

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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IN THE MATTER OF WHETHER THE ACCIDENT AT THE THREE MILE ISLAND NUCLEAR STATION, UNIT 2, ON MARCH 28, 1979, CONSTITUTES AN EXTRAORDINARY NUCLEAR OCCURRENCE AS DEFINED BY SECTION 11(j) OF THE ATOMIC ENERGY ACT AND 10 CFR PART 140 OF THE COMMISSION'S REGULATIONS

DETERMINATION

The Commission today determines that the accident at Three Mile Island did not constitute an "extraordinary nuclear occurrence" (ENO) as that term is defined by the Price-Anderson Act and the Commission's regulations. Specifically, we find that Criterion I for an ENO, contained in 10 CFR 140.85, has not been met. For reasons explained below, we make no explicit finding as to Criterion II.

In the event of a nuclear accident (or nuclear "incident" as the term is used in the Atomic Energy Act), claims for injuries or damages can be brought by any injured person against the plant licensee (in this case Metropolitan Edison Company) and any other party considered responsible for the accident. Congress has established a system of private insurance, funds from electric utilities and government indemnity totalling \$560 million to pay such claims. One of the principal obstacles to a claimant's recovery for injuries or damages could be the necessity of proving in a court proceeding that the defendants were negligent and that their negligence caused or contributed to the accident. However, when the Commission determines that a nuclear incident was an "extraordinary nuclear occurrence," the Price-Anderson Act provides for a system which is similar in some respects to a "no-fault" recovery scheme.

When the Commission determines that an ENO has occurred, persons with claims for injuries or damages need not prove that the licensee or other responsible parties were negligent. Furthermore, the defendants in legal proceedings cannot argue that the person making the claim somehow contributed to the injury. In addition, an ENO determination would extend the time within which a legal action could be commenced. Whether or not an ENO is declared, a claimant must still prove an injury or damage, the monetary amount of the loss and how the loss was caused by the accident. When, as here, an incident is not found to be an ENO, all court proceedings are conducted under applicable state and federal law.

We note at the outset that, in ordinary parlance, the accident at Three Mile Island was "extraordinary". It resulted in heavy damage to the reactor itself, caused evacuation of some persons from the surrounding area, and generated concern and anxiety throughout the country. In our decision today we do not in any respect intend to downplay the seriousness of this accident or its consequences.

However, the Price-Anderson Act sets down clear statutory responsibilities for the Commission to perform when such an event has occurred. The term "extraordinary nuclear occurrence" has a specific legal meaning which is quantified by Commission regulations that have been in effect since 1968. Our decision today is

limited to the application of those regulations to the accident at Three Mile Island. It is only in that sense that we find this accident not to be an "extraordinary nuclear occurrence".

We believe that the accident at Three Mile Island demonstrates that these regulations should be reexamined. Indeed, we have some reservations about the criteria and the statutory definition of an ENO in light of the Three Mile Island experience. 1/ As we note below, a rulemaking is now under way which will examine the need to modify the current criteria and, if necessary, the statute itself.

I. Background

The events which transpired at the Three Mile Island Nuclear Station (TMI) on March 28, 1979, and the days to follow are by now well known to the public. It will not be our purpose here to review the accident itself, which has been described in detail in recent reports by the President's Commission on the Accident at Three Mile Island and by the NRC Special Inquiry Group. For present purposes it is sufficient to note that during the course of the accident, radioactive material was released into the environment at detectable levels offsite and some persons were advised by the Governor of Pennsylvania to evacuate a five-mile zone near the plant. These facts alone were sufficient to suggest an "extraordinary nuclear occurrence".

1/ Commissioner Gilinsky believes that the criteria presently used to determine the occurrence of an ENO reflect an outdated and overly relaxed view of the level of acceptable radiation dosages.

On July 2, 1979, the Commission received a paper from its staff which set out in detail the operation of the ENO provisions in the Price-Anderson Act and NRC regulations, and recommended that the Commission proceed to determine whether the accident at TMI constituted an ENO. The Commission accepted this recommendation, and announced on July 20, 1979, that it was initiating procedures to make the determination. Public comment on this announcement was officially requested in the Federal Register notice published July 23, 1979, 44 Fed. Reg. 43128. Two days later, on July 25, a petition requesting an ENO determination was received from persons residing in the vicinity of TMI.

