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THE REGULATION AND PERMITTING OF RECYCLING RESEARCH AND DEVELOPMENT FACILITIES IN THE COMMONWEALTH OF MASSACHUSETTS

Michelle B. Rosenberg*

"The world we have created today . . . has problems which cannot be solved by thinking the way we thought when we created them."

Albert Einstein

I. INTRODUCTION

Recycling is becoming a more popular alternative for solving the problem of hazardous wastes, replacing the alternatives of treatment and disposal.¹ This movement towards recycling is due to a growing society; increasing concern for the environment by the public, the government, and industry; and a lack of adequate alternatives for disposing of the many tons of hazardous waste produced each year.² Companies are researching and developing innovative new technologies for recycling hazardous wastes and are making these new technologies available to the marketplace.³ State and federal statutes and

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³ Holusha, supra note 2, at D6. For example, Molten Metal Technology, Inc. of Waltham, Massachusetts is researching and marketing a new technology which recycles hazardous waste. Id.
regulations designed to permit hazardous waste facilities, however, are not keeping pace with the special permitting needs of the companies that are trying to research, develop, and market these new technologies.\(^4\) The inadequate development of the law often hinders a new technology even when proponents of the law intend to promote new solutions to the problem of hazardous waste.\(^5\)

The experience of Molten Metal Technology, Inc. (MMT) of Waltham, Massachusetts, illustrates the barriers that Massachusetts law once erected for companies that are trying to develop new recycling technologies. MMT is one example of a company that was advancing a new recycling technology to deal with nonhazardous and hazardous waste, while facing a state regulatory regime that was not designed to accommodate MMT's needs.\(^6\)

MMT is an environmental technology company that has developed and is marketing a new recycling technology called Catalytic Extraction Processing (CEP).\(^7\) Essentially, CEP recycles wastes by dissolving the wastes in a bath of molten metal; recovering the wastes' constituent elements; and then converting these elemental constituents into new, valuable products.\(^8\) In order to continue research and to effectively market CEP, MMT built a state of the art research, development, and demonstration facility in Fall River, Massachusetts.\(^9\) The Fall River Research Facility (Fall River Facility) was designed to be a marketing tool in that the facility would demonstrate to potential customers the effectiveness of CEP in recycling the customers' proposed hazardous waste streams.\(^10\) Upon completion of the Fall

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\(^4\) See Telephone Interview with Chris Ayers, Deputy General Counsel of the Department of Environmental Protection, Commonwealth of Massachusetts Executive Office of Environmental Affairs (Feb. 15, 1994) [hereinafter Ayers Interview]; Telephone Interview with Dean Spencer, Senior Deputy General Counsel of the Department of Environmental Protection, Commonwealth of Massachusetts Executive Office of Environmental Affairs (Feb. 2, 1994) [hereinafter Spencer Interview]; Jones Interview I, supra note 2.

\(^5\) Jones Interview I, supra note 2.

\(^6\) Ayers Interview, supra note 4; Spencer Interview, supra note 4; Jones Interview I, supra note 2.

\(^7\) ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY (Molten Metal Technology, Inc. 1993) (corporate video) (on file with author); ELEMENTAL SOLUTION, supra note 2.

\(^8\) ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7; Rosenberg, supra note 1, at 40.

\(^9\) MOLTEN METAL TECHNOLOGY, INC., RECYCLING-R&D FACILITY (1993) (corporate brochure) (on file with author) [hereinafter RECYCLING-R&D FACILITY]; Rosenberg, supra note 1, at 40.

\(^10\) RECYCLING-R&D FACILITY, supra note 9, at 1.
River Facility in the spring of 1993, MMT had only to obtain the necessary permit for processing hazardous wastes before beginning operations. This obstacle turned out to be more difficult to overcome than MMT had anticipated.

As a recycler of hazardous waste, MMT was exempt from regulation under the federal Resource Conservation and Recovery Act (RCRA). Massachusetts, however, had promulgated regulations governing the recycling of hazardous waste and required companies to obtain a permit to recycle hazardous waste. Unfortunately for MMT, the Massachusetts permitting regulations were not designed to accommodate a recycling research, development, and demonstration facility that processes many different waste streams, such as MMT's Fall River Facility.

The failure of Massachusetts's laws to address MMT's special permitting needs could have prevented MMT from researching CEP and from marketing CEP units to potential customers as MMT desired, by testing and demonstrating the technology on commercial quantity waste streams. The inadequacy of Massachusetts's laws also presented problems for state authorities who wanted to protect the public interest in a clean environment while promoting innovative technologies.

To deal with the problem of a lack of regulations in the short term and begin operations at the Fall River Facility, MMT worked closely with the Massachusetts Department of Environmental Protection (MADEP) to devise a permit that would comply with state law and meet MMT's needs. In September, 1993, MADEP issued MMT a temporary Recycling Research and Development Permit, to expire in

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11 Jones Interview I, supra note 2. MMT had previously obtained all necessary sewer, treatability, and air permits.

12 Id.


15 See Mass. Regs. Code tit. 310, § 30.000–30.910 (1993); Ayers Interview, supra note 4; Jones Interview I, supra note 2. See infra notes 194–258 and accompanying text.

16 Jones Interview I, supra note 2. See infra notes 194–258 and accompanying text.

17 Spencer Interview, supra note 4.

18 See Temporary Permit for Molten Metal Technology, Inc.'s Solid and Hazardous Waste Research and Development Activities at Fall River Facility, issued by Department of Environmental Protection, Commonwealth of Massachusetts Executive Office of Environmental Affairs (effective Oct. 9, 1993) (on file with author) [hereinafter Temporary Permit].
March, 1995. This temporary permit allowed MMT to continue researching CEP and marketing CEP as MMT desired, by demonstrating the effectiveness of CEP to potential customers on various commercial waste streams supplied by the customers.

Because the existing regulations were not designed to address the needs of companies trying to develop and market innovative technologies for recycling hazardous waste, innovative permitting laws for these facilities, such as MMT's Fall River Facility, were needed. These special permitting laws had to both encourage companies to invest in research and development (R&D) for new technologies that recycle hazardous waste, and safeguard the public and the environment. MADEP recognized this need and worked closely with MMT to develop new regulations to cover activities similar to those of MMT.

The MMT experience offers valuable insight and guidance into how the law should evolve in response to technological innovation. Also, by looking at MMT's experience, other similarly situated companies can learn how to operate under the law as it now stands, and regulators in other states can modify and develop their laws to include provisions for permitting research and development facilities like MMT's Fall River Facility.

This Comment will use the experience of MMT as a case study to discuss how the law can either hinder or encourage the development and marketing of new hazardous waste recycling technology. Section II discusses MMT, its new recycling technology, and its marketing strategy. Section III describes the federal and state hazardous waste laws impacting MMT's operations at its Fall River Facility and the events that occurred when MMT attempted to obtain a permit for the Fall River Facility under the Massachusetts Hazardous Waste Management Act. Section IV reviews Massachusetts's temporary permit solution to the problem of a gap in the regulations. Finally, Section V discusses MADEP's development of the new Massachusetts Hazardous Waste Innovative Technology Regulations and advocates that other states follow Massachusetts's example and develop regulations specifically designed to permit hazardous waste research and development facilities.

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19 Id. at 10, 43.
20 Id. at 1-2. Certain conditions had to be met before MMT could process quantities greater than 250 kilograms per day. See infra notes 268-311 and accompanying text.
21 Ayers Interview, supra note 4; Spencer Interview, supra note 4.
II. MOLTEN METAL TECHNOLOGY, INC.

A. Company Background

Disposing of waste is a continually growing concern for industry, the government, and the public. Each year, more than thirteen billion tons of nonhazardous waste and industrial by-products and 200 million tons of hazardous waste are generated in the United States alone. Disposing of these wastes has become increasingly difficult. Environmentalists and regulators have realized the dangers inherent in storing hazardous wastes such as pesticide residues, chemical by-products, and paint sludges in landfills. These dangers include the possibility of toxins contaminating public water supplies. Today, the most common procedures for disposing of waste are: dumping the waste in landfills, burning the waste in incinerators, and releasing the waste into the environment.

Each of these methods of dealing with hazardous waste creates a new set of problems. Incineration of hazardous wastes creates air pollution. Landfilling creates site contamination. Furthermore, the capacity of landfills is declining. The problem with the practices of

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22 ELEMENTAL SOLUTION, supra note 2.
23 ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7; Rosenberg, supra note 1, at 40. This is the equivalent of each person generating more than 50 tons of waste per year. ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7.
24 Rosenberg, supra note 1, at 40.
25 Holusha, supra note 2, at D6.
26 Id.
27 Id.
28 See ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7.
29 Holusha, supra note 2, at D6. All incinerators release pollution into the air. Id. This is due to the incineration process. Not all toxic materials are destroyed by the flame. Hot gases carry the toxic materials and these gases are released into the atmosphere as the incinerator burns waste. Id. The Clinton Administration imposed a ban on new hazardous waste incinerators due to the pollution created. Id. The air pollutants created by incinerators include: "particulate matter containing metals, organics (dioxins and furans), acid gases such as sulfur dioxide and hydrochloric acid, and nitrogen oxides." Arnold W. Reitze, Jr. & Andrew N. Davis, Regulating Municipal Solid Waste Incinerators Under the Clean Air Act: History, Technology and Risks, 21 B.C. ENVTL. AFF. L. REV. 1, 14-15 (1993) (citing Arlene Levin, et al., Comparative Analysis of Health Risk Assessments for Municipal Waste Combustors, 41 J. AIR WASTE MGMT. ASS'N 20 (1991)).
31 Reitze & Davis, supra note 29, at 11, 15.
incineration and landfilling is exemplified by the thousands of contaminated sites already created in the United States. Cleaning up these sites could cost up to $1.7 trillion. In addition, these traditional methods for disposing of hazardous wastes create transportation liability and other liability problems.

An additional method for dealing with hazardous waste is to recycle the waste. Recycling involves collecting the secondary waste material; processing the material so that the material can be reused; and then reusing the recycled material to create new products. Recycling wastes has many benefits. Recycling reduces the amount of materials that need to be incinerated or disposed of in landfills, decreases the need for virgin materials in manufacturing processes, and conserves energy resources. With the existing state of technology, however, some types of hazardous waste streams cannot be recycled.

Companies are in the process of developing new methods for recycling hazardous wastes into useful products. One of these companies is MMT, which has developed a new recycling technology termed

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33 Id.

34 Sheridan, supra note 30, at 34. For example, even if all RCRA requirements are met, liability for landfills under CERCLA can last indefinitely. Reitze & Davis, supra note 29, at 14 (citing Mounteer, *How to Pay for Cleaning Up Co-Disposal Sites: Enlarging the Scope of the Debate*, 23 Env't Rep. (BNA) No. 23, at 1520 (Oct. 2, 1992)).


36 Reitze & Davis, supra note 29, at 7. Although the general concept of recycling is understood, RCRA does not provide a clear definition of recycling. Comella, supra note 35, at 416. This causes a problem in determining whether a facility is recycling. Id.

37 Reitze & Davis, supra note 29, at 9.

38 Sheridan, supra note 30, at 35. For example, there currently is no method to recycle waste streams which have a radioactive component. Id. This is an area which MMT is investigating. Id.

39 Holusha, supra note 2, at D6. A second type of recycling process called Supercritical Water Oxidation is being researched. Id. Supercritical Water Oxidation essentially “burns” the waste in water. Id. This technique involves the phenomenon of “supercritical” water. Id. Water becomes critical and ceases to act as a liquid or a gas when heated to 705 degrees Fahrenheit and compressed to 3,200 pounds per square inch. Id. When water is made supercritical the water's physical properties change in many ways. Id. For example, oily substances do not mix with water at ordinary temperatures and pressures. Id. In supercritical water, however, oily substances are easily soluble. Id. Also, salts which normally dissolve in water, separate out in supercritical water. Id. In supercritical water hazardous waste molecules break down into their constituent atoms. Id. These atoms then combine with oxygen which has been added to the system. Id. Supercritical Water Oxidation is equivalent to burning, but no flame is used or smoke produced. Id. The disposal system consists of water, waste, and a source of excess oxygen being placed in a big pressure cooker. Id. Companies at work on supercritical water systems include the General Atomics Corporation of San Diego, Eco Waste Technologies of Austin, and the Modell Development Corporation of Framingham, Mass. Id.
Catalytic Extraction Processing (CEP). The CEP technology combines metallurgical science and chemical engineering. The CEP system utilizes a molten metal bath kept at a temperature of approximately 3000 degrees Fahrenheit. Due to the intense heat, the molten metal bath acts as a catalytic solvent and breaks down the molecular structure of hazardous and nonhazardous wastes and industrial byproducts into their constituent elements. Reactants are added to the bath to convert the elemental constituents into recoverable products such as high-quality industrial gases, specialty inorganics, and metals. These new products can be reused as raw material by the waste generator or sold to other industrial users.

MMT has successfully demonstrated the ability of CEP to recycle many hazardous wastes regulated by RCRA and toxic wastes regulated by the Toxic Substance Control Act. Some of these wastes include pesticides, sludges, military wastes, spent solvents, and plastics. MMT has also demonstrated CEP on simple compounds such as paraffins, alcohols, and water and complex materials containing heavy metals, halogens, cyanides, PCBs, and polyaromatic hydrocarbons.

MMT was incorporated in November, 1989, and has grown from three founders to a company of over 130 employees. MMT expects its work force to continue to increase. MMT has also formed and continues to develop strategic alliances with other companies in order to advance and commercialize CEP for a wide range of industries.

