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JUL 27 1984

Mr. A. Schwencer, Chief
Licensing Branch No. 2
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Docket Nos.: 50-352
50-353

Subject: Limerick Generating Station, Units 1 and 2
Request for Additional Information
NUREG-0737 Items II.F.1 Attachments 1 and 2,
and Item III.D.1.1.

Reference: Letter, A. Schwencer to E. G. Bauer, Jr. dated
May 9, 1984.

File: GOVT 1-1 (NRC)

Dear Mr. Schwencer:

The reference letter requested additional information on the subject NUREG-0737 items. Information pertaining to Item II.F.1 Attachments 1 and 2 is provided in the attached draft FSAR pages that will be incorporated into the FSAR via Revision 35 which will be submitted in August, 1984. Information pertaining to Item III.D.1.1 will be furnished in September, 1984.

Sincerely,

J. W. Gallagher
for
J. S. Kemper

DFC/gra/07198402

cc: See Attached Service List

B004
1/1

cc: Judge Lawrence Brenner (w/enclosure)
Judge Richard F. Cole (w/enclosure)
Troy B. Conner, Jr., Esq. (w/enclosure)
Ann P. Hodgdon, Esq. (w/enclosure)
Mr. Frank R. Romano (w/enclosure)
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Atomic Safety & Licensing Appeal Board (w/enclosure)
Atomic Safety & Licensing Board Panel (w/enclosure)
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Martha W. Bush, Esq. (w/enclosure)
Mr. James Wiggins (w/enclosure)
Mr. Timothy R. S. Campbell (w/enclosure)
Ms. Phyllis Zitzer (w/enclosure)
Judge Peter A. Morris (w/enclosure)

(i) procedures for minimizing occupational exposures;

(ii) calculational methods for converting instrument readings to release rates based on exhaust air flow and taking into consideration radionuclide spectrum distribution as function of time after shutdown;

(iii) procedures for dissemination of information; and

(iv) procedures for calibration.

TABLE II.F.1-2

INTERIM PROCEDURES FOR QUANTIFYING HIGH-LEVEL ACCIDENTAL RADIOACTIVITY RELEASES

Applicants are to implement procedures for estimating noble gas and radioiodine release rates if the existing effluent instrumentation goes off-scale.

Examples of major elements of a highly radioactive effluent release special procedures (noble gas).

- Preselected location to measure radiation from the exhaust air, e.g., exhaust duct or sample line.
- Provide shielding to minimize background interference.
- Use of an installed monitor (preferable) or dedicated portable monitoring (acceptable) to measure the radiation.
- Predetermined calculational method to convert the radiation level to radioactive effluent release rate.

Response

11.5.2.2.1, and its piping and instrumentation diagram is provided in Figure 11.5-1.

All reactor enclosure stack releases following an accident will be through the north stack. The wide range accident monitoring subsystem of the north stack effluent monitoring system provides continuous monitoring of post-accident releases of noble gases in accordance with the requirements of Table II.F.1-1. The system is described in Sections 7.6 and Control room displays provided for this system meet the requirements of Regulatory Guide 1.97, Revision 2, and are described in Section 7.5. Table II.F.1-2 outlines the requirements for an interim method for quantifying releases to be used by operating reactors and therefore is not applicable to Limerick. Human factors aspects of TMI Item II.F.1 are considered part of the control room design review required by Item I.D.1.

INSERT ①

representative air sampling can be achieved. A flow rate sensing array is provided, consisting of 128 uniformly-spaced total pressure sensors and 32 uniformly-spaced static pressure sensors for providing an instantaneous traverse across the stack. Two independent sampling arrays, each consisting of a set of 64 uniformly-spaced isokinetic nozzles are provided for extracting representative samples at the stack cross section.

NO IP

INSERT ②

One array provides a sample for the normal plant operation radiation monitoring subsystem.

