radiological, chemical or biological warfare, materials that are inadequately described in a permit application, and materials which are persistent and that float.³⁵ The criteria also establish a list of materials the dumping of which is prohibited in more than trace amounts. These materials include organohalogenes, mercury, cadmium, oil, and known or suspected carcinogens, mutagens, or teratogens.³⁶ This prohibition, how-

26. See OPPE Report, *supra* note 1, at 24.

27. See 40 C.F.R. §§ 220.1-228.13 (1986).

28. See *id.*

29. See OPPE Report, *supra* note 1, at 24.

30. 40 C.F.R. § 220.3(f) (1986).

31. *Id.*

32. 40 C.F.R. § 220.3(e) (1986).

33. See 40 C.F.R. § 220.3(d) (1986).

34. 40 C.F.R. § 220.3(b) (1986).

35. 40 C.F.R. § 227.5 (1986).

36. 40 C.F.R. § 227.6(a) (1986).

ever, does not apply to ocean incineration if the permit applicant can show that the stack emissions consist of, materials which are "rapidly rendered harmless by physical, chemical or biological processes in the sea."³⁷ In addition, ocean incineration operations must "comply with requirements which will be established on a case-by-case basis."³⁸

40 C.F.R. Pt. 228 (1986) sets forth the criteria governing the designation of ocean dumping sites. Permitting procedures and an elaborate appeal process are found at 40 C.F.R. Pt. 222 (1986). Since MPRSA contains no specific provision for judicial review of permitting actions, the final denial or grant of a permit may be challenged in the appropriate district court under 28 U.S.C. § 1331 (1982) and the Administrative Procedure Act, 5 U.S.C. §§ 701-706 (1982).

D. THE COASTAL ZONE MANAGEMENT ACT

The Coastal Zone Management Act of 1972³⁹ provides federal grants for the development and administration of state management programs for the land and water resources of coastal areas.⁴⁰ When a state program has been federally approved,

any applicant for a required federal license or permit to conduct an activity affecting land or water uses in the coastal zone of that state shall provide . . . a certification that the proposed activity complies with the state's approved program and that such activity will be conducted in a manner consistent with the program.⁴¹

No federal license or permit may issue until the state has concurred with the applicant's certification, unless the Secretary of Commerce finds that the activity is consistent with the objectives of the Act or is necessary for national security purposes.⁴² The "coastal zone" is defined by the Act to extend "seaward to the outer limit of the United States territorial sea."⁴³

Pursuant to the Coastal Zone Management Act, the National Oceanic and Atmospheric Administration (NOAA) has promulgated regulations that require a state management agency to develop a list of federal license and permit activities "which are likely to affect the coastal zone and which the State agency wishes to review for consistency with

37. 40 C.F.R. § 227.6(h) (1986).

38. *Id.*

39. 16 U.S.C. §§ 1451-1464 (1982).

40. *See* 16 U.S.C. §§ 1454-1455 (1982).

41. 16 U.S.C. § 1456(c)(3)(A) (1982).

42. *Id.*

43. 16 U.S.C. § 1453(1) (1982).

the management program."⁴⁴ The state agency, however, may also seek to review unlisted federal license and permit activities.⁴⁵ When unlisted activities are involved, NOAA must either approve or disapprove the state's decision to review the activity. The test which NOAA applies to such a state decision is "whether the proposed activity can be reasonably expected to affect the coastal zone of the State."⁴⁶ If approved by NOAA, the state agency has at least six months to object to the issuance of the license or permit.⁴⁷

III. THE COURSE OF OCEAN INCINERATION IN THE UNITED STATES

Since 1974, the EPA has issued permits for four series of burns at sea.⁴⁸ The first series was performed aboard the *Vulcanus I* in the Gulf of Mexico between October 1974 and January 1975. During this operation, about 16,000 metric tons of toxic organochlorine waste from the Shell Chemical Company were incinerated pursuant to EPA research and interim permits.⁴⁹ A second ocean incineration operation took place between March and April 1977. Once again, organochlorine waste generated by the Shell Chemical Company was burned on the *Vulcanus I* in the Gulf of Mexico. A total of some 16,000 metric tons of waste was destroyed under an EPA special permit.⁵⁰

Later in 1977, the United States Air Force incinerated its remaining stock (10,400 metric tons) of the herbicide Agent Orange at a designated site about 200 miles west of Johnston Atoll in the Pacific Ocean.⁵¹ The burn was carried out on board the *Vulcanus I* under a research permit and special permit issued by the EPA. Destruction efficiencies for 2, 4-D and 2, 4, 5-T exceeded 99.999 percent. The destruction efficiency for highly toxic dioxin, which was an impurity in the herbicide, was greater than 99.93 percent.⁵² (Destruction efficiency refers to the percentage of hazardous constituents destroyed in the combustion chamber.)⁵³

44. 16 C.F.R. § 930.53(b) (1986).

