10-17-1995

In Re: TMI

UNITED STATES COURT OF APPEALS
FOR THE THIRD CIRCUIT

No. 94-7599

IN RE: TMI

General Public Utilities Corp.;
Metropolitan Edison Company;
Jersey Central Power & Light Co.;
Pennsylvania Electric Co.;
Babcock & Wilcox Company;
McDermott Incorporated;
UE&C Catalytic, Inc. (Raytheon);
Burns & Roe Enterprises;
Dresser Industries,
Appellants

On Appeal from the United States District Court
for the Middle District of Pennsylvania
(D.C. Civil Action No. 88-cv-01452)

Argued May 1, 1995

Before: SCIRICA, McKEE and SAROKIN, Circuit Judges

(Filed October 17, 1995)

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OPINION OF THE COURT

SCIRICA, Circuit Judge.

In 1979, an accident occurred at a nuclear power facility near Harrisburg, Pennsylvania, releasing radiation into the atmosphere and catapulting the name, "Three Mile Island," into the national consciousness. Sixteen years later, we are called on once again to consider the Three Mile Island accident

as we determine the appropriate standard of care for the operators of the facility.

I. Procedural History

The accident at the Three Mile Island ("TMI") nuclear power facility occurred on March 28, 1979. As a result, thousands of area residents and businesses filed suit against the owners and operators of the facility,[0] alleging various injuries.[0] This case involves the consolidated claims of more than 2000 plaintiffs for personal injuries allegedly caused by exposure to radiation released during the TMI accident.

These cases began more than a decade ago, when plaintiffs filed damage actions in the Pennsylvania state courts and the Mississippi federal and state courts.[0] After defendants removed the state cases to federal court, asserting federal jurisdiction under the Price-Anderson Act, we held that the Act created no federal cause of action and was not intended to confer jurisdiction on the federal courts. See Kiick v. Metropolitan Edison Co., 784 F.2d 490 (3d Cir. 1986); see also Stibitz v.

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[0]Defendants in this case were, at the time of the TMI accident, "the owners and operators of the nuclear facility, companies which had provided design, engineering or maintenance services, and those vendors of equipment or systems installed in the facility." In re TMI Litig. Cases Consol. II, 940 F.2d 832, 836 (3d Cir. 1991), cert. denied, 503 U.S. 906 (1992).

[0]Defendants have settled non-personal injury claims brought by individuals, businesses, and non-profit organizations within a twenty-file mile radius of the TMI facility. See Stibitz v. General Pub. Util. Corp., 746 F.2d 993, 995 n.1 (3d Cir. 1984) (citing In Re Three Mile Island Litig., No. 79-0432 (M.D. Pa. Sept. 9, 1981)), cert. denied, 469 U.S. 1214 (1985).

[0]Counsel for plaintiffs concede they filed suit in Mississippi to take advantage of the state's six-year statute of limitations, instead of the two-year Pennsylvania statute.

General Pub. Utils. Corp., 746 F.2d 993 (3d Cir. 1984), cert. denied, 469 U.S. 1214 (1985). The actions were remanded to the appropriate state courts.

Subsequently, Congress enacted the Price-Anderson Amendments Act of 1988 ("1988 Amendments" or "Amendments Act"), Pub. L. No. 100-408, 102 Stat. 1066, which expressly created a federal cause of action for "public liability actions"[0] and provided that such suits arose under the Price-Anderson Act. 42 U.S.C. § 2014(hh) (1988). The Amendments Act also provided for consolidation of such actions, including those already filed, in one federal district court. Id. § 2210(n)(2). Accordingly, these personal injury actions were removed to federal court and consolidated in the Middle District of Pennsylvania. We upheld the constitutionality of the retroactive application of the federal jurisdiction provisions of the Amendments Act and remanded the actions back to the district court. In re TMI Litig. Cases Consol. II, 940 F.2d 832 (3d Cir. 1991) ("TMI II"), cert. denied, 503 U.S. 906 (1992).

Contending they had not breached the duty of care, defendants then moved for summary judgment, which the district court denied. In re TMI Litig. Cases Consol. II, No. 88-1452, slip op. at 36 (M.D. Pa. Feb. 18, 1994). After holding that

[0]The Amendments Act defined a "public liability action" as "any suit asserting public liability." 42 U.S.C. § 2014(hh) (1988). "[P]ublic liability" was defined as "any legal liability arising out of or resulting from a nuclear incident or precautionary evacuation," except for certain claims covered by workers' compensation, incurred in wartime, or that involve the licensed property where the nuclear incident occurs. Id. §2014(w).

federal law determines the standard of care and preempts state tort law, id. at 23, the district court found the standard of care was set by the federal regulations: 1) prescribing the maximum permissible levels of human exposure to radiation[0] and 2) requiring radiation releases to be "as low as is reasonably achievable," which is known as the "ALARA" principle.[0] Id. at 28-29. The court held that each plaintiff must prove individual exposure to radiation in order to establish causation, but not to establish a breach of the duty of care. Id. at 30-31.

Upon defendants' motion, the district court certified for interlocutory appeal the duty of care and causation issues:

> 1) Whether 10 C.F.R. §§ 20.105 and 20.106, and not ALARA, constitute the standard of care to be applied in these actions;
>
> 2) Whether a particular Plaintiff's level of exposure to radiation or radioactive effluents relates solely to causation or also to the duty owed by Defendants.

In re TMI Litig. Cases Consol. II, No. 88-1452 (M.D. Pa. July 13, 1994).[0] We granted the petition for interlocutory appeal.

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[0] See 10 C.F.R. §§ 20.105, 20.106 (1979). For a discussion of these regulations, see infra part III.B.1.

[0] "ALARA" is defined to mean "as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest." 10 C.F.R. § 20.1(c). The term appears in several sections of the C.F.R., including § 20.1(c), §50.34a, and § 50.36a. For a further discussion of the term, see infra part III.B.

[0] The district court also certified a question regarding punitive damages, which we discuss in a separate opinion. See In Re: TMI, **cite**. We resolve other issues concerning the applicable statute of limitations in a third opinion. See In Re: TMI, **cite**.

The district court had jurisdiction under 42 U.S.C. §2210(n)(2) (1988). We have jurisdiction under 28 U.S.C. §1292(b) (1988) and exercise plenary review over the legal questions certified. See Buzzard v. Roadrunner Trucking, Inc., 966 F.2d 777, 779 (3d Cir. 1992).

II. Preemption

Initially, we must address the district court's decision that federal law determines the standard of care, preempting state tort law. See In re TMI Litig. Cases Consol. II, No. 88-1452, slip op. at 23 (M.D. Pa. Feb. 18, 1994). The district court essentially relied on our holding in TMI II, 940 F.2d 832, 859 (3d Cir. 1991), cert. denied, 503 U.S. 906 (1992), and decisions following it.[0] See In re TMI Litig. Cases Consol. II, No. 88-1452, slip op. at 15-23 (M.D. Pa. Feb. 18, 1994). But plaintiffs contend that TMI II did not resolve this issue.