The sample is split into parallel paths. Each half is passed through a particulate filter provided with a radiation detector indicating the corresponding integrated measurement of the particulate effluent, an iodine filter provided with an in-place detector, and a noble gas monitoring chamber. Thus, each of the two redundant monitoring racks provide the following outputs:

- Sampling flow rates
- Particulate radioactivity, integrated
- Iodine radioactivity, integrated
- Noble gas radioactive concentration

THE RMDS DISPLAY CONSOLES

From these data and the stack flow measurement, the total radioactive effluent may readily be evaluated. Readouts from the detectors are fed into microprocessors, which in turn provide outputs to in the control room. The microprocessors are provided with memory-retention capability to preclude the loss of data in event of a power failure.

COMMON

there are one downscale and two upscale alarms which annunciate in the control room. The upscale alarms indicate high and high-high radiation, and the downscale alarm indicates instrument malfunction.

IN ANY OF THE THREE DETECTOR CHANNELS

ABNORMAL CONDITIONS ON EITHER MONITOR

For the normal plant operation mode, the characteristics of the isokinetic sampling system and radiation monitoring subsystem provide plant operations personnel with complete and accurate data of radioactive materials released to the environs from the north stack. The system thus enables personnel to control activity

release rates. Sufficient redundancy is provided to allow maintenance and checking of one channel without losing monitoring capability.

WIDE RANGE ACCIDENT MONITOR

The wide-range accident monitoring subsystem is independent of the normal plant operation monitoring subsystem and operates continuously. sample, drawn from the second 64-nozzle array described above, is passed through a particulate filter, iodine filter, and noble gas detector assembly. This provides redundancy to the normal plant operation monitoring subsystem.

from a separate comb-type probe located downstream of the isokinetic nozzle arrays. This sample is passed through shielded particulate and iodine filters and, range noble gas detector assembly. Detector outputs are fed into THE microprocessor

Outputs of the microprocessors are transmitted to @ readout module and recorders in the control room. The microprocessors have memory retention in event of loss of power. ONE DOWNSCALE AND TWO UPSCALE ALARMS ANNUNCIATE ABNORMAL MONITOR CONDITIONS TO THE CONTROL ROOM. THE WRAM ALSO PROVIDES A HIGH RADIATION TRIP TO THE CONTAINMENT PURGE VALVES.

...THE RMDS DISPLAY CONSOLES

The particulate and iodine filters of the wide-range accident monitoring subsystem are used as grab sample modules to provide the capability of collecting representative samples of iodines and particulates for onsite analysis during and following an accident. The sample lines are heat traced to preclude entrained moisture in the effluent stream that could degrade the filters. Three removable filter modules are provided in both sample flow paths to allow continuous collection. This also allows the control room operator to select a clean set of filters in order to prevent appreciable concentrations of noble gases produced by iodine decay in a loaded filter, which could be falsely interpreted by the noble gas detectors as high activity in the effluent stream. Filters on the high activity sample flow path are (HOUSED IN) shielded to keep personnel exposure in sample handling and transport below the General Design Criteria 19 limits of 5 rem whole-body exposure and 75 rem to the extremities during the duration of the accident.

11.5.2.2.2 South Stack Effluent Radiation Monitors

The objectives and functions of the south stack monitoring system are the same as those of the north stack normal plant operation monitoring subsystem. A system for post-accident monitoring is not provided because any HVAC exhaust to this stack containing accident effluents is automatically isolated.

DRAFT

INSERT ① p. 11.5-13

A DIFFERENTIAL PRESSURE SENSOR CONNECTED TO THIS SENSING ARRAY PROVIDES THE STACK FLOW RATE SIGNAL. TO ALLOW MAINTENANCE WITHOUT LOSING MONITORING CAPABILITY A REDUNDANT STACK FLOW RATE SIGNAL IS PROVIDED BY NINE THERMAL-TYPE VELOCITY SENSORS CONNECTED TO AN AVERAGING NETWORK. A LOCAL SWITCH ALLOWS SELECTION OF ONE OF THE TWO STACK FLOW SIGNALS TO BE INPUT TO THE MICROPROCESSOR-BASED NSE AND WRAM MONITORS FOR ISOKINETIC CONTROL OF THE SAMPLE FLOW RATES. THE STACK FLOW RATE AND SAMPLING FLOW RATES ARE INDICATED ON DEMAND IN THE CONTROL ROOM VIA THE WRAM READOUT MODULE OR THE RMDS DISPLAY CONSOLES (SECTION 11.5.6).