Pursuant to its regulations, the Commission ordered on August 17, 1979, that a staff panel be formed to review available data and to present findings to the Commission on whether the accident at TMI met the criteria for an ENO contained in 10 CFR Part 140. The Executive Director for Operations, chairman of the panel, reported back to the Commission on August 23 that the panel had been formed and would begin work immediately. A week later, on August 30, the Executive Director reported to the Commission the procedures the staff panel would follow in analyzing data and reaching its recommendations. These procedures were published in the Federal Register on September 7, 1979. 44 Fed. Reg. 52391. The panel continued its work throughout the fall of 1979.

On August 29, 1979, the Commission received a request for a public hearing on the ENO determination from attorneys representing plaintiffs in class action suits alleging damages resulting from the accident. The Commission granted this request, and ordered the staff panel to conduct an informal hearing in Harrisburg, Pennsylvania, at which members of the public could address the panel and submit statements for the record. This hearing was announced in the Federal Register on November 6, 1979, 44 Fed. Reg. 64133, and efforts were made to inform the public in the Harrisburg area.

The hearing was held on November 21, 1979, before several members of the staff panel and members of the working group assisting the panel in the review of accident data. Seven persons addressed the panel, and statements were submitted for the record by several speakers and others unable to attend the hearing. A transcript of the hearing was kept as part of the ENO determination record.

On December 31, 1979, the staff panel submitted its report to the Commission. Announcement was made in the Federal Register on January 4, 1980, that the report was available for public comment for a thirty-day period. 45 Fed. Reg. 1180. This public comment period ended on February 4, 1980, thus closing the record for this determination.

II. Summary of the Record Before the Commission

The record in this proceeding is in four parts, all of which are available for public inspection in the NRC Public Document Room in Washington, D.C. and in Middletown, Pennsylvania: (1) Report of the Staff Panel, December 31, 1980, (2) Public comments following the announcement of the ENO determination, (3) Transcripts of the November 21 hearing in Harrisburg, and statements submitted for the record, and (4) Public comments on the Report of the Staff Panel. These documents are appended to this determination as Appendices 1 - 4, respectively.

A total of 58 public comments have been received which generally address the ENO question. These comments are summarized and broken down by category in Appendix C to the Report of the Staff Panel. The Staff Report also responds to each category of comments. Four public comments were received by the Commission which specifically address the staff's report, of which one analyzes the staff's findings in some detail.

In reaching this determination, the Commission has considered all parts of the record. Although we accept the findings of the Staff Report and thus conclude that the accident was not an ENO, we do so having weighed carefully the contrary views expressed in public comments and at the Harrisburg hearing.

III. Statutory and Regulatory Framework

The term "extraordinary nuclear occurrence" is defined by Section 11(j) of the Atomic Energy Act as follows:

The term "extraordinary nuclear occurrence" means any event causing a discharge or dispersal of source, special nuclear, or byproduct material from its intended place of confinement in amounts offsite, or causing radiation levels offsite, which the Commission determines to be substantial, and which the Commission determines has resulted or probably will result in substantial damages to persons offsite or property offsite.

The definition thus provides a two-pronged test: (1) substantial offsite release or substantial offsite radiation, and (2) actual or likely substantial offsite damages. This section also requires the Commission to "establish criteria in writing" for application of these tests to specific events.

The Commission's criteria are found in 10 CFR 140.84 and 140.85, and are set out fully in the Staff Report at pp. 8-11. Appendix B to the Staff Report may be referred to for a more detailed description of the ENO and waivers of defenses provisions of the Price-Anderson Act and of the Commission's ENO criteria. It will suffice to note here that in making this determination we have applied Criterion I and Criterion II to the facts of the Three Mile Island accident. As described below we find that the radiological releases associated with the accident do not rise to the levels specified in Criterion I, and thus are not "substantial" for statutory purposes. We reach no explicit finding on whether

damages resulting from the accident meet Criterion II, and hence make no determination as to whether the damages are "substantial" within the meaning of the statute. Because the statutory definition requires that both tests be satisfied, we reach a negative conclusion.