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40 ELEMENTAL SOLUTION, supra note 2.
41 Rosenberg, supra note 1, at 40.
43 Rosenberg, supra note 1, at 40; Ronald Rosenberg, Molten to Dedicate New Recycling Facility, BOSTON GLOBE, Sept. 20, 1993, at 8.
44 Sheridan, supra note 30, at 34.
45 See Rosenberg, supra note 1, at 40.
47 ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7.
48 "PCBs" stands for polychlorinated biphenyls. RANDOM HOUSE COLLEGE DICTIONARY 976 (revised ed. 1984).
49 ELEMENTAL SOLUTION, supra note 2.
51 Id.
52 MOLTEN METAL TECHNOLOGY, INC., STRATEGIC ALLIANCES (1993) (corporate brochure) (on file with author) [hereinafter STRATEGIC ALLIANCES]. MMT gains access to high quality know-how and support by collaborating with industry leaders such as E.I. Du Pont de Nemours & Company, a partner in CEP development programs. Rosenberg, supra note 1, at 37. Du Pont provides MMT with expertise in process safety and has assisted MMT in developing MMT's Safety and Operations Program. STRATEGIC ALLIANCES, supra. MMT's strategic alliances also
B. How CEP Works

A reactor vessel containing the molten metal, called the Catalytic Processing Unit (CPU), is the basis of CEP. Each commercial facility processing waste with CEP would have its own CPU on site. A small commercial facility would utilize a one-ton CEP unit whose CPU would contain a minimum of 1500 pounds of molten metal. This so-called “one-ton unit” is designed to process approximately seven tons of waste per day. Depending on the contents of the waste feed, the amount of molten metal contained in the vessel may increase to 2300 pounds prior to tapping. The type of metal used in the CPU may vary. The type of metal used is determined by the make-up of the waste stream being processed in the CPU and the desired product to be recovered. For example, a molten nickel bath could be used if the waste stream is nickel-based or if recovery of chlorine as hydrogen chloride is desired. The temperature of the molten metal bath is kept between 2400 and 3200 degrees Fahrenheit.

The first step of CEP is the generation of waste. Waste is generated by industry, government, and households in all physical forms: solids, liquids, sludges, and gases. An example of a hazardous chemical waste that can be processed through CEP is benzene.

include: Flour Daniel Environmental Services, Inc., an international engineering and construction firm; Am-Re Services, an environmental insurer; L’Air Liquide, S.A., a French industrial gas company; and Rollins Environmental, a commercial incineration and hazardous waste treatment company. Id.; Holusha, supra note 42, at D8.

53 ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7.
54 Jones Interview I, supra note 2.
55 Id.
56 Id. Tapping is defined as the act of drawing liquid from a vessel or container. RANDOM HOUSE COLLEGE DICTIONARY 1344 (revised ed. 1984).
58 Jones Interview I, supra note 2.
59 Id.
60 Id.; ELEMENTAL SOLUTION, supra note 2; Sheridan, supra note 30, at 34. These temperatures are hotter than volcanic lava. Rosenberg, supra note 1, at 40.
61 ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7.
62 Id.; ELEMENTAL SOLUTION, supra note 2. CEP does have limitations on the types of waste it can process. See Rosenberg, supra note 1, at 40. For example, wastes containing a high concentration of water cause problems for CEP. Id. Effluent from paper mills is an example of a waste with a high concentration of water. Waste Management: Hot Solution, THE ECONOMIST, July 10–16, 1993, at 78. The problem is that the water cools the molten metal and the energy costs of continually evaporating the water and keeping the metal in a liquid molten state are massive. Rosenberg, supra note 1, at 40; Waste Management: Hot Solution, supra; Holusha, supra note 2, at D6. Supercritical water oxidation is an alternative process for recycling these wastes. See Holusha, supra note 2, at D6.
63 See Bulkeley, supra note 57, at BSA. Benzene is an aromatic hydrocarbon. RALPH H.
is a carcinogen and is a “clear, colorless, highly refractive, flammable liquid . . . derived from petroleum and used in or to manufacture a wide variety of chemical products including DDT, detergents, insecticides, and motor fuels.” Benzene is composed of six carbon and six hydrogen atoms. As benzene rings, carbon atoms and hydrogen atoms are dangerous to the environment. As mere atoms, however, carbon and hydrogen are benign. Other examples of wastes that could be processed through CEP are “used motor oils, chemical residues, paint sludges and materials used in refrigeration.”

The second step of CEP is to inject the waste into the vessel containing the bath of molten metal, the CPU. In the third step of CEP, chemical reactants, called “co-feeds,” may be added to the bath. The elements of the broken-down compounds of the waste may bond with each other or with the new elements of the co-feeds to create new products. In the case of benzene, for example, oxygen could be added to the bath in order to produce carbon monoxide.

In the fourth step of the process, CEP breaks down the wastes and co-feeds by dissolving them in the molten metal bath. Chemically, waste is composed of atoms joined together to form molecules.

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64 The American Heritage Dictionary of the English Language 124 (1970). DDT is the common name for dichlorodiphenyltrichloroethane (C14H9Cl5) and was once a popular insecticide. PETRUCCI, supra note 63, at 399. DDT is no longer used in the United States because of environmental hazards. Id. at 812. In 1985 it was estimated that over eleven billion pounds of benzene was produced annually in the United States alone. Id. at 826.

65 Markham & Smith, supra note 63, at 563.

66 A benzene ring is the “hexagonal ring structure in the benzene molecule and its substitutional derivatives, each vertex of which is occupied and distinguished by a carbon atom.” The American Heritage Dictionary of the English Language 124 (1970).

67 Bulkeley, supra note 57, at B8A.

68 Id. PCBs are examples of extremely hazardous, highly toxic chemicals that are derived from benzene rings and that can be processed through CEP. Elemental Solution, supra note 2; Random House College Dictionary 976 (revised ed. 1984). PCBs are used in electrical transformers and capacitors. Petrucci, supra note 63, at 399. PCBs are one of “the most persistent synthetic chemicals released to the environment . . . [and] can withstand very high temperatures and are not readily degraded by natural agents.” Id. CEP can break PCBs down into their constituent elements of carbon, oxygen, hydrogen, and chlorine.

69 Rosenberg, supra note 43, at 8.

70 Elemental Recycling: The Future of Environmental Technology, supra note 7; Holusha, supra note 2, at D6.

71 Rosenberg, supra note 1, at 40; Holusha, supra note 2, at D6.

72 Sheridan, supra note 30, at 34.

73 See Rosenberg, supra note 1, at 40; Holusha, supra note 2, at D6.

74 Elemental Solution, supra note 2.

75 Elemental Recycling: The Future of Environmental Technology, supra note 7; elemental Solution, supra note 2. Some examples are: nickel hydroxide, monochlorobenzene, calcium oxide, and nickel cyanide. Elemental Recycling: The Future of Environ-
molten metal acts as a catalytic solvent and, in combination with the intense heat, breaks molecular bonds. With the molecular bonds broken, compounds are reduced to their base or constituent elements. It is the intensity of the heat of the molten metal that causes the waste materials in the molten metal bath to break down into their constituent or most basic elements. Because the molecular bonds are broken, all hazardous and toxic molecules are destroyed in the process. All that remains are constituent elements. For example, benzene rings would be broken down into their constituent, base elements of carbon and hydrogen.

The fifth step of CEP involves recapturing these basic elements or recombining them with each other or the added chemical reactants to create new valuable products such as calcium chloride, carbon monoxide, hydrogen gas, metal alloys, and nitrogen. The valuable products are manufactured by controlling the conditions of the bath and adding different co-reactants to the bath. Continuing with the benzene example, from the benzene the hydrogen atoms could bond together to form hydrogen gas (H₂) and the carbon atoms could combine with the added oxygen to form carbon monoxide (CO).

The sixth step of CEP is separating and recovering these new products from the molten metal bath. The new products are recovered in three states: gases, which can easily be collected, filtered, and

MENTAL TECHNOLOGY, supra note 7. Each of these examples are elements bonded into molecules.

76 Sheridan, supra note 30, at 34; Bulkeley, supra note 57, at B8A; Holusha, supra note 2, at D6.

77 ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7; ELEMENTAL SOLUTION, supra note 2.

78 Rosenberg, supra note 43, at 8; Waste Management: Hot Solution, supra note 62, at 78; Rosenberg, supra note 1, at 40; Holusha, supra note 2, at D6. At 3200 degrees Fahrenheit (1760 degrees Celsius) chemical compounds break down into their constituent elements. Waste Management: Hot Solution, supra note 62, at 78.

79 ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7. The extremely high temperatures of 2400–3200 degrees Fahrenheit in combination with well controlled residence times guarantee the complete destruction of hazardous molecules. The destruction of the hazardous materials is far in excess of regulatory requirements. ELEMENTAL SOLUTION, supra note 2.

80 See Bulkeley, supra note 57, at B8A.

81 Sheridan, supra note 30, at 34.

82 ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7; Rosenberg, supra note 1, at 40.

83 Sheridan, supra note 30, at 34. Depending on the waste stream, slag containing chlorine may remain after processing. Waste Management: Hot Solution, supra note 62, at 78. This slag is more difficult for CEP to process and to separate. Id. MMT's current plans are to convert this slag into commercial abrasives. Id.

84 The gaseous product is primarily composed of simple gases such as carbon monoxide and hydrogen. Rosenberg, supra note 1, at 40.
separated; specialty inorganics;\textsuperscript{85} and metals.\textsuperscript{86} In the benzene example, the hydrogen would evolve off the top of the bath as a diatomic gas.\textsuperscript{87} Also, with the addition of oxygen, the carbon would combine with the oxygen to form carbon monoxide and also evolve off the top of the bath as a gas.\textsuperscript{88}

In the final step of CEP, these new products can either be (1) reused in the manufacturing process by the manufacturer that produced the original waste;\textsuperscript{89} (2) returned to the supplier; or (3) sold on the market.\textsuperscript{90} Depending on the particular waste stream, a small amount of unusable residue may remain that will have to be disposed of separately.\textsuperscript{91}

The primary difference between CEP and most other types of recycling technologies is that CEP dissociates the molecules in the waste stream into their constituent elements, and then uses these elements in the manufacture of products that were not originally present in the waste stream.\textsuperscript{92} Typical recycling technologies only attempt to recover a specific component compound from one specific waste stream.\textsuperscript{93} For example, in organic waste there may be hundreds of different compounds, but only five or six different atoms.\textsuperscript{94} The traditional recycling technologies would only attempt to recover a small number of these compounds. In contrast, CEP would break all

\textsuperscript{85} Abrasives and calcium chloride (used for oil production) are examples of specialty inorganics that would be removed. \textit{Id.}

\textsuperscript{86} \textit{Elemental Solution}, \textit{supra} note 2; Rosenberg, \textit{supra} note 1, at 37; Holusha, \textit{supra} note 2, at D6. Recycled products include metals such as chromium, cobalt and nickel. Rosenberg, \textit{supra} note 1, at 40. One limitation of CEP is that presently metals cannot be separated out of the molten metal bath while the CEP process is in operation. Holusha, \textit{supra} note 2, at D6. There are two possible options. First, the metal from the CEP process could be marketed as an alloy. \textit{Id.} An alloy is a substance which is composed of two or more metals or is composed of a metal and a nonmetal which are intimately mixed. \textit{Random House College Dictionary} 37 (revised ed. 1984). In the alternative, the alloy could be treated in an additional process to recover specific pure metals from the alloy. Holusha, \textit{supra} note 2, at D6. To extract and recover a metal from a waste would require two steps. \textit{Id.} The first step would be to run the CEP as normal. See \textit{id.} The second step would be to shut down the furnace, cool and harden the molten metal, and retrieve the desired metal out of the alloy through the use of mining techniques. See \textit{id.} For example, this two-step process would be required to recover the small quantities of gold and silver in printed circuit boards. See \textit{id.} Methods are being investigated to separate out and retrieve metals while the bath is in operation. These methods involve introducing chemicals to the bath that would combine with the metals and cause the metals to precipitate out of the solution. \textit{Id.}

\textsuperscript{87} See Holusha, \textit{supra} note 2, at D6.

\textsuperscript{88} See \textit{id.}

\textsuperscript{89} Rosenberg, \textit{supra} note 1, at 40; Holusha, \textit{supra} note 2, at D6.

\textsuperscript{90} \textit{Elemental Recycling: The Future of Environmental Technology}, \textit{supra} note 7.

\textsuperscript{91} Jones Interview 1, \textit{supra} note 2.

\textsuperscript{92} \textit{Id.}

\textsuperscript{93} \textit{Id.}

\textsuperscript{94} \textit{Id.} The atoms typically include: carbon, hydrogen, oxygen, and chlorine. \textit{Id.}
the compounds down and recapture the five or six different atoms or combine these atoms with added elements to create new products. Also, because CEP operates at the atomic level, CEP can process many different kinds of waste streams as compared to typical recycling technologies that can process only one particular waste stream.95

C. Selling Effort

After developing CEP into a commercially viable technology, MMT was confronted with the problem of how to sell CEP units to potential customers. MMT developed a marketing strategy; built a demonstration facility; and devised a marketing program to effectively sell CEP units.

1. Marketing Strategy

CEP was designed to be a closed loop system installed at the site of waste production.96 MMT does not plan to become a commercial facility that disposes of other people's wastes.97 MMT has no intention to build a central recycling facility to service the needs of several different companies.98 Instead, MMT plans to sell CEP units directly to companies, like chemical producers, so that the CEP units can be integrated as part of each company's manufacturing process.99 For example, if the company creating the waste originally had a thirteen-stage manufacturing process that produced $100,000$ tons of waste per year, the addition of a CEP unit would increase the process to a fourteen-stage process that produces no waste as a by-product of manufacturing.100

MMT decided that CEP units should be installed at the sites where the waste is generated because the majority of industrial hazardous waste is handled at the site where it was generated.101 On-site installation will enable MMT to do the following:

95 Id.
96 Sheridan, supra note 30, at 34; Bulkeley, supra note 57, at B8A; ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7.
97 Holusha, supra note 42, at D8.
98 Bulkeley, supra note 57, at B8A.
99 Holusha, supra note 42, at D8; ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7.
100 ELEMENTAL RECYCLING: THE FUTURE OF ENVIRONMENTAL TECHNOLOGY, supra note 7. CEP does not produce any products of incomplete combustion, toxic air pollution like dioxins, hazardous waste water, ash, furans, or NOx or SOx. ELEMENTAL SOLUTION, supra note 2. This is a great benefit as compared to traditional incinerators. Traditional incinerators burn materials, produce ash, and require air pollution control equipment. Rosenberg, supra note 1, at 40.
101 It has been estimated that currently 96% of all industrial hazardous waste is handled at
(i) integrate systems on-line to handle secondary materials in a manner that may qualify for exclusion from RCRA regulation (e.g. a closed-loop process); (ii) provide systems that may qualify for an exemption from RCRA permitting requirements (e.g. processing of waste materials in a totally enclosed treatment facility); and (iii) provide systems that can be shown to be involved in a bona fide recycling of hazardous wastes.\(^\text{102}\)

MMT's marketing strategy focuses primarily on companies that generate hazardous wastes regulated by RCRA, including spent solvents and contaminated soils.\(^\text{103}\) MMT decided to focus initially on RCRA-regulated wastes because these wastes are hard to dispose of and are subject to "cradle-to-grave" liability.\(^\text{104}\) All generators of hazardous waste are required to comply with RCRA.\(^\text{105}\) As a recycling technology, however, CEP would enable these companies to minimize burdensome RCRA regulation and costly liability.\(^\text{106}\)

2. The Fall River Facility

MMT decided that the most effective way to implement this marketing strategy and commercialize CEP was to build a research, development, and demonstration facility of its own.\(^\text{107}\) MMT felt that the best way to license its technology to potential customers was to

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\(^{102}\) MOLTEN METAL TECHNOLOGY, INC., COMPANY PROSPECTUS 31 (1993) [hereinafter COMPANY PROSPECTUS].

