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Recent Development

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RECENT DEVELOPMENT

The United States Environmental Protection Agency's Proposal for At-Sea Incineration of Hazardous Wastes—A Transnational Perspective

TABLE OF CONTENTS

I. INTRODUCTION

On February 28, 1985, the United States Environmental Protection Agency (EPA or Agency) proposed rules governing the incineration of liquid organic hazardous wastes at sea.[1] By providing specific criteria governing at-sea incineration[2] the proposed rules would modify the provisions of the Ocean Dumping regulations.[3] After more than a year of

1. Ocean Incineration Regulations, 50 Fed. Reg. 8222 (1985) (to be codified at 40 C.F.R. pts. 220, 227, 228, 234) (proposed Feb. 28, 1985) (including explanatory material) [hereinafter Ocean Incineration Regulations].

2. *Id.*

3. 40 C.F.R. 220-228 (1986) (promulgated under authority of Marine Protection, Research and Sanctuaries Act (MPRSA), 33 U.S.C. §§ 1401-1445 (1982)).

discussions among waste handlers, the EPA, and citizen and environmental groups over the merits and risks of at-sea incineration the EPA promulgated the rules. The EPA's rulemaking process drew an immediate and heated response from the public, and attracted the attention of several Congressional committees.[4] Three years after proposing the rules, the EPA continues to consider information received during the comment period.

Although most of the critics focused upon the manner in which the EPA developed the rules, many detractors questioned the sufficiency of the rules under the various international agreements governing ocean dumping and incineration. This Article will address and analyze the shortcomings of the proposed rules with regard to the international law pertaining to ocean incineration.

The controversy regarding at-sea incineration is merely a facet of one of the most serious environmental problems facing the United States today—disposal of hazardous wastes. The EPA has estimated that the United States generates more than 264 million metric tons of hazardous waste per year.[5] Millions more tons will require disposal as the nation faces the task of cleaning up its problem waste sites under Superfund.[6] These wastes present acute and persistent threats to human health and environmental integrity. Data on chemical contamination indicates that exposure to hazardous wastes results in a startling variety of health conditions, including cancer, birth defects, pulmonary and respiratory illness, toxic bioaccumulation, deafness, skin irritation, leukemia, liver and nervous system damage, visual defects, and sterility.[7] Perhaps more frightening is the fact that little is known about the effects of low-level exposure to hazardous compounds.[8]

The traditional method of disposing of hazardous waste is contain-

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4. *See, e.g., Ocean Incineration: Hearings Before the Subcomm. on Environmental Pollution of the Senate Comm. on Environment and Public Works*, 99th Cong., 1st Sess. (1985) [hereinafter *Senate Hearings*]; *Incineration of Hazardous Wastes at Sea: Hearings Before the Environment, Energy and Natural Resources Subcomm. of the House Comm. on Government Operations*, 98th Cong., 2d Sess. (1984) [hereinafter *House Hearings*].

5. *House Hearings, supra* note 4, at 3 (statement of Barbara Boxer); *see also Jerseyans Criticize Plan to Burn Wastes at Sea*, N.Y. Times, Apr. 19, 1985, at B2, col. 1. New Jersey alone produces an annual volume of 500 million gallons of toxic waste. *Burning of Toxic Wastes Debated*, N.Y. Times, Mar. 17, 1985, at 50, col. 1.

6. *House Hearings, supra* note 4, at 3 (statement of Barbara Boxer).

7. *See generally* S. EPSTEIN, L. BROWN & C. POPE, HAZARDOUS WASTE IN AMERICA (1982).

8. *See* HAZARDOUS AND TOXIC WASTES: TECHNOLOGY, MANAGEMENT AND HEALTH EFFECTS 398 (S. Majumdar & E. Miller eds. 1984).

ment in land disposal facilities. Land disposal, however, has several serious shortcomings. Foremost among its drawbacks is the likelihood of environmental contamination. Despite increasingly stringent land disposal regulations, the EPA has conceded that hazardous wastes placed in a land impoundment are "very likely" to migrate from the facility into the environment.[9] Furthermore, landfill capacity is dwindling; Congress, noting the dangers of land disposal, recently has directed waste handlers to phase out use of landfills as a disposal alternative.[10]

In light of the inadequacies inherent in land disposal, an increasing volume of wastes requires that officials utilize the disposal method of incineration.[11] Incineration is a process of controlled oxidation which converts hazardous wastes into less hazardous materials.[12] A typical land-based hazardous waste incinerator consists of (1) a waste feed, (2) an oxygen-fed burner system, (3) a combustion chamber, (4) a combustion monitoring system that incorporates an automatic shutdown system which engages upon malfunction of any of the above elements, and (5) emissions control equipment.[13] One considerable benefit of incineration is that the process destroys most of the waste, thereby reducing greatly the volume of waste which the disposal method introduces into the environment. The land incineration regulations under the Resource Conservation and Recovery Act (RCRA) require a destruction and removal efficiency of 99.99% for principal organic hazardous constituents (POHCs).[14] Regulations under the Toxic Substances Control Act

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9. 46 Fed. Reg. 11, 126 (1981).

10. Hazardous and Solid Waste Amendments of 1984, § 201(c), Pub. L. No. 98-616, 98 Stat. 3221, 3226 (1984).

11. EPA, ASSESSMENT OF INCINERATION AS A TREATMENT METHOD FOR LIQUID ORGANIC HAZARDOUS WASTES: SUMMARY AND CONCLUSIONS 14 (Mar. 1985) (report of Office of Policy, Planning and Evaluation) [hereinafter POLICY ASSESSMENT]. Less than one percent of the 264 million metric tons of hazardous wastes generated in 1981 were disposed of by incineration. A mere ten percent of those incinerated wastes were disposed of by commercial incinerators. *Id.* at 56.

12. The specific products of incineration depend upon the type of waste burned. Incineration of simple organic wastes yields CO_2 and H_2O. Complex organic wastes, such as halogenated industrial wastes, yield additional chemical products upon combustion; for example, incineration of chlorinated materials produces HCl and traces of Cl, plus H_2O and CO_2. Liquid hazardous wastes containing metals, sulfur, or organically-bound nitrogen will produce oxides of those materials upon incineration. *See* POLICY ASSESSMENT, *supra* note 11, at 36-37.

13. *Id.* at 37.

14. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Subpart O—Incinerators, 40 C.F.R. §§ 264.340-51 (1986). Performance of incinerators generally is gauged in terms of either destruction efficiency or destruction and removal efficiency. Destruction efficiency is the percentage of hazardous

(TSCA) require a more stringent destruction and removal efficiency of 99.9999% for incineration of polychlorinated biphenyls (PCBs), dioxins and dibenzofurans.[15]

Despite its advantages over land disposal, incineration has its drawbacks. The process does release a certain amount of hazardous material into the atmosphere.[16] Although this amount may be considerably less concentrated than groundwater contamination from landfills, the atmospheric contaminants also may travel greater distances. Therefore, any harm stemming from atmospheric contaminants may cover a broader geographic area than that from groundwater contamination. Furthermore, incomplete combustion of hazardous wastes sometimes results in the formation and release of certain hazardous compounds not present in the original waste stream. The EPA's regulatory scheme currently does not govern these compounds, known as "PICs" (products of incomplete combustion).[17] Nevertheless, many industries use incineration extensively for managing liquid organic hazardous wastes.[18]

The process of at-sea incineration is virtually identical to land-based incineration. Waste handlers, however, conduct at-sea incineration at a distance calculated to minimize atmospheric contamination of populated areas.[19] Based on data from a series of test burns in the 1970s and early 1980s, the EPA concluded that ocean incineration "could be a viable alternative of waste disposal which should be considered along with other disposal methods."[20] Opponents, nevertheless, contend that ocean incineration entails risks above and beyond those inherent in land incineration. Ocean incineration requires additional handling and transportation of the wastes as they are transferred on board the incineration vessel

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constituents destroyed in the combustion chamber. Destrution and removal efficiency is the percentage of hazardous constituents destroyed and subsequently removed by emission control devices. POLICY ASSESSMENT, *supra* note 11, at 42. POHCs comprise a limited number of hazardous wastes and are ranked according to their difficulty of thermal destruction. They serve as gauges for destruction and removal efficiency and destruction efficiency. *Id.*

15. Incinerator Performance Standards, 40 C.F.R. § 264.343(a)(2) (1986).

16. Metals account for 90% or more of the incremental risks of developing cancer from stack emissions. POLICY ASSESSMENT, *supra* note 11, at 83.

17. *Id.* at 12. EPA states that the "reported levels of PICs from well operated incinerators present very low risks." *Id.* However, scientific understanding of the causes and risks of PICs is very limited. *Id.*

18. *Id.* at 36. As of February 1985, EPA had received 204 RCRA incineration permit applications and had issued 27 final permits. *Id.*

19. Ocean incinerators utilize liquid injection systems which include all elements of land incinerators except pollution control systems. *Id.* at 39.

20. Ocean Incineration Regulations, *supra* note 1, at 8222 (explanatory material).

and carried to the burn site; each step increases the risk of accidental release into the environment. Furthermore, unlike oil spills, an accident involving a hazardous waste incineration vessel could destroy an entire marine ecosystem. In addition, some opponents contend that more information regarding the environmental impact of ocean incineration is necessary before permitting routine operations to occur. Until the EPA addresses and resolves these issues, opponents of the EPA's proposed ocean incineration rules argue that international agreements concerning at-sea incineration prohibit the United States from incinerating wastes at sea.

