11.0 AUXILIARY SYSTEMS

11.1 Radwaste System

The applicant's design objective for treating gaseous and liquid radwaste that result from normal or emergency operation of the plant is to meet the applicable government regulations.

Our analysis shows that the radwaste disposal systems and plant design are adequate to process quantities of radioactivity released during normal operation to levels as set forth in 10 CFR Part 20 and 10 CFR Part 50. The radwaste disposal equipment and piping are all housed within seismic Class I structures that are also designed to retain their integrity during the design basis aircraft incident.

11.2.1 Liquid Radwaste System

A Make-up and Purification System maintains the quality and boron concentration of the primary coolant. A stream is continuously "letdown," cooled, demineralized in a mixed bed ion exchanger, filtered, and fed to the make-up tank from which it is returned to the reactor. When the boron concentration is being lowered, a "bleed" stream from the "letdown" stream is directed to the coolant waste system. This stream is processed through a demineralizer, filter and evaporator. The condensate from the evaporator passes through a mixed bed demineralizer to a storage tank from which it may be recycled or discharged. The concentrated boric acid (evaporator bottoms) is stored for re-use in a subsequent core cycle or sent to the radioactive waste drumming station for offsite disposal.

During the end of the core cycle, when the boron concentration is the lowest, the entire "letdown" stream is then passed through a deborating

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demineralizer to reduce the boron content. This mode of operation does not produce a waste stream directly; however, the deborating bed needs to be regenerated, and the neutralized regenerants and rinses are processed through the Miscellaneous Waste System. Other demineralizers processing radioactive streams are not regenerated. Waste-water containing boric acid from reactor shutdowns, startups, and refueling operations is also processed through the coolant waste disposal system equipment.

Wastes collected in the containment and auxiliary building drains, laboratory drains, sampling drains, demineralizer resin and filter precoat sluice operations, chemicals from deborating bed regeneration and decontamination, and other miscellaneous liquid wastes are processed in the Miscellaneous Waste System. These wastes are collected, filtered, and evaporated. The condensate from this evaporator is passed through a polishing demineralizer and then reused or held-up for discharge. Bottoms from this evaporator are stored in the concentrated waste tank until they can be processed through the waste drumming station.

Laundry wastes will be collected, filtered, monitored, and normally discharged with the sanitary wastes. The turbine building drains are monitored and discharged to the cooling tower effluent stream.

Batch discharges will be made from the radwaste systems at a rate of 5-30 gpm into the cooling tower effluent stream. Activity monitors and flow controllers will maintain appropriate activity levels. No discharge will be made unless the cooling tower effluent flow is at least 5000 gpm.

The releases from the primary sources for normal operation were calculated to be less than 5 Ci/year per unit. Therefore, we conclude that the liquid waste treatment system proposed for Three Mile Island Unit 1 should be capable of providing effluents which can be considered as low as practical as proposed in 10 CFR Part 50.34(a). We also conclude that the liquid waste treatment system can meet the requirements in 10 CFR Part 20.

11.2.2 Gaseous Radwaste System

Only the coolant that is diverted to the boron control system is normally degassed. Gases stripped from the recycled reactor coolant together with cover gases are collected, compressed, and stored in pressurized tanks for radioactive decay. With the exception of long-lived krypton-85, the gases will decay to a small fraction of the original activity prior to being released. The gas is filtered through high efficiency particulate filters and charcoal adsorbers and released to the atmosphere through the auxiliary building vent stack. The holdup system was evaluated based on a minimum holdup of 30 days.

Additional sources of radioactive gases which are not concentrated enough to permit collection and storage include the auxiliary building exhaust, the turbine building exhaust, the reactor building containment air, and the main condenser air ejectors, which remove radioactive gases that have collected in the condenser as a result of primary to secondary system leakage. The air ejector exhaust from the main condenser and turbine building ventilation are discharged without treatment through turbine building roof-mounted fans.

The auxiliary building is maintained at a slightly negative pressure with respect to ambient pressure. All the exhaust air is filtered through high efficiency particulate filters (HEPA) prior to being discharged through the auxiliary building vent stack. Areas within the auxiliary building which have possible contamination have the capability to be exhausted through charcoal adsorbers in addition to HEPA filters.

The expected normal discharges of noble gases and iodines will result in an annual average exposure rate at any location on the boundary of the site of less than 6 millirems to the whole body. Therefore, we conclude that the provisions proposed to control gases released from the plant are sufficient to meet the requirements in 10 CFR Parts 20 and 50.

11.2.3 Solid Radwaste

The following types of solid wastes will be treated:

(1) Compressible Wastes - paper, rags, clothing, and charcoal filters.

(2) Incompressible wastes - metal parts from inside the reactor, wires, cables, and spent filter cartridges.