\(^{103}\) Waste Management: Hot Solution, supra note 62, at 78. MMT is also researching applying CEP to chlorinated wastes, such as PCBs and waste from PVC processing and general municipal waste. Id. MMT is also exploring whether radioactive wastes could be recycled by CEP. Sheridan, supra note 30, at 35; Waste Management: Hot Solution, supra note 62, at 78. MMT narrowed its focus even further than RCRA wastes and is targeting only wastes which, when processed through CEP, yield high value products. COMPANY PROSPECTUS, supra note 102, at 20. MMT estimates that over fifty-five million tons of waste per year, of which approximately seven million tons are hazardous waste, will be included in this initial target market. Id.

\(^{104}\) Jones Interview I, supra note 2.

\(^{105}\) See infra notes 132–35 and accompanying text.

\(^{106}\) See Holusha, supra note 42, at D8. "Once classified as hazardous, waste must be carefully handled and disposed of under complex government regulations." Id. Under the "derived from" rule a hazardous waste remains a hazardous waste. See 40 C.F.R. § 261.3(c)(1). By breaking down the waste molecules and re-using the constituents, no hazardous materials remain that could become a liability in the future. By installing the CEP unit as part of a manufacturer's production system, the hazardous waste material enters the CEP process, and most likely will be considered a "process intermediate" that is rendered harmless before leaving the facility. Waste Management: Hot Solution, supra note 62, at 78; Holusha, supra note 2, at D6. Because of this, the company generates no waste that needs to be regulated and its regulatory compliance burden and potential environmental liability is reduced. See Bulkeley, supra note 57, at B8A; Holusha, supra note 2, at D6.

\(^{107}\) Jones Interview I, supra note 2.
have a demonstration facility where MMT could demonstrate the technology on a customer’s waste stream. MMT constructed such a facility in Fall River, Massachusetts. The Fall River Facility is a 36,000 square foot, $15 million recycling research and development facility. The facility houses seven different CEP systems including experimental, bench, pilot, and commercial scale systems. The commercial prototype is the largest CEP unit and can process up to two tons of waste per hour.

3. Marketing CEP to Customers: Technical Development Programs

After soliciting potential customers, MMT intends to design and sell CEP units by performing Technical Development Programs (TDPs) for the potential customers. MMT uses TDPs as a cost-effective way

108 See Recycling-R&D Facility, supra note 9.
110 Elemental Recycling: The Future of Environmental Technology, supra note 7; Bulkeley, supra note 57, at B8A.
111 Bulkeley, supra note 57, at B8A.
113 See Bulkeley, supra note 57, at B8A.
114 See Molten Metal Technology, Inc., Project Development (1993) (corporate brochure) (on file with author) [hereinafter Project Development]. A typical TDP is made up of the following three stages: Feasibility Study, Proof of Concept, and Prototype Demonstration. Id. These three stages “may be modified or even by-passed, depending upon various factors, such as the proposed feed, financial analysis, and regulatory requirements.” Id.

To begin the Feasibility Study phase, the customer proposes a specified feed stream to be CEP tested. Id. The feed stream is then analyzed by MMT technicians to determine its chemical balance. Id. Process flow diagrams which model and predict system performance are subsequently developed, and MMT creates a conceptual design for a CEP system. Id. In order to determine whether CEP is a cost-effective method for handling the feed stream, economic evaluations including estimations of order-of-magnitude capital and operating costs are undertaken. Id. MMT next performs a market analysis to determine the potential market value for the recovered resources. Id. A regulatory strategy which outlines regulatory requirements and a strategy for obtaining permits is developed. Id. A schedule estimating the time that will be required to build, permit, and start-up the commercial system and a plan outlining the necessary steps to the realization of a commercial facility from the conceptual design are then proposed. Id.

If the customer decides to continue with the TDP, the next stage is the Proof of Concept stage. Id. During this stage, MMT performs bench-scale experimentation to establish the Destruction and Removal Efficiencies of CEP on the proposed feed stream. Id. An appropriate surrogate may be used instead of the actual proposed feed stream. Id. MMT then evaluates and confirms the value of the recovered resources and identifies any levels of trace impurities. Id. The company updates and refines the feasibility evaluation so that the economics of installing a system reflect new information gained from the experiments. Id.

If the customer is satisfied with the information, MMT conducts the third stage or Prototype Demonstration stage. Id.; see infra notes 116–20 and accompanying text.
of establishing the feasibility of CEP for a particular customer.\textsuperscript{115} During the final stage of the TDP, called the Prototype Demonstration, the customers are allowed to test CEP with volumes of their waste streams similar to the volumes that the customers would be processing.\textsuperscript{116} The testing is done in a one-ton commercial scale prototype CEP reactor unit. The Prototype Demonstration stage enables MMT to test the effectiveness of CEP in recycling the waste stream and reclaiming materials that are of commercial quality under conditions similar to commercial usage.\textsuperscript{117} This stage also allows the customers to see for themselves what the technology can do for them before purchasing a system to be constructed at their manufacturing plant.\textsuperscript{118} During the Prototype Demonstration stage, MMT also performs a final economic evaluation to insure that CEP is a cost-effective way for the customer to deal with the waste stream.\textsuperscript{119} In addition to testing the waste stream, the TDP is designed to aid the customer in meeting regulatory requirements.\textsuperscript{120}

III. Working Within the Law

In 1993, MMT had completed the Fall River Facility and had developed a marketing strategy for selling CEP units. If CEP was classified as recycling, the Fall River Facility would not have to be permitted under RCRA in order to process hazardous wastes through CEP.\textsuperscript{121} In Massachusetts, however, all treating, storing, transporting, disposing, or recycling of hazardous wastes requires a permit.\textsuperscript{122} To run the Fall River Facility and perform all the steps in the TDPs necessary to market CEP, Massachusetts regulations required MMT to obtain a permit.\textsuperscript{123} Without the necessary permits, MMT could not

\textsuperscript{115} Project Development, supra note 114.

\textsuperscript{116} See id.

\textsuperscript{117} Id. Commercial scale testing verifies operability and provides sufficient data to prepare MMT for designing and constructing the facility for the customer. Id.

\textsuperscript{118} Id.

\textsuperscript{119} Id.

\textsuperscript{120} Id.

\textsuperscript{121} See Comella, supra note 35, at 416. For certain activities MMT is considered a generator under RCRA. Jones Interview I, supra note 2. For example, MMT is a large quantity generator of hazardous wastes such as refractory brick. Id. Refractory brick is needed in CEP to contain the hot metal. Id. Because of other research materials MMT utilizes it is also considered a generator. Id.


\textsuperscript{123} Jones Interview I, supra note 2. This Comment deals only with the permitting needs for running hazardous wastes through the CEP process. MMT's facility required many other permits, such as an air permit, because the facility releases gaseous material into the atmosphere. Id.
process any hazardous waste at its Fall River Facility and thus could not demonstrate CEP to potential customers.124

During the TDPs, MMT wanted to be able to test and demonstrate to potential customers that CEP was effective on the volume of waste stream that the customer would be processing.125 The problem was that, at the time, Massachusetts regulations lacked provisions for an appropriate permitting procedure.126 MMT was required to obtain a permit, but there was no specific permit that MMT could apply for that allowed the company to perform all of the demonstrations it had planned.127

A. Relevant Federal and State Law


Because MMT's research activities involve hazardous waste, MMT's first concern was whether it had to obtain a RCRA permit to process greater than 250 kilograms of hazardous waste per day at the Fall River Facility.

One of the central objectives of RCRA is to "promote the protection of human health and the environment and to conserve valuable material and energy resources by ... minimizing the generation of hazardous waste and the land disposal of hazardous waste by encouraging process substitution, materials recovery, properly conducted recycling and reuse, and treatment."128 Recycling hazardous wastes meets this objective129 and is the second most preferred method of managing hazardous waste after source reduction.130 The Environmental Protection Agency (EPA) also generally favors recycling as the best method for treating a waste because recycling eliminates or reduces the residual to be disposed.131

124 A recycling permit is required for tests processing 250 kilograms or more per day. A recycling permit is not required for tests of less than 250 kilograms per day because this amount is covered by the treatability approval. See infra notes 208–14 and accompanying text.
125 Jones Interview 1, supra note 2.
126 Id.
127 Id. MMT argued that existing recycling permitting regulations were appropriate, but MADEP disagreed.
129 Comella, supra note 35, at 415 & n.2.
RCRA regulates solid waste. RCRA defines solid waste to include "solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations."\textsuperscript{132} RCRA has been termed "cradle-to-grave" regulation because RCRA attempts to regulate every stage that the solid waste goes through.\textsuperscript{133} RCRA regulates hazardous wastes from the time they are generated\textsuperscript{134} to the time the waste is treated, stored, or disposed.\textsuperscript{135}

RCRA requires a permit for the treatment,\textsuperscript{136} storage,\textsuperscript{137} and disposal\textsuperscript{138} of hazardous waste.\textsuperscript{139} Under the definition of treatment EPA has authority to regulate recycling processes.\textsuperscript{140} EPA's definition of treatment encompasses the two main forms of recycling: processes that recover energy and processes that recover material.\textsuperscript{141} To satisfy the objectives of RCRA,\textsuperscript{142} however, EPA developed its regulatory permitting program to encourage the recycling of hazardous waste where recycling is unavailing or ineffective, the Agency prefers technologies resulting in the destruction of hazardous constituents, where such destruction may be either thermal (i.e. incineration or burning) or chemical especially for organics where neither recovery nor destruction is available or appropriate, immobilization (stabilization) is often effective, especially for inorganic constituents.

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\textit{Id.}

\textsuperscript{133} See, e.g., Chemical Waste Management, Inc. v. United States EPA, 976 F.2d 2, 8 (D.C. Cir. 1992).

\textsuperscript{134} See id. at 13; Comella, supra note 35, at 421. In Chemical Waste Management, the court said: "The Key provisions of [RCRA] support [the] view that hazardous waste becomes subject to the land disposal program as soon as it is generated." 976 F.2d at 13. "[T]he power to manage waste is created '[at] [the] point' a waste is defined as hazardous and discarded." \textit{Id.} (citing Shell Oil v. EPA, 950 F.2d 741, 754 (D.C. Cir. 1991)).

\textsuperscript{135} See Comella, supra note 35, at 426.

\textsuperscript{136} See 42 U.S.C. § 6903(34) (1988). Under EPA's definition: Treatment means any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such wastes, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.

\textsuperscript{137} 40 C.F.R. § 270.2 (1992). EPA's regulatory definition is broader than the statutory definition, 42 U.S.C. § 6903(34), and was upheld in Shell Oil v. EPA, 950 F.2d 741.

\textsuperscript{138} "Storage means the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed, or stored elsewhere." \textsuperscript{139} 40 C.F.R. § 270.2 (1992).

\textsuperscript{139} "Disposal means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any hazardous waste into or on any land or water so that such hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water." \textit{Id.}

\textsuperscript{140} Comella, supra note 35, at 432.

\textsuperscript{141} See id. at 431; see also 40 C.F.R. § 270.2.

and chose not to regulate the materials recovery process. One problem with EPA's regulations is that EPA does not provide a clear definition of materials recovery recycling, but simply "states that a secondary material must be used as an ingredient, or as an 'effective' substitute for a commercial product." Because recycling processes are exempt from coverage under RCRA, hazardous waste recycling facilities are not required to obtain a federal hazardous waste permit. As a recycling operation, MMT was thus exempt from coverage under RCRA and did not have to obtain a federal RCRA permit.

2. Massachusetts State Law

MMT was, however, required to obtain a hazardous waste recycling permit from Massachusetts. Massachusetts has a federally authorized hazardous waste program which operates in Massachusetts in lieu of the federal RCRA program. Although the Massachusetts program has a structure parallel to the federal RCRA, under the Massachu-
setts program all treating, storing, disposing, transporting, and recycling of hazardous wastes are regulated and must be permitted.\textsuperscript{150}

a. Massachusetts's Authority to Regulate Hazardous Waste

Pursuant to Section 3006 of RCRA, EPA is allowed to authorize state hazardous waste programs to operate in the state in lieu of the federal hazardous waste program.\textsuperscript{151} EPA grants final authorization to implement the federal hazardous waste program within the state if EPA determines that the state program "(1) is 'equivalent' to the Federal program; (2) is 'consistent' with the Federal program and other state programs; and (3) provides for adequate enforcement."\textsuperscript{152}

In 1985 EPA granted Massachusetts final authorization to implement the federal hazardous waste program within the state.\textsuperscript{153} EPA determined that the Massachusetts hazardous waste program satisfied all of the necessary requirements to qualify for final authorization because the state's application for final authorization satisfied all of RCRA's statutory and regulatory requirements.\textsuperscript{154} Under this authorization, Massachusetts is responsible for permitting all hazardous waste treatment, storage, and disposal facilities within Massachusetts.\textsuperscript{155} In addition, Massachusetts must carry out the other aspects of the approved Massachusetts program, which include permitting hazardous waste recycling facilities.\textsuperscript{156}

b. Governing Agencies

The Massachusetts Department of Environmental Protection (MADEP) has primary responsibility for administering the Massachusetts hazardous waste program.\textsuperscript{157} The Division of Hazardous Waste

\textsuperscript{150} See MASS. REGS. CODE tit. 310, §§ 30.000–30.910 (1993).