II. LEGAL BACKGROUND

A. *European Experience with Ocean Incineration*

European incineration ships have operated successfully in the North Sea since 1969, due in part to a shortage of land disposal sites.[21] These ships have logged roughly 320 voyages and have incinerated approximately 650,000 metric tons of hazardous waste. No casualties from collision, grounding, ramming, or fire have occurred, and no reported spills during loading exist.[22]

The Oslo Dumping Convention (Oslo Convention) regulates, in part, incineration activities in the North Sea.[23] The Oslo Convention is a regional agreement governing dumping of wastes in the North Sea, the Northeast Atlantic Ocean, and a portion of the Arctic Ocean.[24] Twelve European states are Contracting Parties to the Convention.[25]

Article 19(1) of the Oslo Convention defines "dumping" as follows:

> "Dumping" means any deliberate disposal of substances and materials into the sea by or from ships or aircraft other than:
>
> (a) Any discharge incidental to or derived from the normal operation of ships and aircraft and their equipment;
>
> (b) The placing of substances and materials for a purpose other than the mere disposal thereof, if not contrary to the aim of this Convention.

At-sea incineration is a "deliberate disposal" from ships. Thus, the Oslo

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21. POLICY ASSESSMENT, *supra* note 11, at 78.

22. *Id.*

23. Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, U.N. Doc. A/AC.138/SC.III/L.9 (1972) [hereinafter Oslo Convention].

24. *See* Oslo Convention, *supra* note 24, at art. II.

25. The following nations are parties to the Oslo Convention: Belgium, Denmark, Finland, France, the Federal Republic of Germany, Iceland, Ireland, The Netherlands, Norway, Portugal, Spain, Sweden, and the United Kingdom. REGISTER OF INTERNATIONAL TREATIES AND OTHER AGREEMENTS IN THE FIELD OF THE ENVIRONMENT 102, U.N. Doc. UNEP/GC/INFORMATION/11/REV.1 (1985).

Convention's provisions cover at-sea incineration.[26]

Ocean incineration in Europe began as an interim measure pending development of better waste management technologies.[27] As of 1985 only the United Kingdom expected to increase the use of ocean incineration as a disposal technique.[28] In November 1987, eight European nations agreed to cut ocean incineration to sixty-five percent of current levels by 1991, and to ban completely incineration on the North Sea by 1994.[29]

B. *The London Dumping Convention*

The London Dumping Convention (London Convention), drafted and ratified in 1972, is the first international agreement to contain specific regulations governing ocean incineration.[30] Unlike the Oslo Convention, the London Convention is a global agreement containing no limitation upon the area of application. Forty-five nations, including the United States, are signatories to the London Convention.

The London Convention establishes the general obligation of each contracting party to "promote the effective control of all sources of pollution of the marine environment."[31] The London Convention especially directs states to "take all practicable steps to prevent the pollution of the sea by the dumping of waste and other matter that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea."[32]

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26. The "normal operations" exception of article 19(1)(a) does not cover operational discharges of wastes from ships or aircraft designed for dumping activities. *See* 1 G. TIMAGENIS, INTERNATIONAL CONTROL OF MARINE POLLUTION 131-33 (1980).

27. *Senate Hearings, supra* note 4, at 33 (statement of Sally Lentz).

28. Alternative Means of Disposal for Organochlorine Wastes, Report by the Netherlands presented at the Twelfth Meeting of the Standing Advisory Committee for Scientific Advice of the Oslo Convention (1985), *noted in Senate Hearings, supra* note 4, at 206.

29. *Total Ban on Incineration in North Sea by 1994 Among Steps Backed by Eight Nations*, [Current Developments] Int'l Env't Rep. (BNA) 9 (Jan. 13, 1988).

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

31. *Id.* at art. I.

32. *Id.* Article II directs Contracting Parties to "take effective measures individually, according to their scientific, technical and economic capabilities, and collectively, to prevent marine pollution caused by dumping." The terms "practicable" in article I and "according to their. . .capabilities" in article II have raised concerns that they may be interpreted as escape clauses. However, in view of the entire regulatory system established under the London Dumping Convention, any abuse of these terms is likely to be insignificant. *See* 1 G. TIMAGENIS, *supra* note 26, at 195.

The London Convention defines "dumping" as:

> (i) Any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea;
> (ii) Any deliberate disposal at sea of vessels, aircraft, platforms or other man-made structures at sea.[33]

Article III defines "sea" as "all marine waters other than the internal waters of States." The scope of the London Convention, therefore, is not limited to a particular ocean region, but, with the exclusion of bays and other "internal waters," covers the entire global marine environment.

Ocean incineration is a method of deliberate disposal. Thus, it comes within the London Convention's definition of dumping and falls under the control of that convention. In 1978 at the Third Consultative Meeting of the Parties to the Convention, the contracting parties, desiring more specific control over incineration, adopted further regulations.[34] According to regulation 1(2) of the addendum to Annex I:

> "Incineration at sea" means the deliberate combustion of wastes or other matter on marine incineration facilities for the purpose of their thermal destruction. Activities incidental to the normal operation of vessels, platforms or other man-made structures are excluded from the scope of this definition.[35]

In the preamble to the 1978 incineration regulations, the contracting parties emphasized that incineration at sea was an "interim method of disposal of wastes pending the development of environmentally better solutions, considering at all times the best available technology."[36]

Article IV provides that "Contracting Parties shall prohibit the dumping of any wastes or other matter in whatever form or condition except

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33. London Dumping Convention, *supra* note 30, at art. III (a)(i)-(ii). While this definition excludes "operational wastes," *see id.* at art. III(b)(i), the exclusion does not apply to "wastes or other matter transported by or to vessels, aircraft, platforms or other man-made structures at sea, operating for the purpose of disposal of such matter." *Id.* *Cf.* Oslo Convention art. 19(1), *supra* note 23 and accompanying text.

34. Inter-Governmental Maritime Consultative Organization: Excerpts from the Report of the Third Consultative Meeting of the Parties to the Convention on the Prevention of Maritime Pollution by Dumping of Wastes and Other Matter (Oct. 24, 1978) [hereinafter 1978 Report]. These regulations, jointly prepared by representatives from the United States and Canada, amended Annexes I and II of the London Dumping Convention with respect to at-sea incineration.

35. 1978 Report, *supra* note 34, at regulation 1(2). Regulation 1(1) of the addendum defines "marine incineration facility" as "a vessel, platform, or other man-made structure operating for the purpose of incineration at sea."

36. 1978 Report, *supra* note 34, at Annex 3 (resolution adopted October 12, 1978).

as otherwise specified."[37] Although this language prohibits, on its face, the dumping of *any* substances, article IV actually varies the legal treatment of different categories of wastes. The result is a three-level regulatory scheme for controlling the dumping of waste into the oceans.

The first level of the regulatory scheme prohibits "[t]he dumping of wastes or other matter listed in Annex I."[38] Annex I of the London Convention, the so-called "black list,"[39] is composed of the following classes of environmentally dangerous substances:

1. Organohalogen compounds.
2. Mercury and mercury compounds.
3. Cadmium and cadmium compounds.
4. Persistent plastics and other persistent synthetic materials, for example, netting and ropes, which may float or may remain in suspension in the sea in such a manner as to interfere materially with fishing, navigation or other legitimate uses of the sea.
5. Crude oil, fuel oil, heavy diesel oil, and lubricating oils, hydraulic fluids, and any mixtures containing any of these, taken on board for the purpose of dumping.
6. High-level radio-active wastes or other high-level radio-active matter, defined on public health, biological or other grounds, by the competent international body in this field . . . as unsuitable for dumping at sea.
7. Materials in whatever form (e.g. solids, liquids, semi-liquids, gases or in a living state) produced for biological and chemical warfare.
8. The preceding paragraphs of this Annex do not apply to substances which are rapidly rendered harmless by physical, chemical or biological processes in the sea provided they do not:
   (i) Make edible marine organisms unpalatable, or
   (ii) Endanger human health or that of domestic animals.
   The consultative procedure provided for under Article XIV should be followed by a Party if there is doubt about the harmlessness of the substance.
9. This Annex does not apply to wastes or other materials (e.g. sewage sludges and dredged spoils) containing the matters referred to in paragraphs 1-5 above as trace contaminants. Such wastes shall be subject to the provisions of Annexes II and III as appropriate.[40]

The amendments adopted by the Third Consultative Meeting added a

37. London Dumping Convention, *supra* note 30, at art. IV. Article III(4) defines "wastes or other matter" as "material and substance of any kind, form or description."

38. *Id.* at art. IV(1)(a).

39. 1 G. TIMAGENIS, *supra* note 26, at 203.

