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April 13, 1984

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

Subject: Limerick Generating Station, Units 1&2 Meteorological and Effluent Treatment Branch

Reference: A. Schwencer to E. G. Bauer, Jr., letter dated February 29, 1984.

File: GOVT 1-1 (NRC)

Dear Mr. Schwencer:

In compliance with your request for additional information concerning the standby gas treatment system enclosed please find our draft response to RAI 460.23 and revised response 460.4.

The attached draft RAI(s) will be incorporated into the FSAR exactly as they appear on the enclosed in the revision scheduled for May 1984.

Sincerely,

John S. Kemper

RJS/gra/040384245

cc: See Attached Service List

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	Judge Peter A. Morris	(w/o enclosure)
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QUESTION 460.4

Regulatory Guide 1.52 Revision 2, March 1978, provides several regulatory positions for which additional information should be provided for justification of giving full or partial credit to ESF atmosphere cleanup filters for mitigating accident doses in accordance with the Guide, as follows:

Position 2.a ESF atmosphere cleanup systems should consist of the following sequential components: (1) demister, etc. The FSAR states that demisters are not included in the standby gas treatment system (SGTS), reactor enclosure recirculation system (RERS), or control room emergency fresh air intake system. You state that there are no water droplets in the air stream of the SGTS which is already filtered by the RERS. You state that there are no water droplets in the air stream of the RERS, and there are no water droplets in the air stream of the control room emergency fresh air intake system. Provide information to assure that water droplets will not contact the SGTS filters by fully supporting either (1) that the absence of water droplets in the RERS air stream is assured in consideration of potential sources of water droplets, such as leakage from ESF components outside the primary containment following a LOCA during the recirculation phase for long-term core cooling and primary containment spray cooling; (2) the capability of the RERS is assured for providing the function that an SGTS demister would be designed to provide: or (3) that the SGTS will be provided with a demister in accordance with Regulatory Guide 1.52.

Position 2.g ESF atmosphere cleanup systems should be instrumented to signal, alarm, and record pertinent pressure drops and flow rates in the control room. (Standard Review Plan Section 6.5.1 states that the design of instrumentation for the ESF atmosphere cleanup system should conform to the guidelines of Regulatory Guide 1.52 and to the recommendations of ANSI N509. Minimum instrumentation, read out, recording, and alarm provision for ESF atmosphere cleanup systems are given in Table 6.5.1-1 of this SRP section).

No provisions are described in the FSAR for recording pertinent pressure drops and flow rates in the control room for any of the ESF atmosphere cleanup systems. Also, no provision has been made to provide flow rate alarms at the control room for the SGTS, nor has provision been made to provide flow rate indications at the control room for the RERS or the control room emergency fresh air intake system. For each system, instruments are provided to indicate and alarm overall pressure drop across the entire filter train; local pressure indicators are provided for each filter

component; and no recorders are provided because the filters are able to be changed on high-pressure readings. No other information is provided to assure compliance with the items identified in Table 6.5.1-1 of SRP 6.5.1. State the locations of the instruments provided to indicate and alarm on overall pressure drop (differential) and whether the alarm is provided for high and low pressure differential. State accessibility, during normal operations and anticipated operational conditions, to each of the ESF atmosphere cleanup system train locations for reading local pressure, pressure drop flow rate indicators and for performing necessary maintenance. State how, in the absence of recorders, records will be maintained of ESF atmosphere cleanup system pressure drops and flow rates to indicate trends. Provide information to address all items identified in Table 6.5.1-1 of SRP 6.5.1.

No Change of this Page

Position 3.b ESF air heaters should be designed in accordance with the requirements of Section 5.5 of ANSI N509-1976, which states that the sensible heat produced by the heater stage shall not result in increasing air temperatures to more than 225°F and that a manual cutoff switch set at this value should be provided. The FSAR states that two automatic controls set at 180°F and one manual control at 324°F will be provided for the SGTS air heaters. Describe functions actuated by the automatic controls and the basis for providing manual control at 324°F rather than a manual cutoff switch at 225°F.