Under the 1988 Amendments, the applicable law for "public liability actions" is "the law of the State in which the nuclear incident involved occurs, unless such law is inconsistent" with federal law. 42 U.S.C. § 2014(hh) (1988). Thus, Pennsylvania tort law would control here, unless inconsistent with federal law. But TMI II decided this issue by preempting state tort law on the standard of care.

[0] See, e.g., O'Conner v. Commonwealth Edison Co., 13 F.3d 1090, 1105 (7th Cir.) ("[W]e agree with the Third Circuit in TMI that it is clear . . . that state regulation of nuclear safety, through either legislation or negligence actions, is preempted by federal law."), cert. denied, 114 S. Ct. 2711 (1994).

In TMI II, we considered the constitutionality of the 1988 Amendments, specifically, whether they improperly conferred "arising under" jurisdiction. 940 F.2d at 848-49. Examining the Amendments Act's "federal components," we found federal preemption of state tort law on the applicable standard of care. See id. at 858 ("Two Supreme Court cases indicate that the duty the defendants owe the plaintiffs in tort is dictated by federal law."); id. at 859 ("Permitting the states to apply their own nuclear regulatory standards, in the form of the duty owed by nuclear defendants in tort, would, however, 'frustrate the objectives of federal law.'") (citation omitted); id. ("Under Pacific Gas & Electric Co., states are preempted from imposing a non-federal duty in tort, because any state duty would infringe upon pervasive federal regulation in the field of nuclear safety, and thus would conflict with federal law."). Thus, TMI II definitively resolved the issue whether federal law preempts state tort law on the standard of care.

But we also said, "Consequently the plaintiffs' rights will necessarily be determined, in part, by reference to federal law, namely the federal statutes and regulations governing the safety and operation of nuclear facilities." Id. at 860. Plaintiffs contend that, by using the term "in part," "this Court left open the question of whether the applicable duty of care is exclusively federal." Appellees' Br. at 37. We cannot agree. Because we held that federal law preempted state law on the duty of care, plaintiffs' rights had to be determined, at least in part, by federal law. We did not address whether federal law

also controlled other aspects of plaintiffs' claims, such as causation and damages, because they were not at issue. TMI II controls, and federal law determines the standard of care and preempts state tort law. See also O'Conner v. Commonwealth Edison Co., 13 F.3d 1090, 1105 (7th Cir.) (citing TMI II) (holding state law on the duty of care preempted in tort suits involving nuclear safety), cert. denied, 114 S. Ct. 2711 (1994).

III. Statutory and Regulatory History

Although it is clear that federal law governs the standard of care for tort claims arising from nuclear accidents, it is more difficult to discern the precise contours of that federal duty. The question appears to be one of first impression for a federal appellate court.[0] Accordingly, we will examine the language of the relevant statutes and regulations, and the underlying history and policies.

A. Statutes

Nearly a half century ago, Congress initiated its regulation of nuclear power through the enactment of the Atomic Energy Act of 1946, Pub. L. No. 79-585, 60 Stat. 755. The Act was designed to establish an industry to generate inexpensive electrical power, transforming "atomic power into a source of energy" and turning "swords into plowshares." Pacific Gas & Elec. Co. v. State Energy Resources Conservation & Dev. Comm'n, 461 U.S. 190, 193 (1983).

[0]Some federal district courts and state courts have considered this issue, with varying results. See infra part IV.C.

Although the 1946 Act designated the nuclear industry a government monopoly, Congress later decided to permit private sector involvement. See Atomic Energy Act of 1954, Pub. L. No. 83-703, 68 Stat. 919. The 1954 Act "grew out of Congress' determination that the national interest would be best served if the Government encouraged the private sector to become involved in the development of atomic energy for peaceful purposes under a program of federal regulation and licensing." Pacific Gas & Elec., 461 U.S. at 206-07 (citing H.R. Rep. No. 2181, 83d Cong., 2d Sess. 1-11 (1954)).

Nevertheless, because of the unique nature of this form of energy production, the fledgling nuclear industry faced many problems, particularly:

> the risk of potentially vast liability in the event of a nuclear accident of a sizable magnitude . . . . [W]hile repeatedly stressing that the risk of a major nuclear accident was extremely remote, spokesmen for the private sector informed Congress that they would be forced to withdraw from the field if their liability were not limited by appropriate legislation.

Duke Power Co. v. Carolina Envtl. Study Group, Inc., 438 U.S. 59, 64 (1978) (citations omitted).

In response, Congress enacted the Price-Anderson Act "to protect the public and to encourage the development of the atomic energy industry." Pub. L. No. 85-256, § 1, 71 Stat. 576 (1957). The Act limited the potential civil liability of nuclear plant operators and provided federal funds to help pay damages caused by nuclear accidents. Id. Congress has amended the Price-Anderson Act three times, most recently in 1988,

"provid[ing] a mechanism whereby the federal government can continue to encourage private sector participation in the beneficial uses of nuclear materials." In re TMI Litig. Cases Consol. II, 940 F.2d 832, 853 (3d Cir. 1991) ("TMI II") (citing S. Rep. No. 218, 100th Cong., 2d Sess. 4, reprinted in 1988 U.S.C.C.A.N. 1476, 1479), cert. denied, 503 U.S. 906 (1992).

Throughout this period, Congress repeatedly sought to encourage the development of the nuclear power industry. Yet, Congress has continued the "dual regulation of nuclear-powered electricity generation: the Federal Government maintains complete control of the safety and 'nuclear' aspects of energy generation; the States exercise their traditional authority over the need for additional generating capacity, the type of generating facilities to be licensed, land use, ratemaking, and the like." Pacific Gas & Elec., 461 U.S. at 211-12 (footnote omitted).

B. Regulations

Volume 10 of the Code of Federal Regulations (1979)[0] governs energy matters, and its first chapter regulates the Nuclear Regulatory Commission ("NRC").[0] Parts 20 and 50 of Chapter 1 are the relevant sections.

1. 10 C.F.R. Part 20

[0]In this case, the relevant federal regulations were those in place at the time of the TMI accident in 1979. Unless otherwise noted, all citations to the Code of Federal Regulations refer to the 1979 version.
[0]See infra note 20.

Part 20 of 10 C.F.R. ch. 1 outlines "Standards for Protection Against Radiation." Under the "General Provisions" of Part 20, § 20.1(c) provides a statement of the ALARA principle:

> In accordance with recommendations of the Federal Radiation Council, approved by the President, persons engaged in activities under licenses issued by the Nuclear Regulatory Commission . . . should, in addition to complying with the requirements set forth in this part, make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable. The term "as low as is reasonably achievable" means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest.

(emphasis added).

Immediately following the "General Provisions" of Part 20 is a subpart covering "Permissible Doses, Levels, and Concentrations," which regulates exposures of radiation to persons on the property of a nuclear facility, see 10 C.F.R. §§20.101-.104,[0] as well as those off premises, see id. § 20.105-.106. The latter regulations, governing "unrestricted areas,"[0] are relevant here because plaintiffs were outside the TMI premises when the alleged radiation exposures occurred.