45. 16 C.F.R. § 930.54(a), (b) (1986).

46. 16 C.F.R. § 930.54(c) (1986).

47. 16 C.F.R. § 930.54(e) (1986).

48. See OPPE Report, *supra* note 1, at 25.

49. See U.S. Environmental Protection Agency, U.S. Department of Commerce & U.S. Department of Transportation, Report of the Interagency Ad Hoc Work Group for the Chemical Waste Incinerator Ship Program 4 (1980) [hereinafter Interagency Report].

50. *Id.*

51. See Proposed Ocean Incineration Regulations, *supra* note 2, at 8,223.

52. See Interagency Report, *supra* note 49, at 4-5.

53. See OPPE Report, *supra* note 1, at 42.

The last incineration operation was performed during 1981 and 1982 when liquid waste containing PCBs was burned at the Gulf of Mexico Incineration Site.⁵⁴ A total of 7,000 metric tons was incinerated by the Vulcanus I⁵⁵ under a research permit issued to Chemical Waste Management, Inc. and Ocean Combustion Services, B.V.⁵⁶ The August 1982 burn in this series yielded a destruction efficiency for PCBs of over 99.999 percent.⁵⁷

With regard to the designation of ocean incineration sites, the EPA gave final approval to the Gulf Incineration Site for the incineration of liquid organohalogen waste in September 1976. The site, 189 nautical miles south of Cameron, Louisiana and 170 nautical miles south-southeast of Galveston, Texas, was approved for continuing use until September 15, 1981.⁵⁸ This site was redesignated as an incineration site for continuing use in 1982.⁵⁹ Finally, the EPA proposed to designate a new at sea incineration site in the North Atlantic Ocean for the thermal destruction of liquid organic waste in November 1982. This site, proposed for continuing use, is located 140 nautical miles east from Delaware Bay and 155 nautical miles east-southeast from Ambrose Light at the entrance to New York Harbor.⁶⁰

Chemical Waste Management, Inc. and Ocean Combustion Services, B.V. applied in 1981 for a special permit and a research permit to incinerate a total of 300,000 metric tons of mixed liquid organic compounds at the Gulf Incineration Site. After public hearings were held, the EPA decided to change its approach for developing the conditions for these permits.⁶¹ Subsequently, on October 17, 1982, the EPA made a tentative determination to issue these permits.⁶² Public hearings were held in Brownsville, Texas and Mobile, Alabama, which drew about 6,500 persons. Many of those attending the hearings were strongly opposed to incinerating chemicals in the Gulf. In addition, several members of the House Merchant Marine and Fisheries Committee told EPA officials at a congressional hearing not to issue any permits until the EPA had promulgated regulations governing ocean incineration.⁶³

54. See 48 Fed. Reg. 20,984 (1983).

55. See OPPE Report, *supra* note 1, at 45.

56. See 48 Fed. Reg. 20,984 (1983).

57. See OPPE Report, *supra* note 1, at 45.

58. 41 FED. REG. 39,319 (1976).

59. 47 FED. REG. 17,817 (1982).

60. 47 FED. REG. 51,769 (1982).

61. See 48 FED. REG. 48,986 (1983).

62. *Id.*

63. See *Current Developments*, 14 ENV'T REP. (BNA) 1415 (Dec. 9, 1983).

On May 23, 1984, the EPA Assistant Administrator for Water, Jack Ravan, issued his determination not to grant these permits.⁶⁴ The decision was based on several factors, including the lack of specific criteria for regulating ocean incineration and deficiencies in information for determining the need for ocean incineration. The Assistant Administrator, however, did not rule out all future incineration at sea. He simply deferred issuance of operational permits pending further study and promulgation of regulations governing ocean incineration.⁶⁵