IV. Review of Staff Panel Findings and Recommendations

A. Standards for Review

The ENO determination envisioned by Congress and the Commission's rules is an objective decision, depending upon the application of specific criteria to the facts of a particular accident. This is especially true of Criterion I, where the question is whether measured releases or radiation levels (or the best estimates of releases or radiation levels for which direct measurements are not available) meet the levels specified in the criterion. Criterion II is somewhat more subjective, at least as to certain of the damage categories. Assessment of dollar amounts of damages that "probably will result" from the accident, prior to any court judgments reducing claims to exact figures, is by nature more difficult than comparison of measured or estimated releases or radiation levels with established levels. The purpose of having objective tests, of course, is to permit their application soon after an accident has occurred in order to speed recoveries in appropriate cases.

While the final determination in this case is our responsibility, we necessarily must rely upon the work of the staff in analyzing the mass of data relevant to the criteria. Our review of the staff's findings first focuses on whether the staff has taken a sufficiently conservative approach to application of the criteria. Also appropriate for close Commission scrutiny are any major legal or policy questions presented, for example, whether a particular category of damages should be included under Criterion II.

Finally, we must examine the record as a whole to determine whether all available data have been assembled and considered and whether adequate opportunity for public input has been provided.

If the staff's findings are acceptable in the above respects, the remaining questions are quantitative, i.e., whether, based on the record that has been compiled, radiological releases or radiation met the levels specified in Criterion I, and whether damages met the levels specified in Criterion II. In approaching these questions the Commission has not redone the various calculations of doses and radiation levels prepared by the staff. Rather, the Commission's review has focused on whether there is anything apparent in the record as a whole indicating that the staff made any significant errors requiring re-analysis.

B. Criterion I

1. Conservatism

Section VIII(A) of the Staff Report discusses the assumptions made by the staff panel in evaluating exposure levels relevant to Criterion I. As to duration of the accident, the staff assumes that it began on March 28 and ended on May 9, when "all discharges from the reactor were within the dose levels and concentrations specified in Appendix I to 10 CFR Part 50 ... and 10 CFR Part 20 of the Commission's regulations". While the staff acknowledges that further releases above these levels are possible at TMI, the Report concludes that such releases would be separate "nuclear incidents" within the meaning of the Price-Anderson Act.

For a definition of "offsite", the staff concluded that while the possible choices were separated by less than a 100 feet at points nearest to the plant, the definition adopted "include[d] all areas, whether or not owned by the licensee, outside of the owner-controlled area enclosed by the permanent fence on Three Mile Island". (See Staff Report at 14 - 16). This definition would include some area owned by Metropolitan Edison outside the permanent station fence.

The staff panel considered four possibilities in applying the language of Criterion I referring to "persons offsite [who] were, or could have been, or might be exposed ...". The panel decided to

carry out calculations for three of these possibilities, all of which pertain to the "could have been" category:

Under one assumption, individuals were assumed to be located at points corresponding to the highest recorded doses where, in fact, no individuals are known to have been ... The Panel also considered a hypothetical person exposed outdoors for the periods of releases of noble gas and iodine from the accident and placed just offsite at spots that the Panel concluded would have seen the highest exposure. Finally, in order to obtain an upper limit for possible exposure to compare against the values in Criterion I, a person was hypothesized to have the ability and knowledge to be transported so as to be in the area of highest radiation exposure during the course of the accident. (Report at 17-18)

The staff added a statistical measurement error to recorded doses corresponding to a 99.9 percent confidence level, and did not include a reduction factor of 1.2 to 2.2 for the demonstrated over-response of thermoluminescent dosimeter to radiation emitted during the accident. These calculational methods would naturally result in projected doses far in excess of the maximum actual dose received by real persons, which was probably on the order of 75 millirem. (See Document 6 to Appendix A of the Staff Report).