\textsuperscript{153} Final authorization of the Massachusetts hazardous waste program became effective February 7, 1985. 50 Fed. Reg. 3344.

\textsuperscript{154} Id.

\textsuperscript{155} Id.

\textsuperscript{156} Id.

\textsuperscript{157} Kathryn A. Georgian, Massachusetts Environmental Agencies and Programs, in MASSACHUSETTS ENVIRONMENTAL LAW HANDBOOK 1, 2 (Susan M. Cooke & Donald S. Berry eds.,
(DHW) of the Bureau of Waste Prevention has the responsibility of implementing most of the provisions of the Massachusetts Hazardous Waste Management Act.158 The DHW has promulgated regulations governing the identification, management, disposal, and recycling of hazardous waste.159 DHW has also developed standards for the operation and licensing of hazardous waste management facilities.160 In addition, the Hazardous Waste Facility Site Safety Council regulates the construction and alteration of facilities that treat, store, dispose, or recycle hazardous waste.161 The regulations governing the construction and alteration of these facilities are located at 990 C.M.R. §§ 1.00–16.03.162

In addition to state agencies, hazardous waste facilities are also governed by local agencies.164 For example, municipal boards of health165 take part in the siting of hazardous waste facilities.166

c. Hazardous Waste Management Requirements

Chapter 21C of the Massachusetts Hazardous Waste Management Act167 (chapter 21C) regulates the management of hazardous waste at the state level in Massachusetts.168 Regulations promulgated by MADEP implement chapter 21C.169 Chapter 21C is similar to RCRA, but in many ways its regulations are more comprehensive and stringent.170

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159 MASS. REGS. CODE tit. 310, §§ 30.000–30.910.

160 Id. §§ 30.800–30.890.

161 See id. §§ 30.000–30.910 .


163 MASS. REGS. CODE tit. 990, §§ 1.00–16.03 (1993).

164 Georgian, supra note 157, at 17.

165 These boards are established pursuant to MASS. GEN. L. ch. 41, § 1 (1992).


168 See id.

than the federal regulations. The hazardous waste management regulations include requirements for identification of hazardous waste, generators of hazardous waste, transporters of hazardous waste, recycling facilities, and treatment, storage, and disposal facilities.

i. Identification of a Hazardous Waste

Chapter 21C broadly defines hazardous waste as:

> [W]aste, or combination of wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness or pose a substantial present or potential hazard to human health, safety or welfare or to the environment when improperly treated, stored, transported, used or disposed of, or otherwise managed.

In the regulations, MADEP only designated wastes as hazardous which exhibit any of the four specified hazardous waste characteristics or which were among those specified on any of the four lists prepared on the basis of waste type or source. MADEP may also characterize a waste as hazardous if "in the course of inspecting any premises, [MADEP] has reason to believe that the waste being generated, transported, stored, treated, used, or disposed of meets the general criteria of a hazardous waste ... [and MADEP] believes that an imminent threat ... may exist."

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170 Cooke, supra note 158, at 189.
171 See generally MASS. REGS. CODE tit. 310, §§ 30.000–30.910.
172 Cooke, supra note 158, at 192–93.
174 Cooke, supra note 158, at 194–95; MASS. REGS. CODE tit. 310, § 30.010.
175 Cooke, supra note 158, at 194–95; MASS. REGS. CODE tit. 310, § 30.090.
176 Cooke, supra note 158, at 194–95; MASS. REGS. CODE tit. 310, § 30.010.
177 Cooke, supra note 158, at 194–95; MASS. REGS. CODE tit. 310, § 30.010.
Unlike the federal regulations, MADEP's hazardous waste regulations do not exclude from regulation hazardous waste recycling processes. Rather, the Massachusetts regulations require that all hazardous waste recycling activities be permitted.

ii. Hazardous Waste Recycling Facility Requirements

The regulations delineating the requirements for hazardous waste recycling activities group the types of hazardous waste that can be recycled into three categories and specify permitting requirements that apply to each category of material.

Class A recyclable materials is the first category of recyclable hazardous waste. MADEP does not impose facility-specific management standards on the recycling of these materials because MADEP "has determined that these materials or the process by which they are recycled present only a minimal hazard to public health, safety, and welfare." In general, a facility must be permitted to accumulate or recycle any Class A regulated recyclable material.

Class B recyclable materials is the second category of recyclable hazardous waste and is composed of "materials which [MADEP] has determined should be subject to some specific management practices to ensure that [the materials] will not pose a significant hazard to public health, safety, or welfare." Class C is the final category of recyclable hazardous waste and is composed of those materials not included in Class A or B.

iii. Hazardous Waste Treatment, Storage, and Disposal Facility Requirements

The Massachusetts Hazardous Waste Regulations require a hazardous waste treatment, storage, or disposal facility (TSDF) to be permitted, and subjects the facility to licensing, financial responsibility

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177 See id. §§ 30.200–30.298. Some hazardous wastes are not subject to regulation under the Massachusetts Hazardous Waste Management Program. See id. § 30.104.
178 See id. §§ 30.200–30.298.
179 Id. §§ 30.200–30.299.
181 Id. § 30.212.
182 Cooke, supra note 158, at 205.
183 Id. at 207–08.
184 Id. at 206; MASS. REGS. CODE tit. 310, § 30.213 (1990). Class B is subdivided into classes B(1)–B(4). MASS. REGS. CODE tit. 310, § 30.213.
185 Id. § 30.214 (1990). Examples of Class C materials are spent material, sludge, or a by-product listed in sections 30.131 or 30.132 of MADEP's regulations where that sludge or by-product is being reclaimed. Id.
requirements, and detailed operating standards.\textsuperscript{186} The regulations specify management standards for all TSDFs;\textsuperscript{187} technical standards for each type of TSDF;\textsuperscript{188} facility location standards and land disposal restrictions;\textsuperscript{189} licensing requirements and procedures;\textsuperscript{190} and financial responsibility requirements.\textsuperscript{191}

Under MADEP's management standards, "a TSDF must prepare and submit to \[MADEP\] written plans on the following subjects: waste analysis, security, facility inspection, personnel training, emergency response contingency procedures and preventive measures, closure, and post closure."\textsuperscript{192} A TSDF must also satisfy requirements governing operations, closure, and testing, including analysis of representative samples of any hazardous waste that is to be treated, stored, used, or disposed of.\textsuperscript{193}

B. Permitting MMT's Fall River Facility Before the Development of the Hazardous Waste Innovative Technology Regulations

Under the Massachusetts Hazardous Waste Regulations MMT was required to obtain a recycling permit prior to beginning operations at the Fall River Facility.\textsuperscript{194} As discussed above, Massachusetts was operating under a federally authorized hazardous waste program.\textsuperscript{195} Although MMT potentially could have been permitted under the existing Massachusetts RCRA permitting scheme, due to marketing and time concerns MMT chose not to seek such a permit.\textsuperscript{196} The main problem in being permitted under the existing scheme was that MADEP felt that MMT should be permitted under either the TSDF permit program or under the Research, Development, and Demonstration

\textsuperscript{186} See id. §§ 30.500–30.910.
\textsuperscript{187} Id. §§ 30.500–30.596.
\textsuperscript{188} Id. §§ 30.600–30.699.
\textsuperscript{189} Id. §§ 30.700–30.782.
\textsuperscript{190} Id. §§ 30.800–30.890. The licensing procedures provide for an adjudicatory hearing procedure. Id. § 30.890. Under this procedure, if a request for review is filed the finality of the permit is stayed until the completion of an adjudicatory hearing. Id.
\textsuperscript{191} Id. §§ 30.900–30.910.
\textsuperscript{194} See \textit{supra} notes 148–50 and accompanying text. A TSDF permit must be obtained before construction of a facility may begin. In discussions with MADEP before construction of the Fall River Facility began (mid-1992) MMT and MADEP agreed the facility would not need a TSDF permit, rather a recycling permit. Letter from Randall A. Jones, Director of Regulatory Affairs for Molten Metal Technology, Inc., to author 28 (June 17, 1994) (on file with author) [hereinafter Jones Letter I].
\textsuperscript{195} See \textit{supra} note 148 and accompanying text.
\textsuperscript{196} Jones Interview I, \textit{supra} note 2.
(RD&D) permit program and MMT felt that the Fall River Facility should be permitted under the state's recycling permit program.\footnote{Id.}

MMT viewed the Fall River Facility as a research facility that performed recycling.\footnote{Id.} MADEP responded that it was not possible to determine, ex ante, whether a research facility is engaged in treatment or recycling, and that to ensure that any "treatment" activities were properly permitted, the facility should obtain a TSDF permit, or in the alternative, an RD&D permit.\footnote{Id.} Thus, the main permitting issue became whether MMT's activities could be regulated under the MADEP recycling regulations.

At that time there were four permitting options in the existing Massachusetts program that MMT could have considered: a Hazardous Waste Treatability Study Permit;\footnote{See infra notes 208-15 and accompanying text. The Hazardous Waste Treatability Study Permit was not a mutually exclusive option. MMT obtained this permit.} a Research, Development and Demonstration Permit;\footnote{See infra notes 216-30 and accompanying text.} a Hazardous Waste Recycling Permit;\footnote{See infra notes 231-45 and accompanying text.} or a Treatment, Storage, and Disposal Facility Permit.\footnote{See infra notes 246-58 and accompanying text.} None of these permitting programs were specifically designed for or tailored to meet the needs of companies like MMT which planned to be in the business of performing research, development, and demonstrations on large quantities of many different hazardous waste streams.\footnote{Spencer Interview, supra note 4; Ayers Interview, supra note 4.} The permits and licenses authorized under the Massachusetts program were designed for ongoing operations with constant waste streams, activity normally associated with commercial facilities.\footnote{Spencer Interview, supra note 4.}

One of the major factors MMT considered in deciding which permit to apply for was timing.\footnote{Jones Interview I, supra note 2.} As a new innovative technology company in a competitive industry MMT needed to begin operations as quickly as possible.\footnote{Id.}

1. Hazardous Waste Treatability Study Permit

MMT could have applied to MADEP for a Hazardous Waste Treatability Study Permit.\footnote{See MASS. REGS. CODE tit. 310, § 30.104(19) (1990).} The purpose of this type of permit is to allow...
a company to process small quantities of hazardous waste for limited periods of time in order to determine if the company is capable of treating the waste, while not being subject to the Massachusetts hazardous waste regulations. This type of permit allows facilities to process up to 250 kilograms of waste per day. MADEP has a duty to approve or disapprove of an application for a treatability study permit within forty-five days of receipt.

In order to begin operations at Fall River as soon as possible, MMT applied for and received a Treatability Studies Permit. With only a few exceptions, this permit enabled MMT to process up to 250 kilograms per day of any wastes classified by RCRA as hazardous, without further approvals. This was a fine first step for MMT, but MMT wanted to be able to process more than 250 kilograms per day of hazardous waste for research purposes. Furthermore, a permit to process amounts greater than 250 kilograms per day was necessary in order to market CEP as MMT intended; by demonstrating to potential customers that CEP could effectively process the large quantities of waste customers would be processing.

2. Research, Development and Demonstration Permit

MMT could also have applied to EPA for an RD&D permit. This permit is normally granted to facilities which propose to experiment with an innovative hazardous waste treatment technology or process. The concept behind this type of permit is that companies may need some sort of a waiver from the normal RCRA permitting scheme for a few years in order to work the bugs out and to fine tune a new technology. After a short time, however, the company would move into being permitted under the mainstream RCRA regulations.

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209 Spencer Interview, supra note 4. Section 30.104(19), the Treatability Study Permit program, is an exemption program under RCRA. Id. While operating under this federal permit the facility is not subject to RCRA’s requirements. See MASS. REGS. CODE tit. 310, § 30.104(19).

210 Id. § 30.104(19)(e).

211 See id. § 30.104(19)(a). “[MADEP] shall make a reasonable attempt to approve or disapprove such application within forty-five days from receipt of such application.” Id.

212 Temporary Permit, supra note 18, at 15. MADEP granted treatability approval to MMT on February 17, 1993. In the treatability permit application MMT revealed the wastes MMT planned to process. The wastes listed encompassed essentially all RCRA regulated hazardous wastes. Jones Interview I, supra note 2.

213 250 kilograms is approximately 550 pounds.


215 Jones Interview I, supra note 2.


218 Spencer Interview, supra note 4; Ayers Interview, supra note 4.

219 Spencer Interview, supra note 4.
basis for the RD&D permit is that there are no existing federal permit standards for continuous experimental activity.\textsuperscript{220}

One drawback with MMT obtaining an RD&D permit was that MADEP had not yet been authorized to issue this type of permit on EPA’s behalf.\textsuperscript{221} The RD&D permit is part of the federal RCRA regulatory program and would be a federal permit.\textsuperscript{222} As such, MMT would have to get approval from MADEP and EPA Region I, which, from MMT’s point of view, added another layer of bureaucracy to deal with.\textsuperscript{223}

There were several other reasons why MMT did not seek to operate under an RD&D permit. First, the RD&D permits are granted to allow a company to solve one particular problem on one particular waste stream and MMT intended to process many different waste streams.\textsuperscript{224} The RD&D permit was designed for facilities testing one specific waste stream, with an eye towards converting the process to full scale commercial operation at the end of the RD&D term. Second, “the federal program was considered to be poorly administered and the permitting requirements were lengthy and poorly defined.”\textsuperscript{225} The history associated with the RD&D permit program was that the permit was difficult to get and the permitting process involved many bureaucratic delays.\textsuperscript{226} MMT was aware of significant problems and time delays associated with obtaining a federal RD&D permit.\textsuperscript{227} MMT perceived that it would take one to two years to obtain this permit, much longer than the company wanted to wait to begin processing customers’ wastes.\textsuperscript{228} Naturally, as a start-up company MMT wanted to begin operations as quickly as possible, in order to service potential customers and rapidly commercialize the technology.