[0]These regulations apply to persons in "restricted areas," which are defined as "any area access to which is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials." 10 C.F.R. §20.3(a)(14).
[0]An "unrestricted area" is "any area access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, and any area used for residential quarters." Id. § 20.1(a)(17).

Section 20.105 sets the "[p]ermissible levels of radiation in unrestricted areas," i.e., outside the TMI facility's boundaries. It mandates that the NRC approve license applications if the applicant shows its plan is not likely to cause anyone to receive radiation in excess of 0.5 rem[0] per year. § 20.105(a). In subsection (b), the regulation provides that except as authorized by the NRC, no licensee shall cause "[r]adiation levels which, if an individual were continually present in the area, could result in his receiving a dose in excess of" two millirems in any hour or 100 millirems in any week. The parties dispute whether the § 20.105 standard governing off-site exposure was violated during or after the TMI accident.

While § 20.105 defines the levels of radiation permitted in unrestricted areas, § 20.106 defines the levels of radioactivity permitted in liquid or airborne effluents released off premises. It provides that licensees "shall not possess, use, or transfer licensed material so as to release to an unrestricted area radioactive material in concentrations which exceed the limits specified in Appendix 'B', Table II of this part, except as authorized . . . ." Appendix B then lists more

[0]Doses of radiation of different ionizations are expressed in "rems," a unit of measurement that "embodies both the magnitude of the dose and its biological effectiveness." U.S. Dep't of Commerce, Permissible Dose From External Sources of Ionizing Radiation: National Bureau of Standards Handbook 59 30-31 (1954); see also 10 C.F.R. § 20.4(c) (defining rem as "a measure of the dose of any ionizing radiation to body tissues in terms of its estimated biological effect relative to a dose of one roentgen (r) of X-rays").

than 100 isotopes of almost 100 radioactive elements and provides the maximum permissible level of releases. Defendants admit that the radiation levels at the boundary of the TMI facility exceeded the § 20.106 standards after the 1979 accident.[0] Nevertheless, they claim that no plaintiff was in an area exposed to the impermissible levels.

2. 10 C.F.R. Part 50

In order to understand the ALARA concept and whether it forms part of the standard of care, it is necessary to examine Part 50 of 10 C.F.R. ch. 1, which covers the "Domestic Licensing of Production and Utilization Facilities." Section 50.34a(a) requires that applications for construction permits include certain information about equipment design:

> An application for a permit to construct a nuclear power reactors [sic] shall . . . also identify the design objectives, and the means to be employed, for keeping levels of radioactive material in effluents to unrestricted areas as low as is reasonably achievable. The term "as low as is reasonably achievable" as used in this part means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety

[0] See Appellants' Brf. at 6 ("[T]he concentrations of radioactivity at the site boundary exceeded the permissible levels set by 10 C.F.R. § 20.106 (1979)); id. at 33 ("[D]efendants would concede" that "the amount of radiation at the edge of Three Mile Island exceeded the federal permissible dose levels"). Nevertheless, defendants contend "that no excess releases reached any inhabited areas, much less those inhabited by Plaintiffs. For example, Defendants' evidence indicates that the only regions where the effluents and the dose exceeded the federal levels were Three Mile Island itself, some of the Susquehanna River, and some other uninhabited islands in the river." In re TMI Litig. Cases Consol. II, No. 88-1452, slip op. at 34 n.10 (M.D. Pa. Feb. 18, 1994).

> and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest. The guides set out in Appendix I provide numerical guidance on design objectives for light-water-cooled nuclear power reactors to meet the requirements that radioactive material in effluents released to unrestricted areas be kept as low as is reasonably achievable. These numerical guides for design objectives and limiting conditions for operation are not to be construed as radiation protection standards.

Section 50.36a lists technical specifications "to keep releases of radioactive materials to unrestricted areas during normal reactor operations, including expected operational occurrences, as low as is reasonably achievable." § 50.36a(a). Subsection (b) provides in part:

> Experience with the design, construction and operation of nuclear power reactors indicates that compliance with the technical specifications described in this section will keep average annual releases of radioactive material in effluents at small percentages of the limits specified in § 20.106 of this chapter and in the operating license. At the same time, the licensee is permitted the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided a dependable source of power even under unusual operating conditions which may temporarily result in releases higher than such small percentages, but still within the limits specified in § 20.106 of this chapter and the operating license. It is expected that in using this operational flexibility under unusual operating conditions, the licensee will exert his best efforts to keep levels of radioactive material in effluents as low as practicable. The guides set out in Appendix I provide numerical guidance on limiting conditions for light-water-cooled nuclear power reactors to meet the requirement that radioactive materials in effluents released

> to unrestricted areas be kept as low as is reasonably achievable.

Appendix I to Part 50, referenced in §§ 50.34a and 50.36a, then provides:

> numerical guides for design objectives and limiting conditions for operation to assist applicants for, and holders of, licenses for light-water-cooled nuclear power reactors in meeting the requirements of §§ 50.34a and 50.36a that radioactive material in effluents released from those facilities to unrestricted areas be kept as low as is reasonably achievable. Design objectives and limiting conditions for operation conforming to the guidelines of this Appendix shall be deemed a conclusive showing of compliance with the "as low as is reasonably achievable" requirements of 10 C.F.R. 50.34a and 50.36a. Design objectives and limiting conditions for operations differing from the guidelines may also be used, subject to a case-by-case showing of a sufficient basis for the findings of "as low as is reasonably achievable" required by §§ 50.34a and 50.36a.

The Part 50 Appendix I standards, governing permissible radiation releases, were set far below the levels permitted by §§20.105 and 20.106. The parties apparently agree that a plant operator's compliance with the Appendix I guidelines will shield it from liability. But they disagree on whether an operator's compliance with the higher emission levels permitted by §§ 20.105 and 20.106 also suffices to protect it from liability.

IV. Duty of Care

A fundamental disagreement in this case centers on which of the federal regulations, or combination thereof, sets the applicable standard of care for nuclear power defendants. Plaintiffs contend the ALARA regulations articulate the duty owed

by defendants, while defendants claim that 10 C.F.R. §§ 20.105 and 20.106 govern.

The district court held that a "tri-level scheme," combining the ALARA regulations and 10 C.F.R. § 20.106, constituted the applicable standard of care. In re TMI Litig. Cases Consol. II, No. 88-1452, slip op. at 28 (M.D. Pa. Feb. 18, 1994). The court found that nuclear power defendants could not be held liable for radiation emissions below the minimum levels set by Appendix I of 10 C.F.R. part 50. Id. The court continued:

> [I]f Plaintiffs can prove that Defendants' emissions exceeded those levels set out in §20.106, Defendants will have violated the relevant standard of care and will be held liable, provided Plaintiffs are also able to satisfy the causation and harm elements of their claims. If the evidence indicates that emissions levels fall between the two standards, Defendants may be held liable if Plaintiff can prove (along with the causation and harm prongs) that Defendants did not use their best efforts to reduce radioactive emissions.