IV. NEW DIRECTIONS IN THE REGULATORY SCHEME

A. PROPOSED OCEAN INCINERATION REGULATIONS

On February 28, 1985, the EPA published proposed rules which would modify the Ocean Dumping Regulations insofar as they deal with ocean incineration permits and the designation of ocean incineration sites.⁶⁶ The rules would regulate only the incineration of liquid waste at sea. The proposal contains specific criteria for ocean incineration activities and explicit information on permit applications, permit processing procedures, EPA review of permit applications, as well as performance standards and operating requirements.⁶⁷

The proposed rules would authorize the issuance of three kinds of permits.⁶⁸ Operating permits could be issued for up to ten years with a review after five years. The permittee initially would be required to show the efficiency of the incinerators through a trial burn. Only after EPA approval is secured may the permittee proceed to the operating stage of the permit. Operating permits may be issued only for sites designated by the EPA.⁶⁹ Research permits could be issued for up to six months to conduct research on new incineration technology or to evaluate whether ocean incineration unreasonably degrades the environment. Research burns may take place either at previously designated burn sites or at sites designated on a case-by-case basis.⁷⁰ Emergency permits could be issued only in emergencies which pose an unreasonable risk to human health and where no other feasible solution is available.⁷¹

The proposal prohibits ocean incineration of high-level radioactive

64. See *Current Developments*, 14 ENV'T REP. (BNA) 2277 (Apr. 27, 1984).

65. See PROPOSED OCEAN INCINERATION REGULATIONS, *supra* note 2, at 8223.

66. *Id.* at 8222.

67. *Id.*

68. *Id.* at 8259 (to be codified at 40 C.F.R. § 234.6).

69. *Id.* (to be codified at 40 C.F.R. § 234.6(b)).

70. *Id.* (to be codified at 40 C.F.R. § 234.6(c)).

71. Added to balance with 71 in text.

waste, materials produced for radiological, chemical, or biological warfare, materials which may float after incineration, quantifiable concentrations of organic compounds which are more difficult to destroy than those tested in a trial burn, insufficiently described materials, and materials containing metals in concentrations greater than 500 parts per million.⁷² The incineration of certain other materials such as low level radioactive wastes and polychlorinated terphenyls is restricted.⁷³

Ocean incineration would only be permitted where the incinerator has met or is likely to meet two incinerator performance standards. The first standard deals with combustion efficiency,⁷⁴ which is a measure of the efficiency with which the incinerator is burning the waste.⁷⁵ The proposal requires a combustion efficiency of 99.95 percent plus or minus 0.05 percent on the waste stream. The second standard prescribes a destruction efficiency of 99.99 percent, except that a destruction efficiency of at least 99.9999 percent must be demonstrated on PCBs, dioxins, and dibenzofurans.⁷⁶

The EPA also proposed two environmental performance standards which must be met. The first such standard is designed to control acid forming emissions,⁷⁷ primarily hydrochloric acid.⁷⁸ The second standard requires that emissions not unreasonably degrade or endanger the following elements: human health, welfare, or amenities; the marine environment, ecological systems, or economic potentialities; recreational or commercial shipping or boating; or recreational use of beaches or shorelines.⁷⁹

To protect against the effects of an accidental spill, the EPA proposed to require all permit applicants to prepare a contingency plan. This contingency plan must be specific to the port and the incineration route. The plan would outline precautionary measures to prevent accidents and would outline response measures in case of an accident.⁸⁰ In addition, the EPA proposed a mandatory permit condition that would require permittees to take all necessary cleanup and mitigation measures in response to an unauthorized release of waste.⁸¹

72. *Id.* at 8266 (to be codified at 40 C.F.R. § 234.45).

73. *Id.* (to be codified at 40 C.F.R. § 234.46).

74. *Id.* (to be codified at 40 C.F.R. § 234.47).

75. *See id.* at 8258 (to be codified at 40 C.F.R. § 234.2).

76. *Id.* at 8266 (to be codified at 40 C.F.R. § 234.47).

77. *Id.* at 8266-8267 (to be codified at 40 C.F.R. § 234.48).

78. *Id.* at 8245.

79. *Id.* at 8266-8267 (to be codified at 40 C.F.R. § 234.48).

80. *Id.* at 8262 (to be codified at 40 C.F.R. § 234.19).

81. *Id.* at 8267 (to be codified at 40 C.F.R. § 234.52(l)).