40. London Dumping Convention, *supra* note 30, at Annex I.

tenth paragraph to Annex I[41] stating that the incineration of wastes listed in paragraphs 1 and 5 (organohalogen wastes and oils) shall not be prohibited, but shall require a prior special permit. The amendment to Annex I further directs that, when issuing special permits for incineration of these wastes, contracting parties shall apply the regulations pertaining to incineration (which are set forth in the addendum to Annex I) and shall "take full account" of the Technical Guidelines on the Control of Incineration which the contracting parties have adopted.[42]

The Third Consultative Meeting also interpreted the exception for wastes "rapidly rendered harmless" or present as "trace contaminants."[43] Annex 6 of the Third Consultative Meeting provides that an Annex I substance may be considered "rapidly rendered harmless" if tests show that dumping will not cause "acute or chronic toxic effects or bioaccumulation in sensitive marine organisms typical of the marine ecosystem at the disposal site."[44] An Annex I substance may *not* qualify as a "trace contaminant" if (1) it has been added to an otherwise acceptable waste for the purpose of dumping, (2) concentrations of the substance in the waste mixture are such that the dumping of the waste could cause undesirable environmental effects, or (3) the substance is present at a concentration or amount which may practically be reduced by technical means before dumping.[45]

The second level of the regulatory scheme[46] requires a prior special permit for the dumping of wastes listed in Annex II. Annex II—the

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41. Amendments to Annexes to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter Concerning Incineration at Sea, 1978 Report, *supra* note 34, at Annex 3. The text of the amendment reads:

> 10. Paragraphs 1 and 5 of this Annex do not apply to the disposal of wastes or other matter referred to in these paragraphs by means of incineration at sea. Incineration of such wastes or other matter at sea requires a prior special permit. In the issue of special permits for incineration the Contracting Parties shall apply the Regulations for the Control of Incineration of Wastes and Other Matter at Sea set forth in the Addendum to this Annex (which shall constitute an integral part of this Annex) and take full account of the Technical Guidelines on the Control of Incineration of Wastes and Other Matter at Sea adopted by the Contracting Parties in consultation.

42. The Technical Guidelines on the Control of Incineration of Wastes and Other Matter were drafted at the Fourth Consultative Meeting (1979) and were finalized at the Fifth Consultative Meeting (1980). *See Senate Hearings*, *supra* note 4, at 170.

43. 1978 Report, *supra* note 34, at Annex 6.

44. *Id.* at Annex 6(B)(4).

45. *Id.* at Annex 6(B)(5).

46. London Dumping Convention, *supra* note 30, at art. IV(1)(b).

"grey list"[47]—contains substances "requiring special care" in disposal.[48] The list reads as follows:

A. Wastes containing significant amounts of the matters listed below:

Arsenic, Lead, Copper, Zinc } and their compounds

Organosilicon compounds
Cyanides
Flourides
Pesticides and their by-products not covered in Annex I.

B. In the issue of permits for the dumping of large quantities of acids and alkalis, consideration shall be given to the possible presence in such wastes of the substances listed in paragraph A and to the following additional substances:

Beryllium, Chromium, Nickel, Vanadium } and their compounds

C. Containers, scrap metal and other bulky wastes liable to sink to the sea bottom which may present a serious obstacle to fishing or navigation.
D. Radio-active wastes and other radio-active matter not included in Annex I.[49]

The 1978 ocean incineration amendments added paragraph (E) to Annex II. This paragraph states that, in issuing special permits, contracting parties shall apply the regulations set forth in the addendum to Annex I and shall take full account of the Technical Guidelines on the Control of Incineration.

The third level of the regulatory scheme[50] requires a prior general permit in order to dump any substances not listed in Annexes I or II. This provision extends the London Convention's regulatory control to the dumping of any and all substances.

The issuance of general and special permits is central to the London Convention's regulatory program. Article VI provides that each con-

47. *See* 1 G. TIMAGENIS, *supra* note 26, at 208.
48. London Dumping Convention, *supra* note 30, at Annex II.
49. *Id.* at Annex II.
50. *Id.* at art. IV(1)(c).

tracting party shall designate an authority to issue general and special permits and to monitor and record dumping activities and the environmental effects thereof.[51] Each national authority shall issue permits for substances intended for dumping that either are loaded in its territory, or (in the case of loading in the territory of a non-contracting party) are loaded by a vessel or aircraft that is flying the flag of the authority.[52] The applicable authority may grant "special permits" only upon application. Furthermore, the "special permits" apply only to individually identified acts of dumping, and are subject to Annexes II and III. On the other hand, the authority may grant "general permits" by regulation rather than by application. The "general permits" need not apply to individually identified acts of dumping, and are subject only to Annex III.[53]

Article VI gives the national permitting authority broad discretion in granting permits. The London Convention, however, contains certain legally binding guidelines which the authority must consider in exercising its discretion.[54] Furthermore, article IV(2) and article VI(2) provide that the authority shall grant the permit only after careful consideration of the factors set forth in Annex III.[55] Annex III loosely groups these factors into (1) characteristics and composition of the matter, (2) characteristics of the dumping site and the method of dumping, and (3) general considerations and conditions.[56]

The 1978 incineration amendments provided the authorities with several key criteria to consider in issuing incineration permits. Regulation 2(2) requires that permitting authorities first determine whether the incineration at issue is needed, stating:

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51. *Id.* at art. IV(1).

52. *Id.* at art. VI(2).

53. *Id.* at art. III(5), (6); *see also* 1 G. TIMAGENIS, *supra* note 26, at 212.

54. Articles I and II, as discussed above, are examples of general criteria intended to guide permitting decisions.

55. Article IV(2) reads: "Any permit shall be issued only after careful consideration of all the factors set forth in Annex III, including prior studies of the characteristics of the dumping site as set forth in Sections B and C of that Annex."

Article VI (3) reads: "In issuing permits . . . the appropriate authority or authorities shall comply with Annex III, together with such additional criteria, measures and requirements as they may consider relevant."

Timagenis points out that "[t]he obligation to comply with the criteria set forth is repeatedly stressed in the Convention precisely in order to impress upon the appropriate authority the importance of so doing." 1 G. TIMAGENIS, *supra* note 26, at 216.

56. *See* London Dumping Convention, *supra* note 30, at Annex III. Note also that, under article III(5), special permits must be issued in accordance with Annex II.

> Contracting parties shall first consider the practical availability of alternative land-based methods of treatment, disposal or elimination, or of treatment to render the wastes or other matter less harmful, before issuing a permit for incineration at sea in accordance with these Regulations. Incineration at sea shall in no way be interpreted as discouraging progress towards environmentally better solutions including the development of new techniques.[57]

The Eighth Consultative Meeting of Contracting Parties to the Convention interpreted regulation 2(2) as follows:

> Before considering the dumping of matter at sea every effort should be made to determine the practical availability, including technical feasibility and environmental soundness, of alternative land-based methods of treatment, disposal or elimination, or of treatment to render the matter less harmful for dumping at sea.
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> Other means of disposal should be considered in the light of a comparative assessment of:
>
> —Human risks;
>
> —Environmental costs;
>
> —Hazards (including accidents) associated with treatment, packaging, transport, and disposal;
>
> —Economics (including energy costs);
>
> —Exclusion of future uses of disposal areas, for both sea disposal and the alternatives.
>
> If the foregoing analysis shows the land alternatives to be more practical, a license for sea disposal should not be given.[58]

Furthermore, permitting authorities must conduct an initial survey of the incineration system for every proposed marine incineration facility. The survey shall confirm the performance of the system by "intensive stack monitoring" using wastes typical of those expected to be incinerated.[59] The survey shall ensure a performance destruction efficiency in excess of 99.9 percent,[60] and a combustion efficiency in excess of 99.95 percent, plus or minus .05 percent.[61] A contracting party having doubts as to the thermal destructability of a substance shall conduct a test burn of that substance to ensure that the incineration system can meet the required

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57. 1978 Report, *supra* note 34, at regulation 2(2) of the addendum.

58. Eighth Consultative Meeting of the Contracting Parties to the Convention 20-24 (Feb. 1984), *quoted in* Ocean Incineration Regulations, *supra* note 1, at 8247 (explanatory material) [hereinafter Eighth Consultative Meeting].

59. 1978 Report, *supra* note 34, at regulation 3(1)(b)(vi).

60. *Id.* at regulation 3(1)(a).

61. *Id.* at regulation 5.

performance standards.[62]

The London Convention provides for the enforcement of its regulatory scheme. Article VII, in establishing each contracting party's duty to implement and enforce the terms of the London Convention, states that:

1. Each Contracting Party shall apply the measures required to implement the present Convention to all:

   (a) Vessels and aircraft registered in its territory or flying its flag;

   (b) Vessels and aircraft loading in its territory or territorial seas matter which is to be dumped;

   (c) Vessels and aircraft and fixed or floating platforms under its jurisdiction believed to be engaged in dumping.

2. Each Party shall take in its territory appropriate measures to prevent and punish conduct in contravention of the provisions of this Convention.

3. The Parties agree to co-operate in the development of procedures for the effective application of this Convention particularly on the high seas, including procedures for the reporting of vessels and aircraft observed dumping in contravention of the Convention.

4. This Convention shall not apply to those vessels and aircraft entitled to sovereign immunity under international law. However each Party shall ensure by the adoption of appropriate measures that such vessels and aircraft owned or operated by it act in a manner consistent with the object and purpose of this Convention, and shall inform the Organisation accordingly.

