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10 CFR Parts 50 and 51

Nuclear Power Plant Accident Considerations Under the National Environmental Policy Act of 1969

AGENCY: U.S Nuclear Regulatory Commission

ACTION: Statement of Interim Policy.

SUMMARY: The Nuclear Regulatory Commission (NRC) is revising its policy for considering the more severe kinds of very low probability accidents that are physically possible in environmental impact assessments required by the National Environmental Policy Act (NEPA) Such accidents are commonly referred to as Class 9 accidents, following an accident classification scheme proposed by the Atomic Energy Commission (predecessor to NRC) in 1971 for purposes of implementing NEPA.[1] The March 28, 1979 accident at Unit 2 of the Three Mile Island nuclear plant has emphasized the need for changes in NRC policies regarding the considerations to be given to serious accidents from an environmental as well as a safety point of view.

This statement of interim policy announces the withdrawal of the proposed Annex to Appendix D of 10 CFR Part 50 and the suspension of the rulemaking proceeding that began with the publication of that proposed Annex on December 1, 1971 It is the Commission's position that its Environmental Impact Statements shall include considerations of the site-specific environmental impacts attributable to accident sequences that

[1] Proposed as an Annex to 10 CFR Part 50 Appendix D. 36 FR 22851 The Commission's NEPA implementing regulations were subsequently (July 18, 1974) revised and recast as 10 CFR Part 51 but at that time the Commission noted that "The Proposed Annex is still under consideration * * *" 39 FR 26279

lead to releases of radiation and/or radioactive materials, including sequences that can result in inadequate cooling of reactor fuel and to melting of the reactor core. In this regard, attention shall be given both to the probability of occurrence of such releases and to the environmental consequences of such releases. This statement of interim policy is taken in coordination with other ongoing safety-related activities that are directly related to accident considerations in the areas of plant design, operational safety, siting policy, and emergency planning. The Commission intends to continue the rulemaking on this matter when new siting requirements and other safety related requirements incorporating accident considerations are in place.

DATES: This statement of interim policy is effective June 13, 1980 Comment period expires September 11, 1980.

ADDRESSES: The Commission intends the interim policy guidance contained herein to be immediately effective. However, all interested persons who desire to submit written comments or suggestions for consideration in connection with this statement should send them to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

FOR FURTHER INFORMATION CONTACT:
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SUPPLEMENTARY INFORMATION:

Accident Considerations in Past NEPA Reviews

The proposed Annex to Appendix D of 10 CFR Part 50 (hereafter the "Annex") was published for comment on December 1, 1971 by the (former) Atomic Energy Commission. It proposed to specify a set of standardized accident assumptions to be used in Environmental Reports submitted by applicants for construction permits or operating licenses for nuclear power reactors. It also included a system for classifying accidents according to a graded scale of severity and probability of occurrence. Nine classes of accidents were defined, ranging from trivial to very serious. It directed that "for each class, except classes 1 and 9, the environmental consequences shall be evaluated as indicated." Class 1 events were not to be considered because of their trivial consequences, whereas in regard to Class 9 events, the Annex stated as follows:

> The occurrences in Class 9 involve sequences of postulated successive failures more severe than those postulated for the design basis for protective systems and engineered safety features. Their consequences could be severe. However, the probability of their occurrence is so small that their environmental risk is extremely low. Defense in depth (multiple physical barriers), quality assurance for design, manufacture, and operation, continued surveillance and testing, and conservative design are all applied to provide and maintain the required high degree of assurance that potential accidents in this class are, and will remain, sufficiently remote in probability that the environmental risk is extremely low. For these reasons, it is not necessary to discuss such events in applicants' Environmental Reports.

A footnote to the Annex stated:

> Although this annex refers to applicant's Environmental Reports, the current assumptions and other provisions thereof are applicable, except as the content may otherwise require, to AEC draft and final Detailed Statements.

During the public comment period that followed publication of the Annex a number of criticisms of the Annex were received. Principal among these were the following:

(1) The philosophy of prescribing assumptions does not lead to objective analysis.