In order to assure that funds will be available for such cleanups and mitigation,⁸² the proposed rules require applicants to provide assurances that they have the financial ability to take necessary response actions. Applicants must, therefore, demonstrate insurance coverage of \$50,000,000 to \$500,000,000.⁸³ The EPA expressly solicited public comment on what figure to choose within this range.⁸⁴

The EPA also proposed that all applicants be required to provide detailed information on the incineration system, monitoring and recording devices, the waste loading, storage, and handling systems of the vessel, waste analysis procedures, and the waste proposed for incineration.⁸⁵

The proposed rules outline in detail the terms and conditions of a permit. For example, all permits must prohibit the transfer of waste to an incinerator vessel outside harbor limits and must contain all requirements deemed appropriate after consultation with the Coast Guard.⁸⁶ All permits must stipulate a minimum flame temperature of 1250 degrees centigrade, unless the trial burn demonstrates that the combustion and destruction efficiencies can be achieved at a lower temperature.⁸⁷ All tank washings, ballast water, and bilge water contaminated beyond background levels with hazardous materials must be incinerated at sea or disposed of on land in accordance with either RCRA or the Toxic Substances Control Act, 15 U.S.C. §§ 2601-2629 (1982).⁸⁸ Permittees must have automatic waste feed shut off systems that immediately halt the flow of waste to the incinerators whenever certain contingencies arise. These contingencies include the flame going out or a fall in temperature below stipulated levels.⁸⁹ Permittees must also comply with certain procedures for waste analysis, monitoring and recording requirements, and reporting requirements.⁹⁰ Moreover, permittees may not transport for incineration or incinerate any material unless a representative of the EPA, a "shiprider," is on board the vessel.⁹¹

Permits may be issued only after notice and public comment.⁹² A public hearing must be held whenever the Assistant Administrator for

82. *Id.* at 8233.

83. *Id.* at 8260 (to be codified at 40 C.F.R. § 234.10).

84. *Id.* at 8234.

85. *Id.* at 8260-8261 (to be codified at 40 C.F.R. §§ 234.12-234.16).

86. *Id.* at 8267 (to be codified at 40 C.F.R. § 234.52(h)).

87. *Id.* at 8268 (to be codified at 40 C.F.R. § 234.56(b)).

88. *See id.* (to be codified at 40 C.F.R. § 234.56(i)).

89. *See id.* (to be codified at 40 C.F.R. § 234.57(a)).

90. *Id.* at 8268-8269 (to be codified at 40 C.F.R. §§ 234.58, 234.60-234.61).

91. *Id.* at 8269-8270 (to be codified at 40 C.F.R. § 234.62).

92. *See id.* at 8263-8264 (to be codified at 40 C.F.R. §§ 234.33-234.34).

Water finds a significant degree of public interest in a draft permit.⁹³ At the close of the public comment period, the Assistant Administrator will issue a permit decision that may be appealed to the Administrator.⁹⁴

Finally, the proposed rules set out elaborate criteria and procedures for the selection of ocean incineration sites.⁹⁵ (EPA has decided not to prepare an Environmental Impact Statement on the proposed rules.)⁹⁶

EPA received 943 written and oral submissions during the public comment period.⁹⁷ Many commentators believed that the agency should first develop a long-term waste management strategy before utilizing ocean incineration. Some citizens also felt that ocean incineration would discourage industry from using better, less expensive waste management methods.⁹⁸ Many believed, however, that ocean incineration was a low risk technology conducted far away from places of human habitation.⁹⁹

One of the most common comments involved the need for more research. The recommendations for further research included the following aspects of ocean incineration: the characteristics of the waste; monitoring of the incineration process; the effects on the marine environment; and the constituents of the emissions, particularly the identification of the products of incomplete combustion (PICs) and their toxicity.¹⁰⁰

Many persons feared that pollution from ocean incineration activities and possible accidental spills would destroy existing recreational and commercial activities, such as tourism and fishing, which are dependent upon a healthy coastal environment.¹⁰¹

B. EPA INCINERATION-AT-SEA RESEARCH STRATEGY

When the Assistant Administrator for Water denied the permits for Chemical Waste Management, Inc. and Ocean Combustion Services, B.V. in May 1974, he directed his staff to develop a research strategy that

93. *Id.* at 8264 (to be codified at 40 C.F.R. § 234.35).

94. *Id.* at 8265 (to be codified at 40 C.F.R. §§ 234.39, 234.41).

95. *Id.* at 8271-8273 (to be codified at 40 C.F.R. §§ 234.73-234.81).