5. Nothing in this Convention shall affect the right of each Party to adopt other measures, in accordance with the principles of international law, to prevent dumping at sea.[63]

In addition to article VII, article III(1)(a) requires states to enforce the London Convention with regard to vessels and aircraft registered in its territory. This requirement follows traditional "flag state" enforcement which applies regardless of where loading or dumping takes place.[64]

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62. *Id.* at regulation 4.

63. London Dumping Convention, *supra* note 30, at art. VII. Note that article VII(1) applies at sea against vessels, aircraft and platforms acting in violation of the Convention. Article VII(2), on the other hand, applies against land-based sources of dumping within the territory of a Contracting Party. *See* 1 G. TIMAGENIS, *supra* note 26, at 229.

64. 1 G. TIMAGENIS, *supra* note 26, at 231.

C. *The U.N. Convention on the Law of the Sea*

The environmental protection provisions of the 1982 United Nations Convention on the Law of the Sea (LOS Convention)[65] represent the first attempt to establish a general legal scheme for all matters of global marine environmental protection.[66] The LOS Convention was the product of over a decade's work by more than 150 countries at the Third United Nations Conference on the Law of the Sea.[67] The LOS Convention, which enters into force twelve months after accession or ratification by sixty states, has received 159 signatures and twenty-seven ratifications as of April 1986.[68]

The United States has stated that it will not be a party to the LOS Convention.[69] The Restatement (Revised) of Foreign Relations Law (Restatement) states that the LOS Convention will only apply to the United States if the United States becomes a party to the agreement.[70] Nevertheless, the Restatement notes further that "by express or tacit agreement accompanied by consistent practice, the United States, and states generally, have accepted the bulk of the provisions of the [LOS] Convention as statements of customary law binding upon them apart from the [LOS] Convention."[71] The Restatement recognizes the LOS Convention's provisions for protection of the marine environment as embodiments of customary law.[72]

The LOS Convention's environmental protection provisions contain several general principles relevant to ocean incineration. Under article 192 each state has the general obligation to protect and preserve the

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65. Convention on the Law of the Sea, *opened for signature* Dec. 10, 1982, U.N. Doc. A/Conf. 62/122, *reprinted in* 21 I.L.M. 1261 (1982) [hereinafter LOS Convention].

66. Boyle, *Marine Pollution Under the Law of the Sea Convention*, 79 AM. J. INT'L L. 347, 349-50 (1985).

67. *See* President's Statement on the Convention on the Law of the Sea, 19 WEEKLY COMP. PRES. DOC. 887 (July 9, 1982) [hereinafter President's Statement].

68. LOS Convention, *supra* note 65; *Status of the United Nations Convention on the Law of the Sea*, LAW OF THE SEA BULL. No. 7 at 1-6 (Apr. 1986).

69. *See* President's Statement, *supra* note 67. The refusal to sign the Convention arises out of a dispute over the Convention's provisions regarding deep-seabed mining. *Id.*

70. RESTATEMENT (REVISED) OF THE FOREIGN RELATIONS LAW OF THE UNITED STATES pt. V, introductory note at 440 (Tent. Draft No. 6, 1986).

71. *Id.*

72. RESTATEMENT (REVISED) OF THE FOREIGN RELATIONS LAW OF THE UNITED STATES pt. VI, introductory note at 167 (Tent. Draft No. 4, 1984) (law of the environment); *id.* § 612 comments d, e. *See also* Charney, *International Agreements and the Development of Customary International Law*, 61 WASH. L. REV. 971, 989 (1986).

marine environment.[73] Article 194 expands this obligation by establishing the duty to take all measures necessary to "prevent, reduce, and control" marine pollution using the best practicable means. Furthermore, this article obliges states to "take all measures necessary to ensure that . . . pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention."[74] The latter obligation is particularly applicable to ocean incineration, the effects of which are likely to be carried great distances. Perhaps most significant in the context of ocean incineration, however, is article 195, which establishes the duty not to transfer damage or hazards or to transform one type of pollution into another.[75] The language of this article seems particularly relevant to the transfer of land-generated wastes to ocean disposal sites, and the transformation of liquid pollutants to airborne pollutants.

The principles contained in the articles mentioned above appear to have general, but direct, applicability to ocean incineration. Although the Restatement has recognized the LOS Convention's environmental provisions as the embodiment of customary international law, other authorities refuse to accept the provisions as law binding non-parties to the LOS Convention.[76] Because a principle of customary law requires wide acceptance and *opinio juris*, existing state practice consistent with the principle is essential to the principle's legal effect.[77]

D. *United States Experience with Ocean Incineration*

The United States statute governing ocean dumping is the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA).[78] The MPRSA requires a federal permit for dumping activities from vessels or aircraft registered in the United States, flying the United States flag, or transporting wastes from the United States.[79] The purpose of the

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73. LOS Convention, *supra* note 65, at art. 192.

74. *Id.* at art. 194.

75. *Id.* at art. 195. Article 195 reads as follows:

> In taking measures to prevent, reduce and control pollution of the marine environment, States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another.

76. *See* Charney, *supra* note 72, at 986.

77. *See* RESTATEMENT (REVISED) OF LAW OF THE FOREIGN RELATIONS LAW OF THE UNITED STATES pt. VI, at 102 (Tent. Draft No. 6, 1986); Charney, *supra* note 72, at 973-74.

78. 33 U.S.C. §§ 1401-1445 (1982).

79. *See* 33 U.S.C. § 1411; *id.* § 1412. The MPRSA defines "dumping" as "a dispo-

MPRSA is to limit dumping of materials that "adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities."[80]

In 1973 the EPA began promulgating dumping regulations under the MPRSA.[81] Because the legislative history of the MPRSA failed to indicate Congressional intent to include airborne pollutants, the agency originally believed it lacked authority to regulate ocean incineration.[82] Congressman Dingell, one of the authors of the MPRSA, and the National Wildlife Federation, however, persuaded the EPA that it had authority to regulate ocean incineration as "indirect" dumping.[83] In 1974 the EPA required operators to hold a prior federal permit in order to incinerate wastes at sea.[84] The EPA's ocean dumping regulations, however, contained no criteria for incinerator performance. Thereafter, the EPA issued the few incineration permits under MPRSA by consulting the regulations and technical guidelines under the London Convention.[85]

The first use of ocean incineration in the United States occurred in the Gulf of Mexico from October 1974 to January 1975.[86] Shell Chemical Company, prohibited under the EPA's ocean dumping regulations from continuing to dump liquid organochlorine wastes at sea, investigated at-sea incineration as a feasible disposal alternative. Pursuant to a joint proposal by the EPA, Shell and the National Wildlife Federation to evaluate the effectiveness of ocean incineration as a disposal technique, Shell received federal permits for two test burns and two operational burns.[87] Shell conducted the burns aboard *M/T Vulcanus*, a vessel owned by Ocean Combustion Services, B.V.[88] The EPA monitored the burns closely using both ships and aircraft to gather data on incineration performance and environmental effects.[89] After evaluating data from the burns, the EPA concluded that "ocean incineration could be a viable

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sition of material." 33 U.S.C. § 1402(f).

80. 33 U.S.C. § 1402.

81. 40 C.F.R. §§ 220-29 (1986).

82. POLICY ASSESSMENT, *supra* note 11, at 24.

83. *Id.* Note that the definition of "dumping" in the MPRSA encompasses incineration. *See* 33 U.S.C. § 1402.

84. POLICY ASSESSMENT, *supra* note 11, at 24.

85. *Id.*

86. EPA, DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA 227 (July 1975) (report of Office of Water and Hazardous Materials) [hereinafter 1975 REPORT].

87. POLICY ASSESSMENT, *supra* note 11, at 25.

88. *Id.* at 23-24. Ocean Combustion Services is a Dutch waste disposal company.

89. *See generally* 1975 REPORT, *supra* note 86.

alternative of waste disposal which should be considered along with other disposal methods."[90]

The EPA issued permits for three additional sets of burns—two in the Gulf of Mexico and one in the Pacific Ocean—between 1975 and 1982. The last series of burns occurred in 1981 and 1982 under a research permit issued to Chemical Waste Management, Inc. and Ocean Combustion Services, B.V.[91] That series of burns, which was the first attempt by the United States to incinerate PCB wastes, took place off the coast of Texas and Louisiana aboard the *M/T Vulcanus*.[92]

In late 1981 Chemical Waste Management and Ocean Combustion Services applied for permits for further PCB burns.[93] In May 1982, the EPA conducted public meetings in Brownsville, Texas and Mobile, Alabama to discuss these requests for permits. The EPA received formal comments on the proposed permits at a hearing in Brownsville on August 31, 1982. On October 17, 1983, after reviewing the hearing and after modifying the permit process, the EPA proposed new special permits and research permits to Chemical Waste Management and Ocean Combustion Services. After receiving strong public opposition to the permits,[94] the Assistant Administrator for Water denied the permits on May 23, 1984. The Administrator denied the permits based in part upon (1) the lack of specific criteria governing ocean incineration, and (2) the insufficiency of the Agency's analysis as to the need for ocean incineration.[95] In response to the desire for specific criteria for the regulation of at-sea incineration, the EPA drafted proposed rules for the incineration of liquid wastes at sea.

III. Recent Development

On February 22, 1985, the EPA published proposed rules in the *Federal Register* modifying the provisions of its ocean dumping regulations[96] with regard to both the issuance of ocean incineration permits and the

90. *Id.* at 227.