The final drawback that made an RD&D permit completely unworkable for MMT was that the federal permit would expire one year after being granted\textsuperscript{229} and could only be renewed three times for one year.

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\textsuperscript{220} See 40 C.F.R. § 270.65(a).
\textsuperscript{221} Spencer Interview, supra note 4.
\textsuperscript{222} 40 C.F.R. § 270.65.
\textsuperscript{223} Jones Interview I, supra note 2.
\textsuperscript{224} Spencer Interview, supra note 4.
\textsuperscript{225} These problems were highlighted in an EPA commissioned study which stated, “the RD&D permit mechanism has not generally been a streamlined process for fostering technology development.” UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, THE NATION’S HAZARDOUS WASTE MANAGEMENT PROGRAM AT A CROSSROADS: THE RCRA IMPLEMENTATION STUDY 111 (1990).
\textsuperscript{226} Jones Interview I, supra note 2.
\textsuperscript{227} Jones Letter I, supra note 194, at 32.
\textsuperscript{228} Jones Interview I, supra note 2.
\textsuperscript{229} 40 C.F.R. § 270.65(a)(1), (d).
at a time. \(^{230}\) MMT intended to use the Fall River Facility as a permanent facility to research and commercialize CEP. Obviously, being able to permit the facility for only four years would not allow MMT to do this.

3. Hazardous Waste Recycling Permit

MMT could have also applied to MADEP for a Hazardous Waste Recycling Permit as authorized under the Massachusetts State Hazardous Waste Regulations. \(^{231}\) MMT wanted to obtain this type of permit for two main reasons. First, MMT viewed CEP as a recycling technology and was marketing it as such. \(^{232}\) If CEP was not classified as recycling, the technology would lose much of its attraction to customers who are looking to minimize the burdens of RCRA regulation. \(^{233}\) Second, MMT perceived that this permitting process would only take about six months. \(^{234}\) This was the shortest amount of time for any of the possible permits.

In August, 1992 MMT proceeded under the presumption that it would be permitted under the recycling permit program. \(^{235}\) MMT and MADEP had agreed that this was the type of permit to pursue. \(^{236}\) In December, when a draft permit had been written, the Massachusetts Attorney General's Office became involved and expressed their concern to MADEP about MADEP's authority to grant a recycling permit to a research and development facility like MMT's. \(^{237}\) The concerns apparently were whether actual recycling was going on at MMT or only research for recycling, and whether the regulations only authorized permits for actual recycling. \(^{238}\) MMT read the statutes expansively and took the position that the statutes and regulations were broadly written to encourage recycling of hazardous wastes. Accordingly, MMT felt it was well within MADEP's authority to issue a permit to a recycling research facility. \(^{239}\) The Attorney General's Office, however, read the regulations more narrowly. \(^{240}\)

\(^{230}\) Id. § 270.65(d).
\(^{232}\) See supra notes 96–106 and accompanying text.
\(^{233}\) See supra notes 102–106 and accompanying text.
\(^{234}\) Jones Interview I, supra note 2. Class A permits can be issued instantly upon application.
\(^{235}\) Interview with John Bewick, President of Compliance Management Inc., Newton, Mass. (Mar. 19, 1994) [hereinafter Bewick Interview II].
\(^{236}\) Jones Interview I, supra note 2.
\(^{237}\) Id.
\(^{238}\) Id.
\(^{239}\) Id.
\(^{240}\) Id.
authorization for issuance of permits to recycling research facilities, the Attorney General's Office felt the authority to issue the permit under MADEP's recycling regulations was questionable.\textsuperscript{241} After some back and forth on the issue, the Attorney General's Office agreed with MADEP's decision to grant the permit if the permit was granted for only a short term, and during the interim period MADEP would issue new regulations containing explicit authority to issue permits for recycling research and development facilities like MMT's.\textsuperscript{242}

MMT's operations also differed from operations for which MADEP has issued Class A, B(4), or C recycling permits in that MMT proposed to process a variety of hazardous waste streams rather than a single waste stream.\textsuperscript{243} As a consequence, the resulting products and degree of recovery would change with each different waste stream that was processed.\textsuperscript{244} With previously permitted operations, the degree of recovery and resulting products remained constant.\textsuperscript{245}

4. Treatment, Storage, and Disposal Facility Permit

Because MADEP did not issue MMT a Hazardous Waste Recycling Permit, MMT could apply to MADEP for a TSDF permit.\textsuperscript{246} A TSDF permit is the equivalent of a RCRA Part B permit.\textsuperscript{247} MMT's decision not to apply for a TSDF permit was based on marketing, perception, and timing concerns.\textsuperscript{248} MMT chose not to operate under a TSDF permit because it wanted to be viewed as an innovative waste minimization technology, rather than just waste treatment.\textsuperscript{249} In order to effectively market CEP, MMT wanted to be viewed as a recycling facility.\textsuperscript{250} A main thrust of MMT's marketing strategy was that facilities could avoid certain RCRA regulations by recycling their wastes with CEP.\textsuperscript{251} Additionally, the process for obtaining a Hazardous Waste

\textsuperscript{241} Id.
\textsuperscript{242} See id.
\textsuperscript{243} Temporary Permit, supra note 18, at 2. Normally Class A, B(4), or C recycling permits are issued to facilities where recycling is being conducted on a commercial scale, not to facilities where only research and development of a recycling technology is being performed. Id.
\textsuperscript{244} Id.
\textsuperscript{245} Id.
\textsuperscript{248} Jones Interview I, supra note 2.
\textsuperscript{249} Id.
\textsuperscript{250} Id. MMT found it to be a challenge to be viewed as recycling because there are not that many environmentally sound recycling technologies.
\textsuperscript{251} See supra notes 101–06 and accompanying text.
TSDF Permit was very cumbersome and MMT would have been subject to a multitude of regulations. MMT estimated that a RCRA Part B permit for a research facility could take one to two years or more to obtain. In fact, the federal RCRA permitting process has been known to take three to twelve years. As a start up company that needed to begin operations quickly, MMT could not afford to get involved in that kind of permitting quagmire.

Because none of the options under the existing Massachusetts hazardous waste program met MMT's needs, MMT asked MADEP to design a Recycling Research and Development Permit. This was something MADEP had never done before. There was no guidance in the Massachusetts state recycling regulations or in the federal regulations for MADEP to follow in fashioning a permit for the type of facility MMT wanted to operate.

C. Special Permit Solution

When first approached with the idea of issuing a special permit, MADEP was uncertain whether it had the statutory authority to issue a recycling R&D permit. As of that point, EPA had not given MADEP the authority to issue RCRA authorized RD&D permits. Because the Massachusetts program is federally authorized and subject to federal oversight, MADEP consulted with the regional office of EPA to determine whether MADEP had the authority to grant a recycling R&D permit. EPA decided that MADEP could issue the

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252 Ayers Interview, supra note 4. Massachusetts has not granted a TSDF permit within the last ten years. Bewick Interview II, supra note 234.

253 Jones Interview I, supra note 2. The process of obtaining Part B permits for commercial facilities such as incinerators or landfills could take several years. Id.; see Bewick Interview II, supra note 234.

254 See, e.g., Comella, supra note 35, at 416. Comella cites as an example a commercial hazardous waste company that has spent approximately twelve years obtaining a permit, and as of January 1993 still had not received a permit. Id. at 416 n.8 (citing Waste Industry Fears Gore WTI Decision Signals Tough Time Ahead for Incineration, 23 Env't Rep. (BNA) No. 36, at 2220 (Jan. 1, 1993)).

255 Jones Interview I, supra note 2.

256 Id.

257 Ayers Interview, supra note 4.

258 Id.

259 Jones Interview I, supra note 2.

260 See supra notes 221-23 and accompanying text.

261 See supra notes 151-56 and accompanying text.

262 Ayers Interview, supra note 4. MADEP wanted to insure that it did not contravene existing federal regulations. Id.
permit if MADEP determined that MMT was indeed performing recycling and not treatment.263

The main problem that MADEP then faced was how to issue the facility a recycling permit when only limited recycling was actually occurring. MMT recycled metals and ceramic material produced at the Fall River Facility by selling those materials to a local metals broker.264 MMT, however, did not recover gases because there was no infrastructure in Fall River for capturing and selling the gas, and because the quantities of gas produced at the research facility could not be recovered economically.265 What MMT generated as its main proof of recycling were huge quantities of data to show that the materials produced at the Fall River Facility could meet commercial specifications or requirements for such products.266 Nevertheless, MADEP was still concerned that what MMT was doing at the Fall River Facility constituted legitimate recycling because this permit would serve as a precedent for other recycling research and development facilities that might apply for permits.267

IV. THE TEMPORARY SOLUTION—RECYCLING RESEARCH AND DEVELOPMENT PERMIT

As a temporary solution to the problem that MMT's activities did not fit into the Massachusetts regulatory scheme, MADEP issued a temporary permit under the state RCRA permitting program for MMT's solid and hazardous waste research and development activities at the Fall River Facility.268 MADEP was willing to draft a special permit to encourage development of MMT's technology and others like it.269 MADEP has now undertaken as part of its mission to encourage innovative environmental technologies such as MMT's.270 The temporary Recycling Research and Development Permit (Temporary

263 EPA did however retain the right to review and comment on the final permit. Jones Interview I, supra note 2.
264 Jones Letter I, supra note 194, at 38.
265 Id. at 39.
266 Id.
267 Ayers Interview, supra note 4.
268 See Temporary Permit, supra note 18, at 1–43; Letter from Daniel S. Greenbaum, Commissioner, Department of Environmental Protection, Commonwealth of Massachusetts Executive Office of Environmental Affairs, to William H. Haney, III, President, Molten Metal Technology, Inc. 1 (Sept. 20, 1993) (on file with author) [hereinafter Greenbaum Letter]. This permit was in addition to construction, sewer connection, and air permits that MMT had already received. RECYCLING-R&D FACILITY, supra note 9.
269 Greenbaum Letter, supra note 268.
270 Id.
Permit) granted to MMT was the first of its kind in the United States.271 There were no existing permitting programs in either the federal regulations or in the state regulations that specifically governed recycling R&D activities.272

The Temporary Permit allowed MMT to perform recycling research, development, and demonstrations on a wide range of hazardous and nonhazardous waste streams.273 The permit became effective October 9, 1993, and terminated on March 17, 1995.274

MMT was disappointed with the Temporary Permit because it was not issued under the recycling regulations of 310 C.M.R. § 30.200, but under the umbrella of the Massachusetts Hazardous Waste Regulations, 310 C.M.R. § 30.000.275 Because the Temporary Permit was not issued under the recycling regulations of 310 C.M.R. § 30.200, MMT had to comply with all applicable provisions of chapters 21C and 21E of the Massachusetts General Laws, the Massachusetts Hazardous Waste Regulations, the provisions of the Temporary Permit, and all other applicable federal and state statutes and regulations.276 Moreover, by issuing the permit under the umbrella of the Massachusetts Hazardous Waste Regulations, MADEP was able to pick and choose requirements other than those provided in the recycling regulations. MMT essentially ended up with a RCRA Part B permit.277 The Temporary Permit was at least as restrictive, substantively, as a TSDF permit would be.278 The addition of requirements beyond the requirements of § 30.200 recycling permits also extended the permitting process out longer than MMT had anticipated.279

The Temporary Permit was actually a combined permit and consisted of three main parts.280 The first part covered recycling research for hazardous wastes and was entitled “Permit for the Research and Development of Hazardous Waste Recycling Proc-

271 Telephone Interview with Randall A. Jones, Director of Regulatory Affairs for Molten Metal Technology, Inc. (Jan. 17, 1994) [hereinafter Jones Interview II].
272 Ayers Interview, supra note 4.
273 RECYCLING-R&D FACILITY, supra note 9; Greenbaum Letter, supra note 268.
274 Greenbaum Letter, supra note 268; Temporary Permit, supra note 18, at 10, 43. However, this date could have been changed. An earlier expiration date could have been set by regulation or MADEP. Temporary Permit, supra note 18, at 10. Also, this permit would have expired if MMT obtained another permit or approval which came into effect prior to March 17, 1995. Id.
275 Jones Interview I, supra note 2; see Temporary Permit, supra note 18, at 1.
276 Temporary Permit, supra note 18, at 5.
277 See id.
279 Jones Interview I, supra note 2. It took MMT a little over a year to obtain this temporary permit. Id. MMT did obtain the permit in the time frame that it needed. Id.
280 See Temporary Permit, supra note 18, at 1, 28, 42.
The second part concerned nonhazardous recyclable material and was entitled "Permit to Approve Demonstration Project for Processing of Non-Hazardous Recyclable Material." The third part gave MADEP access to MMT's property and specified the effective date of the permit.

Part one of the permit allowed MMT to process specific hazardous wastes classified as Class A, Class B(4), and Class C regulated recyclable materials through CEP units at the Fall River Facility. MADEP granted this part of the permit pursuant to its authority under chapter 21C of the Massachusetts General Laws.