96. *Id.* at 8224.

97. OFFICE OF WATER REGULATIONS AND STANDARDS, U.S. ENVTL. PROTECTION AGENCY, SUMMARY OF PUBLIC COMMENTS ON THE PROPOSED OCEAN INCINERATION REGULATION (1985).

98. *Id.* at 1.

99. *Id.* at 2.

100. *Id.* at 3.

101. *Id.* at 5.

would respond to the need for more research on ocean incineration.¹⁰² The Office of Water published its Research Strategy on February 19, 1985.¹⁰³ The strategy addressed three primary issues.

First, the strategy called for the development of methods to determine the aquatic toxicity of incinerator emissions. This would involve a system for removing a volume of emissions from an incinerator which would be incorporated into seawater. The seawater would then be subjected to various bioassays to determine toxicity.¹⁰⁴

The second issue addressed by the strategy concerned monitoring of ocean incineration operations. The strategy proposed the collection of emissions during an actual burn at sea for chemical characterization and toxicity testing. In addition, the strategy called for environmental sampling during an ocean burn to determine if emissions can be detected in the environment near the incinerator and if environmental effects can be detected.¹⁰⁵

Finally, the strategy proposed additional studies to evaluate the ocean incineration of other waste and the environmental impacts of alternative ocean incineration technologies.¹⁰⁶

C. THE OPPE INCINERATION STUDY

At the request of the Deputy Administrator of EPA, the Office of Policy, Planning and Evaluation (OPPE) performed an agency-wide assessment of incineration, including ocean-based incineration systems.¹⁰⁷ That study was published in March of 1985.¹⁰⁸ The study concluded that ocean incineration is a valuable and environmentally sound treatment alternative for destroying liquid hazardous waste.¹⁰⁹ Although the study recognized that the EPA's long-term goals are to reduce the generation of waste and encourage recycling, the study indicated that the EPA must deal realistically with the waste currently being generated.¹¹⁰ Additionally, the study found that ocean incineration presents a sound current option since risk assessments indicate that properly designed and oper-

102. See PROPOSED OCEAN INCINERATION REGULATIONS, *supra* note 2, at 8223.

103. OFFICE OF WATER, U.S. ENVTL. PROTECTION AGENCY, INCINERATION-AT-SEA RESEARCH STRATEGY (1985).

104. *Id.* at 9.

105. *Id.*

106. *Id.*

107. OPPE REPORT, *supra* note 1.

108. *Id.*

109. *Id.* at 1.

110. *Id.*

ated incinerators pose minimal risks to human health and the environment.¹¹¹

The study called for a program of continuing research to improve our understanding of combustion processes and effects. For ocean incineration, the study suggested improved stack and ambient monitoring, better characterization of emissions, and laboratory toxicity testing.¹¹² Finally, the study stated no preference for ocean or land incineration in terms of risk. Since ocean incineration takes place at such a distance from populated areas, ocean incineration seems to pose a lesser risk. However, there is a remote chance of accident and spill of hazardous waste in an operation at sea.¹¹³

D. SCIENTIFIC ADVISORY BOARD REPORT ON THE INCINERATION OF LIQUID HAZARDOUS WASTES

In October 1983, the Administrator of the EPA asked the Science Advisory Board to help the agency in its scientific evaluation of incineration at sea.¹¹⁴ The Science Advisory Board is composed of independent scientists and engineers who provide advice to the agency on a variety of scientific issues.¹¹⁵ The Board's review was performed by the Environmental Effects, Transport and Fate Committee which published its report in April of 1985.¹¹⁶

The report stated that incineration is a valuable and potentially safe way to dispose of hazardous wastes.¹¹⁷ In addition, the report indicated that the Committee wished to strengthen the existing incineration program rather than discontinue it.¹¹⁸ Nevertheless, the charge to the Committee was to address the shortcomings and needs of the program,¹¹⁹ and that is exactly what the Committee did. This paper will address a few of the major conclusions and recommendations made by the Committee.

The Committee found no documentation that the operation of ocean incinerators had produced acute adverse effects to public health or the

111. *Id.*

112. *Id.* at 2.

113. *Id.* at 1.

114. SCIENCE ADVISORY BOARD, U.S. ENVTL. PROTECTION AGENCY, REPORT ON THE INCINERATION OF LIQUID HAZARDOUS WASTES BY THE ENVIRONMENTAL EFFECTS, TRANSPORT AND FATE COMMITTEE iii (1985), [hereinafter SAB REPORT].