DRAFT

INSERT ② p. 11.5-13

... AND THE OTHER FOR THE WRAM. SAMPLE BYPASS WITH ASSOCIATED PUMPS AND FLOW CONTROLS ARE PROVIDED TO ALLOW THE SAMPLING ARRAY FLOW TO FOLLOW THE STACK FLOW RATE ISOKINETICALLY WITHOUT EXCEEDING THE MAXIMUM SAMPLE FLOW RANGE OF THE MONITORS. THE SYSTEM HAS THE CAPABILITY TO MAINTAIN ISOKINETIC CONDITIONS WITH VARIATIONS IN STACK FLOW RATE OF ± 25%.

INSERT (A) p. 11.5-14

EFFLUENT SAMPLES ARE DRAWN VIA TWO SAMPLE FLOW PATHS. DURING NORMAL PLANT OPERATION ONE...

INSERT (B)

LOW RANGE

INSERT (C)

IF THE LOW RANGE DETECTOR APPROACHES ITS UPSCALE LIMIT, THE SYSTEM AUTOMATICALLY STARTS PUMPING EFFLUENT SAMPLE ...

INSERT (D)

A MID- AND HIGH-...

INSERT (E)

WHEN THE MID-RANGE DETECTOR REACHES A PRE-SELECTED POINT, THE LOW RANGE DETECTOR IS AUTOMATICALLY PURGED AND FLOW THROUGH IT IS STOPPED. PURGING ASSURES THAT THE LOW RANGE DETECTOR CAN RESUME MONITORING WHEN ACTIVITY AGAIN DECREASES. A SIMILAR AUTOMATIC PURGE/SHUTDOWN CYCLE IS PERFORMED ON THE MID- AND HIGH-RANGE DETECTORS WHEN ACTIVITY DECREASES. JP (CONTINUES)

INSERT (E) p. 11.5-14 (CONTINUED)

THE LOW RANGE DETECTOR ASSEMBLY CONSISTS OF A SHIELDED CHAMBER AND A BETA-SENSITIVE PLASTIC SCINTILLATION DETECTOR. THE MID- AND HIGH-RANGE DETECTORS USE CADMIUM TELLURIDE SOLID STATE SENSORS HOUSED IN A SHIELDED CHAMBER.

INSERT (F)

...THAT APPLIES CONVERSION FACTORS, DETERMINES IF ALARM SETPOINTS HAVE BEEN EXCEEDED AND RETAINS DATA FOR EACH DETECTOR CHANNEL IN HISTORY FILES. IN ADDITION, THE MICROPROCESSOR AUTOMATICALLY CALCULATES EFFLUENT RELEASE RATE PER UNIT TIME BASED ON DETECTOR MEASUREMENT AND STACK FLOW RATE. BACKGROUND SUBTRACTION IS PROVIDED BASED ON MANUALLY ENTERED BACKGROUND VALUES.

INSERT (G) p. 11.5-14

ONE THREE-PEN RECORDER PROVIDES INDICATION OF RADIOACTIVITY CONCENTRATION IN THE LOW, MID- AND HIGH-RANGE CHANNELS, WHILE EFFLUENT RELEASE RATE IS RECORDED IN A SINGLE PEN RECORDER. THE RMDS DISPLAY CONSOLES CAN ALSO PROVIDE TREND PRINTOUTS ON DEMAND OF THE MICROPROCESSOR HISTORY FILES.

