Docket Nos. 115-1
& 50-263

PDR

NOV 19 1968

Mr. John P. Badalich
Executive Director
Minnesota Pollution Control Agency
459 Board of Health Building
University Campus
Minneapolis, Minnesota 55440

Dear Mr. Badalich:

In response to your letter of September 3, 1968, I am pleased to provide some regulatory staff comments on the various questions raised in the letter and its attachments from Mr. Steve Gadler. Also enclosed are eight information documents bearing on these questions.

I hope the staff comments and information documents will be helpful to you and your colleagues of the Minnesota Pollution Control Agency.

Sincerely yours,

(signed) Harold L. Price

Harold L. Price
Director of Regulation

Enclosure:
Staff Comments with attachments

Distribution:
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CLHenderson PDR (2) – retain in Reg. files for dispatch to PDR 1-7-69 inasmuch as Mr. Henderson was undecided about including in public record. – note on record sheet
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REGULATORY STAFF COMMENTS ON QUESTIONS
PREPARED BY
MINNESOTA POLLUTION CONTROL AGENCY MEMBER, STEVE J. GADLER

Information bearing directly on many of the questions listed by Mr. Gadler is contained in the following documents, copies of which are transmitted herewith.

1. 10 CFR Part 20 - Standards for Protection Against Radiation
2. 10 CFR Part 50 - Licensing of Production and Utilization Facilities
3. 10 CFR Part 100 - Reactor Site Criteria
4. TID 14844 - Calculation of Distance Factors for Power and Test Reactor Sites
5. General Design Criteria for Nuclear Power Plant Construction Permits
6. ORNL-4070 - Management of Radioactive Wastes at Nuclear Power Stations
7. Staff Safety Evaluation of Monticello Nuclear Generating Plant, Unit 1
8. Portions of Section 170 of Atomic Energy Act

The first three references set forth the regulatory requirements which must be met in the siting, design, construction and operation of nuclear power plants. Radioactive releases from these plants into the air or into contiguous waters during their operating lifetime are subject to the provisions of Part 20 (Reference #1) designed to limit exposures of the public to levels well within limits recommended by the Federal Radiation Council, the National Committee on Radiation Protection, and the International Commission on Radiological Protection. As an administrative technique, these limits are translated into detailed operating restrictions based on a study at the site and of local meteorological and hydrological conditions. Instrumentation to measure releases into the air and water must be provided at each plant, and records must be kept of all releases. Both are subject to inspection by regulatory Compliance inspectors.

Factors that must be considered in evaluating proposed sites for nuclear plants are set forth in Part 100 (Reference #3). These relate both to the proposed reactor design and the characteristics peculiar to the site. The procedures to be used in estimating potential radiation exposure of offsite populations under accident conditions are given in TID-14844 (Reference #4). Safety design requirements to provide a wide margin of ublic safety under both normal operating and accident conditions are given in Part 50 and in more detail in the General Design Criteria for Nuclear Power Plant Construction Permits, (References #2 and #5). The latter document was published in the Federal Register for public comment in July 1967, and is expected to be issued as a formal design requirement in the near future.

There have been no accidents to date in any nuclear plant in the United States which involved a significant offsite release of radioactivity. As regards releases during normal operations, the most recent experience information is contained in a report, ORNL-4070, (Reference #6) issued in January 1968 by the Oak Ridge National Laboratory. This contains a reference to Elk River.

Reference #7 is included in the information material being transmitted in order to give Minnesota Pollution Control Agency members an opportunity to see what matters were considered by the regulatory staff and Advisory Committee on Reactor Safeguards in their safety review of the Monticello Nuclear Power Station. This report was prepared for presentation at the public hearing held on May 25-26, 1967, in connection with the issuance of the construction permit. Although the Northern States Power designation of Unit No. 1 appears on the cover sheet for this report, we know of no present plans for additional units at the Monticello location. Among the several supplementai, attachments to the staff review is a letter from the Fish and Wildlife Service of the U. S. Department of the Interior which may be of interest to MPCA members.

Approximately half of the questions listed by Mr. Gadler are concerned with various aspects of the radioactive releases from Elk River and Monticello plants into the air and into the Mississippi River during their operating lifetime. Our comments will first be directed to the substance of these questions, then will go to the miscellaneous subjects covered in the remaining questions.

