



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

November 21, 1979

OFFICE OF THE
CHAIRMAN

The Honorable James Weaver
Committee on Interior and
Insular Affairs
U.S. House of Representatives
Washington, D.C. 20515

Dear Congressman Weaver:

This letter is in response to your letter dated July 13, 1979, requesting information regarding the releases of radioactive materials to the environment for the period of March 28, 1979 through April 7, 1979, at Three Mile Island Nuclear Station. You requested our position regarding the following points:

1. The magnitude of the release that occurred each day during the period March 28 through April 7 of iodine, xenon, and other isotopes that might have contributed significantly to human exposure.
2. The degree of uncertainty and sources thereof in estimates of the radiological release and resulting human exposure.
3. The staff's calculations leading to estimates of the release of iodine, xenon, and other isotopes, and calculations of human exposure to ionizing radiation.

With regard to the magnitude of releases that occurred, Enclosure 1 lists data collected by Metropolitan Edison's consultants, Porter-Gertz Consultants, Inc., for releases that were made to the atmosphere. Based on radioactivity species measurements made both in the plume and at off-site locations, only iodine and noble gases are listed in the enclosure because they were the only radioactive materials of any consequence that were released.

The radioiodine releases were determined from an analysis of iodine collecting charcoal cartridges in the effluent sampling system for the Unit 2 station exhaust vent. For I-131, the licensee has estimated approximately 14 curies released through May, 1979. This license estimate was based on measurements of samples from the source of release. We have independently estimated the I-131 release by using measured atmospheric concentrations of I-131 and the prevailing meteorology to back-calculate the release. On this basis, we estimate that the licensee's release estimate is accurate to within a factor of two.

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The station noble gas monitoring system was made inoperative by high radioactivity levels very early in the accident. Therefore, noble gas releases were estimated from off-site TLD measurements, the meteorological dispersion characteristics during the accident, and the plume radionuclide composition as determined by helicopter measurements. This calculational procedure has substantial uncertainty in estimating noble gas releases. The detailed procedures for estimating a source term in this manner are described in a report by the licensees' consultants, Pickart, Lowe, and Garrick.^{1/} In this report the activity of noble gases released is estimated to be about 10 million curies during the first month after the accident, most of which was released during the first few days. It should also be mentioned that an alternative method for estimating the source term has been developed by Dr. Carol Burger of Oak Ridge National Laboratory for the President's Commission on TMI.^{2/} This method involves estimating the source term from recordings made by an area radiation monitor located inside the auxiliary building near the release duct. Her results were that the total noble gas activity released was about 2.4 million curies. The staff is reviewing that report. The NRC currently has a task force reviewing whether the TMI accident was an Extraordinary Nuclear Occurrence (10 CFR 140.83). In this connection, we are again reviewing the releases from TMI and will make publicly available the results of this review when available.

Based on our analysis of the uncertainties existing in the factors above, the estimate of the Xe-133 releases could range from about 1 million curies to 40 million curies. However, it is important to note that this uncertainty in the noble gas source does not affect our confidence in the population doses or the associated health effects in any way. The reason for this lies with the fact that the doses were measured directly in the environment and do not depend on knowledge of source magnitude. Enclosure 2 describes and provides an analysis of the magnitude of the releases that were made to the river. These values were determined from actual measurements of samples of effluents prior to release. At no time were the licensee's release limits as set by the technical specifications violated for the liquid discharges when the release rates are averaged over one day.^{3/} Operating within the technical specifications limits would assure that the resulting radiological impact is minimal or non-existent.

Our response to your question regarding the uncertainties in the health impacts requires rather detailed discussion. Presently, the NRC staff and the Metropolitan Edison consultants have relied on off-site dose data (from TLD's) to estimate both the magnitude of the noble gas releases and the magnitude of human exposure. Estimates of human exposure for various distances and directions from TMI were interpolated from the TLD data using several

^{1/}Woodard, Keith, "Assessment of Offsite Radiation Doses from the Three Mile Island Unit 2 Accident," July 31, 1979, Report TDR-TMI-116, Pickard, Lowe and Garrick, Consultants.

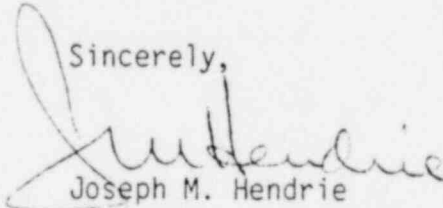
^{2/}Burger, Carol, "Report by the Task Group on Health Physics and Dosimetry," September 28, 1979, President's Commission on TMI.

^{3/}Executive Summary of Liquid and Gaseous Releases from TMI, Porter-Gertz Consultants, Inc., August 24, 1979.

calculational procedures. These procedures are described in the Ad Hoc Committee Report 4/ and Enclosure 3. The NRC staff believes that the individual doses estimated in this way are reasonable and most likely overestimate the doses received by real individuals. Nevertheless, the individual doses calculated in this manner were used to estimate both the cumulative population dose and health effects. These estimates, therefore, are also believed to be conservative ones. Based on the Ad Hoc Committee Report, the estimated population dose is 3,300 man-rem with a range from 1,600 to 5,300 man-rem. Using the 3,300 man-rem value, we estimate that less than one additional fatal cancer (0.7) could be expected over the lifetime of the exposed population (about 2,000,000 people). Depending upon the opinion of various experts in the field of risk estimation, the health impact could range from a minimum of zero (0) to as much as about 10 additional fatal cancers. We are not aware of any new information that would significantly affect these conclusions.

The staff's calculated estimate of doses and health effects are contained in the Ad Hoc Committee Report for air releases and in Enclosure 2 for river releases. Enclosure 3 describes the staff's procedure for estimating noble gas releases. In addition, Enclosure 3 contains a more detailed description of a procedure to estimate population doses. The licensee's radioiodine releases information listed in Enclosure 1 is primarily based on direct measurements of activity in charcoal cartridges. Samples of liquid were analyzed prior to discharge; thus, the liquid releases are based on direct measurement rather than on calculations. Hence, no indirect calculational methods were needed to estimate the airborne radioiodine or liquid radioactivity release values.

Sincerely,



Joseph M. Hendrie
Chairman

Enclosures:

1. Summary of Gaseous Releases to the Environment at TMI During the Period 3/28-3/31/79
2. Releases of Radionuclides into the Susquehanna River from TMI During the Period 3/28-5/11/79 -- Data and Analysis
3. A Method for Calculating Doses to the Population from Xe-133 Releases During the Three Mile Island Accident

4/Population Dose and Health Impact of the Accident at Three Mile Island Nuclear Station, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, May 1979.