We are satisfied that, as to each of the three assumptions, the staff has taken a suitably conservative approach. The period chosen to delimit the accident encompasses all releases fairly attributable to the March 28 accident itself. We agree that it is appropriate to regard any further elevated releases from the reactor site as separate incidents once the plant has been brought to cold

shutdown and release levels have declined to within normal operating range. Similarly, the staff has chosen the most conservative definition of "offsite" for purposes of measuring possible exposure levels.

Finally, it would be difficult to conceive of a more conservative method of calculating possible dose levels than assuming a person constantly moving into the area of highest possible exposure throughout the duration of the accident. In fact, this category probably goes beyond any fair reading of "could have been" exposed. Nevertheless, it does establish, as the Staff Report states, an upper bound of projected doses. If calculations based on this unrealistic scenario did not meet the levels of Criterion I, it is clear that the Criterion has not been met.

2. Legal or Policy Issues

As we have noted above, the application of Criterion I is largely quantitative. When making the comparison of actual or projected doses (or contamination levels) with the levels in the Criterion, however, the question arises, how close must calculated or measured levels be to those in the Criterion in order for it to be met?

There will always be a significant margin of error in measurements of radiation offsite and in calculations which estimate offsite exposures or contamination levels. With this in mind, it is appropriate to regard the thresholds of Criterion I as a guide for the meaning of "substantial" rather than as rigid levels with no allowance for uncertainties. If it appears that calculations based on reasonable scenarios (or actual measurements, if available and sufficiently accurate) enter the basic range of the criterion, e.g. tens of rems for person exposures, we would conclude that the criterion had been met. On the other hand, if this range can only be reached by extreme upper-limit bounding calculations, or when actual measurements and reasonable calculations do not enter this range, we must conclude that the criterion has not been met. We view the range of discretion in applying Criterion I wide, but not to the extent of making the judgment subjective. The purpose of having prospective criteria is to permit the resolution of individual cases on an objective basis. The exercise of unlimited discretion would frustrate this purpose and would leave our determination subject to criticism for failure to follow our own regulations.

3. Record Supporting the Staff Finding

Appendices E and F to the Staff Report collect the technical data and calculations supporting the finding that Criterion I has not been met. Appendix E approaches the problem from the "source

term" perspective, while Appendix F analyzes measurement data.

In compiling Appendices E and F, the staff panel drew upon work performed by the NRC staff, other Federal agencies, the State of Pennsylvania, Metropolitan Edison, and industry consultants. Furthermore, the staff had before it the public comments and transcript of the Harrisburg hearing (and statements for the record), some of which addressed the question of radiological releases and offsite exposures.

In reviewing Appendices E and F, we find them to be a detailed and complete analysis of available data. Furthermore, we are unaware of any significant source of data which has been overlooked or inadequately considered. Our conclusion is that the record before us is complete and that adequate provision has been made throughout this proceeding for public comment.

4. Application of Criterion I

Table 16 of Appendix E to the Staff Report summarizes the upper-bound estimates of doses relevant to Criterion I, and compares those doses with the levels in the criterion. These "total" doses are themselves somewhat unrealistic since, as the Report explains, obtaining the total dose listed would require a person to be in two places at once. Table 17 summarizes results for ground contamination.

The upper-bound dose rates are generally an order of magnitude lower than Criterion I levels, ranging from about a factor of four to a factor of 25. (The best estimate of maximum exposure based on a realistic scenario is at least an order of magnitude smaller. See Table 4 to Appendix E). Ground contamination dose rates range from a factor of several hundred (for gamma) to about six (for beta). Again, realistic estimates would be much lower.

Measurements summarized in Appendix F generally support this analysis. Projected upper-bound doses based on actual measurements range from a factor of 14 below Criterion I (for whole body) to a factor of 6.6 (for skin exposure). Upper bounds on surface contamination were two to three orders of magnitude below the levels of Criterion I (See Appendix F to Staff Report at 63-65).

Based on these calculations and measurements, we must conclude that the radiological consequences of this accident, as to both exposures and surface contamination, did not enter the range of Criterion I in any respect. We accept the conclusion of the Staff Report that Criterion I has not been met.