Position 3.i This position addresses physical property specifications of new activated carbon, processing of batches of activated carbon, adsorber bed design to an average atmosphere residence time of at least 0.25 sec per two inches of bed depth, design to a maximum loading of 2.5 mg of total iodine per gram of carbon, the maximum quantity of impregnant to be used, and the radiation stability of the carbon. The FSAR states that the SGTS activated carbon adsorber provides a residence time of only 0.354 sec and the bed depth is 8 inches. Also, no residence time is specified for the control room emergency fresh air intake system because the iodine concentration is expected to be extremely low due to recirculation air mixing. No other information is provided to assure compliance with the other items under position 3.i. (It is also stated in the FSAR, p. 6.5-5, that the minimum loading capacity of the SGTS activated carbon adsorber is 25 mg per gram of activated carbon).

Provide justification to support the assignment of 99% iodine and iodide decontamination efficiencies, in accordance with Table 2 of Regulatory Guide 1.52, for the SGTS filters in consideration that the residence time is less than 0.25 sec per two inches of bed depth. If not, a filter efficiency of 95% will be assigned

for accident evaluations. Provide the residence time for the control room emergency fresh air intake system filter. Clarify that the maximum loading capacity meets the guidelines of Regulatory Guide 1.52. If not justify your position.

Position 4.c ESF atmosphere cleanup systems design should provide for permanant test probes with external connections in accordance with the provisions of Section 4.11 of ANSI N509-1976. The FSAR states that 4 charcoal test cannisters are provided (for each adsorber bank) for the SGTS rather than minimum of six as recommended in ANSI N509-1976. Provide information to justify your position.

Position 4.d Each ESF atmosphere cleanup train should be operated at least 10 hours per month in order to reduce the buildup of moisture on the adsorbers and the HEPA filters. The FSAR states that each ESF atmosphere cleanup train is to be continuously purged with dry instrument air to prevent buildup of moisture. Provide information to assure that the quantity of dry air used to purge the cleanup train is sufficient to prevent buildup of moisture.

RESPONSE

Additional information about the ESF atmosphere cleanup systems in regard to Regulatory Guide 1.52 positions 2.a, 2.g, 3.b, 3.i, 4.c, and 4.d is provided below.

Position 2.a

The absence of water droplets in the RERS air stream during reactor enclosure isolation is assured based on the following:

- As discussed in the response to Question 460.5, the reactor enclosure relative humidity will not exceed 77 percent during normal operation. This relative humidity will decrease to below 70 percent post-LOCA due to the increase in heat to the structure.
- ESF system leakage will be held to a minimum because Limerick will follow the guidelines of NUREG-0737 Item III.D.1.1, i.e., provide periodic surveillance tests to minimize system leakage.
- Neither the RERS nor the SGTS are required to mitigate the consequences of a high energy line break or a moderate energy line break. Therefore these line breaks

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As indicated in table 6.5-2,

are not considered sources of water that could enter the RERS air stream.

The RERS will not communicate with the refueling area during reactor enclosure isolation or refueling area isolation. Therefore humidity from the fuel pool is not considered a source of water that could enter the RERS air stream. the SGTS, which will drawdown the refueling area upon refueling area isolation, will be provided with a Prefilter in accordance with Regulatory Guide 1.52 prior to the first refueling. The SGTS Prefilter is not necessary prior to the first refueling because ~~humidity release from a fuel pool heated by spent fuel decay heat can only occur after the first refueling.~~ SGTS drawdown of the refueling area will not be necessary until spent fuel is removed from the Reactor vessel.

Position 2.g

Insert A

The Limerick system was designed prior to the original issuance of Regulatory Guide 1.52, ANSI N509, and SRP Table 6.5.1, and therefore were not specifically considered in the design.

Table 6.5-9 has been added to provide information addressing all items identified in SRP 6.5.1 table 6.5.1-1. ESF atmosphere cleanup systems are accessible during normal operation and during anticipated transients. ESF atmosphere cleanup systems operate only after an accident or during drywell purge. This allows records to be kept of periodic tests performed during normal operation on all ESF atmosphere cleanup systems, which ensures that prefilters and HEPA filters are either changed on high pressure readings or checked on abnormal readings.