INSERT (H)

THE MONITOR IS INITIALLY CALIBRATED BY THE MANUFACTURER USING GASEOUS AND SOLID SOURCES INCLUDING SR-90. TRANSFER SOURCES ARE THEN USED TO TRANSFER THIS CALIBRATION DATA BASE TO THE PLANT BY REALIGNING EACH DETECTOR TO THE CONDITIONS ESTABLISHED DURING PRIMARY CALIBRATION. THIS TRANSFER CALIBRATION IS PERFORMED PERIODICALLY IN THE PLANT AT DESIGNATED INTERVALS ACCORDING TO THE PLANT TECHNICAL SPECIFICATIONS.

INSERT (I) p. 11.5-14

DISSEMINATION OF INFORMATION FROM THIS MONITOR VIA THE RMMS DATA LINKS TO THE CONTROL ROOM, TECHNICAL SUPPORT CENTER AND EMERGENCY OPERATIONS FACILITY, AS WELL AS CONSIDERATION OF RADIONUCLIDE DISTRIBUTION AS A FUNCTION OF TIME AFTER SHUTDOWN IN DOSE ASSESSMENT IS DISCUSSED IN SECTION 11.5.6.

INSERT (J) p. 11.5-14

CONTROLS ARE PROVIDED IN THE CONTROL ROOM TO SELECT FILTERS, GRAB SAMPLE LOCALLY OR REMOTELY, AND TO INITIATE AUTOMATICALLY TIMED GRAB SAMPLING.

INSERT (K)

... ENCLOSURES DESIGNED FOR EASE OF REMOVAL AND REPLACEMENT OF FILTER MEDIA. FILTER REMOVAL IS PROVIDED BY MEANS OF QUICK DISCONNECT COUPLINGS. AFTER REMOVAL, THE FILTER IS PLACED IN A SHIELDED CASK FOR TRANSPORT TO THE ONSITE ANALYSIS FACILITY. THE FILTER ENCLOSURE AND TRANSPORT CASK HAVE BEEN DESIGNED, AND THE ACCESS ROUTES SELECTED, in accordance with the requirements of NUREG-0737...

INSERT (L)

THE SAMPLE FILTER, CONSTRUCTED OF SILVER ZEOLITE HAS A COLLECTION EFFICIENCY OF 99% FOR IODINE AND FOR 0.3 MICRON PARTICLES.

(Fig. 5.6.2.1)

TECHNICAL SUPPORT CENTER (TSC) AND EMERGENCY OPERATIONS FACILITY (EOF)

In the RMDS dual computer configuration each computer is equipped with fast access mass storage devices to store executable programs, application data base and a dynamically created data storage. RMDS display consoles and terminals located in the control room, are interfaced to the RMDS computers to allow the access of information from the computers and PRMs and to display PRMs status. The RMDS has seven data links from each computer. Five data links communicate each RMDS computer with the PRMs located throughout the plant. A sixth link communicates each RMDS computer with the MMDRS. The seventh link provides communications between each RMDS computer.

The RMDS provides PRMs status and RMDS status through annunciation of alarm conditions at the RMDS display consoles to supplement the PRM alarms at the plant annunciator panel. The operator is alerted of abnormal conditions through visual alarms located at each RMDS display console. Alarm events are stored on the RMDS mass storage devices and logged on the RMDS terminals. TREND DISPLAYS OF THE PRM MICROPROCESSORS HISTORICAL FILES ARE AVAILABLE FOR DISPLAY OR HARDCOPY AT THE RMDS DISPLAY CONSOLES.

11.5.6

~~7.7.1.9.13~~.2.2 Meteorological Monitoring Display and Reporting Subsystem (MMDRS)

The MMDRS is a computer system provided with increased memory capabilities, fast access mass storage devices, high speed line printing devices, magnetic tape storage facilities, and remote display console devices with hardcopy outputs.