Id. at 29. Both plaintiffs and defendants challenge this holding and, as we have noted, the district court certified whether 10 C.F.R. §§ 20.105 and 20.106, and not ALARA, constitute the applicable standard of care.

A. Development of Radiation Protection Standards

We begin our analysis with a review of 10 C.F.R. §§20.105 and 20.106. In 1957, the Atomic Energy Commission ("AEC") issued regulations "to establish standards for the protection of [nuclear plant] licensees, their employees and the general public against radiation hazards." 25 Fed. Reg. 8595,

8595 (1960). The dosage for persons in "unrestricted areas" (the public) was limited to ten percent of that permitted for persons in "restricted areas" (plant employees). 22 Fed. Reg. 548, 549 (1957). The preface to the regulation explained, "It is believed that the standards incorporated in these regulations provide, in accordance with present knowledge, a very substantial margin of safety for exposed individuals. It is believed also that the standards are practical from the standpoint of licensees." Id.

In 1960, the AEC substantially revised these regulations. Upon recommendations from the Federal Radiation Council[0] and the National Committee on Radiation Protection,[0] the AEC promulgated §§ 20.105 and 20.106, setting 0.5 rem as the maximum yearly radiation exposure allowed for the general

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[0]A 1959 amendment to the Atomic Energy Act created the Federal Radiation Council and ordered it to "consult qualified scientists and experts in radiation matters" in order "to advise the President with respect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards . . . ." Pub. L. No. 86-373, 73 Stat. 688, 690 (1959). Upon the establishment of the Environmental Protection Agency in 1970, the functions of the council were transferred to the EPA, and it was abolished. See Reorganization Plan No. 3 of 1970, 84 Stat. 2086, 2088-89 (1970); 35 Fed. Reg. 15623, 15624, 15626 (1970).

[0]The National Bureau of Standards sponsored the creation of the Advisory Committee on X-ray and Radium Protection in 1929. In 1954, after the advent of atomic energy, the committee changed its name to the National Committee on Radiation Protection. See U.S. Dep't of Commerce, Permissible Dose From External Sources of Ionizing Radiation: National Bureau of Standards Handbook 59 iii (1954). In 1964, Congress transformed the committee into the National Council on Radiation Protection and Measurements and charged it with developing information and recommendations concerning radiation protection. Pub. L. No. 88-376, §§ 3, 16, 78 Stat. 320, 321, 324 (1964) (codified at 36 U.S.C. §§ 4501-17 (1988)).

public.[0] 25 Fed. Reg. 8595, 8595 (1960). The AEC concluded the new regulations represented "an appropriate regulatory basis for protection of the health and safety of employees and the public without imposing undue burdens upon licensed users of radioactive material." Id. The AEC stated:

> Recommended limits on exposure, based upon extensive scientific and technical investigation and upon years of experience with the practical problems of radiation protection, represent a consensus as to the measures generally desirable to provide appropriate degrees of safety in the situations to which these measures apply. While the numerical values for exposure limits established in this regulation provide a conservative standard of safety, the nature of the problem is such that lower exposure limits would be used if considered practical. At the same time, if there were sufficient reason, the use of considerably higher exposure limits in this regulation would not have been considered to result in excessive hazards.

Id. Four years later, in 1964, the AEC amended § 20.106 (and the Appendix B levels to which § 20.106 refers) to incorporate new recommendations made by the Federal Radiation Council to the President. See 29 Fed. Reg. 14434, 14434 (1964); see also 28 Fed. Reg. 10170, 10171 (1963). The new limitations were designed

[0] In 1991, the NRC issued new regulations reducing the annual permissible exposure rate for the public to 0.1 rem per individual -- down from the 0.5 rem standard that had existed for more than three decades. See 10 C.F.R. § 20.1301 (1995); 56 Fed. Reg. 23398 (1991). The 1991 regulations adopted recommendations made by the International Commission on Radiological Protection in 1977. See Leonard S. Greenberger, NRC Amends Radiation Protection Requirements, Pub. Util. Fortnightly, Jan. 15, 1991, at 54, 54. Even with these reductions, the permissible exposure rate for the public in the United States remained higher than the .05 rem public exposure limit in Great Britain and the .03 rem limit in Germany. See id.

"to protect individuals in the general population from exposure to radiation as a result of intake of radioactivity through air and water." Id. These regulations remained in effect at the time of the TMI accident in 1979.[0]

B. Development of ALARA

A decade after promulgation of §§ 20.105 and 20.106, the Atomic Energy Commission amended 10 C.F.R. parts 20 and 50 to incorporate an early version of the ALARA rule. 35 Fed. Reg. 18385 (1970). The AEC noted that a general purpose of its regulatory policy was to ensure "radiation exposures to the public should be kept as low as practicable." Id. at 18386-87 (promulgating §§ 20.1(c)). The AEC then promulgated two sections in Part 50 to further this policy. First, it added § 50.34a to ensure that applicants for nuclear license permits identified "the design objectives, and the means to be employed," for keeping levels of radioactive material in effluents as low as practicable. Second, it enacted § 50.36a to require that licenses issued to nuclear operators include technical specifications to keep releases of radiation as low as practicable. Id. at 18387-88.

In 1975, these regulations were modified in two ways. First, the Nuclear Regulatory Commission, the statutory successor to the Atomic Energy Commission,[0] added Appendix I[0] to define the

[0]The regulations have been significantly modified since 1979. See generally 10 C.F.R. chs. 20, 50 (1995).

[0]The Atomic Energy Commission's regulatory functions were transferred to the Nuclear Regulatory Commission in 1974. See 40 Fed. Reg. 19439 (1975) (citing Energy Reorganization Act of 1974, Pub. L. No. 93-438, § 201(f), 88 Stat. 1242-43).

"as low as practicable" admonition with numerical criteria. But in doing so the agency emphasized the criteria were not to be considered "radiation protection standards." 40 Fed. Reg. 19439, 19439 (1975). Second, the NRC replaced the term "as low as practicable" with "as low as reasonably achievable"; the former term was deemed "less precise" and already had been replaced by the International Commission on Radiological Protection ("ICRP").[0] Id. at 58847.

C. Case Law

In framing their arguments, both plaintiffs and defendants rely on decisional law, although we find the applicable case law inconclusive. Plaintiffs, as well as the district court, cite Crawford v. National Lead Co., 784 F. Supp. 439 (S.D. Ohio 1989). In Crawford, neighbors of a uranium production plant sued over the plant's discharge of uranium into the atmosphere and a nearby river. In denying defendants' motion for summary judgment, the district court found sufficient evidence of state law violations. The court decided there was "no conflict between state tort law and the federal interests at issue here," because it found defendants had violated pertinent federal regulations, including ALARA. Id. at 447. Although the

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[0]For a description of Appendix I, see supra part III.B.2.