115. *Id.* at i.

116. *Id.* at iii.

117. *Id.* at v.

118. *Id.*

119. *See id.*

environment. However, the report noted that monitoring programs have been few and narrow in scope. Consequently, the report recommended that the EPA evaluate the possible long-term effects to human health and design field studies to assure that long-term ocean incineration operations do not produce significant adverse effects to the environment.¹²⁰ Moreover, the report found that the toxicities of emissions from ocean incineration are largely unknown. The report, therefore, recommended testing of representative emissions for toxicity.¹²¹

The report also concluded that the EPA's approach to determining whether incineration had destroyed liquid hazardous waste was deficient. The EPA's approach emphasizes the identification of several preselected substances and, thus, does not address adequately either partial oxidation or chemical recombinations that may create new toxic substances (PICs).¹²² For example, dioxin and dibenzofurans have been detected when PCBs are burned.¹²³ As a result, the EPA's concept of the problem is limited to what is discharged from the incinerator. The report, thus, recommended analysis of emissions in such a way so as to estimate the identity and quantity of the chemicals actually released into the environment.¹²⁴

V. THE FUTURE OF OCEAN INCINERATION

A. PROPOSED RESEARCH BURN

On December 16, 1985, the EPA published its tentative decision to issue a research permit to Chemical Waste Management, Inc. for a burn of PCBs aboard the *Vulcanus II*.¹²⁵ The operation would involve the incineration of a maximum of 708,958 gallons of fuel oil contaminated with PCBs and would take place at the proposed North Atlantic Incineration Site off the Delaware coast.¹²⁶ The proposed permit would authorize the applicant to participate in research activities designed by the EPA and based upon the agency's Research Strategy.¹²⁷

The EPA is planning to conduct a number of tests during this research burn. The tests would include various samplings to determine the

120. *Id.* at 5.

121. *Id.*

122. *See id.* at 1.

123. OPPE REPORT, *supra* note 1, at 47.

124. SAB REPORT, *supra* note 114, at 21-22.

125. EPA Tentative Determination to Issue a Research Permit for Ocean Incineration, 50 Fed. Reg. 51,360 (1985), [hereinafter Tentative Determination to Issue a Research Permit].

126. *Id.*

127. *Id.* at 51,360-51,361.

toxicity of emissions.¹²⁸ The agency would also perform two sets of bioassays to assess the effect of various concentrations of emissions on aquatic organisms.¹²⁹ In addition, the plume will be sampled, and samples of air, water, and biota will be collected in the plume area to determine the levels of incineration-related materials.¹³⁰

The proposed permit contains a great many safety related conditions. The incinerator must achieve a destruction efficiency of 99.9999 percent for PCBs.¹³¹ The incinerator must be equipped with automatic waste feed shut-off devices and automatic, tamper-proof monitoring devices.¹³² To provide continuous observation of all incineration activities, the proposal requires that an EPA employee be stationed on board the vessel at all times.¹³³ Moreover, a contingency plan is required, as well as a demonstration of financial responsibility amounting to at least \$60,000,000.¹³⁴

In addition to the safety precautions built into the vessel, a Coast Guard shiprider will be present during all or part of the trips to and from the incineration site. The vessel may not sail if there are any conditions identified by the Coast Guard which would interfere with the safe passage of the vessel.¹³⁵ The Coast Guard will also enforce a safety zone around the vessel during a portion of the voyage.¹³⁶

B. PUBLIC OPPOSITION

The EPA's proposal to issue this research permit has met with a tremendous amount of opposition from citizens of the adjacent coastal areas. Thousands, in fact, testified against the proposed permit at several public hearings held by the EPA.

Two bills, furthermore, have been introduced into Congress that would significantly delay the proposed burn. Representative Barbara Boxer introduced H.R. 1295 in February 1985. This bill would place a moratorium on ocean incineration until a number of scientific questions are resolved by a study to be conducted by the congressional Office of

128. *Id.* at 51,361.

129. *Id.*

130. *Id.*

131. *Id.* at 51,363.

132. *Id.* at 51,365.

133. *Id.*

134. *Id.* at 51,365-51,367.

135. *Id.* at 51,366.

136. *Id.* at 51,364.