The MMDRS computer is equipped with remote consoles and hardcopy units located in the control room, TSC, Counting laboratory (Section 12.5.2) and the EOF to allow access of information from the computer, display PRMs information obtained from the RMDS, display meteorological data obtained from the meteorological instrumentation, and to allow for manual input of multichannel analyzer data, radiation levels, meteorological data and process data.

The MMDRS has three data links. Two data links communicate data from each RMDS computer to the MMDRS. The third data link communicates data from the meteorological instrumentation described in section 2.3 to the MMDRS computer.

11.5.6.3.2

The MMDRS computer can also do calculations of atmospheric dispersion and dose for accidental release of gaseous effluent. To do calculations of atmospheric dispersion ($^{X}/_{Q}$ values), the MMDRS computer uses data obtained from the meteorological towers or prompts the operator to enter the desired data. These data are used to compute the most recent dispersion conditions for a given release point. Dose calculations can be done using radiological release data obtained automatically from the RMDS or entered manually by the operator. These calculations can be performed using data obtained over a 1-minute, 15-minute, or 1 hour time interval.

The model used for the dispersion and dose calculations corresponds to the Class A model outlined in Appendix 2 of NUREG-0654.

An enhanced Class A model is provided which is also used for dispersion and dose calculations. This model uses on-site and forecast meteorological data to plot the time dependent movement of the plume.

The results of the dose calculations, in addition to being available at the control room, TSC counting laboratory, and EOF are available to local, state and federal emergency officials through an interrogation/broadcast system.

THE SOFTWARE INCLUDES RADIONUCLIDE SPECTRUM DISTRIBUTION AS A FUNCTION OF TIME FOR DIFFERENT TYPES OF ACCIDENTS. THE SOFTWARE PROVIDES DECAY OF THE SPECTRA FROM THE TIME ACCIDENTS BEGIN TO THE TIME THE CONCENTRATIONS ARE CALCULATED. MANUAL ENTRY ALLOWS USE OF ACTUAL SPECTRA THAT IS OBTAINED ONCE GRAB SAMPLES CAN BE RETRIEVED.

(5) License applicants should have available for review the final design description of the as-built system, including piping and instrument diagrams together with either (a) a description of procedures for system operation and calibration, or (b) copies of procedures for system operation and calibration. Changes to technical specifications will be required. Applicants will submit the above details in accordance with proposed review schedule, but in no case less than 4 months prior to the issuance of an operating license. A postimplementation review will be performed.

Response

Sampling of plant gaseous effluents for post-accident releases of iodines and particulates is provided as part of the wide range accident monitoring subsystem of the north stack effluent radiation monitoring system described in Sections 7.6 and ~~11.5.2.1.9c~~. The design of onsite laboratory facilities for analysis of these samples is described in Chapter 12. The design of the sampling media and sampling considerations are in conformance with Table II.F.1-3 of NUREG-0737. Human factors aspects of TMI Item II.F.1 are considered part of the control room design review required by ATTACHMENT 3, Containment High-Range Radiation Monitor Item I.D.1.

Position

In containment radiation-level monitors with a maximum range of 10^8 rad/hr shall be installed. A minimum of two such monitors that are physically separated shall be provided. Monitors shall be developed and qualified to function in an accident environment.

Clarification

(1) Provide two radiation monitor systems in containment which are documented to meet the requirements of Table II.F.1-4.

(2) The specification of 10^8 rad/hr in the above position was based on a calculation of postaccident containment radiation levels that include both particulate (beta) and photon (gamma) radiation. A radiation detector that responds to both beta and gamma radiation cannot be qualified to post-LOCA (loss-of-coolant accident) containment environments but gama-sensitive instruments can be so qualified. In order to follow the course of an accident, a containment monitor that measures only gamma radiation is adequate. The requirement was revised in the October 30, 1979 letter to provide for a photon-only measurement with an upper range of 10^7 R/hr.

(3) The monitors shall be located in containment(s) in a manner as to provide a reasonable assessment of area radiation conditions inside containment. The monitors shall be widely separated so as to provide independent measurements