Position 3.b

The automatic reset cutout (setpoint 260°F) and manual reset cutout (setpoint 324°F) are located inside the heater where the sensed temperature is higher than the actual air temperature downstream of the heater. These are heater protection devices that were selected and installed by the heater manufacturer. The automatic reset cutout (setpoint 180°F), which is located downstream of the heater, senses the actual temperature of air leaving the heater and causes an alarm signal in the control room when the air temperature exceeds 180°F. Because the SGTS electric heaters operate with a fixed temperature differential of 15°F between the inlet and outlet air temperatures and the maximum inlet temperature is 135°F, the maximum air temperature downstream of the heater should not exceed 150°F. In the event of a heater malfunction, the discharge air automatic reset cutout will shut off the heater when the downstream air temperature exceeds 180°F. Because we have conservatively selected 180°F as the heater cutout temperature, and an alarm annunciates in the control room to notify the operator if this condition should occur, we consider the Limerick design to be equivalent to the

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Insert A DRAFT

A demister is not required for the SGTS filters. The absence of water droplets in the air stream entering the SGTS filters is assured based on the response to Question 460.23.

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225°F manual heater cutout required by section 5.5 of ANSI N509-76.

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Position 3.i

Tables 6.5-1 and 6.5-2 and Section 6.5.1 have been changed to indicate conformance with Regulatory Guide 1.52 position 3.i. Table 6.5-1 has been changed to state that the residence time in the 8-inch SGTS charcoal bed is not less than 1.0 second. Section 6.5.1.2.1 has been changed to state that the air residence time in the 2-inch control room emergency fresh air intake system charcoal bed is not less than 0.25 seconds. Section 6.5.1.1.2 has been changed to state that the maximum loading capacity of the charcoal is 2.5 mg of total iodine (radioactive plus stable) per gram of activiated carbon.

Position 4.c

Permanently installed injection and sampling ports are provided for all ESF systems to permit accurate testing in accordance with ANSI N510. Providing fewer charcoal test canisters on the ESF atmosphere cleanup systems than specified in ANSI N509-1980 section 4.11 results in equal or more frequent replacement of activated carbon. Regulatory Guide 1.52 states that testing of representative samples should be performed (1) initially, (2) at least once per 18 months thereafter for systems in a standby status or after 720 hours of system operation and (3) following painting, fire, or chemical release in any ventilation zone communicating with the system. More frequent replacement may result because Regulatory Guide 1.52 further states that when no representative samples are available for testing, the activated carbon should be replaced with new activated carbon.

Position 4.d

Each charcoal train is continuously purged with 1 cfm of dry instrument air; however, any amount of dry air continuously purged through the adsorbers and HEPA filters will entrain moisture and maintain moisture levels at a minimum because the ductwork is gastight and there is no internal humidity source. (The periodic operation of the ESF atmosphere cleanup train could introduce additional moisture into the system and increase moisture levels above those normally maintained.)

Request For Additional Information

RAI 460.23

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Question 460.23

The FSAR, Revision 25, October 1983, indicates in Section 6.5, that a prefilter would be used in the standby gas treatment system (SGTS) instead of a demister. Position 2.a of Regulatory Guide 1.52, Revision 2, March 1978, is that ESF atmosphere cleanup systems should consist of a prescribed sequence of components: (1) demisters, (2) prefilters (demisters may serve this function), etc. Provide information to assure that water droplets will not contact the SGTS filters by fully supporting either (1) that the absence of water droplets in the SGTS air stream is assured in consideration of all potential sources of water droplets, or (2) that the SGTS will be provided with a demister in accordance with Regulatory Guide 1.52.

Response 460.23

A demister is not required for the SGTS filters. The absence of water droplets in the air stream entering the SGTS filters during post-LOCA isolation, refueling area isolation and primary containment purging is assured based on the following:

- The SGTS intake is downstream of the RERS filters so that entrained water droplets cannot exist in the air stream entering the SGTS filters during post-LOCA reactor enclosure isolation and drawdown. The absence of water droplets in the RERS air stream during reactor enclosure isolation was demonstrated in the response to NRC Question 460.4.