[0]The ICRP is an "international radiation standards setting agency." Robert K. Temple, Regulation of Nuclear Waste and Reactor Safety within the Commonwealth of Independent States: Toward a Workable Model, 69 Chi.-Kent L. Rev. 1071, 1088 (1994). Formed in 1928 to "discuss and recommend safety standards for the use of radiation," its recommendations have become a primary basis for federal government regulation of the nuclear industry. A Guide to Toxic Torts (MB), § 36.03[5](b), at 36-55 (1995).

opinion cites favorably to the ALARA requirement, the court conducted a cursory review of the federal regulatory scheme and discussed the federal regulations only to demonstrate the absence of a conflict with state law.

For their part, defendants cite Akins v. Sacramento Municipal Utililty District, 8 Cal. Rptr. 2d 785 (Cal. Ct. App. 1992), dismissed, 868 P.2d 905 (Cal. 1994), a suit alleging excessive discharges of radioactive materials from the Rancho Seco Nuclear Power Plant. The court noted that Appendix I and the ALARA standard in § 50.36a(b) were not radiation protection standards, see id. at 794 n.7, and affirmed the grant of defendants' motion for summary judgment. The court held that the evidence established that "no one, including any of the plaintiffs, was actually exposed to dosages of radiation which were more than a small fraction of the NRC and EPA standards." Id. at 814.

Defendants also cite several cases involving nuclear plant employees suing over alleged radiation exposures. In these cases, courts routinely applied the parallel federal regulations governing persons in "restricted areas," see supra note 12, but did not apply ALARA. For example, in O'Conner v. Commonwealth Edison Co., 748 F. Supp. 672 (C.D. Ill. 1990), aff'd, 13 F.3d 1090, 1103-05 (7th Cir.), cert. denied, 114 S. Ct. 2711 (1994), a nuclear plant worker filed suit against the operator of the plant, alleging injuries from radiation exposure. After an analysis of the federal regulatory scheme, the district court held that the limits set in 10 C.F.R. § 20.101 (applicable to

workers on site, just as §§ 20.105 and 20.106 apply to persons off site) supplied the duty of care. The court, without mentioning the ALARA regulations, stated:

> These federal permissible dose limits are based upon the national and international scientific consensus as to the hypothetical risk from exposure to low occupational levels of ionizing radiation. . . .
>
> In determining the likelihood of the injury from radiation, this Court believes that it should give deference to the administrative regulations which are the result of the agency's applied expertise.

Id. The Seventh Circuit affirmed the district court's ruling that federal law preempts state tort law and that the a legislative enactment or an administrative regulation." Restatement (Seconcable standard of care. O'Conner, 13 F.3d 1090 (7th Cir.), cert. denied, 114 S. Ct. 2711 (1994).

Similarly, in Hennessy v. Commonwealth Edison Co., 764 F. Supp. 495 (N.D. Ill. 1991), a nuclear plant worker received a routine medical exam and learned he had been contaminated with a radioactive material, but at a level below that permitted by 10 C.F.R. § 20.103 (setting permissible levels for plant workers). Although he claimed no physical injury from the exposure, he sued under strict liability and for battery and negligent infliction of emotional distress. The district court granted summary judgment to defendants, but stated in dicta that ALARA might have constituted part of the relevant standard of care. Id. at 502.[0]

[0]For other cases in which courts have used the chapter 20 permissible radiation levels as the standard of care in suits by nuclear plant employees, see Coley v. Commonwealth Edison Co., 768 F. Supp. 625 (N.D. Ill. 1991) (granting summary judgment to

Although instructive, these cases do not resolve the precise issue here. Nevertheless, we note that no court appears to have actually applied ALARA as part of the duty of care.

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defendant nuclear power plant because "the NRC regulations [specifically, § 20.102(b)] are determinative of the standard of care in occupational exposure cases"); Whiting v. Boston Edison Co., No. 88-2125 (D. Mass. Sept. 5, 1991) ("[T]he Federal Permissible Dose Standard constitutes the duty of care owed to the decedent in this case."); Jurka v. Commonwealth Edison Co., No. 88-C-7852 (N.D. Ill. Aug. 9, 1990) (granting summary judgment against worker because plant did not exceed regulatory levels of exposure permitted by § 20.101(b)). None of these cases discusses or applies ALARA. But see Silkwood v. Kerr-McGee Corp., 485 F. Supp. 566, 580-83 (W.D. Okla. 1979) (holding state law not inconsistent with, and therefore not preempted by, federal radiation standards, including ALARA), aff'd in part, rev'd in part, 667 F.2d 908 (10th Cir. 1981), rev'd, 464 U.S. 238 (1984).

D. Duty of Care

After reviewing the regulations, the reasons behind their promulgation, and the relevant case law, we hold that §§20.105 and 20.106 constitute the federal standard of care.[0] These regulations represent the considered judgment of the

[0]The Restatement (Second) of Torts expressly provides that, in certain situations, a "court may adopt as the standard of conduct of a reasonable man the requirements of a legislative enactment or an administrative regulation." Restatement (Second) of Torts § 286 (1965); see also W. Page Keeton et al., Prosser and Keeton on the Law of Torts § 36, at 220 (5th ed. 1984) (citing numerous cases) ("When a statute provides that under certain circumstances particular acts shall be done or not done, it may be interpreted as fixing a standard for all members of the community, from which it is negligence to deviate. The same may be true of . . . regulations of administrative bodies."). We believe it appropriate to adopt §§ 20.105 and 20.106 as the standard of conduct in this situation. As one commentator noted:

> The element of breach of duty is a critical issue in the adjudication of radiation cases and one that presents significant problems. The problems arise out of the necessity to create or adopt a legally sufficient standard by which to measure breach. The answer to the problem in this highly regulated area should be straightforward: compliance or noncompliance with applicable government safety standards provides an excellent measure of breach.

David S. Gooden, Radiation Injury and the Law, 1989 B.Y.U. L. Rev. 1155, 1167-68 (1989); see also John C. Berghoff, Jr., NRC Regulations as a Standard for Legal Actions: Has the Public Shield Been Forged Into a Private Sword?, in Nuclear Litigation 1984, at 57, 66 (PLI Litig. & Admin. Practice Course Handbook Series No. 272, 1984) ("It can be argued that the nuclear industry is appropriate for considering compliance to be conclusive proof of 'non-negligence' because Congress and the NRC have retained such close control over radiological hazards. The nation's leading experts on radiation danger were involved in establishing the federal standards, and a reasonably prudent person should be able to rely on them as a standard of conduct."). But see id. (offering alternative interpretations of the regulations).

relevant regulatory bodies -- the Federal Radiation Council, EPA, AEC, and NRC -- on the appropriate levels of radiation to which the general public may be exposed.[0] See, e.g., 25 Fed. Reg. 8595, 8595 (1960) (Sections 20.105 and 20.106 "provide an appropriate regulatory basis for protection of the health and safety of employees and the public without imposing undue burdens upon licensed users of radioactive material."). In fact, the heading for this category of regulations is "Permissible Doses, Levels, and Concentrations," and the relevant regulations are phrased in terms of the maximum levels of radiation that may be released. See 10 C.F.R. §§ 20.101-.108.