(2) It failed to treat the probabilities of accidents in any but the most general way.

(3) No supporting analysis was given to show that Class 9 accidents are sufficiently low in probability that their consequences in terms of environmental risks need not be discussed.

(4) No guidance was given as to how accident and normal releases of radioactive effluents during plant operation should be factored into the cost-benefit analysis.

(5) The accident assumptions are not generally applicable to gas cooled or liquid metal cooled reactors.

(6) Safety and environmental risks are not essentially different considerations

Neither the Atomic Energy Commission nor the NRC took any further action on this rulemaking except in 1974 when 10 CFR Part 51 was promulgated. Over the intervening years the accident considerations discussed in Environmental Impact Statements for proposed nuclear power plants reflected the guidance of the Annex with few exceptions. Typically, the discussions of accident consequences through Class 8 (design basis accidents) for each case have reflected specific site characteristics associated with meteorology (the dispersion of releases of radioactive material into the atmosphere), the actual population within a 50-mile radius of the plant, and some differences between boiling water reactors (BWR) and pressurized water reactors (PWR). Beyond these few specifics, the discussions have reiterated the guidance of the Annex and have relied upon the Annex's conclusion that the probability of occurrence of a Class 9 event is too low to warrant consideration, a conclusion based upon generally stated safety considerations.

With the publication of the Reactor Safety Study (WASH-1400), in draft form in August 1974 and final form in October 1975, the accident discussions in Environmental Impact Statements began to refer to this first detailed study of the risks associated with nuclear power plant accidents, particularly events which can lead to the melting of the fuel inside a reactor.[2] The references to this study were in keeping with the intent and spirit of NEPA "to disclose" relevant information, but it is obvious that WASH-1400 did not form the basis for the conclusion expressed in the Annex in 1971 that the probability of occurrence of Class 9 events was too low to warrant their (site-specific) consideration under NEPA.

The Commission's staff has, however, identified in certain cases unique circumstances which it felt warranted more extensive and detailed consideration of Class 9 events. One of these was the proposed Clinch River Breeder Reactor Plant (CRBRP), a liquid metal cooled fast breeder reactor very different from the more conventional light water reactor plants for which the safety experience base is much broader. In the Final Environmental Statement for the CRBRP,[3] the staff included a discussion of the consideration it had given to Class 9 events.

In the early site review for the Perryman site, the staff performed an informal assessment of the relative differences in Class 9 accident consequences among the alternative sites. (SECY-78-137)

In the case of the application by Offshore Power Systems to manufacture floating nuclear power plants, the staff judged that the environmental risks of some Class 9 events warranted special consideration. The special circumstances were the potentially serious consequences associated with water (liquid) pathways leading to radiological exposures if a molten reactor core were to fall into the water

[2] It is of interest that the Reactor Safety Study never refers to nor uses the term "Class 9 accident" although this term is commonly used as loosely equivalent to a core melt accident

[3] NUREG-0139, February 1977

body on which the plant floats. Here the staff emphasized its focus on risk to the environment but did not find that the probability of a core melt event occurring in the first place was essentially any different than for land-based plant. In its Memorandum and Order In the Matter of Offshore Power Systems,[4] the Commission concurred in the staff's judgment. Thus, the Reactor Safety Study and NRC experience with these cases has served to refocus attention on the need to reemphasize that environmental risk entails both probabilities and consequences, a point that was made in the publication of the Annex, but was not given adequate emphasis.

In July 1977 the NRC commissioned a Risk Assessment Review Group "to clarify the achievements and limitations of the Reactor Safety Study." One of the conclusions of this study, published in September 1978, as NUREG/CR-0400, "Risk Assessment Review Group Report to the U.S. Nuclear Regulatory Commission," was that "The Review Group was unable to determine whether the absolute probabilities of accident sequences in WASH-1400 are high or low, but believes that the error bounds on those estimates are in general, greatly understated." This and other findings of the Review Group have also subsequently been referred to in Environmental Impact Statements, along with a reference to the Commission's policy statement on the Reactor Safety Study in light of the Risk Assessment Review Group Report, published on January 18, 1979. The Commission's statement accepted the findings of the Review Group, both as to the Reactor Safety Study's achievements and as to its limitations.