C. Criterion II

The Staff Panel experienced considerable difficulty in applying Criterion II to this accident. In part, this difficulty was due to the unusual nature of this accident, i.e., severe onsite consequences resulting in relatively small offsite releases of

radiation. As the Staff Report points out (note at 25), the assumption that an accident could not meet Criterion II without--almost automatically--meeting Criterion I is not necessarily true. One can envision an accident even more severe than TMI in terms of onsite damage, resulting in widespread evacuation and losses related thereto, yet minor in terms of actual radiological consequences.

The dual nature of the criteria, however, reflect the dual nature of the statutory definition noted above: one must have both "substantial" offsite releases or radiation and "substantial" offsite damages for an ENO to be found. In this case, it is clear that Criterion I has not been met, and thus the Staff Panel did not find it necessary to go beyond pointing out the difficulties in applying Criterion II to an accident of this kind.

The legislative history of the ENO concept, and the background for the criteria, seem to address an accident where rather sudden offsite releases cause personal exposures and contamination to property meeting Criterion I, rather than an accident of long duration causing anxiety--and some evacuation--but not "substantial" effects in radiological terms. In the former case, the estimate of immediate losses--which generate the need for quick recoveries--can be made and the waivers activated if the Criterion II levels are met. In the case of TMI, however, "damages" other than those directly associated with the evacuation (which have, for the most

part, already been compensated) can only be ascertained after extended litigation. The actions filed in Harrisburg claim losses for mental suffering, diminution in property values, business losses, and so on--all extremely difficult to estimate numerically. Further, it is by no means clear that Congress intended such indirect damages (that is, not caused by a substantial release of radiation) to be considered as part of the ENO determination.

We find ourselves in agreement with the Staff Panel that application of Criterion II in this case presents difficulties which make an explicit finding almost impossible to reach. Since the Staff Panel found conclusively that Criterion I had not been met, and both Criterion I and Criterion II must be met for there to be an ENO, it decided not to explore the matter further.

This accident demonstrates that Criterion II needs to be addressed by rulemaking to resolve the problems pointed up by the facts of TMI. Such a rulemaking is now under way, in which Criterion I will also be re-examined. Full opportunity for public participation will be provided. It should be noted, however, that while the criteria can be revised by the Commission as appropriate, the basic definition of Section 11(j)--and the Congressional intent behind the ENO concept--must be followed.

D. Public Comments on the Staff Report

Four public comments were received following transmittal of the Staff Report. Of these, only the comment from attorneys representing TMI class action plaintiffs subjects the Staff Report to careful analysis. Four major points are made by this comment: (1) The Commission should use upper-bound dose figures and find that the thresholds of Criterion I have been met, (2) the "Heidelberg Report" should be considered in assessing doses, (3) Damages far exceed the Criterion II thresholds, and (4) A negative ENO determination at this time would be premature. We address these points in order.

We have above accepted the use of upper-bound calculations based upon unrealistic exposure scenarios as a basis for finding that Criterion I is not met. The comment takes issue, however, with the refusal of the Staff Report to consider thyroid exposure of a child at the site boundary, moving in such a way as to be downwind of the plant during the entire release period. The Staff Panel found it "inconceivable that an infant was anywhere near the exclusion boundary". The Staff Panel also found it unrealistic to imagine continuous movement over the entire 43-day period of iodine releases in order to maximize the dose. (Report at 21). The comment claims that using this extreme scenario--a moving child at the site boundary--one could obtain a thyroid dose level meeting that aspect of Criterion I.

As we have indicated above, Criterion I cannot be regarded as met when one of its levels can only be met or approached by an extreme upper-bound calculation based on an unrealistic scenario. We must agree with the conclusion of the Staff Panel that thyroid exposure of a child held downwind of the plant at the site boundary during the entire 43-day period of iodine release may not be considered a realistic scenario, nor is it even useful as a bounding calculation. While we have accepted the Staff Panel's upper-bound approach as a demonstration that no real persons could have been exposed to substantial amounts of radiation, we cannot go so far as to rest a determination upon total departures from realistically estimated exposures.