Boiling water reactors such as Elk River and Monticello release small amounts of radioactive gase into the steam which go through the turbine and accumulate in the condensate system. These gases, which include tritium, xenon and krypton, and possibly some particulates, go to the holdup tank where any short-lived isotopes decay and measurements are made of the level of radioactivity in the gas. If suitable for release into the high-velocity air stream going up the stack under the limitations of Part 20 of the Commission's regulations, the gas is passed through several high-efficiency filters to trap any particulates that may be present and then released to the atmosphere from a high stack at an exit velocity of the order of 50 ft./sec. If excessively high activities are detected during the holdup period, or if very unfavorable weather conditions prevail, release to the atmosphere will probably not be able to meet the conditions of Part 20. The Monticello plant has only a limited holdup capability which, however, should be sufficient to meet the requirements of Part 20 on atmospheric releases under normal operating and weather conditions. If a situation should arise where release under Part 20 is prohibited and the holdup tanks are filled to capacity, it would be necessary to shut the plant down until favorable conditions develop.

In the event of an accidental escape of potentially dangerous amounts of radioactivity from the stack, emergency actions would be required. Although detailed emergency procedures have not yet been developed for the Monticello plant, the basic plan will be to notify local authorities such as fire and police departments and other civil agencies that previously planned procedures should be followed. If necessary, the twin-city area would be notified. Notification would be by NSP officials or alternately by local police or fire departments. Under extreme conditions, emergency radioactive monitoring assistance might also be supplied by the U. S. Atomic Energy Commission.

In addition to the radioactivity released to the atmosphere, some radioactive liquid effluents are generated during the course of normal operations both in pressurized water reactors and boiling water reactors. These water residues are collected in onsite storage tanks, sampled to determine the activity level, and if the level is sufficiently low are eventually released into the condenser cooling water under the limitations imposed by Part 20 of the Commission's regulations.

Some tritium is present in the liquid effluent along with such other possible nuclides as Cs^{137}, Co^{60}, Sb^{124}, and Sr^{90}. Since MPCA has expressed a special interest in tritium, some comments on this subject are in order. Tritium, incidentally, is one of the less hazardous of the radionuclides produced in nuclear reactors because of its relatively low disintegration energy and relatively short residence time in the body.

First, with regard to the tritium releases at Elk River, information in the regulatory inspection files based on RCP batch release records shows that during 1967, 12.5 curies of tritium were released to the Mississippi River with the condenser cooling water from the Elk River reactor. The cooling water had a flow rate of 28,000 gpm. The releases made in batches during the year amounted to an average concentration in the cooling water of about one ten-thousandth of the maximum permissible concentration specified in Part 20 of the Commission's regulations. The average concentration of tritium in the cooling water from Monticello will depend on a number of operating factors, but must necessarily meet the restrictions imposed by Part 20.

How much effect has the tritium release from Elk River had on the tritium content of the Mississippi River? This can be estimated from the following considerations. The 12.5 curies released during 1967 with the condenser cooling water gave an average concentration of 170 pico-curies per liter in that water (a pico-curie is 10^{-12} curie). Mixing of the cooling water with the Mississippi River gave a further dilution to approximately 3 pico-curies (pci) per liter. To place this number in proper perspective, USPHS data for 1966 indicate a tritium concentration in surface waters of the United States ranging from 2000 to 15,000 pci/liter. The estimated 3 pci/liter added to the Mississippi by the Elk River plant during 1967 is insignificant compared to the normal background content. It is much too small to be measured, since the minimum detectable level difference is 500 pci/liter. Hence there would be no detectable difference between the tritium content of the Mississippi upstream and downstream of Elk River.

To reduce the level of radioactivity (other than tritium) in the liquid effluent released to the Mississippi River, the Monticello facility will incorporate, in its liquid radwaste system, non-regenerative demineralizers employing resins which after they are spent are disposed of as solid radioactive waste.

The liquid waste storage tanks are located in the reactor building which provides secondary containment for the reactor. (The 230,000 gallon tanks referred to in one of the questions do not contain radwaste. They are condensate storage tanks and contain only non-radioactive water.) The building in which the radioactive liquid waste tanks are located is a concrete structure which could contain gross leakage from the tanks. The level of radioactivity in these liquid wastes will vary from time to time, but normally a concentration of the order of 0.1 curie per liter would be expected.

At present there are 27,650 gallons of contaminated water at the Elk River reactor. It contains a total activity of about 1.5 curies. We understand that it is planned to discharge this contaminated water into the Mississippi River at a rate of 4500 gallons per month over a 5-month period.