A few Draft Environmental Statements have been published subsequent to the Three Mile Island accident. These were for conventional land-based light water reactor plants and continued to reflect the past practice with respect to accidents at such plants, but noted that the experience gained from the Three Mile Island accident was not factored into the discussion.

Our experience with past NEPA reviews of accidents and the TMI accident clearly leads us to believe that a change is needed.

Accordingly, the proposed Annex to Appendix D of 10 CFR Part 50, published on December 1, 1971, is hereby withdrawn and shall not hereafter be used by applicants nor by the staff. The reasons for the withdrawal are as follows:

1. The Annex proscribes consideration of the kinds of accidents (Class 9) that, according to the Reactor Safety Study, dominate the accident risk.
2. The definition of Class 9 accidents in the Annex is not sufficiently precise to warrant its further use in Commission policy, rules, and regulations, nor as a decision criterion in agency practice.
3. The Annex's prescription of assumptions to be used in the analysis of the environmental consequences of accidents does not contribute to objective consideration.
4. The Annex does not give adequate consideration to the detailed treatment of measures taken to prevent and to mitigate the consequences of accidents in the safety review of each application.

The classification of accidents proposed in that Annex shall no longer be used. In its place the following interim guidance is given for the treatment of accident risk considerations in NEPA reviews.

Accident Considerations in Future NEPA Reviews

It is the position of the Commission that its Environmental Impact Statements, pursuant to Section 102(c)(i) of the National Environmental Policy Act of 1969, shall include a reasoned consideration of the environmental risks (impacts) attributable to accidents at the particular facility or facilities within the scope of each such statement. In the analysis and discussion of such risks, approximately equal attention shall be given to the probability of occurrence of releases and to the probability of occurrence of the environmental consequences of those releases. Releases refer to radiation and/or radioactive materials entering environmental exposure pathways, including air, water, and ground water.

Events or accident sequences that lead to releases shall include but not be limited to those that can reasonably be expected to occur. In-plant accident sequences that can lead to a spectrum of releases shall be discussed and shall include sequences that can result in inadequate cooling of reactor fuel and to melting of the reactor core. The extent to which events arising from causes external to the plant which are considered possible contributors to the risk associated with the particular plant shall also be discussed. Detailed quantitative considerations that form the basis of probabilistic estimates of releases need not be incorporated in the Environmental Impact Statements but shall be referenced therein. Such references shall include, as applicable, reports on safety evaluations.

The environmental consequences of releases whose probability of occurence has been estimated shall also be discussed in probabilistic terms. Such consequences shall be characterized in terms of potential radiological exposures to individuals, to population groups, and, where applicable, to biota. Health and safety risks that may be associated with exposures to people shall be discussed in a manner that fairly reflects the current state of knowledge regarding such risks. Socioeconomic impacts that might be associated with emergency measures during or following an accident should also be discussed. The environmental risk of accidents should also be compared to and contrasted with radiological risks associated with normal and anticipated operational releases.

In promulgating this interim guidance, the Commission is aware that there are and will likely remain for some time to come many uncertainties in the application of risk assessment methods, and it expects that its Environmental Impact Statements will identify major uncertainties in its probabilistic estimates. On the other hand the Commission believes that the state of the art is sufficiently advanced that a beginning should now be made in the use of these methodologies in the regulatory process, and that such use will represent a contructive and rational forward step in the discharge of its reponsibilities.