The "Heidelberg Report" is not part of the record in this proceeding, nor is it specifically addressed in the Report of the Staff Panel. The comment requests that the "Commission give due weight to the findings of that Report which have great relevance to exposures from plants in the United States". The comment then quotes portions of this report alleged to cast doubt on TMI dose calculations. The comment asks that TMI radiation data be supplied to the University of Heidelberg for analysis based on this report and the results compared with those already reached.

This report (also known as the "Wyhl Report") has been the subject of several recent staff papers. In the first, dated December 10, 1979, the staff informed us that it had performed a preliminary review of this report and had concluded that its dose

estimates were unrealistically high when compared to dose estimates based on models used by the NRC. As recently as January 30, 1980, the staff transmitted to us a complete draft review of the "Heidelberg Report". The basic conclusion of this review was unchanged from the earlier staff paper: the "Heidelberg Report" used input parameters which were not supported by environmental monitoring data near nuclear plants in the United States, and hence its dose estimates were from 10 to 10,000 times too high when compared with NRC values or measured environmental radioactivity levels near power reactors. The staff concluded that "the Wyhl Report's estimated dose from vegetation, meat, and milk ingestion is not a realistic dose for the hypothetical maximum individual living near nuclear power plants in the U.S."

It is also important to recognize that the "Heidelberg Report" focuses upon food chain pathways, i.e., estimated doses from vegetation, meat and milk ingestion. The principal exposure pathways at Three Mile Island were external radiation and radioiodine inhalation. Exposures related to the food chain would be, at most, small fractions of the calculated or estimated exposures used in the Staff Report.

We are therefore satisfied that the staff was well aware of the "Heidelberg Report" during its preparation of the ENO findings, and based upon its analysis of the Report declined to use its dose estimates. The comment here considered provides several brief

quotes from the Report, but supplies no basis for concluding that the staff's review is in error. For purposes of this ENO determination, we regard it as sound to use dose calculational models which use environmental monitoring data taken from operating nuclear power plants in the United States, and thus decline to further consider the "Heidelberg Report" in this proceeding. 2/

The comment next presents facts which, it is alleged, show that Criterion II has been met in this case. These facts only serve to emphasize the problems we have already acknowledged in applying Criterion II to this accident. They are academic in this case, however, since we find that Criterion I has not been met.

Finally, the comment argues that a negative determination should not be made "until the possibility of future releases is foreclosed". On this point we strongly disagree. We have above agreed with the conclusion of the Staff Panel that any future releases exceeding Commission regulations must be considered a separate incident. It was the intent of Congress in providing the ENO concept (and the waivers of defenses) that it should be expeditiously applied. This is, in fact, a major reason for precluding judicial review of the Commission's determination. It may well be several more years before Unit 2 has been decontaminated. Our determination should not await the possibility of further releases

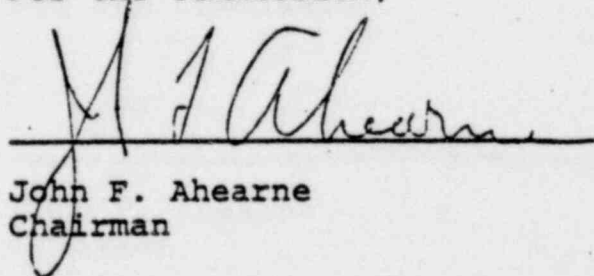
2/ Commissioners Gilinsky and Bradford do not believe that the "Heidelberg Report" is relevant to this ENO determination. Consequently they do not think it is necessary to reach a conclusion as to the merits of the Report.

during that period which could result from clean-up operations. A determination at this time, whether negative or positive, informs the Federal court in Harrisburg of whether the waivers of defenses are to be applied. A negative determination leaves the Court free to apply state tort law to the pending cases without application of any waivers of defenses, the result intended by Congress where an ENO was not found.

DETERMINATION

The Commission finds that Criterion I, 10 CFR 140.84, has not been met by the March 28, 1979, accident at Three Mile Island Nuclear Station, Unit 2. The Commission therefore determines that this accident does not constitute an "extraordinary nuclear occurrence" within the meaning of Section 11(j) of the Atomic Energy Act and 10 CFR Part 140 of the Commission's regulations.

For the Commission,



John F. Ahearne
Chairman

Dated at Washington, D. C. this

16th day of April 1980