- There are no sources of water droplets in the refueling area which could enter the duct connection to SGTS. As discussed below, water droplets from condensation will not reach the SGTS filters during refueling area isolation because of the tortuous flow path and low velocities through the ducts, and low point drains in the ducts. The duct from the refueling area to the SGTS filters passes the Unit 1 reactor enclosure for approximately 260 feet and includes at least 20 bends and turns. If condensation does occur, the amount of condensation would be minor, based upon the potential amount of water vapor in the air stream. One inch diameter low point drains are provided for the portion of ductwork in the reactor enclosure to ensure that any condensation will be drained from the duct. When refueling area drawdown begins, the flowrate could reach 3000 cfm for a short period of time. As water vapor accumulates in the refueling area, the flowrate will be decreasing. During the period when any significant condensation could occur in the ducts, the flowrate in the duct will be no more than 800 cfm. The

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air velocity during this period varies from approximately 162 to 325 feet per minute (1.8-3.7 mph) for the majority of the ductwork.

The ductwork in the control enclosure that leads to the SGTS filters is completely insulated and rises immediately more than 15 feet through one vertical upward 90 degree turn, one additional 90 degree turn and three bends. The refueling area exhaust air velocity is 162 fpm (1.8 mph) in this portion of the duct. This velocity is not sufficient to overcome the force of gravity to impart a vertical upward velocity to any water droplets. Condensation of water vapor in the insulated ductwork will be negligible.

The SGTS heaters are capable of reducing the relative humidity (RH) of the air, (3000 cfm maximum for this mode), from 100 percent RH to less than 70 percent RH.

Water droplets will not reach the SGTS filters during drywell purging because of the reasons discussed below.

It is highly unlikely that water droplets will enter the purge lines during drywell purging. As discussed in the response to Question 460.5, the PECO preventative maintenance program will maintain normal plant leaks to low flow dripping type leakages. Any leakage with spraying water droplets, (such as those due to failed seals in pumps and valves), will be identified and corrected as part of the maintenance program. As discussed in the response to Question 460.5, it can be shown that any droplets formed travel less than 20 feet. There are no potential sources of water droplets within 20 feet of the suppression chamber purge exhaust opening. There are no pumps, and only a few valves, within 20 feet of the drywell purge exhaust opening. The closest valve is 8 feet away from the opening. Because the purge system is used only a limited period of power operation (typically less than 90 hours per year), it is highly unlikely that a valve seal would fail and spray water into the drywell purge exhaust opening during purge system operation.

If water droplets are hypothetically assumed to enter the purge exhaust ducts, or if condensation within the ductwork occurs, the water droplets would not reach the SGTS filters because of the tortuous flow path, the insulated ductwork in the control structure, and the SGTS heaters. Purge air exhausted from the drywell flows approximately 215 feet in the reactor enclosure through three valves, two vertical upward turns and four additional bends and turns with a flow rate of 11,000 cfm at a velocity of 2240 fpm (25.5 mph) in the

duct, and 3731 fpm in the pipe. The purge air from the suppression chamber flows more than 160 feet in the reactor enclosure through valves and six bends and turns with a flow rate of 9750 cfm and a velocity of 1986 fpm (22.6 mph) in the duct, and 6008 fpm in the pipe. At these velocities, if condensation occurs within the ductwork, it is possible for some water droplets to be entrained in the air stream. Condensation within the reactor enclosure ductwork could occur while purging the suppression chamber, but would not occur while purging the drywell because the drywell is maintained at a low relative humidity by the drywell coolers. No significant condensation would occur in the control enclosure ductwork for either purge mode because it is insulated. Even if all the condensation that forms during suppression chamber purging is assumed to be entrained in the air stream and is assumed to travel through the tortuous flow path, the SGTS filters would not be adversely affected because the SGTS heaters are capable of reducing the relative humidity of the air (9750 CFM for this mode) from 100 percent RH, with entrained droplets, to less than 70 percent RH, with no entrained droplets.

The SGTS heaters are also capable of reducing the relative humidity of the air during drywell purging (11,000 CFM for this mode), from 100 percent RH to less than 70 percent RH.