91. Ocean Incineration Regulations, *supra* note 1, at 8223 (explanatory material).

92. *Id.*; *see also Rules Proposed for Ocean Burning of Wastes*, N.Y. Times, Feb. 21, 1985, at A12, col. 1.

93. Chemical Waste Management, Inc. and Ocean Combustion Services, B.V., applied for a special permit on July 10, 1981, and a research permit on November 2, 1981. Ocean Incineration Regulations, *supra* note 1, at 8223 (explanatory material).

94. The hearings, held between November 21-23 in Brownsville, Texas and Mobile, Alabama, attracted more than 6,400 people. The EPA received over 2,000 letters and postcards on the proposed permits during the comment period. *See id.*

95. *Id.*

96. 40 C.F.R. §§ 220-28 (1986).

designation and management of incineration sites.[97] The proposed rules established a framework for a commercial ocean incineration program applicable both to hazardous and non-hazardous liquid materials.[98] The following discussion will present a broad, though not exhaustive, overview of the EPA's proposed regulatory scheme.

The EPA drafted the proposed rules under the authority of the MPRSA.[99] Section 234.3 of the proposed rules notes that the rules apply the criteria binding upon the United States under the London Convention and its Annexes, to the extent that such criteria do not relax the provisions of the MPRSA. The explanatory material to the rules asserts that the rules meet or exceed the requirements set forth in the London Convention.[100] In addition, the proposed rules are similar in many ways to the regulations promulgated under RCRA for land-based incineration.[101]

Section 234.1(a) prohibits the unauthorized incineration of liquid wastes at sea by United States vessels or by foreign vessels who conduct their activities in United States territorial seas or the contiguous zone.[102] The section authorizes the transportation of wastes from a foreign state for the purpose of incineration in United States waters if the following conditions are met: 1) the material is transported by a vessel, agency or instrumentality of the United States; 2) the material is transported from a location in a foreign state which is party to the London Convention; 3) the foreign state has issued a permit which is consistent with the requirements of the London Convention and the proposed rules; and 4) in the case of a United States agency or instrumentality, application for such permit was approved by the EPA's Assistant Administrator for Water.[103] Section 234.45, however, expressly prohibits incineration of

97. Ocean Incineration Regulations, *supra* note 1, at 8257.

98. *Id.* at 8226. The EPA plans to propose rules governing at-sea incineration of solid waste.

99. *Id.* at 8228.

100. *Id.*

101. *See id.* at 8231. Both programs use performance standards rather than specification (equipment design) standards. Both programs also use destruction efficiency as the primary indicator of incinerator performance, and both use a destruction efficiency standard of 99.99 percent (99.9999 percent for PCBs, dioxins and dibenzofurans). Furthermore, both base destruction efficiency measurements on monitoring data from a small number of POHCs. *See* POLICY ASSESSMENT, *supra* note 11, at 30-31. One notable difference between the two regulatory schemes is the needs assessment, which is required for ocean incineration under the London Dumping Convention but which is not required for land incineration.

102. *See* Ocean Incineration Regulations, *supra* note 1, § 234.1(a), at 8257.

103. *Id.*

the following substances:

(a) High-level radioactive wastes [defined in § 234.2(g)];[104] and
(b) Materials in whatever form produced or used for radiological, chemical or biological warfare; and
(c) Materials which after incineration emit persistent inert synthetic materials which may float or remain in suspension in the ocean in such a manner as to interfere materially with fishing, navigation, or other legitimate uses of the ocean; and
(d) Quantifiable concentrations of organic compounds which are more difficult to destroy than most thermally refractive compound on which, in a trial burn the incineration, attained a destruction efficiency of at least [99.99%, or 99.9999% for PCBs, dioxins, and dibenzofurans];[105] and
(e) Materials insufficiently described by the applicant in terms of their composition and properties for EPA to determine that the materials when incinerated would meet the incinerator performance standards in §234.44 or the environmental performance standards in §234.45; and
(f) Separately manifested shipments of materials . . . containing metals in concentrations of greater than 500 ppm.[106]

Part 234 does not apply to "operational" combustion of materials for propulsion or other purposes.[107]

The Administrator of the EPA has delegated to the Assistant Administrator for Water (Assistant Administrator) the authority to issue ocean incineration permits and to designate and manage ocean incineration sites.[108]

The proposed rules create three types of permits. The first type is the *research permit*, which the Assistant Administrator may issue for the purpose of either studying new ocean incineration technology or evaluating the impact of incineration activities on the environment.[109] A re-

104. Section 234.2 defines "high-level waste" as "the aqueous waste resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated waste from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuels or irradiated fuel from nuclear power reactors." *Id.* at 8258.

105. *See id.* § 234.47(b), at 8266.

106. *Id.* § 234.45(f), at 8266.

107. *Id.* § 234.1(d), at 8257-58.

108. *Id.* § 234.5, at 8259.

109. The explanatory material to the proposed rules suggests that likely subjects for study under a research permit include the formation and effects of products of incomplete combustion, effects of incineration on the ocean microlayer, and improved plume modeling. *See* Ocean Incineration Regulations, *supra* note 1, at 8231 (explanatory material).

search permit has a duration of up to six months.[110] Before issuing a research permit, however, the Assistant Administrator must determine that (a) the proposed research activities are necessary and the applicant cannot reasonably conduct them by other means, (b) the incinerator(s) likely will meet the incineration performance standards listed in §234.47, and (c) the emissions likely will meet the environmental performance standards of § 234.48 or, alternatively, that the scale of the incineration activities will have minimal adverse environmental impact.[111]

The second type of permit under the proposed rules is the *emergency permit*, which the Assistant Administrator may issue in situations requiring urgent action for the protection of human health.[112] The EPA may issue emergency permits for at-sea incineration of any wastes except those blacklisted in § 234.45.[113] Emergency permits, like all other ocean incineration permits under the proposed rules, must be developed in accordance with Subpart E, which establishes various general provisions for operating conditions, financial responsibility, and penalties.[114] The rules, however, provide an expedited application process for emergency permits, and the Assistant Administrator need only publish notice of an emergency permit as soon as practicable after issuance.[115]

The third type of permit contemplated by the ocean incineration regulations is the *operating permit.* An operating permit applies to routine commercial incineration of liquid wastes at sites designated or listed in accordance with the procedures specified in the proposed rules.[116] Before issuing an operating permit, the Assistant Administrator must conduct a

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110. *Id.* at § 234.6(a), at 8259.

111. *See id.* § 234.49, at 8266 (research permit applications).

112. The language of this portion of the proposed rules is unclear. Section 234.6(c)(1) states that emergency permits may be issued to protect human health. Section 234.6(c)(2) defines "emergency" as a situation requiring urgent action to protect human health *and welfare. Id.* at 8259 (emphasis added). The criteria listed in Subpart D (Evaluation of Ocean Incineration Activities) lend little clarification. Section 234.51 states that, in evaluating an application for an emergency permit, the EPA must determine (1) that the applicant has adequately demonstrated that an emergency (as defined by § 234.6 (c)) exists; (2) that the emergency poses an unreasonable risk to public health; (3) that the emergency admits of no other feasible solution but ocean incineration; and (4) that the public interest, health, welfare, and safety require the issuance of the permit. *Id.* at 8267.

113. *See id.* § 234.45, *supra* note 106 and accompanying text.

114. Ocean Incineration Regulations, *supra* note 1, § 234.6(c)(5), at 8259. *See generally id.* Subpart F, §§ 234.68-72, at 8270 (Ocean Incineration Permit Requirements).

115. *See id.* § 234.6, at 8259.

116. *See generally id.* Subpart G, § 234.73-234.81, at 8271-74 (procedures governing the designation or listing of incineration sites under the proposed rules).

"needs assessment" by evaluating "the human health and environmental risks associated with ocean incineration as compared to those of practicable land-based alternatives."[117] The EPA states that "[n]eed will be presumptively demonstrated if ocean incineration poses less or no greater risks than practicable land-based alternatives."[118] Rather than determining need separately for each permit application, the EPA proposes to conduct a "generic" national needs assessment.[119] The results of this assessment, which will examine the technological, environmental, and economic aspects of incineration at sea, will create a rebuttable presumption of need in each permit issuance.[120] Although the EPA will consider specific aspects of the applicant's operations in light of the generic needs assessment, the EPA will reconsider the issue of need only if the applicant's operations are different from those considered in the generic assessment, or it is established that the information upon which the EPA based its generic assessment has changed significantly.[121]

An operating permit has two phases.[122] During Phase I—the trial burn stage—the equipment is tested for conformance with the proposed rules.[123] During the trial burn stage, the EPA must conduct an examination of the applicant's incineration system in order to approve the moni-

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117. *Id.* § 234.50, at 8267 (Operating Permit Applications). The needs assessment is required by the London Dumping Convention. See 1978 Report, *supra* note 35, at regulation 2(2). EPA does not interpret need in terms of lack of landfill capacity. However, capacity is a factor to be considered by the Agency in its evaluation. Ocean Incineration Regulations, *supra* note 1, at 8248 (explanatory material).