It is the intent of the Commission in issuing this Statement of Interim Policy that the staff will initiate treatments of accident considerations, in accordance with the foregoing guidance, in its ongoing NEPA reviews, i.e., for any proceeding at a licensing stage where a Final Environmental Impact Statement has not yet been issued. These new treatments, which will take into account significant site- and plant-specific features, will result in more detailed discussions of accident risks than in previous environmental statements, particularly for those related to conventional light water plants at land-based sites. It is expected that these revised treatments will lead to conclusions regarding the environmental risks of accidents similar to those that would be reached by a continuation of current practices, particularly for cases involving special circumstances where Class 9 risks have been considered by the staff, as described above. Thus, this change in policy is not to be construed as any lack of confidence in conclusions regarding the environmental risks of accidents expressed in any previously

[4] Docket No. STN 50-437, September 14, 1979

issued Statements, nor, absent a showing of similar special circumstances, as a basis for opening, reopening, or expanding any previous or ongoing proceeding.[5]

However, it is also the intent of the Commission that the staff take steps to identify additional cases that might warrant early consideration of either additional features or other actions which would prevent or mitigate the consequences of serious accidents. Cases for such consideration are those for which a Final Environmental Statement has already been issued at the Construction Permit stage but for which the Operating License review stage has not yet been reached. In carrying out this directive, the staff should consider relevant site features, including population density, associated with accident risk in comparison to such features at presently operating plants. Staff should also consider the likelihood that substantive changes in plant design features which may compensate further for adverse site features may be more easily incorporated in plants when construction has not yet progressed very far.

Environmental Reports submitted by applicants for construction permits and for operating licenses on or after July 1, 1980 should include a discussion of the environmental risks associated with accidents that follows the guidance given herein.

Related Policy Matters Under Consideration

In addition to its responsibilities under NEPA, the NRC also bears responsibility under the Atomic Energy Act for the protection of the public health and safety from the hazards associated with the use of nuclear energy. Pursuant to this responsibility the Commission notes that there are currently a number of ongoing activities being considered by the Commission and its staff which intimately relate to the "Class 9 accident" question and which are either the subject of current rulemaking or are candidate subjects for rulemaking.

On December 19, 1979 the Commission issued for public comment[6] a proposed rule which would significantly revise its requirements in 10 CFR Part 50 for emergency planning for nuclear power plants. One of the considerations in this rulemaking was the potential consequences of Class 9 accidents in a generic sense.[7]

In August 1979, pursuant to the Commission's request, a Siting Policy Task Force made recommendations with respect to possible changes in NRC reactor siting policy and criteria,[8] currently set forth in 10 CFR Part 100. As stated therein, its recommendations were made to accomplish (among others) the following goal:

> To take into consideration in siting the risk associated with accidents beyond the design basis (Class 9) by establishing population density and distribution criteria.

This matter is currently before the Commission.

This and other recommendations that have been made as a result of the investigations into the Three Mile Island accident are currently being brought together by the Commission's staff in the form of proposed Action Plans.[9] Among other matters, these incorporate recommendations for rulemaking related to degraded core cooling and core melt accidents. The Commission expects to issue decisions on these Action Plans in the near future. It is the Commission's policy and intent to devote NRC's major resources to matters which the Commission believes will make existing and future nuclear power plants safer, and to prevent a recurrence of the kind of accident that occurred at Three Mile Island. In the interim, however, and pending completion of rulemaking activities in the areas of emergency planning, siting criteria, and design and operational safety, all of which involve considerations of serious accident potential, the Commission finds it essential to improve its procedures for describing and disclosing to the public the basis for arriving at conclusions regarding the environmental risks due to accidents at nuclear power plants. On completion of the rulemaking activities in these areas, and based also upon the experience gained with this statement of interim policy and guidance, the Commission intends to pursue possible changes or additions to 10 CFR Part 51 to codify its position on the role of accident risks under NEPA.

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[5] Commissioners Gilinsky and Bradford disagree with the inclusion of the preceding two sentences. They feel that they are absolutely inconsistent with an even-handed reappraisal of the former, erroneous position on Class 9 accidents.

[6] 44 FR 75167.

[7] Cf. NUREG–0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," November 1978.

[8] NUREG–0625, "Report of the Siting Policy Task Force," August 1979.

[9] Draft NUREG-0660, "Action Plans for Implementing Recommendations of the President's Commission and Other Studies of the TMI-2 Accident," December 10, 1979.