(3) Evaporator concentrates.

(4) Spent resins and used filter precoat.

All solid waste will be packaged and shipped to a licensed burial ground in accordance with AEC and DOT regulations. Based on plants presently in operation, it is expected that approximately 300 to 600 drums of solid waste with activity of about 20 curies/drum after 90 days decay will be transported offsite each year. In addition, 1200 drums containing a cumulative activity less than 5 curies of dry compacted waste will be shipped.

Design and operation of the solid radwaste system do not involve any unusual safety problems not already considered on other PWR applications, and therefore this system is acceptable.

11.3 Shielding

The applicant has designed the shielding in the plant to attenuate radiation levels in the plant, from direct and scattered radiation, to dose rate levels specified for each of several areas. The control room is shielded to prevent the integrated whole body dose for 90 days following the Design Basis Accident from exceeding 3 rem. We have reviewed the applicant's design criteria and have found them acceptable.

11.4 Radiation Monitoring

Radiation monitoring systems include area, atmospheric, and liquid sub-systems. These sub-systems detect, indicate, annunciate, and record the radiation level at selected locations to verify compliance with 10 CFR Part 20 limits. All the monitors except portable ones display their measured variable and alarm condition on the radiation monitoring panel located in the control room. The area and atmospheric monitors have audible alarms in the location monitored.

The area monitoring sub-system has 15 gamma sensitive ionization chambers to measure radiation levels in the reactor, auxiliary and refueling buildings.

The atmospheric monitoring sub-system has 8 monitors that continuously monitor the activity in the control room air intake, in the reactor and auxiliary buildings and in the ventilation exhaust from areas and components that will contain gaseous radioactivity. The control room air intake, reactor and auxiliary building, and reactor, auxiliary, and fuel handling exhaust monitors have detectors for particulate and charcoal filters, in addition to the gaseous detector.

The liquid monitoring sub-system has 9 monitors. Five of these monitors are used for monitoring closed cooling-loops which act as barriers against release of activity to the river. The sixth monitor measures the primary coolant letdown, after passing through a delay line. The seventh and eighth monitors measure the waste water discharge and the miscellaneous sump discharge, respectively. They are located prior to the plant effluent discharge and are capable of closing the respective discharge valve if high activity is detected. The final monitor measures the plant discharge to the river.

We conclude that the station is suitably equipped with radiation detection instrumentation.

11.5 Personnel Protection

All personnel and visitors are required to follow procedures established for protection against radiation and contamination. All personnel entering a Radiation Control Area will wear a film badge or its equivalent. Film badges will be processed monthly unless conditions warrant more frequent processing. Records of radiation exposure history and current occupational exposure will be maintained.

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Protective clothing will be worn as required to protect personnel against radioactive contamination. The first line of defense against airborne contamination in the work area will be the ventilation system; however, respiratory equipment will be available should its use become necessary.

Portable radiation survey instruments will be provided. In addition, fixed monitoring instruments are located at exits from radiation control areas to prevent spread of contamination into unrestricted areas. Monitors are available at various locations within the radiation control areas for contamination control purposes. Permanently installed area and process radiation monitoring systems are available for airborne gaseous and particulate radioactivity, and external exposure levels.

We conclude that the personnel protection program is acceptable.

11.6 Environmental Monitoring

Metropolitan Edison has established a four-phase environmental monitoring program for the Three Mile Island site. The first phase has been in operation since January 1968 and has consisted of measurements of background radioactivity in well and river water, sediment, fish, soil, and vegetation.

Phase 2 of the program involves studies of pathways of potential exposure via human food, and is currently in progress. Stable element concentrations in river water, fish, and crops which may be irrigated with river water are being determined, and will be related to those elements which may be present in plant liquid effluents in significant amounts. Work done to date indicates that river fish and milk are probably the most significant food materials.

The preoperational program will include 6 to 12 months of sampling and measurement of the same type as proposed for Phase 4, the operational environmental monitoring program. Pending completion of the studies in Phases 2 and 3, the applicant proposes to sample and analyze activity in air, rainwater, river water, aquatic biota, sediment, milk and food crops and external radiation. Water at the intake for the Borough of Columbia, 16 miles downstream, will also be sampled.

The operational environmental monitoring program will be a continuation of the program discussed above. Tentatively, for the first year of operation, weekly samples will be taken of air; monthly samples will be taken of milk, river water, precipitation and the Columbia intake quarterly samples of aquatic biota, sediment and foodcrops. Thereafter, the sampling intervals may be adjusted according to the quantity of activity released, but in no case will be greater than 13 weeks (one quarter).

We conclude that the proposed environmental monitoring program is acceptable. Key provisions will be incorporated in the Technical Specifications.

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