Although plaintiffs assert that § 20.105 applies exclusively to nuclear plant employees, we disagree. Part 20 of 10 C.F.R. ch. 1 is divided into separate sections governing permissible dose limits for individuals in "restricted areas," see §§ 20.101, 20.103, and "unrestricted areas," see §§ 20.105, 20.106. The definitions of "restricted" and "unrestricted areas"[0] demonstrate that the C.F.R. sections governing persons in "unrestricted areas" were intended to cover persons outside a nuclear plant's boundaries, i.e., the general public. The case law, while differing over the use of the ALARA standard, appears to have uniformly accepted this meaning. See, e.g., Akins, 8 Cal. Rptr. 2d at 794; Crawford, 784 F. Supp. at 447.

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[0]As we have noted, these agencies have promulgated different standards regarding radiation levels for workers at nuclear power plants. See 10 C.F.R. §§ 20.101-.104; see also supra part III.B.1.

[0]See supra notes 12-13.

Plaintiffs also contend that the Part 20 dose standards govern only during normal operating conditions, not during accidents. But neither the language of the regulations nor its history suggests this interpretation. Instead, we believe the Part 20 dose limits were intended as the maximum permitted under all conditions, accident and normal operations alike. The NRC itself has adopted this interpretation, stating it "believes that the dose limits for normal operation should remain the primary guidelines in emergencies," 56 Fed. Reg. 23360, 23365 (1991), and we believe this agency interpretation is entitled to some deference. See Chevron, U.S.A. Inc. v. Natural Resources Defense Council, Inc., 467 U.S. 837, 844 (1984).

For many of the same reasons that we adopt §§ 20.105 and 20.106 as the applicable standard of care, we reject the ALARA regulations as part of that standard. First, we believe the language of the ALARA regulations compels this result. Section 50.34a explicitly provides:

> The guides set out in Appendix I provide numerical guidance on design objectives for light-water-cooled nuclear power reactors to meet the requirements that radioactive material in effluents released to unrestricted areas be kept as low as is reasonably achievable. These numerical guides for design objectives and limiting conditions for operation are not to be construed as radiation protection standards.

(emphasis added). The regulation could not be more clear. The guidelines that satisfy ALARA "are not to be construed as radiation protection standards." Id.[0] In fact, § 50.36a(b)

[0]We recognize some ambiguity in the regulatory history on whether ALARA is intended to serve as a radiation protection standard,

expressly permits continued operation of a nuclear plant if radiation releases rise above the Appendix I ALARA levels so long as they remain "within the limits specified in § 20.106."[0]

Second, the regulation that incorporated the Appendix I guidelines (that contains ALARA language) explained that the "radiation protection standards" of 10 C.F.R. Part 20 continued to protect public health:

> It should be emphasized that the Appendix I guides as here adopted by the Commission are not radiation protection standards. The numerical guides of Appendix I which we announce today are a quantitative expression of the meaning of the requirement that radioactive material in effluents released to unrestricted areas . . . be kept "as low as practicable."
>
> The Commission's radiation protection standards, which are based on recommendations of the Federal Radiation Council (FRC) as approved by the President, are contained in 10 CFR Part 20, "Standards for Protection Against Radiation," and remain unchanged by this Commission decision. . . . [T]hese FRC standards which have been previously adopted give appropriate consideration to the overall requirements of health protection and the

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see, e.g., 40 Fed. Reg. 19439, 19440 (1975); 35 Fed. Reg. 18385, 18386 (1970); Staff Report of the Federal Radiation Council, Background Material for the Development of Radiation Protection Standards, May 13, 1960, at 26; Staff Report of the Federal Radiation Council, Background Material for the Development of Radiation Protection Standards, Sept. 1961, at 1, but we are unpersuaded by these ambiguous regulatory statements.

[0]In 1987, President Reagan approved an EPA memorandum that revised radiation protection standards for nuclear plant employees. That EPA memorandum noted that "[t]he recommendation that Federal agencies, through their regulations, operational procedures and other appropriate means, maintain doses ALARA is not intended to express, and therefore should not be interpreted as expressing, a view whether the ALARA concept should constitute a duty of care in tort litigation." 52 Fed. Reg. 2822, 2826 (1987).

> beneficial use of radiation and atomic energy. The Commission believes that the record clearly indicates that any biological effects that might occur at the low levels of these standards have such low probability of occurrence that they would escape detection by present-day methods of observation and measurement.

40 Fed. Reg. 19439, 19439-40 (1975).

Furthermore, as we have noted, the Atomic Energy Commission adopted the reasoning of the Federal Radiation Council in promulgating the ALARA regulations. The Federal Radiation Council stipulated it had intended that federal agencies would determine the reasonableness of radiation releases. See Staff Report of the Federal Radiation Council, Background Material for the Development of Radiation Protection Standards, May 13, 1960, at 38 ("The Federal agencies should apply these Radiation Protection Guides with judgment and discretion, to assure that reasonable probability is achieved in the attainment of the desired goal of protecting man from the undesirable effects of radiation. The Guides may be exceeded only after the Federal agency having jurisdiction over the matter has carefully considered the reason for doing so . . . ."); Staff Report of the Federal Radiation Council, Background Material for the Development of Radiation Protection Standards, Sept. 1961, at 2 ("[N]o exposure to radiation should be permitted unless . . . [t]he various benefits to be expected as a result of the exposure, as evaluated by the appropriate responsible group, must outweigh the potential hazard or risk . . . .").

Finally, ALARA is defined as meaning "as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest." See §§ 20.1(c); 50.34a(a). As the district court noted, if jurors make the ALARA determination, then this "results, essentially, in a negligence standard." In re TMI Litig. Cases Consol. II, No. 88-1452, slip op. at 29 (M.D. Pa. Feb. 18, 1994). Adopting ALARA as part of the standard of care would put juries in charge of deciding the permissible levels of radiation exposure and, more generally, the adequacy of safety procedures at nuclear plants -- issues that have explicitly been reserved to the federal government in general and the NRC specifically. See Pacific Gas & Elec., 461 U.S. at 212 ("[T]he Federal Government maintains complete control of the safety and 'nuclear' aspects of energy generation. . . .").[0]

Adoption of a standard as vague as ALARA would give no real guidance to operators and would allow juries to fix the standard case by case and plant by plant. An operator acting in the utmost good faith and diligence could still find itself liable for failing to meet such an elusive and undeterminable standard. Our holding protects the public and provides owners

[0]Defendants concede that the NRC may cite operators of nuclear plants when it believes they have not complied with ALARA. Our holding does not diminish this NRC authority.

and operators of nuclear power plants with a definitive standard by which their conduct will be measured.[0]

V. Exposure Relevant to Duty or Causation?

The second certified question asks, "Whether a particular Plaintiff's level of exposure to radiation or radioactive effluents relates solely to causation or also to the duty owed by Defendants." The district court held that, to prove a breach of duty, plaintiffs need not prove they were located in areas in which radiation exceeded permissible levels. Instead, the court concluded that such evidence is relevant only to determine causation, i.e., whether plaintiffs' injuries were caused by the TMI accident. See In re TMI Litig. Cases Consol. II, No. 88-1452, slip op. at 30-31 (M.D. Pa. Feb. 18, 1994).