Technology Assessment.¹³⁷ The second bill, H.R. 3835, was introduced by Representative Roy Dyson in December 1985. It would ban the proposed research burn until the EPA submits a comprehensive report to Congress on ocean incineration. The bill would also require the agency to establish a detailed permitting system.¹³⁸ Both bills have been referred to the Oceanography Subcommittee of the House Merchant Marine and Fisheries Committee.

C. MARYLAND CONSISTENCY REVIEW UNDER THE COASTAL ZONE MANAGEMENT ACT

Four coastal states are adjacent to the proposed research burn site—Delaware, Pennsylvania, New Jersey, and Maryland. Three of those states, Delaware, Pennsylvania, and New Jersey, had listed ocean incineration permits as activities “which are likely to affect the coastal zone” and which the states would like to review for consistency with their coastal zone management programs.¹³⁹ Delaware and Pennsylvania have found the proposed permit consistent with their coastal zone programs, and New Jersey is expected to complete its review shortly.¹⁴⁰

Maryland had not listed ocean incineration permits as an activity that it wished to review. However, Maryland sought approval from NOAA to perform a consistency review on this proposed permit. In February of 1986, NOAA decided to allow Maryland to conduct its consistency review. NOAA found that there is a reasonable expectation that the burn could adversely affect Maryland's coastal zone.¹⁴¹ (Maryland's coastal zone extends three miles seaward.)¹⁴² Maryland now has at least six months to complete its review.¹⁴³

The EPA had hoped to perform the research burn this spring. However, if Maryland completes its review by June and approves the burn, the project could be completed in late summer or early fall. If the review delays the project until late fall, the North Atlantic may well be too rough to allow a burn at that time.¹⁴⁴

137. See *Current Developments*, 16 ENV'T REP. (BNA) 1508 (Dec. 6, 1985).

138. See *id.*

139. See Tentative Determination to Issue a Research Permit, *supra* note 125, at 51,370.

140. See *Current Developments*, 16 ENV'T REP. (BNA) 1879 (Feb. 14, 1986).

141. See *id.* at 1878-1879.

142. See 16 U.S.C. § 1453(1) (1982).

143. See 15 C.F.R. § 930.55(e) (1986).

144. See *Current Developments*, 16 ENV'T REP. (BNA) 1879 (Feb. 14, 1986).

VI. CONCLUSION

The EPA has made substantial progress in developing an appropriate regulatory scheme for the ocean incineration of hazardous waste. Before the agency promulgates its final regulations governing ocean incineration, however, the EPA needs to answer several nagging questions. The EPA should decide, on the basis of solid scientific data, whether the emission of products of incomplete combustion (PICs) must be regulated. The agency should also address the questions involving the toxicities of emissions and the long-term effects of ocean incineration on human health and the environment.

The proposed research permit was designed to provide some answers to these and other questions. Without appropriate field studies, the EPA may never be able to answer these questions adequately. Consequently, the entire future of ocean incineration in the United States may rest upon the execution of the proposed research burn. That burn may now be delayed, perhaps for a substantial period of time. In fact, it is possible that this proposed burn may never take place if Maryland finds the burn inconsistent with its coastal zone management program and the Secretary of Commerce does not approve the burn.

The EPA, of course, could promulgate final ocean incineration regulations without the benefit of additional scientific information. However, in view of the agency's position on the need for more data and the seriousness of the questions raised by the scientific community, the EPA would be ill-advised to proceed without this additional information.¹⁴⁵

145. Subsequent to the delivery of this paper, the EPA decided to deny the permit for the proposed research burn. The EPA, moreover, announced that it did not intend to issue any research permits until final ocean incineration regulations are promulgated because it believed that additional data was not absolutely necessary to the issuance of those final regulations. 51 Fed. Reg. 20,344 (1986). Nevertheless, the EPA has performed at least one of the tests originally scheduled for the research burn at a land-based facility located in Arkansas. See *Current Developments*, 17 ENV'T REP. (BNA) 1710 (Feb. 2, 1987). It is unclear, however, whether the EPA plans further land-based research or intends to issue these long-delayed regulations without the benefit of additional scientific information. Meanwhile, a potentially attractive technology for destroying highly chlorinated liquid waste goes unused in the United States. See generally OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, OCEAN INCINERATION: ITS ROLE IN MANAGING HAZARDOUS WASTE (1986) (concluding that ocean incineration presents an attractive interim option for managing liquid waste).