The advantage of the Temporary Permit over standard treatability study permits was that MMT could perform the final stage of its TDPs and process hazardous waste streams in CEP units in volumes greater than those authorized under treatability approval if certain conditions were met. This freedom was important to MMT because larger volume runs were needed to fully demonstrate the process to potential customers. These conditions required that for each proposed waste stream MMT perform three steps: 1) conduct a treatability study; 2) submit an application for an R&D Recycling Certification; and 3) receive an R&D Recycling Certification from MADEP. In other words, to perform large volume testing on a customer's waste stream, the final or Prototype Demonstration stage of a TDP, MMT was required to first conduct a treatability study on that waste stream. Then, with the data from the treatability study, MMT had to file an application with MADEP for authorization to process larger quantities. In essence, for each waste stream that MMT proposed to process in quantities greater than 250 kilograms per day, MMT had to provide data and other information that CEP processing of that stream at a

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281 See id. at 1-27.
282 See id. at 28-41.
283 See id. at 42-43.
284 See id. at 1, 14. These classes are defined at MASS. REGS. CODE tit. 310, §§ 30.212-30.214.
285 MASS. GEN. L. ch. 21C, § 4 (1992). Chapter 21C section 4 grants MADEP the authority to develop and establish provisions for waiver of regulation of any hazardous waste which MADEP determines is insignificant as a potential hazard to public health and safety and welfare of the environment. MADEP is also responsible for developing and establishing standards and requirements for the recovery of resources from such hazardous waste. Id.
286 MADEP issued MMT treatability approval pursuant to MASS. REGS. CODE tit. 310, § 30.104(19) on February 17, 1993. See supra notes 212-14 and accompanying text.
287 Temporary Permit, supra note 18, at 1-2.
288 Id. at 15.
289 Jones Interview I, supra note 2.
290 Id.
commercial scale facility would constitute legitimate recycling. This three-step process was a compromise between MMT and MADEP to insure that MMT's activities constituted legitimate recycling and not treatment.291

A. The Three-Step Process

1. Treatability Studies

Pursuant to the Temporary Permit, before MMT was able to apply for an R&D Recycling Certification, MMT had to conduct one or more treatability studies on each proposed waste stream following the terms and conditions of the separate Treatability Study Permit granted by MADEP.292 During each treatability study, MMT was not allowed to process more than 250 kilograms per day of the waste stream.293 The treatability study was performed first to verify material conversion and to demonstrate the kinds and quality of materials that could be generated by processing the waste material through CEP.294

2. R&D Recycling Certification Application

Upon completion of the treatability study, MMT was required to prepare an application for submittal to MADEP for an R&D Recycling Certification for the particular waste stream on which the treatability study was performed.295 In the R&D Recycling Certification Application MMT had to prove that for the proposed waste stream, the operation of a CEP unit at the customer's site of waste generation would constitute legitimate recycling rather than treatment.296

To evaluate the data submitted in each R&D Recycling Certification application and to determine whether the processing of each particular waste stream constituted recycling rather than treatment, MADEP followed three general criteria: "(1) the degree to which each recoverable CEP product [was] 'commodity-like',"297 (2) the relative

291 Id.; see Temporary Permit, supra note 18, at 2.
292 Temporary Permit, supra note 18, at 3. MMT did not have to conduct a treatability study if "suitable data from prior treatability studies on similar waste streams [were] available." Id.
293 See MASS. REGS. CODE tit. 310, § 30.104(19)(e).
294 Jones Interview I, supra note 2; RECYCLING-R&D FACILITY, supra note 9.
295 Temporary Permit, supra note 18, at 3.
296 Id.
297 "The more 'commodity-like' the recoverable CEP products the greater presumption of recycling." Id.
amount of recoverable products and residual waste after processing through a CEP unit; and (3) the toxicity and exposure pathway(s) risk of recoverable CEP products and residual waste.”

Along with submitting the data from the treatability study, MMT was also required to demonstrate to MADEP that each reclaimed component had value as a recognized commodity and would be used as such at a commercial CEP facility. To do this MMT had to show that the reclaimed material was marketable and that the price was competitive. In other words, MMT was required to show that the recoverable product would be saleable on the open market. By demonstrating that CEP produced marketable materials from the waste stream, MMT could carry its burden of proving that CEP actually recycles the waste. In addition, MMT was required to provide the net incremental operating cost that would be incurred by the company for which the treatability study was conducted should that company install a CEP system at its production facility.

All the information from the treatability study was to be submitted to MADEP; and if MADEP agreed that CEP could generate enough marketable products to meet the recycling demonstration burden, MADEP would issue the R&D Recycling Certification. MADEP’s authorization was essentially to be a determination that processing this waste material using CEP was recycling, and not treatment.

3. R&D Recycling Certification

If complete, each Recycling Certification Application would be approved or denied within thirty-five days of receipt by MADEP. Each Recycling Certification would not be effective until twenty-one days after MADEP rendered its decision to approve. During this

298 "The greater the amount of recoverable CEP products compared to residual waste of the processing the greater presumption of recycling." Id.
299 Id.
300 Id. at 16–20.
301 Id. at 16–17.
302 Id. at 16.
303 Jones Interview I, supra note 2.
304 Temporary Permit, supra note 18, at 18–19. The net incremental operating cost included, but was not limited to, reactants, energy, and co-feed costs. Id. To better demonstrate recycling, the net incremental operating costs had to be less than the combined value of the CEP products, less the cost of disposing of any residue remaining after the waste was processed. See id.
305 Id. at 21.
306 Jones Interview I, supra note 2.
307 See Temporary Permit, supra note 18, at 21.
308 See id. at 11.
twenty-one days, if a request for an adjudicatory hearing was filed, MADEP would automatically stay the finality of the certification until the completion of the adjudicatory hearing process.\footnote{Id. A request for an adjudicatory hearing was an appeal of MADEP's decision to grant the certification. MASS. REGS. CODE tit. 310, § 30.890 (1990).} Once the R&D Recycling Certification was effective, MMT would be able to process wastes in quantities greater than treatability study volume limits and to demonstrate the technology to potential customers on the volume of a customer's waste stream that the customer would process.\footnote{Temporary Permit, \textit{supra} note 18, at 3. The recycling demonstration had to be conducted in accordance with the application, permit, and any conditions or limitations set forth by MADEP in the approval. For example, there were storage, volume and processing limitations, as well as reporting and recordkeeping requirements.}

MADEP granted the Recycling R&D permit to MMT as a temporary permit to last only eighteen months because it planned to reform its existing regulations.\footnote{Id. at 4.}

V. THE MASSACHUSETTS SOLUTION: MADEP'S DEVELOPMENT OF HAZARDOUS WASTE RESEARCH AND DEVELOPMENT REGULATIONS

MMT worked closely with MADEP to revise the existing Massachusetts Hazardous Waste Regulations to include new regulations which accommodate recycling research and development facilities, like MMT's Fall River Facility. MADEP realized there was a need for this kind of permit because traditional recycling technologies do not solve the current hazardous waste problem.\footnote{Spencer Interview, \textit{supra} note 4.} Moreover, MADEP wanted to encourage companies developing innovative technologies to locate in Massachusetts.\footnote{See Rosenberg, \textit{supra} note 1, at 40.} MADEP made draft regulations available to the public in July, 1994, conducted public hearings during July and August, 1994,\footnote{See Commonwealth of Massachusetts Executive Office of Environmental Affairs, Department of Environmental Protection, Bureau of Waste Prevention, Division of Hazardous Materials, Public Hearing Draft Amendments to Regulations, July-August 1994, July 1994 [hereinafter Draft Regulations].} and finalized the new regulations in November, 1994.\footnote{See MASS. REGS. CODE tit. 310, § 30.864.} The new Hazardous Waste Innovative Technology Regulations (Innovative Technology Regulations) make great strides and "reflect the special needs of emerging innovative environmental technology companies and their processes."\footnote{Letter from Randall A. Jones, Director of Regulatory Affairs for Molten Metal Technology, Inc., to James Paterson, Division of Hazardous Materials of the Bureau of Waste Prevention of the Department of Environmental Protection, Commonwealth of Massachusetts Executive
MADEP acknowledged that prior to the Innovative Technology Regulations there were no regulations that specifically governed recycling R&D activities or that met the special needs of companies which intended to conduct R&D activities. Accordingly, MADEP tried to fill this gap in the permitting regulations.\(^{317}\) MADEP's goals in developing these new regulations were to encourage new technologies and to facilitate innovation without sacrificing environmental protection.\(^{318}\) MADEP designed the new regulations to enable companies with new technologies to perform research, development, and demonstration activities while satisfying appropriate environmental safeguards.\(^{319}\) MADEP accomplished its goals while maintaining substantive environmental protections.\(^{320}\) Overall, MADEP encouraged development and protected the environment, an outcome that other state DEPs should pursue.

A. MMT's Reasons for Locating in Massachusetts

Although it was a struggle to obtain the Temporary Permit and to have MADEP revise the existing Hazardous Waste Regulations, MMT had strategic reasons for wanting to be permitted under the Massachusetts regulatory scheme.\(^{321}\) Under MMT's marketing and permitting strategy it was essential to MMT to have CEP classified as recycling.\(^{322}\) Under RCRA, the federal hazardous waste regulatory scheme, if a company is recycling, it is not required to obtain a federal permit.\(^{323}\) Being able to minimize RCRA regulation is a very attractive quality to MMT's potential customers.\(^{324}\) Also, because most states do not require recycling processes to be permitted, state agencies may

Office of Environmental Affairs 1 (Aug. 5, 1994) (on file with author) [hereinafter Jones Letter II].

\(^{317}\) Spencer Interview, supra note 4; Ayers Interview, supra note 4. In a conversation with Chris Ayers of MADEP, she stated that she felt that there was currently nothing that facilities like MMT's could do to be permitted under the Massachusetts regulations. Ayers Interview, supra note 4. Daniel Greenbaum, Former Acting Commissioner of MADEP, acknowledged that there were difficulties with the existing permitting regulations and that changes had to be made. Rosenberg, supra note 1, at 40.

\(^{318}\) Temporary Permit, supra note 18, at 3.

\(^{319}\) Id. at 3–4.

\(^{320}\) Spencer Interview, supra note 4.

\(^{321}\) Jones Interview I, supra note 2.

\(^{322}\) Id.

\(^{323}\) See Comella, supra note 35, at 416.

\(^{324}\) For MMT the whole idea in being classified as recycling was to avoid the burdensome procedural requirements and delays associated with RCRA permitting. Obtaining a RCRA permit can take two, three, five years or more. As a start-up company, MMT could not tolerate such delay. While MMT wanted to avoid procedural requirements, MMT did not seek to avoid
not have the opportunity to make the determination that a process truly qualifies as recycling. In some cases EPA or a state agency has to take a sham recycler to court to shut it down.

By being permitted in Massachusetts, however, MMT had the opportunity to secure a formal determination that CEP was legitimate recycling because Massachusetts required hazardous waste recycling facilities to be permitted. This determination had long term marketing advantages for MMT. MMT viewed obtaining a recycling permit in Massachusetts as a valuable precedent for potential customers' operations in other states. If Massachusetts agreed that CEP was a recycling technology and not treatment, customers in Massachusetts and other states would have an easier time convincing their regulatory authorities that a proposed commercial CEP facility was a recycling facility and obtaining the necessary approval under the customer's state program. Massachusetts's regulations are tough by reputation, and, after MMT's experience, documentation would exist for a customer company to demonstrate that a proposed CEP facility would be a recycling facility.

B. MMT's Concerns with the Temporary Permit

In revising the hazardous waste regulations, MADEP had to balance the needs of companies like MMT with the state's interest in protecting the public and the environment. MMT had four main concerns with the Temporary Permit which MADEP considered in developing the new regulations in order to encourage recycling research and development companies like MMT to operate in Massachusetts: (1) the ambiguity of exactly which provisions of the Massachusetts substantive requirements. MMT stated that it could and would meet the most stringent standards for protection of the environment. Jones Letter I, supra note 194, at 49.

Because of this many companies are able to get away with activities that are not true recycling. This is termed "sham recycling." Comella, supra note 35, at 416. An example of a sham recycler is Marine Shale Processors located in Morgan City, Louisiana. Id. Marine Shale incinerates a variety of low energy, hazardous wastes, including creosote, in a converted lime kiln. Id. at 416-17. Marine Shale claims that this activity is recycling because it turns the hazardous waste into aggregate for use as road base material. Id. at 417-18. EPA has not been able to stop Marine Shale's activities nor has a judicial determination been made that the activities are recycling or treatment. See id. at 419-20.

Id.; Bewick Interview II, supra note 234.

Bewick Interview II, supra note 234.
Hazardous Waste Regulations were applicable to MMT; (2) the short term duration of the permit; (3) the necessity of the three-step process for each waste stream; and (4) the inclusion of the adjudicatory hearing provision.332

1. Applicable Provisions of the Massachusetts Hazardous Waste Regulations

MMT's first concern with the Temporary Permit was that the permit did not clarify which provisions of the Massachusetts Hazardous Waste Regulations333 were applicable to MMT and to recycling research and development facilities in general. MADEP stated in the Statement of Authority and Purpose for Part One of MMT's permit that MADEP issued the permit pursuant to the authority of chapter 21C section 4 and "the requirements set forth in 310 C.M.R. 30.000 . . . ."334 MADEP also stated that recyclable materials must be managed in accordance with the terms of the permit, the provisions of the hazardous waste regulations specifically stated in the permit, "and all other provisions of 310 C.M.R. 30.000 which are applicable whether or not such provisions are specifically identified in this permit."335 This language was vague and subjected MMT to the possibility of violating a regulation that MMT did not know was applicable.336 Because the permit was unique and was issued as a consent order under Massachusetts General Laws chapter 21C337 and under the umbrella of the Massachusetts Hazardous Waste Regulations rather than one of the specific regulatory permitting programs, MMT could not possibly have known which of the over 400 sections of the hazardous waste regulations were applicable.338 Within the Temporary Permit MADEP should have specified which provisions of the hazardous waste recycling facility permitting program and the TSDF permitting program were applicable.339 It is important to specify in the permit all the applicable provisions in order to clarify the facility's responsibi-
ties and to provide certainty that the facility is complying with all necessary regulations.\footnote{Id.}

\section*{2. Duration of the Permit}

MMT's second concern with the Temporary Permit was its short duration.\footnote{Letter from Eugene Berman, Vice President of Regulatory Affairs, Molten Metal Technology, Inc., to Steven DeGabriele, Director, Division of Hazardous Materials of the Bureau of Waste Prevention of the Department of Environmental Protection, Commonwealth of Massachusetts Executive Office of Environmental Affairs 1 (Aug. 13, 1993) (on file with author) [hereinafter Berman Letter].} The duration of the Temporary Permit was eighteen months.\footnote{Temporary Permit, \textit{supra} note 18, at 10.} Prudent business people investing millions of dollars to develop new technologies require certainty that their facility will be permitted for a reasonable length of time.\footnote{Jones Interview I, \textit{supra} note 2; Berman Letter, \textit{supra} note 341, at 1. In a draft model permit MADEP had originally made the term five years. Berman Letter, \textit{supra} note 341, at 1.} Eighteen months does not provide the certainty necessary to encourage investment in new technologies.\footnote{Typically permits have a five or ten year term. Jones Letter I, \textit{supra} note 194, at 53.} The short term of the permit could have "significantly impact[ed] MMT's efforts to plan for future operations at Fall River."\footnote{Berman Letter, \textit{supra} note 341, at 1.} In addition, MADEP did not give any assurance to MMT that MADEP would renew the permit after the permit expired or that MMT could continue its activities under the Temporary Permit beyond the eighteen month period.\footnote{Id. at 1.}

While a short term permit was better than no permit at all, MADEP could have issued the permit for a longer period of time. MADEP could have adequately addressed any concerns that MADEP may have had by including language, similar to that contained in the Temporary Permit,\footnote{Temporary Permit, \textit{supra} note 18, at 10.} that allowed MADEP to set an earlier expiration date by regulation or to revoke the permit if necessary. MADEP's justification for the short term duration was that MADEP was in the process of developing new regulations and wanted MMT to be permitted under the new regulations.