Defendants contend that plaintiffs must establish that they were located in areas exposed to radiation in excess of that allowed under §§ 20.105 and/or 20.106 to establish a breach of duty. Like the district court, we disagree.

A. Regulatory Language

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[0]As one court noted, in adopting parallel regulations applicable to nuclear plant workers as the standard of care:

> In a highly technical field such as this, although a plaintiff should be provided a very high level [of] protection from excessive exposure to radiation, a defendant public utility should also be provided with some clear statement regarding how it may limit a worker's dose without exposing the worker to injury or itself to liability.

O'Conner v. Commonwealth Edison Co., 748 F. Supp. 672, 678 (C.D. Ill. 1990), aff'd, 13 F.3d 1090, 1103-05 (7th Cir.), cert. denied, 114 S. Ct. 2711 (1994).

The language of §§ 20.105 and 20.106, which regulate off-site radiation exposures, does not suggest that a breach occurs only when persons are exposed to excessive radiation. Instead, the regulations provide that a breach occurs whenever excessive radiation is released, whether or not anyone is present in the area exposed. Because the relevant unit of measurement (the rem) defines radiation levels in terms of their effect on persons, see supra note 14, the regulations must define impermissible radiation levels in the same way. For example, §20.105(b) prohibits "[r]adiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of two millirems in any one hour," or "[r]adiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 100 millirems in any seven consecutive days." As the language suggests, this regulation does not prohibit only those emissions that actually expose individuals to certain radiation levels. Instead, the regulation prohibits releases that could result in certain radiation levels if persons were present in the area. We believe the regulation would not use the conditional, "if," if it was meant to specify that persons must be present in the area exposed.

Similarly, the language of § 20.106 provides, "For purposes of this section the concentration limits in Appendix 'B', Table II of this part shall apply at the boundary of the restricted area." The regulation does not require that any person actually be present at the boundary line; it merely states

that the regulation is violated if the radiation at the boundary exceeds the Appendix B limits.[0]

Therefore, the regulations provide that a violation occurs whenever radiation exceeds the §§ 20.105 and 20.106 levels -- whether or not persons actually are located in the exposed areas. These regulations resemble those governing other areas of environmental safety, where the duty is breached by the release of pollutants, not by any subsequent personal injury.[0]

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[0]Section 20.106(d) mandates that "the concentration limits in Appendix 'B', Table II of this part shall apply at the boundary of the restricted area," except "[t]he concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit." Therefore, to be precise, the regulation is violated when radiation exceeds the § 20.106 levels at the boundary of the facility or, if applicable, at a conduit exit.

[0]For example, even absent allegations of personal injury, the EPA may impose penalties for, inter alia, violations of statutes and regulations governing air pollution, see United States v. B & W Investment Properties, 38 F.3d 362, 364 (7th Cir. 1994), cert. denied, 115 S. Ct. 1998 (1995); and toxic substances, see Alm Corp. v. United States EPA, Region II, 974 F.2d 380, 381-82 (3d Cir. 1992), cert. denied, 113 S. Ct. 1412 (1993). Similarly, "the NRC is authorized to impose civil penalties on licensees when federal standards have been violated." Silkwood v. Kerr-McGee Corp., 464 U.S. 238, 257 (1984) (citing 42 U.S.C. § 2282). These fines are available for violations of "any applicable rule, regulation or order related to nuclear safety," 42 U.S.C. § 2282 (1988), not just those violations that result in personal injury. In fact, although defendants contend that no one was injured by the TMI accident, they received a $155,000 fine for violations of various NRC regulations and technical specifications. See Diane Sponseller, The Increasing Use of Fines as an Enforcement Mechanism, Pub. Util. Fortnightly, May 11, 1989, at 42, 42; see also Letter from Victor Stello, Jr., Director, NRC Office of Inspection and Enforcement, to R.C. Arnold, Sr. Vice President, Metropolitan Edison Company (Oct. 25, 1979). The penalty would have been higher -- regulators had wanted to fine defendants $725,000 for the violations -- but they were limited by a $25,000 per month maximum on fines then imposed by the Atomic Energy Act. See id. at 3.

B. Tort Law

Despite the regulations, defendants argue that, under traditional tort law principles, whether there has been a breach of duty is specific to each plaintiff. Thus, defendants contend that the duty element requires a showing that each individual plaintiff was exposed to radiation exceeding the §§ 20.105 and/or 20.106 permissible levels.

Under Pennsylvania law[0] and traditional tort principles, a negligence cause of action requires proof of four elements:

> 1) A duty or obligation recognized by the law, requiring the actor to conform to a certain standard of conduct for the protection of others against unreasonable risks;
>
> 2) A failure to conform to the standard required;
>
> 3) A causal connection between the conduct and the resulting injury; and
>
> 4) Actual loss or damage resulting to the interests of another.

Griggs v. BIC Corp., 981 F.2d 1429, 1434 (3d Cir. 1992) (citations omitted); see also Kleinknecht v. Gettysburg College, 989 F.2d 1360, 1366 (3d Cir. 1993); Morena v. South Hills Health Sys., 462 A.2d 680, 684 n.5 (Pa. 1983); W. Page Keeton et al.,

[0]As we have noted, the 1988 Amendments retroactively required the applicable law for "public liability actions" be "the law of the State in which the nuclear incident involved occurs, unless such law is inconsistent" with federal law. 42 U.S.C. § 2014(hh) (1988). Although we have held that federal law preempts state tort law on the standard of care, see supra part II, we find it useful to refer to state tort law in construing the relationship between the elements of duty and causation.

Prosser and Keeton on the Law of Torts § 30, at 164-65 (5th ed. 1984).

Whether a defendant owes a duty to a plaintiff is a question of law. Kleinknecht, 989 F.2d at 1366; see also Restatement (Second) of Torts § 328B (1965) (court determines whether "facts give rise to any legal duty on the part of the defendant" and "the standard of conduct required of the defendant by his legal duty"). Furthermore, the determination "whether to impose a duty is essentially one of policy." Hoffman v. Sun Pipe Line Co., 575 A.2d 122, 125 (Pa. Super. Ct. 1990); see also Keeton et al., supra, § 53, at 358 ("[I]t should be recognized that 'duty' is not sacrosanct in itself, but is only an expression of the sum total of those considerations of policy which lead the law to say that the plaintiff is entitled to protection.").

In this case, the applicable regulatory agencies already have weighed the competing policy considerations. As we have noted, the Atomic Energy Commission viewed §§ 20.105 and 20.106 as providing a balance between public safety and operational practicality. See 25 Fed. Reg. 8595 (1960). Although the AEC noted that its regulations provided a "conservative standard of safety," it said it realized that "lower exposure limits would be used if considered practical" and "considerably higher exposure limits . . . would not have been considered to result in excessive hazards." Id. Thus, the federal regulatory agencies have analyzed the competing policies in defining acceptable (and non-acceptable) conduct. We hold that the duty

of care is measured by whether defendants released radiation in excess of the levels permitted by §§ 20.105 or 20.106, as measured at the boundary of the facility, not whether each plaintiff was exposed to those excessive radiation levels.