118. Ocean Incineration Regulations, *supra* note 1, at 8247 (explanatory material).

119. POLICY ASSESSMENT, *supra* note 11, at 15-19.

120. Ocean Incineration Regulations, *supra* note 1, at 8248 (explanatory material).

121. *Id.*

122. *Id.* at 8259.

123. *Id.* § 234.6(b)(2)(i), at 8259. Test burns must be conducted biannually thereafter or at the discretion of the Permit Program Manager. *Id.* § 234.53, at 8267. Under the existing ocean dumping regulations, the EPA required separate permits for the test burn phase and the operating phase of at-sea incineration activities. *See* 40 C.F.R. 220.3(f) (1986). Test burns were conducted under research permits, and operational burns under special permits. In 1974, when the EPA issued its ocean dumping regulations, at-sea incineration was new to the United States, and the EPA believed that it was proper to conduct test burns under research permits. This scheme, however, created the possibility that a company would spend considerable sums on a test burn, only to be denied an operating permit for reasons unrelated to test burn performance (e.g. inadequate demonstration of need). The EPA, therefore, concluded that test burns would be better handled as a component of the operational permit. *See* Ocean Incineration Regulations, *supra* note 1, at 8231 (explanatory material). The two-phase operating permit is similar to that issued to land-based incinerators under RCRA. *See* 40 C.F.R. § 270.62 (1986).

toring devices and automatic shutdown devices.[124] The EPA also must ascertain that there are no other means of disposing of the waste except by thermal destruction, and must test one or more incinerators (using wastes typical of those to be incinerated during the operational phase) to ascertain whether the facility is capable of achieving the incineration performance standards.[125] If the test burn data indicates that the operating conditions listed in the original permit should be altered, the EPA may either modify or revoke the permit.

Phase II of the operating permit is the operational phase. The permittee may not commence operations until the EPA issues a Letter of Approval certifying that the permittee has satisfactorily completed Phase I.[126]

The proposed rules allow an operating permit to run for up to ten years.[127] The EPA rejected the ocean dumping regulations' three-year limit on special permits because the Agency wished to encourage long-term planning on the part of at-sea incineration companies.[128] The proposed rules, however, make the operating permit reviewable after five years, at which time the EPA may modify or revoke the permit if necessary.[129] The EPA believes that the reviewing process will allow the Agency to control permits while also providing conditions favorable to the establishment of at-sea incineration enterprises.[130]

Subpart D of the proposed rules establishes a set of standards and criteria by which operators must conduct ocean incineration. Section 234.47 establishes two standards for incinerator performance. First, at-sea incinerators must achieve a combustion efficiency of 99.95 ± 0.05 percent on the waste stream.[131] Second, at-sea incinerators must achieve a destruction efficiency of at least 99.99% on all compounds except

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124. *See* Ocean Incineration Regulations, *supra* note 1, § 234.57, at 8268 (Instantaneous Waste Feed Shutoff System).

125. *See id.* § 234.53, at 8267 (Trial Burn).

126. *Id.* § 234.6(b)(2)(ii), at 8259.

127. *Id.*

128. Ocean Incineration Regulations, *supra* note 1, § 234.6(b)(2), at 8259.

129. *See id.* § 234.6(b)(1), at 8259. Examples of factors which may lead to modification or revocation include (1) inadequate performance as indicated by monitoring data or performance standard tests; (2) termination of need for disposal by ocean incineration; and (3) new evidence indicating unacceptable health or environmental impacts from ocean incineration.

130. *Id.* at 8232.

131. *Id.* § 234.47(a), at 8266. *See also* 1978 Report, *supra* note 34, at regulation 5. Combustion efficiency is determined by comparing the concentrations of CO and CO_2 in the exhaust gas. *See* Ocean Incineration Regulations, *supra* note 1, at 8245 (explanatory material).

PCBs, dioxins and dibenzofurans, which must achieve an efficiency of 99.9999%.[132] The proposed destruction efficiency standards are considerably more stringent than those required under the London Convention, which requires a destruction efficiency of 99.9%.[133] The EPA believes that the London Convention standard represents only a minimum requirement, and that a more stringent standard is both attainable and necessary.[134]

Section 234.48 establishes two environmental performance standards. The first standard places a limit upon acid-forming emissions (primarily hydrochloric acid (HCl)).[135] The second standard requires the applicant to demonstrate, through approved stack emissions modeling, that waste concentrations in the marine environment will not exceed applicable water quality standards or, if no such standards exist, that concentrations do not exceed an aquatic life no-effect level or a prescribed toxicity threshold.[136] The section treats mercury and cadmium separately under the second standard requiring that the applicant limit the amounts of these substances to those concentrations which would not exceed the applicable water quality standards if the substances were dumped directly into the water.[137] The Agency believes that limited concentrations of mercury and cadmium, dispersed into the marine environment through incineration, are rapidly rendered harmless or are present only as trace contaminants.[138] The explanatory material to the regulations, therefore, suggests that incineration of mercury and cadmium is consistent with the restrictions of Annex I of the London Convention.

Subpart D also establishes limitations upon the types of materials which waste handlers may incinerate at sea. As discussed above, section 234.45 bans the incineration of certain "prohibited" substances.[139] Section 234.46 places limitations upon the incineration of certain "re-

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132. Ocean Incineration Regulations, *supra* note 1, § 234.47(b), at 8266.

133. 1978 Report, *supra* note 34, at regulation 5.

134. Ocean Incineration Regulations, *supra* note 1, at 8245 (explanatory material).

135. *Id.* § 234.48(a), at 8266.

136. *Id.* § 234.48(b), at 8266-67. The toxicity threshold is defined as "0.01 [percent] of an ambient marine water concentration shown to be acutely toxic to appropriately sensitive marine organisms in a bioassay carried out in accordance with EPA-approved procedures." *Id.*

137. *Id.*

138. *See id.* at 8245 (explanatory material). *See also* London Dumping Convention, *supra* note 30, at Annex I(8); 1978 Report, *supra* note 34, at Annex 6(B)(4) (interpretation of exceptions).

139. *See* Ocean Incineration Regulations, *supra* note 1, at § 234.45 (Prohibited Substances), *reprinted supra* at text accompanying notes 104-06.

stricted" substances. Under section 234.46, the EPA and the applicant must comply with the assessment and congressional approval provisions of the MPRSA[140] before low-level radioactive wastes may be incinerated at sea.[141] Furthermore, the applicant may not incinerate quantifiable concentrations of polychlorinated terphenyls (PCTs) without first conducting a destruction efficiency test specifically upon PCTs.[142] Finally, section 234.46 prohibits the incineration of metallic or organic compounds in concentrations that will exceed environmental performance standards or that likely will have greater than minimal adverse environmental impact.[143]

Shortly after publishing the proposed rules, the EPA released two supporting documents. Early in March, the Office of Policy, Planning and Evaluation released a needs assessment which concluded that ocean incineration was a useful and environmentally sound method of waste disposal.[144] The assessment, one of several sources which the EPA plans to consult when making its generic needs determination, made several conclusions which are summarized below.

First, the assessment concluded that "[i]ncineration, whether at sea or on land, is a valuable and environmentally sound treatment option for destroying liquid hazardous wastes, particularly when compared to land disposal options now available."[145] The EPA noted that properly designed and operated incinerators present minimal health and environmental risks. The Agency also indicated, however, that in order to improve understanding of the environmental impact further research is necessary.[146]

Second, the assessment determined that "[t]here is no clear preference for ocean or land incineration in terms of risks to human health and the environment."[147] The EPA reached this conclusion by weighing the benefits of ocean incineration (e.g. greater distance from populated areas) against its drawbacks (e.g. risk of a catastrophic spill).

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140. *See* 33 U.S.C. § 1414.

141. Ocean Incineration Regulations, *supra* note 1, § 234.46(a), at 8266 (Restricted Substances).

142. *Id.* §234.46(c), at 8266.

143. *Id.* § 234.46(b), at 8266.

144. POLICY ASSESSMENT, *supra* note 11.

145. *Id.* at 1.

146. *Id.* at 2. In particular, the EPA indicated the need for more data on products of incomplete combustion. *See also* EPA, Report on the Incineration of Liquid Hazardous Wastes by the Environmental Effects, Transport and Fate Committee of the Science Advisory Board at 19 (Apr. 1985) [hereinafter SAB Report].

147. POLICY ASSESSMENT, *supra* note 11, at 1.

Last, the assessment stated that "[a]lthough current commercial and on-site hazardous waste incineration capacities on land are adequate to handle existing demand (except for PCBs), future demand will significantly exceed this capacity as other disposal alternatives are increasingly restricted."[148] The Agency cited the 1984 RCRA amendments, increased Superfund activity, declining landfill capacity, and generators' concerns over long-term liability as factors that will intensify demands for incineration in coming years.

In April 1985, the Environmental Effects, Transport and Fate Committee of the EPA's Science Advisory Board released its study of public health and environmental effects of ocean incineration.[149] Although this report cautiously concluded that incineration is "probably" valuable and "potentially" safe,[150] the committee noted that the existing data regarding the effects of incineration is "insufficient to make a definitive statement about its environmental impacts over time."[151] Furthermore, the report urges further research on a vast array of subjects ranging from the impact of incineration products on marine ecology to the risk of fugitive waste releases.[152]

The EPA continues to evaluate the proposed rules in light of the information received during the comment period. Chemical Waste Management, Inc., as part of a study of the impact of incineration on aquatic ecology, requested authorization to conduct a test burn of PCBs in the Atlantic Ocean.[153] On May 28, 1986, the Agency denied the research permit. In denying the permit, the EPA suggested that it was evaluating the safety and need for ocean incineration, and that a test burn was not necessary for the evaluation of these issues.[154] On December 31, 1987,

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148. *Id.* at 2.