\section*{3. The Three-Step Approval Process}

MMT's third concern with the Temporary Permit was the three-step approval process. Completing the three-step approval process
for each waste stream was cumbersome for both MMT and MADEP. In order for MMT to process commercial quantities of each waste, MMT had to (1) conduct a treatability study, (2) apply for a recycling certification, and (3) receive the certification from MADEP. In other words, MMT's Temporary Permit required MMT to continually apply for more permits. MMT argued that this three-step process was draining both on MMT and on MADEP because MADEP would have had to perform in-depth reviews of each material MMT wanted to process. MADEP had created a system that required senior MADEP managers to make decisions over and over again. MMT had predicted that if operations at the Fall River Facility became very busy, MMT could have filed recycling certification applications quite frequently. If MMT had filed as many applications as expected, MADEP may not have been able to promptly respond to each of them.

MADEP's reason for having the three-step process was that it was important to have proof that each waste processed at the Fall River Facility in quantities greater than 250 kilograms per day was being recycled, not treated. MMT did not object to the three-step process, but was concerned with the time involved. MMT's ability to respond quickly to customer inquiries may have been inhibited by delays associated with the three-step process. MMT would have preferred a self-implementing permit rather than a permit that required MMT to continually apply for more permits.

4. Automatic Stay Requirement of the Adjudicatory Hearing Provision

MMT's fourth concern with the Temporary Permit was that in addition to the substantive requirements, MADEP incorporated
into the Temporary Permit procedural requirements of the Massachusetts Hazardous Waste Regulations which normally apply only to the permitting of TSDFs and not to permits issued under the recycling regulations.\textsuperscript{359} Examples of these requirements were the adjudicatory hearing provision and the automatic stay requirement.\textsuperscript{360} Randall Jones, the Director of Regulatory Affairs at MMT, stated that MMT would have gladly complied with the substantive standards of a TSDF permit,\textsuperscript{361} but that the procedural aspects of TSDF licensing were of concern.\textsuperscript{362} If MADEP had insisted that MMT obtain a TSDF license, the potential time delays on processing potential customers' wastes would have been too great to make it worth while for MMT to be in Massachusetts.\textsuperscript{363} Time is a critical matter for start-up companies, and each procedural delay adds additional costs to the company.\textsuperscript{364}

The Temporary Permit's adjudicatory hearing provision applied both to MMT's acquisition of the Temporary Permit and to each application for Recycling Certification that MMT filed.\textsuperscript{365} Under the adjudicatory hearing provision of the Temporary Permit, any decision made by MADEP would not be effective for twenty-one days from the date the decision was made.\textsuperscript{366} The purpose of the twenty-one day waiting period was to give the public an opportunity to appeal a decision.\textsuperscript{367} MMT disagreed with the necessity for the twenty-one day waiting period.\textsuperscript{368} MMT was also concerned by the prospect of un-

\textsuperscript{359} Compare Temporary Permit, supra note 18 with MASS. REGS. CODE tit. 310, §§ 30.500–30.910.


\textsuperscript{361} Jones Interview I, supra note 2. MMT did not take the position that it should receive any breaks on substantive environmental requirements, such as emission limits and record keeping, just because they were an innovative technology. Id.

\textsuperscript{362} Id.; Berman Letter, supra note 341, at 2. MMT agreed to accept a permit that largely resembled the substantive requirements of a TSDF permit. Berman Letter, supra note 341, at 2.

\textsuperscript{363} Jones Interview I, supra note 2.

\textsuperscript{364} Id.

\textsuperscript{365} Temporary Permit, supra note 18, at 11, 23.

\textsuperscript{366} Id. at 11.

\textsuperscript{367} Bewick Interview II, supra note 234.

\textsuperscript{368} This was a large concern for MMT. Jones Interview I, supra note 2. MMT argued that as a start-up company, it needed to do things in an expedited fashion. Id. Under the Temporary Permit MMT had to do the three-step process in which MADEP had approximately thirty-five days to review the application. See Temporary Permit, supra note 18, at 21. After the thirty-five days, if MADEP approved the application, MMT had to wait an additional twenty-one days until the approval became effective. See id. at 11. If MMT obtained approval, MMT wanted to go ahead and process the waste, but MMT had to wait twenty-one days to see if someone appealed the approval. Jones Interview I, supra note 2. The best case scenario for MMT was that when
founded or frivolous appeals of any MADEP approval. If someone filed a request for an adjudicatory hearing within the twenty-one days, MADEP's approval would be automatically stayed, regardless of the significance of the issues raised, until the conclusion of an adjudicatory hearing. Therefore, each time MMT filed an application for a Recycling Certification to process a new waste stream, there was the threat that someone could appeal and automatically stay the decision, thus causing MMT a delay in servicing a potential customer.

Experience with the MADEP adjudicatory appeal process suggested there could be a six to twelve month delay while the appeal went forward. MADEP had given MMT informal assurance that if someone appealed a decision, MADEP would expedite the appeal process. As a practical matter, however, administrative appeals at MADEP take a minimum of nine months and can take much longer than that.

As it turned out, no one appealed MMT's underlying Recycling Research and Development Permit. MMT's concern remained, however, that individual Recycling Certifications could be subject to frivolous appeals. MMT felt that if MADEP wanted to encourage and promote innovative recycling technologies that offer great potential benefits to the environment and to the Commonwealth's economy, MADEP should not, as a matter of public policy, automatically stay the permit during any hearing process. In general, new companies cannot afford to have the threat of a lengthy delay hanging over them before beginning operations. The automatic stay provision could have significantly hindered a new company just getting off the ground.

One possible solution offered by MMT was not to make the stay automatic, but, instead, to shift the burden to the person appealing the approval to demonstrate that a stay was appropriate or to make a showing why MADEP should not have granted the approval. If the appellant could meet this burden, then the approval would be

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369 Jones Interview I, supra note 2.
370 Temporary Permit, supra note 18, at 11; Berman Letter, supra note 341, at 1.
371 Jones Interview I, supra note 2.
372 Id.
373 Id.
374 Id.
375 Id.
376 Jones Letter III, supra note 332, at 1–4.
377 Jones Interview I, supra note 2.
378 Id.
stayed. MMT was not suggesting that MADEP must not stay the permit if the appeal had merit. MMT's recommendation was only that MADEP retain the option not to stay the permit until the conclusion of an adjudicatory proceeding if a request appeared frivolous, groundless, or unlikely to succeed. MMT argued that MADEP is the expert permitting authority. As such, there should be a presumption that MADEP had done their job correctly. There should also be a presumption that MADEP's permits and approvals were valid.

The reason for the automatic stay provision in TSDF permits was for the protection of the public. It was not clear that the same protections were required or necessary for recycling R&D facilities. If MADEP makes wrong decision with regards to a commercial TSDF permit, the public probably should have the opportunity to stay the permit, because such a facility could have a significant impact on the environment or public health. Research activities are by nature quite different. The scale of operations is much smaller. If MADEP makes mistake in permitting a research facility, any unforeseen impact on the environment will be modest.

MMT argued that if MADEP insisted on automatically staying each permit approval upon a request for an appeal, at the very least MADEP should include a provision for an expedited appeal process to be used to screen out meritless appeals. MMT also wanted MADEP to include a provision requiring MADEP to conduct and complete the appeal within a reasonable time. This could have been done by limiting the amount of time the stay would remain in effect.

C. Massachusetts Hazardous Waste Innovative Technology Regulations

MADEP made two changes to the existing Hazardous Waste Regulations that better enable the research and development of new technologies. First, MADEP amended the hazardous waste regulations applicable to treatability studies. The new regulations change how the total quantity of hazardous waste allowed for treatability studies

379 Id.
380 Id.
381 Id.
382 Id.
383 Id.
384 Id.
385 Id.
386 Id.
387 Jones Letter III, supra note 332, at 3.
is counted.\textsuperscript{388} The total allowable quantity is now based \textit{only} on the amount of hazardous waste "as received."\textsuperscript{389} Previously, the Hazardous Waste Regulations required that the total quantity of hazardous waste allowed for processing under treatability studies also include treatment materials—including nonhazardous solid waste—added to the as-received hazardous waste and treatability study residues.\textsuperscript{390} The total amount of hazardous waste that can be subjected to treatability studies is therefore increased by the change. This increase enables facilities to process greater quantities of waste.\textsuperscript{391} This change makes the Massachusetts rules consistent with the federal rules.

Second, MADEP revised the rules for hazardous waste innovative technology by promulgating the Innovative Technology Regulations and adding a new permit category in 310 C.M.R. § 30.800 which explicitly covers activities similar to MMT's.\textsuperscript{392} MADEP specifically designed the Innovative Technology Regulations for licensing the continuing research, development, and demonstration of innovative hazardous waste management technologies.\textsuperscript{393} The new permit category in the Innovative Technology Regulations is called the Research Facility License and replaces the need for MMT's Temporary Permit.\textsuperscript{394} The purpose of the new permit category is "to allow facilities to conduct research, development and demonstration activity using one or more hazardous waste streams for the sole purpose of developing new treatment or recycling technology for marketing and/or application elsewhere."\textsuperscript{395} The Innovative Technology Regulations only apply to R&D facilities and not to commercial treatment or recycling facilities.\textsuperscript{396}

1. Effective Date of the Research Facility License Regulations

As of November 18, 1994, any person who conducts or intends to conduct a research study must comply with the new Research Facility License Regulations.\textsuperscript{388} Id.\textsuperscript{389} Id. "The total quantity of as-received hazardous waste for the purpose of evaluation in treatability studies, stored or accumulated at a laboratory or testing facility, shall not at any time exceed, in the aggregate, one kilogram of acutely hazardous waste, or 1,000 kilograms of hazardous waste that is not acutely hazardous waste, which 1,000 kilograms may include not more than 500 kilograms of soils, water, or debris contaminated with no more than 1 kilogram of acutely hazardous waste." Id.\textsuperscript{390} See Mass. Regs. Code tit. 310, § 30.104(19)(f) (1990); Draft Regulations, supra note 314, at Summary of Proposed Hazardous Waste Regulations.\textsuperscript{391} Mass. Regs. Code tit. 310, § 30.104(19)(f) (1994).\textsuperscript{392} Mass. Regs. Code tit. 310, § 30.864 (1994).\textsuperscript{393} See id.\textsuperscript{394} See id.\textsuperscript{395} Draft Regulations, supra note 314, at Summary of Proposed Hazardous Waste Regulations.\textsuperscript{396} Mass. Regs. Code tit. 310, § 30.864(1)(f).
License (RFL) requirements in the Innovative Technology Regulations. The RFL regulations distinguish between existing and new companies. Companies like MMT that already have MADEP's approval to conduct research, development, and demonstration activities, may continue to do so until the prior approval expires, but must apply for an RFL. All prior approvals expire at the end of their terms and if a final RFL is not in effect at the time the prior approval expires, the company must cease all research, development, and demonstration activity until an RFL is in effect. All new companies that do not have a prior approval by MADEP must “apply for, obtain and have in effect a valid RFL prior to construction, operation or maintenance of a new research facility, or operation, maintenance or modification of an existing research facility.”

2. Applicability of an RFL

The regulations include new definitions in order to distinguish between commercial processing activities and research and development activities. The three key terms that were added to the regulations are demonstration, research facility, and research study. The regulations emphasize that RFLs do not authorize any commer-

\[297 id. \textit{§} 30.864.\]
\[298 id. \textit{§} 30.099(26) (1994).\]
\[299 id.\]
\[300 id. \textit{§} 30.099(26)(a). The company must submit a Preliminary Application within thirty days of November 18, 1994.\]
\[301 id.\]
\[302 id.\]
\[303 A new company is a company that, “on November 18, 1994, does not have [MADEP's] approval to conduct research studies or otherwise engage in continuous research, development, and demonstration activity.” \textit{id. \textit{§} 30.099(26)(b).}\]
\[304 id.\]
\[305 \textit{Id.}\]
\[306 \textit{Id.}\]
\[307 \textit{Id.}\]
\[308 \textit{Id.}\]

Research facility means a site or works at which research studies are conducted or where hazardous waste is otherwise subjected to an innovative and experimental treatment, recycling or disposal technology or other process for which permit or license standards have not been promulgated under 310 C.M.R. 30.000 . . . [S]uch facility may consist of several operating units, and shall include all land, structures, and other appurtenances and improvements which are directly related to continuous research, development, and demonstration activity.

\[309 id.\]
\[310 id.\]

Research study means the continuous research, development and demonstration activity conducted by a research facility, in which a hazardous waste is subjected to an
cial processing. An RFL only allows the use of a technology to perform research studies.

An RFL only applies to "the handling of hazardous waste on which a research study is being conducted." Research studies performed on nonhazardous wastes are not regulated by an RFL. The scope of potential activities regulated by an RFL is broader than MMT had asked MADEP to make it. In addition to authorizing a licensee to recycle hazardous waste for the purpose of conducting a research study, an RFL may authorize a licensee to store, treat or dispose of hazardous waste, or otherwise to accept, handle or process hazardous waste at a research facility for the purpose of conducting research study activity. An RFL, however, does not authorize any purpose other than to conduct research study activity.

MADEP's inclusion of activities other than recycling R&D was an appropriate next step and makes sense in light of MADEP's goal to promote innovative hazardous waste technologies in Massachusetts. It is likely to be only a matter of time before a company researching a process other than recycling needs to be permitted under the Massachusetts Hazardous Waste Regulations. MADEP's inclusion of more processes than are immediately necessary is a good example of a regulatory agency looking to the future and filling in possible gaps in the regulations before the gaps become a problem and hinder new technologies.