With regard to effect of dilution of the radioactive material discharged into the water on the reconcentration in the biota and the food chain, we have the following comments. Dilution will not prevent reconcentration in biota. But, since the equilibrium concentration in the biota is proportional to the concentration in the water, the dilution of the released radioactivity by the river will reduce the concentrations which would otherwise occur in organisms growing in the water if there were no dilution. The meaningful question with respect to public health and safety is whether the average concentration of a given nuclide in the river will result in a concentration in the biota such that the latter becomes a significant source of exposure to man. Operating experience with power reactors and information on types and quantities of radionuclides likely to be released from such reactors indicate that this is not likely to be the case. Environmental monitoring programs of the facility licensees, various health agencies and the Atomic Energy Commission are designed (1) to confirm that actual radionuclide releases from power reactors, and their behavior in the environment, are as anticipated or (2) to detect any significant variance that might occur.

Turning now to the substance of the miscellaneous questions in Mr. Gadler's list, each applicant for a construction permit to build and operate a nuclear power plant at a proposed location is required to submit along with his application a Preliminary Safety Analysis Report containing detailed information on the site selected for the plant, and on the proposed plant design. The education of the applicant in the nuclear field is his own responsibility, but before a construction permit or operating license is issued there must be a finding on the part of the AEC that the applicant is technically qualified to construct and operate the proposed plant safely. This technical competence is subject to continuing scrutiny by the Compliance inspectors throughout the entire operating life of the plant.

A number of questions in Mr. Gadler's list express his concern that construction and operation of the Monticello plant may be subject to some or all of the difficulties experienced at other nuclear stations, such as Senn, Selni, Oyster Creek, Tarapur, Fermi, Piqua, and Dresden 1. The answer to all the questions is the same, -we do not think there is any essential relationship between what happened at any of these reactors and what may be expected to happen at Monticello. Some of the operational difficulties were due to unforeseen factors associated with the developing technology of nuclear power. None of them created a hazard to public safety. Most of the construction difficulties experienced to date have been due to deficiencies in quality assurance and quality control in the selection and fabrication of materials, components and systems that go to make up the finished nuclear plant. Much emphasis is being placed on these matters, and the Commission is taking a very active part in the development of codes, standards and criteria governing the design and construction of nuclear power plants. Of course, this does not preclude the possibility of difficulties at other plants now under construction, including Monticello. However, any difficulties that arise having the potential of affecting public safety must necessarily be resolved before the plant will be permitted to operate.

As regards the use of stainless steel in the tube-side of the feedwater heaters at Monticello and other similar nuclear installations, this is done to minimize corrosion products in the water passing through the reactor core. Feedwater demineralizers are used for the same purpose. Activation of corrosion products in the reactor coolant water raises its radioactivity to an unnecessarily high level and poses undesirable operating problems.

Various types of postulated accidents are analyzed for their potential consequences in the applicant's safety evaluation of proposed nuclear power plants. For the Monticello plant several different types of accidents considered by NSP are discussed on pages 14-19 of Reference #7. The refueling accident corresponding to the one referred to at Peach Bottom No. 1 is discussed on pages 15 and 16. This was assumed to result from dropping a spent fuel assembly during refueling. The fission products released would be from those fuel rods mechanically damaged. The gas-cooled Peach Bottom reactor is entirely different from the boiling water reactor at Monticello.

As regards the matter of sabotage, 10 CFR section 50.13 of the Commission's regulations states that an applicant for a license to construct and operate a reactor is not required to provide for design features or other measures for the specific purpose of protection against the effects of attacks and destructive acts, including sabotage, directed against the facility by an enemy of the United States. In connection with this rule, the Commission has pointed out that many of the safety features incorporated in the design of a reactor facility, while not having as their specific purpose protection against the effects of enemy attacks and destructive acts, could serve a useful purpose in that regard. Prominent among these are the massive containment for the reactor and procedures and systems for a rapid shutdown of the facility in the event of an emergency. Moreover, to the extent that the matter of "industrial sabotage" of a nuclear reactor may be appropriate for consideration, it will be considered by AEC at the operating license stage.

As a final item of information, a licensee may not abandon a nuclear plant without first being authorized by the AEC to do so. Chapter 10 CFR section 50.82 provides as follows:

> Section 50.82 Applications for termination of licenses.
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> (a) Any licensee may apply to the Commission for authority to surrender a license voluntarily and to dismantle the facility and dispose of its component parts. The Commission may require information, including information as to proposed procedures for the disposal of radioactive material, decontamination of the site, and other procedures, to provide reasonable assurance that the dismantling of the facility and disposal of the component parts will be performed in accordance with the regulations in this chapter and will not be inimical to the common defense and security or to the health and safety of the public.
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> (b) If the application demonstrates that the dismantling of the facility and disposal of the component parts will be performed in accordance with the regulations in this chapter and will not be inimical to the common defense and security or to the health and safety of the public, and after notice to interested persons, the Commission may issue an order authorizing such dismantling and disposal, and providing for the termination of the license upon completion of such procedures in accordance with any conditions specified in the order.