149. SAB Report, *supra* note 146.

150. *Id.* at v. *See also Senate Hearings*, *supra* note 4, at 380 (statement of Terry Yosie).

151. SAB Report, *supra* note 146, at 7. The Science Advisory Board (Board), however, did not believe that research questions were great enough to delay or divert the EPA from its regulatory course. A strong majority of the Board supported the EPA in licensing commercial incineration. *Senate Hearings*, *supra* note 4, at 394 (statement of Terry Yosie).

152. SAB Report, *supra* note 146, at 13, 43. EPA Deputy Administrator Christopher Daggett denied that the EPA acted prematurely in proposing rules before the supporting documents were completed. *See* N.Y. Times, Apr. 21, 1985, at § 11, p. 21, col. 4. *See also* Ocean Incineration Regulations, *supra* note 1, at 8224 (explanatory material).

153. *See Federal Court Defers to EPA Review in Waste Incineration Permit Dispute*, 17 Env't Rep. (BNA) 265 (June 27, 1986).

154. *See Test Ocean Burn Deemed Not Necessary to EPA Development of Incineration Rules*, 17 Env't Rep. (BNA) 153 (June 6, 1986).

Waste Management abandoned its attempts to obtain a permit for incineration at sea.[155] The company cited administrative delay and new competition from land incineration facilities as reasons for its decision.[156] While some environmentalists are hopeful that Waste Management's decision "will prompt the Environmental Protection Agency to put the final nail in the ocean incineration coffin" by dropping the proposed incineration regulations, EPA has not indicated an intention to do so as of the date of this writing.[157]

IV. ANALYSIS

The EPA states that the proposed rules meet or exceed the requirements for the London Convention. Nevertheless, critics and supporters of ocean incineration alike acknowledge flaws in the rules which render them unacceptable under international law.[158] Although some flaws may be technical matters capable of simple remedy, others are more serious and raise questions concerning the legality of ocean incineration under international environmental law.

A. *Mercury and Cadmium Compounds*

One area of inconsistency is in the rules' treatment of mercury and cadmium. Section 234.46(b) and 234.48(b) permit incineration of blended wastes containing mercury or cadmium as long as direct dumping of the blended wastes would not exceed applicable water quality standards. Although the EPA relies upon the "trace contaminant" and "rapidly rendered harmless" exceptions to the London Convention's Annex I,[159] these exceptions do not permit the blending of persistent substances. The Third Consultative Meeting indicated that persistent substances shall not be considered "harmless" unless present as a trace contaminant.[160] Furthermore, the "trace contaminant" exception does

155. *Waste Management Abandons Proposal to Burn Hazardous Wastes off U.S. Coast*, Env't Rep. (BNA) 10, 10 (Jan. 13, 1988); *Company Abandons Proposal on Burning Toxic Wastes at Sea*, N.Y. Times, Dec. 31, 1987, at 1, col. 1.

156. *Waste Management Abandons Proposal to Burn Hazardous Wastes off U.S. Coast*, *supra* note 155, at 10; *Company Abandons Proposal on Burning Toxic Wastes at Sea*, *supra* note 155, at 1, col. 1.

157. *Company Abandons Proposal on Burning Toxic Wastes at Sea*, *supra* note 155, at 7, col. 3.

158. *See Senate Hearings*, *supra* note 4, at 54 (statement of Gov. Mark White); *id.* at 182 (statement of Kenneth Kamlet); *id.* at 211 (statement of Sally Lentz).

159. *See* Ocean Incineration Regulations, *supra* note 1, at 8245 (explanatory material).

160. 1978 Report, *supra* note 34, at Annex 6(b)(4).

not apply when a handler of wastes added the substance for the purpose of dumping.[161] For these reasons, the allowance of mercury and cadmium compounds in the "final blended waste mixture" of § 234.46 is improper under the London Convention.[162]

B. *Needs Assessment*

The EPA's proposed needs assessment constitutes a very serious potential inconsistency with the London Convention. In the introductory material to the proposed rules, the Agency indicated that a waste handler could presumptively demonstrate the need for ocean incineration if the incineration poses risks no greater than those posed by practicable land-based alternatives.[163] The EPA apparently derived this definition of "need" from the language of the Eighth Consultative Meeting, which states that a permit for dumping should not be granted if the needs analysis shows land disposal to be "more practical."[164] However, that same language interprets "need" as the "practical availability, including technical feasibility and environmental soundness, of alternative land-based methods of treatment, disposal or elimination."[165] Thus it appears that an adequate needs assessment under the London Convention must weigh more than the relative risks of land-based and ocean-based disposal.

The EPA acknowledges that, at present, land disposal capabilities are sufficient for all but PCB wastes.[166] The Agency also points out that the climate for land disposal will change significantly in the future, although it cannot accurately predict the amount of capacity which will be required.[167] According to the EPA's logic, prudence requires that at-sea incineration be permitted now to assure that incineration facilities will

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161. *Id.* at Annex 6(b)(5).

162. This conclusion seems particularly appropriate in light of the fact that metals cause 90 percent of the incremental risk of cancer from incinerator stack emissions. *See* POLICY ASSESSMENT, *supra* note 11, at 83; *see also Senate Hearings*, *supra* note 4, at 182 (statement of Kenneth Kamlet); *id.* at 211 (statement of Sally Lentz).

163. Ocean Incineration Regulations, *supra* note 1, at 8247 (explanatory material).

164. Eighth Consultative Meeting, *supra* note 58.

165. *Id.* For language of the guidelines to be considered in the needs assessment, see *supra* note 57 and accompanying text. *See also Senate Hearings*, *supra* note 4, at 182 (statement of Kenneth Kamlet).

166. POLICY ASSESSMENT, *supra* note 11, at 2. According to Chemical Waste Management, Inc., the relief from the requirement of scrubbers allows destruction of highly chlorinated wastes (such as vinyl chloride) that cannot be incinerated in land facilities; the difficulty of meeting emissions performance standards limits the amount of chlorine that may be present in the wastes to be incinerated on land. *See Senate Hearings*, *supra* note 4, at 288 (statement of William Brown).

167. POLICY ASSESSMENT, *supra* note 11, at 61.

be available when the need arises.[168] On the other hand, this rationale may serve to encourage the expansion of hazardous waste generation, thereby circumventing the national goals of waste reduction and recycling.[169] The practical necessity for ocean incineration seems more questionable in light of the intent of European nations to eliminate incineration in the North Sea by the end of the century.[170] International experience, national policy, and the plain meaning of the London Convention's interpretation of "need" appear to require a more compelling and specific determination of availability (or lack thereof) before ocean incineration should be permitted by the United States.

Though relied upon by the EPA in its proposed needs assessment, conclusions as to the relative risks of ocean incineration are far from certain. The opposing camps of the ocean incineration battle have argued extensively over the impact of the disposal practice upon human health and environmental quality.[171] Two issues arise from this debate: the environmental and health impact of incineration emissions, and the risk and impact of fugitive or catastrophic releases.

The problem of scientific uncertainty is painfully clear in the issue of emissions impact. Although the Office of Policy, Planning and Evaluation indicates that research and risk studies on incineration emissions show "minimal impact" upon health and the environment, its analysis is subject to disclaimers which warn of "many limitations and caveats due

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168. At this writing, the only operational United States incineration vessels are the *Vulcanus* and *Vulcanus II*, owned by Chemical Waste Management, Inc. Two more vessels—the *Apollo* and *Apollo II*—are being constructed by At-Sea Incineration, Inc. Seaburn, Inc. and Environmental Oceanic Services, Inc. have each proposed a conceptual containerized design. *Id.* at 36. The EPA estimates a need for up to 33 incinerator ships to handle projected demands. *Id.* at 60.

169. One critic argues that rising costs of disposal have caused companies to invest in reduction technologies, resulting in a market for liquid waste disposal which is much more limited than the EPA originally projected. This commentator claims that there will be no need for ocean incineration for the next ten years. *See Senate Hearings*, *supra* note 4, at 43 (statement of Jerry Neel). Another commentator, while agreeing that increasing disposal costs will reduce waste generation, is not as optimistic about present reductions. He feels that cutting off ocean incineration as an option "is far more likely to promote illegal or inappropriate dumping than it is to stimulate waste minimization." *Id.* at 32 (statement of Kenneth Kamlet).

170. *Id.* at 207 (statement of Sally Lentz).