3. License Application Process and Requirements

In the RFL regulations MADEP addressed many of MMT's concerns with the Temporary Permit.

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in innovative and experimental treatment, recycling or disposal technology or other process for which permit or license standards have not been promulgated under 310 C.M.R. 30.000, and for the primary purpose of determining: (a) whether the waste is amenable to such process; (b) what pretreatment, if any, is required; (c) the optimal process conditions needed to achieve the desired treatment, recycling, disposal or other process result; (d) the efficiency of such process for a specific waste or waste; (e) the characteristics and volumes of residuals from a particular process; and/or (f) cost effectiveness.

Id.

408 Id.

409 Id.

410 Id. § 30.864(1)(a).

411 Id.

412 Id. § 30.864(1)(f).

413 Id.
a. Elimination of the Temporary Permit's Three-Step Process

MADEP addressed MMT's concern with the three-step permitting process that the Temporary Permit required for each waste stream. MADEP streamlined the process by taking the existing treatability study exemption for laboratories and testing facilities as precedent and developing a license resembling the treatability studies permit, but with a higher cap on the volume of waste that can be processed.\textsuperscript{414} Under an RFL, a facility can process many different waste streams without applying for special approval for each waste stream.\textsuperscript{415} MADEP's approach to licensing R&D facilities makes sense because MMT only differed from these other research facilities in that MMT performed large commercial scale experiments in addition to treatability studies.\textsuperscript{416}

The application process for an RFL is a two-step process consisting of a Preliminary Application and a Final Application.\textsuperscript{417} Unlike MMT's Temporary Permit, however, a company must complete the two-step process only once. A separate application is not needed for each proposed waste stream.\textsuperscript{418}

The RFL application method eliminates the need for individual pre-approvals for each proposed waste stream.\textsuperscript{419} Instead, MADEP enforces the terms of the license by incorporating after the fact reporting requirements into the license.\textsuperscript{420} An R&D facility must submit a report to MADEP each year which contains both information about future research studies as well as information about activity during the previous calendar year.\textsuperscript{421} Some of the information about activity during the previous calendar year that the report must supply includes the following:

1. The type of processing conducted at the facility;\textsuperscript{422}

\textsuperscript{414} See id. § 30.104(19) (1990). The reason that the quantity that may be processed under a treatability study is limited is because to minimize risk is to minimize quantity. Bewick Interview II, supra note 234. However, MMT was not running a commercial facility and the risk to the public of conducting research activities involving processing of more than 250 kilograms per day was minimal. Id.


\textsuperscript{416} See supra notes 114–18 and accompanying text.


\textsuperscript{418} Id. § 30.864(2).

\textsuperscript{419} Compare Mass. Regs. Code tit. 310, § 30.864(2)(b), (e) with Temporary Permit, supra note 18, at 15.


\textsuperscript{421} Id. § 30.864(3)(d)(1).

\textsuperscript{422} Id. § 30.864(3)(d)(1)(b).
(2) The types and quantities of hazardous waste subjected to research studies;\textsuperscript{423}
(3) The total quantity of hazardous waste stored by the facility each day;\textsuperscript{424}
(4) The identity of each generator or sample collector for whom the facility conducted a research study;\textsuperscript{425}
(5) “The date on which each shipment was received from each generator or sample collector, and the amount of each shipment;”\textsuperscript{426}
(6) The initiation and completion dates of each research study;\textsuperscript{427}
(7) A detailed description of each research study;\textsuperscript{428}
(8) “The final disposition of all hazardous waste generated by the research facility . . . .”\textsuperscript{429}
(9) “[The] documentation necessary to demonstrate the degree to which the research facility is achieving [its] goals and objectives . . . including the rate of treatment, recycling and/or disposal achieved;”\textsuperscript{430}
and
(10) Documentation to demonstrate that the research facility accumulated and processed each waste stream in compliance with 310 C.M.R. § 30.864(3)(a) and the terms and conditions of its license.\textsuperscript{431}

By requiring MMT to report results, MADEP is able to insure that MMT is complying with its license and recycling rather than treat-

\textsuperscript{423} Id. § 30.864(3)(d)(1)(c).
\textsuperscript{424} Id. § 30.864(3)(d)(1)(d). The information must specify: “i. The total quantity of as received hazardous waste; and ii. The total quantity of hazardous waste which results from processing a specific waste stream.” \textit{Id.}
\textsuperscript{425} The identity must include the name, address, and EPA identification number. Id. § 30.864(3)(d)(1)(e).
\textsuperscript{426} Id. § 30.864(3)(d)(1)(f).
\textsuperscript{427} Id. § 30.864(3)(d)(1)(g).
\textsuperscript{428} The detailed description must specify:
  i. The total volume or mass of each waste stream introduced into each processing run;
  ii. The type and volume or mass of each co-reactant that may be introduced into each processing run; iii. The type, volume or mass, and market value of each product that may be recovered from each processing run; iv. The type, volume or mass, disposition and cost of disposal of all residual waste that may result from each processing run; v. The net incremental operating cost of conducting each processing run; and vi. The gross mass balance of hazardous waste, including total amount of as received waste received from the generator or sample collector, unprocessed as received waste, and the waste, residue and material which result from or remain after processing, including co-reactants and other treatment materials (including non-hazardous solid waste) added to as received waste.
\textit{Id.} § 30.864(3)(d)(1)(h).
\textsuperscript{429} Id. § 30.864(3)(d)(1)(i).
\textsuperscript{430} Id. § 30.864(3)(d)(1)(j).
\textsuperscript{431} Id. § 30.864(3)(d)(1)(k), (l).
MMT runs the risk of violating and potentially losing its license if MMT processes a waste that does not satisfy the recycling criteria.

b. **Clarification of Applicable Provisions**

MADEP addressed MMT's concern with the Temporary Permit's ambiguity of which provisions of the Massachusetts Hazardous Waste Regulations were applicable to MMT and to research and demonstration facilities in general. In addition to the requirements for all license applications, in the Preliminary Application an applicant must identify on a checklist form provided by MADEP containing all requirements applicable to hazardous waste facilities, those requirements of 310 C.M.R. § 30.000 that may be applicable to the proposed research facility. Within fifteen days of the close of the public comment period to the Preliminary Application, MADEP will perform an applicability determination. The purpose of this determination is to decide whether the Preliminary Application identified as applicable to the proposed facility all necessary license application requirements. MADEP may either approve the scope of the Preliminary Application or discuss with the applicant whether any license application requirements not identified by the applicant as applicable, should be deemed applicable, modified or waived.

These provisions address MMT's concern with the Temporary Permit that MADEP did not specify all applicable provisions of the Massachusetts Hazardous Waste Regulations, 310 C.M.R. § 30.000. While the RFL regulations do not specify the exact provisions of 310 C.M.R. § 30.000 which are applicable to all R&D facilities, by the time a license is approved, the license lists all the provisions applicable to the facility and puts the facility on notice of what regulations with which the facility must comply. This provision remedies the problem with the Temporary Permit that a company would not be aware of all applicable regulations. This solution to the problem of the Temporary Permit's ambiguity of applicable regulatory provisions is actually an advantage to R&D facilities because the provision provides an opportunity for each applicant to work with MADEP to tailor the regulatory requirements to each applicant's particular facility, rather than

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432 See Bewick Interview II, supra note 234.
435 Id. § 30.864(2)(d).
436 See id.
437 Id.
having all applicants comply with a bundle of regulations that may not allow a company to operate as desired. This provision is also beneficial to the state because the provision allows MADEP the flexibility to adapt an RFL to many types of R&D facilities, rather than being forced now to design regulations that can cover the multitude of possible facilities.

In addition to specifying the provisions of 310 C.M.R. § 30.000 which are applicable to a facility, MADEP may add other conditions to the license. First, MADEP may specify limitations on the quantity of hazardous waste that may be processed daily. If MADEP does not specify a maximum quantity in the license, the maximum quantity to be processed in one day is presumed to be a quantity no greater than the total quantity that is necessary for purposes of conducting a research study. The license may also specify the total quantity of hazardous waste accumulated at the research facility at any one time.

A Preliminary Application must also include a detailed description of the proposed research study activity and must identify all types and quantities of hazardous wastes to be processed.

438 Id. § 30.864(3)(a)(1).
439 Id.
440 Id. § 30.864(3)(a)(2). If MADEP has not issued the research facility a hazardous waste storage permit, pursuant to 310 C.M.R. § 30.800, the research facility can only accumulate hazardous waste for a period not to exceed ninety days from the date of generation of such wastes. Id. § 30.864(3)(a)(3). “The date of generation shall be either: (a) The date of receipt of as received hazardous waste by the research facility from the original generator or sample collector; or (b) The date of the processing run from which hazardous waste results.” Id. “The research facility shall maintain a daily inventory of the type and volume of hazardous waste in each accumulation, storage, flo-bin and processing unit.” Id. § 30.864(3)(a)(5).
441 A Preliminary Application must also include the following:
   a. A discussion of the purposes of the research study activity ... and the goals and objectives of each proposed technology, process or activity, and the methods by which the applicant will evaluate whether the proposed technology, process or activity has achieved the specified goals and objectives; b. An analysis indicating the benefits of each proposed technology, process or activity; c. A description of the applicability of each proposed technology, process or activity to hazardous waste management in general; d. Identification of all types and quantities of hazardous wastes ... proposed to be received, handled and processed at the research facility at any one time, and to be necessary for purposes of determining the efficiency and performance capabilities of each proposed technology, process or activity; e. A description of how the applicant intends to provide for the receipt, sampling, screening, handling, processing and ultimate treatment or disposal after processing of those types and quantities of hazardous waste proposed to be necessary for the purposes of determining the efficiency and performance capabilities of each technology, process or activity; f. A technical analysis indicating environmental, public health and safety benefits and risks from each proposed technology, process or activity to the extent such benefits and risks can be evaluated at the time of application; g. A site plan indicating the location of the research facility if a location has been selected at the time of application, provided that if a
c. Public Participation

In addition to addressing the potential time delay concerns of the Temporary Permit’s three-step process and the ambiguity of the applicable regulations, the RFL application process also reduces the potential time delays of the automatic stay requirement of the Temporary Permit’s adjudicatory hearing provision and increases the certainty under which businesses can operate. MADEP altered the public’s participation in the licensing process. Instead of allowing the public to be involved each time a facility proposes to process a new waste stream, the new RFL regulations invite public comment only during the application stage.  

MADEP will issue public notice inviting comment on the scope of the Preliminary Application within ten days of determining that the preliminary application is complete. The public notice must allow for at least fifteen days from the date of the notice for public comment. Within fifteen days of the close of the public comment period MADEP will perform the applicability determination. Once all the applicable license application requirements are identified, MADEP sets a schedule of dates by which the applicant must supplement the Preliminary Application “by submitting information concerning requirements identified by the applicant as being applicable to the research facility.” The supplementation of the Preliminary Application is basically the second step in the process, the Final Application.  

Within thirty days of the Final Application being completed, MADEP shall establish “a decision schedule estimating dates by which it intends to conduct the technical review of the application, give public notice of the needs of the technical review, and set the dates for public hearings.”  

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442 See id. § 30.864(2)(c), (e), (f).
443 Id. § 30.864(2)(c)(1).
444 Id. § 30.864(2)(c)(2).
445 Id. § 30.864(2)(d).
446 Id.
447 See id. § 30.864(2)(e)(1). One of MMT’s concerns with the RFL application process is that “[MADEP] may deny a research facility license before receiving a complete application for a license.” See id. § 30.864(2)(a)(5); Jones Letter II, supra note 316, at 4.
notice, complete the public comment period\textsuperscript{448} and issue a final license decision.\textsuperscript{449}

While an RFL may be stayed during the public comment period,\textsuperscript{450} the only time that a license may be stayed is during the application process. Once an RFL is approved, the license can no longer be stayed. This is a great improvement over the Temporary Permit. Under the Temporary Permit, in addition to the application for the Temporary Permit, each time MMT proposed to process a new waste stream there was a potential for an appeal to be filed and the authority to process the new waste stream to be automatically stayed. Companies applying for an RFL only risk a stay at the application stage and not throughout the life of the license. RFL licensees can therefore operate their facilities with a greater amount of certainty that they can respond quickly to customer inquiries.

\section*{VI. Conclusion}

MMT's experience demonstrates how the law may hinder the development and marketing of innovative hazardous waste recycling technologies. Such hinderance may have the effect of discouraging companies from investing in research for new technologies while at the same time, the law and those implementing it are trying to promote new technologies. MMT's experience also demonstrates that if an existing permitting scheme does not meet a company's needs, special permits can be devised and regulations revised to meet that company's needs. MMT's experience caused regulators to rethink current regulations and make appropriate revisions in the law.

MADEP's "Temporary Permit" was a good, though imperfect, interim solution to the need for regulations specifically governing recycling research and development activities. Devising a temporary permit allowed MMT to begin operations rather than wait for formal regulations to be drafted and finalized. There were certain provisions of the Temporary Permit, however, such as the term of the permit, the ambiguity of the exact regulatory provisions applicable to a facility, the multiple step permitting procedure for each waste stream, and the automatic stay requirement of the adjudicatory hearing provision, that were of concern to MMT and could have caused significant problems for MMT and other similar facilities. The new Research Facility

\textsuperscript{448} MADEP may extend the public comment period to give interested persons an opportunity to comment on information submitted. \textit{Id.} § 30.864(2)(f).

\textsuperscript{449} \textit{Id.} § 30.864(2)(e)(2).

\textsuperscript{450} \textit{See id.} § 30.864(1)(c), (2)(e).
License of the Hazardous Waste Innovative Technology Regulations addresses many of these problems. Working with MMT, MADEP was able to amend the regulations in ways that protect the public and the environment, while meeting the special needs of emerging, innovative, environmental technology companies, like MMT.

Other states can learn from Massachusetts's experience that the need for permits specifically tailored to hazardous waste research and development facilities is clear. States should follow Massachusetts's example and should include in their regulatory scheme a permit for R&D facilities in order to promote and encourage new innovative hazardous waste technologies.