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Ms. Susan M. Rivetto
32836 Rugby Drive
Warren, Michigan 48093

857 254

Dear Ms. Rivetto

I have been asked to respond to your letter to Mr. Harold Denton regarding the potential dangers to man and the environment from accidents at nuclear power plants.

At the outset, it should be understood that it is physically impossible for a nuclear power plant, which is designed to generate electrical power, to explode as an atomic bomb. The safety of nuclear power plants depends essentially on containing the radioactive material generated in the nuclear fission process. A high degree of protection against occurrence of accidents at nuclear power plants is provided through current design, manufacture, operation, and the quality assurance program used to establish the necessary high integrity of the reactor system; these factors will be considered in a Safety Evaluation Report, which is issued for each licensing application. System transients that may occur are handled by protective systems to place and hold the plant in a safe condition. Notwithstanding this, the conservative postulate is made that even though serious accidents may be extremely unlikely and even though engineered safety features are installed to mitigate the consequences of those postulated events that are judged credible, such accidents might occur.

In the course of reviewing applications for the construction and operation of nuclear power plants, the NRC assesses the environmental impact of various postulated accidents. The probability of the occurrence of accidents and the spectrum of their consequences to be considered from an environmental effects standpoint have been analyzed using best estimate of probabilities as well as realistic fission product release and transport assumptions. For site evaluation in the Commission's safety review, extremely conservative assumptions are used to compare calculated doses resulting from a hypothetical release of fission products from the fuel with the 10 CFR Part 100 siting guidelines (See Enclosure 1) Realistically computed doses that would be received by the population and environment from the postulated accidents are significantly lower than those presente in the Safety Evaluation Report.

Nine classes of accidents and occurrences are considered (See Table 1) ranging in severity from trivial to very serious.

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In general, accidents in the high-potential-consequence end of the spectrum have a low occurrence rate; those on the low-potential-consequence end have a higher occurrence rate. The events in Classes 1 and 2 represent occurrences that are anticipated during plant operation; their consequences, which are very small, are considered within the framework of routine effluents from the plant. Except for a limited number of fuel failures and some steam-generator leakage, the events in Classes 3 through 5 are not anticipated during plant operation; however, events of this type could occur sometime during the 40-year plant lifetime. Accidents in Classes 6 and 7 and small accidents in Class 8 are of similar or lower probability than accidents in Classes 1 through 5 but are still possible. The probability of occurrence of large Class 8 accidents is very small.

Class 9 accidents involve sequences of successive failures more severe than those required to be considered in the design bases of protection systems and engineered safety features. Their consequences could be severe. However, the probability of their occurrence is judged 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 a high degree of assurance that potential accidents in this class are, and will remain, sufficiently low in probability that the environmental risk is extremely low.

The NRC does not perform a general calculation to determine the radiological risk to man and the environment from possible nuclear power plant accidents. Rather, estimates of the dose that might be received by an individual are determined on a site specific basis for each licensing application. To establish a realistic annual risk, the calculated dose must be multiplied by estimated probabilities of occurrence.

NRC has performed a study to assess these nuclear accident risks more quantitatively. This study, called the "Reactor Safety Study" (RSS) issued in 1975, is an effort to develop realistic data on the probabilities and consequences of accidents in water-cooled power reactors in order to improve the quantification of available knowledge related to nuclear reactor accident probabilities. The NRC organized a special group of about 50 specialists, under the direction of Professor Norman Rasmussen of MIT, to conduct a study. (Executive Summary Enclosed)

In July 1977, the NRC organized the independent Risk Assessment Review Group to: clarify the achievements and limitations of the RSS, assess the peer comments theron and the responses to those comments, study the present state of such risk assessment methodology, and recommend to the Commission how and whether such methodology can be used in the regulatory and licensing process. The results of this study were issued in September 1978.

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This report, called the Lewis Report, contains several findings and recommendations. Several of the more significant findings are summarized here:

1. A number of sources of both conservatism and nonconservatism in the probability calculations in RSS were found, which were very difficult to balance. Although the Review Group was unable to determine whether the overall probability of a core-melt given in the RSS was high or low, they did conclude that the error bands were understated.

2. The methodology, which was an important advance over earlier methodologies that had been applied to reactor risk, was sound.

3. It is very difficult to follow the detailed thread of calculations through the RSS. In particular, the executive summary, which is a poor description of the contents of the report, and should not be used as such, has lent itself to misuse in the discussion of reactor risk.

On January 19, 1979, the Commission issued a statement of policy concerning the RSS and the Lewis Report. The Commission accepted the findings of the Review Group.

With respect to the impacts of the Three Mile Island accident, the NRC staff is engaged, at present, in an extensive evaluation of the safety and environmental implications of the accident. In addition, several other groups, including Congressional committees and the President's Commission, are investigating the accident. The results of these studies will provide a basis for actions which will reduce the likelihood of future accidents of the type that occurred at Three Mile Island.

We trust this information will prove useful to you and your associates.

Sincerely,

Original Signed by
Phillip C. Cota

Ronald L. Ballard, Chief
Environmental Projects Branch 1
Division of Site Safety
and Environmental Analysis

Enclosure: WASH 1400
~~10 CFR Part 100~~

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Table 1. Classification of Postulated Accidents and Occurrences

Class	Description	Example
1	Trivial incidents	Included in the evaluation of routine releases
2	Small releases outside containment	Included in the evaluation of routine releases
3	Radioactive waste system failure	Releases from the boron recovery tank, process gas system, and high-level waste drain tank
4	Fission products to primary system (BWR)	Fuel failures during transients outside the normal usage of plant variables, but within expected range of protective equipment and other parameter operation
5	Fission products to primary and secondary systems (PWR)	Not applicable
6	Refueling accident	Fuel assembly drop; heavy object drop onto fuel in core
7	Spent-fuel handling accident	Fuel assembly drop in the fuel pool; heavy object drop onto final storage rack; fuel core drop
8	Accident initiation events considered in design-basis evaluation in the Safety Analysis Report (SAR)	Pipe breaks; rod drop accident; steam line breaks
9	Hypothetical sequence of failures more severe than Class 8	Not considered