171. *See generally House Hearings*, *supra* note 4; *Senate Hearings*, *supra* note 4; EPA, ASSESSMENT OF INCINERATION AS A TREATMENT METHOD FOR LIQUID ORGANIC HAZARDOUS WASTES, BACKGROUND REPORT V: PUBLIC CONCERNS REGARDING LAND-BASED AND OCEAN-BASED INCINERATION (Mar. 1985) (report of Office of Policy, Planning and Evaluation) [hereinafter PUBLIC CONCERNS ASSESSMENT].

to uncertainties in the data and methods that were used."[172] The degree of scientific uncertainty in this area is amplified in the Science Advisory Board report. While the Board acknowledges that limited disposal alternatives compel the EPA to make policy and permit decisions in the face of uncertainty, it points out that "[i]t is also the EPA's responsibility . . . to address and to reduce the levels of uncertainty associated with this activity by carrying out and/or sponsoring the needed research."[173]

The hesitance of the scientific community (including the scientific community within the Agency) to vouch for the safety of incineration emissions raises concerns about the actual impact of emissions on human health and the marine environment. The EPA points out that, because of the distance from human populations, ocean incineration has considerably less impact upon human health than its land-based counterpart.[174] The Agency also concludes that "no measurable effect on the marine ecosystem is expected due to stack releases from [non-PCB] waste[s]."[175] This conclusion was reached with limited understanding of the effects of bioaccumulation of PCBs and dioxins upon the ocean microlayer.[176]

A serious concern raised by opponents of ocean incineration is the risk of spills during transportation. Compared to land incineration, ocean incineration involves two additional transportation steps: (1) loading onto the ship, and (2) a voyage of approximately 800 kilometers to the incineration site.[177] These additional steps necessarily increase the risk of spillage during transportation. The impact of a major spill would be catastrophic. For example, it has been estimated that a release of 500,000 gallons of PCB wastes would pollute a radius of 200 miles to a depth of more than 4,500 feet, effectively deteriorating all life in the

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172. *See* POLICY ASSESSMENT, *supra* note 11, at 2, 69. Limitations cited in the report include weak data on PICs, incomplete analysis of effects from releases of wastes into the marine environment, and analysis on an "expected case" bases rather than a "worst case" basis.

173. SAB Report, *supra* note 146, at v.

174. The EPA estimates that the incremental risk of cancer from land-based PCB emissions is 40 times greater than corresponding ocean-based emissions. See POLICY ASSESSMENT, *supra* note 11, at 85.

175. *Id.* at 86.

176. *Id.* The microlayer is a thin layer on the ocean's surface which contains a high concentration of organic material. *See* SAB Report, *supra* note 146, at 33. This layer is thought to be an important link in the marine food chain. *Id.* The microlayer is slightly oily. Because PCBs and dioxins dissolve easily in oil but not in water, concerns have been raised about the accumulation of these toxic compounds on the microlayer. *See, e.g., Why Risk Poisoning the Ocean?*, N.Y. Times, Apr. 18, 1985, at 26, col. 1.

177. *See* POLICY ASSESSMENT, *supra* note 11, at 70, 72.

Gulf of Mexico.[178] Unlike an oil spill, a spill from a hazardous waste vessel would probably sink to the bottom, making containment and cleanup extremely difficult.[179]

The EPA points out that European incinerator ships have established a very good safety record, but that their activities have been too limited to be used in estimating statistically the risks of spills.[180] A statistical analysis conducted for the Agency shows that spills would be "very infrequent events."[181] The EPA also states that the tonnage carried by the *M/T Vulcanus* constitutes only .01 percent of the petroleum and hazardous substances transported yearly through the Gulf of Mexico. Despite these reassurances, the possibility of a spill is an acknowledged risk unique to ocean incineration. Considering the magnitude of effect of a potential spill and the difficulty of cleanup or containment, this is a risk which cannot be taken lightly.[182]

In summary, the London Convention requires the EPA to consider more than relative risk in making its needs assessment. However, considering the marked degree of uncertainty attending the EPA's conclusions in the area of relative risks, it appears that even the Agency's conclusion the area of relative risk is premature and insufficiently considered.[183] Further research and a reformulation of the criteria for needs assessment are necessary to conform the proposed rules to regulation 2(2) of the London Convention.

C. *Duty to Limit Pollution*

Implicit in the discussion of the sufficiency of the proposed rules under international law is this larger question: does the general duty to limit marine pollution preclude the United States from initiating commercial

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178. *See Senate Hearings*, *supra* note 4, at 29 (statement of Sharon Stewart).

179. Ocean Incineration Regulations, *supra* note 1, at 8225 (explanatory material).

180. *See* POLICY ASSESSMENT, *supra* note 11, at 78.

181. *Id.* at 79. Statistics estimate that the frequency of a spill (per ship) would be approximately one spill in 1,200 operating years. Frequencies vary depending upon the location of the spill and the amount of the release. *See id.*

182. Critics also fear that monitoring of ocean incineration activities is more difficult than those on land, and that illegal release by unscrupulous operators would initially be undetectable. See N.Y. Times, Apr. 21, 1985, § 11, at 24, col. 1. These concerns appear to be unfounded in light of specific provisions in the proposed rules which safeguard against such releases. *See, e.g.*, Ocean Incineration Regulations, *supra* note 1, § 234.62, at 8269-70 (requires EPA official to accompany every incineration voyage); *id.* § 234.53(a)(4), at 8267-68 (requires pre-permit survey to ensure that there exist no means of disposal except by incineration during normal operations).

183. *Senate Hearings*, *supra* note 4, at 55 (statement of Mark White).

incineration activities? Considering the difficulty of ocean cleanup and the scant scientific knowledge about the effects of incineration, some see the oceans as a unique resource that should receive special protection.[184] Ocean incineration, the argument goes, simply transforms the oceans into a handy waste pit that is "out of sight, out of mind."[185] These critics of ocean incineration see the ocean as "everybody's backyard rather than nobody's backyard."[186] General principles embodied in the London Convention and the LOS Convention shed light upon the view that the ocean is deserving of special protection.

Article I of the London Convention establishes the duty to "take all practicable steps" to prevent pollution which is liable to damage human health or the environment. This provision does not prohibit absolutely the dumping of wastes, since the whole purpose of the London Convention is to establish a regulatory framework for dumping. Nevertheless, the language "all practical steps" does raise the issue of need. As noted above, this issue is fraught with scientific uncertainty and disparities of interpretation. In light of this observation, it would be premature to conclude that article I prohibits altogether the initiation of commercial at-sea incineration by the United States. On the other hand, like regulation 2(2) of the London Convention, article I appears to require a more comprehensive and conclusive study of the effects of and need for ocean incineration before the United States can be deemed to have fulfilled its duty under that article.

Although the United States has not signed the LOS Convention, the Restatement's adoption of the LOS Convention's environmental provisions as customary law suggests that the United States is bound by the general principles contained therein. The LOS Convention sets forth the obligation to protect and preserve the marine environment and to "prevent, reduce and control" marine pollution using the best practical means. The degree of uncertainty attending the EPA's ocean incineration studies suggests that the Agency has not applied the best practical means in accordance with these principles.

The principles embodied in the LOS Convention also require states to take all measures necessary to ensure that pollution arising from activi-

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184. *See* PUBLIC CONCERNS ASSESSMENT, *supra* note 171, at 38.

185. *See id.* One critic of EPA's handling of ocean incineration noted: "It seems to me that the EPA is playing an ostrich game with toxics. . . . Anchor a ship some 200 miles off our coast, and forget it. The burners can roar day and night without disturbing anyone's tranquility." *House Hearings*, *supra* note 4, at 6 (statement of Jack O'Connell).

186. PUBLIC CONCERNS ASSESSMENT, *supra* note 171, at 38.

ties such as incineration do not spread beyond their respective zones of sovereign control. Considering the potential for incineration emissions to travel long distances through the atmosphere, this provision may be interpreted to prohibit ocean incineration altogether. This interpretation is supported by the language of article 195 of the LOS Convention, which establishes the duty not to transfer damage or hazards or to transform one type of pollution into another. This provision can be read to address directly the transportation of land-generated wastes to ocean disposal sites, and the transformation of liquid pollutants to airborne pollutants.

Despite the amenability of the LOS Convention's language to broad prohibitory interpretations, however, the United States recognizes the LOS Convention's environmental provisions only so far as they represent customary international law. Considering the incineration activities conducted under the London Convention, one may perceive a lack of state practice consistent with some of the principles of environmental protection within the LOS Convention. The practice of European nations in the area of at-sea incineration casts doubt upon the existence of any customary international law that prohibits ocean incineration per se.

V. CONCLUSION

As currently drafted, the EPA's proposed ocean incineration regulations fail in several respects to meet the requirements of international law. The standards for mercury and cadmium can easily be revised to pass muster under the London Convention. The other deficiencies in the proposed rules, however, are not as easily remedied, because these deficiencies stem from the problem of scientific uncertainty.

To expect the EPA to eliminate all uncertainty before proceeding with a regulatory program such as this would be unreasonable and naive. The exigencies of modern environmental management require that decisionmakers formulate policy based upon probabilities, and excessive research on an issue may result in little real progress towards its resolution. However, many fear that a policy decision without a sufficient factual foundation may cause as many problems as it is designed to solve. Regarding the proposed ocean incineration regulations, the extensive limitations and post hoc nature of the EPA's scientific and analytical support justify this fear.

This nation's hazardous waste problem necessitates the investigation of new methods for the reduction and safe disposal of wastes. Existing international law does not bind the EPA's hands in this matter. Interna-

tional law simply ensures that a reasonable degree of caution is exercised in the implementation of new technology.

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