Because defendants conceded that they violated §20.106, they violated their duty of care, thus satisfying the first and second elements of a negligence action.[0] See Griggs, 981 F.2d at 1434. Of course, plaintiffs still must prove causation and damages before they may recover. Id.

This situation is analogous to the practice followed by many jurisdictions with negligence per se cases. In such cases, where defendants violated the relevant statute or regulation, courts have held as a matter of law that plaintiffs have satisfied the first two elements of their cause of action: the duty and breach of duty. Nevertheless, "[t]here will still remain open such questions as the causal relationship between the violation and the harm to the plaintiff . . . ." Keeton et al., supra, § 36, at 230; see also 1 J.D. Lee & Barry A. Lindahl,

[0]We note that "the scope of the duty not to place others at risk is limited to those risks which are reasonably foreseeable." Maxwell v. Keas, 639 A.2d 1215, 1217 (Pa. Super. Ct. 1994); see also Keeton et al., § 43, at 280 (negligence "necessarily involves a foreseeable risk"). Thus, there may be cases in which plaintiffs were located far enough away from a defendant's power plant that any injuries from excessive radiation released at the boundary of the plant would be unforeseeable. See, e.g., Palsgraf v. Long Island R.R. Co., 162 N.E. 99 (N.Y. 1928). Nevertheless, we believe it is entirely foreseeable for nuclear power plant operators to expect that any excessive radiation releases might cause harm, even if the injured were not at the precise spots where the radiation exceeded federal levels, but instead were located in areas where radiation could spread via wind, rain, or water.

Modern Tort Law: Liability & Litigation, § 3.33, at 102 (1980) ("Under the per se rule, the violation of an applicable statute is conclusive proof of negligence, leaving only the question of causation to be determined.") (footnote omitted).

But defendants contend that, if individual radiation exposures are not considered in determining breach of duty, they will be forced to stand trial on potentially thousands of meritless claims. We disagree. As part of the causation inquiry, each plaintiff must demonstrate exposure to radiation released during the TMI accident. See In Re Paoli Railroad Yard PCB Litigation, 916 F.2d 829, 860 (3d Cir. 1990) (holding exposure to be an element of claim for injuries from hazardous substance), cert. denied, 499 U.S. 961 (1991); In re "Agent Orange" Prod. Liab. Litig., 996 F.2d 1425, 1437 (2d Cir. 1993) (requiring that plaintiffs "demonstrate with sufficient accuracy their levels of personal exposure to Agent Orange," in addition to "individual causation, i.e., that Agent Orange exposure caused the particular illnesses upon which they base their claims"), cert. denied, 114 S. Ct. 1125 (1994); A Guide to Toxic Torts (MB), § 10.01[2](a), at 10-5 (1995) ("In toxic tort litigation, however, causation is not a simple matter for the jury. The plaintiff must establish by a preponderance of evidence the presence of the injury-causing substance, that he or she has been exposed to the substance, and that the exposure has resulted in certain injuries.").[0]

[0] See also Latimer v. SmithKline & French Labs., 919 F.2d 301, 304 (5th Cir. 1990) (mandating evidence of "the requisite exposure"

In Paoli, plaintiffs claimed they were injured by exposure to high levels of polychlorinated biphenyls, better known as PCBs. We agreed with the district court that plaintiffs' prima facie case consisted of four elements:

> 1) that defendants released PCBs into the environment; 2) that plaintiffs somehow ingested these PCBs into their bodies; 3) that plaintiffs have an injury; and 4) that PCBs are the cause of that injury.

Id.; see also Hines v. Consolidated Rail Corp., 926 F.2d 262, 275 (3d Cir. 1991) (quoting Paoli's four required elements).

The first element represents a combination of the traditional duty and breach of duty elements, as stated in Griggs, supra; it assumes that defendants had a duty not to release PCBs into the environment but did so anyway. The remainder of the Paoli factors breaks up the causation and injury requirements into three elements, adding an "exposure" prong into the causation and injury inquiry. As in Paoli, this analysis is useful here, where the substance that allegedly injured plaintiffs also occurs naturally in the environment. This

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in case alleging injury from pesticide); Catrett v. Johns-Manville Sales Corp., 756 F.2d 181, 185 (D.C. Cir. 1985) (noting that plaintiff has "burden of proving by admissible evidence that her husband's exposure to Celotex's [asbestos-containing] products had proximately caused his death"), rev'd on other grounds, 477 U.S. 317 (1986). Similarly, in Thompson v. Southern Pacific Transp. Co., 809 F.2d 1167, 1168 (5th Cir.), cert. denied, 484 U.S. 819 (1987), a railroad brakeman sued his former employer and a chemical company alleging that exposure to dioxin caused his illness. Before trial, the chemical company admitted that dioxin had contaminated its plant site. A jury found for plaintiff, but the Court of Appeals for the Fifth Circuit overturned the award. The court noted the plaintiff's evidence as to causation was insufficient because he failed to produce adequate evidence showing that he actually was exposed to dioxin and that dioxin caused his illness. Id. at 1169.

"exposure" element requires that plaintiffs demonstrate they have been exposed "to a greater extent than anyone else," i.e., that their "exposure level exceeds the normal background level." Paoli, 916 F.2d at 860-61.

Translated to this case, the Paoli factors require plaintiffs to show that: 1) defendants released radiation into the environment in excess of the §§ 20.105 or 20.106 levels; 2) plaintiffs were exposed to this radiation (although not necessarily at the levels prohibited by §§ 20.105 and 20.106); 3) plaintiffs have injuries; and 4) radiation was the cause of those injuries. Although defendants concede the first element here, summary judgment still may be entered on any of the remaining issues, just as it ordinarily might be entered on the question of duty or breach thereof. See, e.g., In re Agent Orange Prod. Liab. Litig., 611 F. Supp. 1290 (E.D.N.Y. 1985) (granting summary judgment to defendants because, even accepting plaintiff's claim that he was exposed to Agent Orange, "there is no proof that the diseases and symptoms suffered by him were caused by Agent Orange"), aff'd on other grounds, 818 F.2d 210 (2d Cir. 1987), cert. denied, 484 U.S. 1004 (1988); Latimer v. SmithKline & French Labs., 919 F.2d 301, 304 (5th Cir. 1990) (affirming summary judgment on causation element for defendant in case alleging injury from pesticide "because the evidence in the record does not establish the requisite exposure"). Therefore, contrary to defendants' assertions, our holding on the scope of their duty will not require them to stand trial on meritless claims.

VI. Conclusion

In sum, defendants violated their standard of care if they released radiation exceeding the levels permitted under §§20.105 and 20.106 -- whether or not individual plaintiffs were harmed. Once defendants exceeded the federal standards on radiation emission, they breached their duty. Plaintiffs' exposures to radiation remain relevant, but only to prove causation and damages.

For the foregoing reasons, we will affirm in part and reverse in part.