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March 19, 1979

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✓ The Honorable Gary Hart, Chair
Subcommittee on Nuclear Regulation
Committee on Environment and Public Works
United States Senate
Washington, D. C. 20510

Dear Mr. Chairman:

Your letter, dated February 15, 1979, requested information concerning repair of the steam generators at Virginia Electric and Power Company's Surry Power Station. Our response to your specific questions is provided as Enclosure 1.

The steam-generator repair program for Surry Unit No. 1 and Unit No. 2 was granted NRC approval by license amendments dated January 19, 1979 and supported by an Environmental Impact Appraisal (EIA) and a Safety Evaluation Report (SER). Copies of the license amendments, the Notice of Issuance, the EIA and SER are also enclosed.

In order to further assist you in understanding the phenomenon of tube denting, I am also enclosing a copy of a report which has just been completed entitled, "Summary of Operating Experience with Recirculating Steam Generators, NUREG-0523," dated January, 1979.

In a note of interest to your staff, the Commission has requested a staff briefing on the issues of denting, steam generator repairs and associated legal questions. The briefing has been scheduled for Thursday, March 29, 1979 at 2:30 p.m. at the Commissioners Conference Room. The briefing is open to the public.

Sincerely,

Original Signed by
Joseph M. Hendrie

Chairman (2)

Joseph M. Hendrie

Enclosures:

1. Answers to Questions
2. Ltr to VEPCO fm NRC w/Encls dtd 1/20/79
3. Ltr to VEPCO fm NRC w/Encl dtd 12/15/78
4. NUREG-0523
5. Ltr fm Allen, NAEC to Commissioners dtd 12/29/78

Cleared with Cmrs. by SECY 6/R.
Retyped in SECY to incorporate Cmr. comments

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SAustin
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OCM
JM Hendrie
3/14/79

OFFICE	Ltr fm Denton, NRR to Allen, NAEC	EDO/NRR	OCA	SECY
SURNAME	dtd 2/1/79	JDNeighbors	S. D. [Signature]	TCombs [Signature]
CC	Sen. Alan Simpson		3/15/79	3/15/79

ANSWERS TO QUESTIONS IN
FEBRUARY 20, 1979 LETTER FROM
SENATOR GARY HART, CHAIRMAN,
SUBCOMMITTEE ON NUCLEAR REGULATION

1. How widespread is the problem of steam generator tube denting, and what are the safety implications involved?

Answer: Denting as a form of steam generator tube degradation has only been observed in recirculating (U-tube) type steam generators designed and manufactured by Westinghouse (W) and Combustion Engineering (CE). As of December 1978, there were 33 plants in the United States with this type of steam generator. Sixteen of these (12 W and 4 CE) have suffered some tube denting.

A recently published report (NUREG-0523) summarizes various operating problems, including tube denting, associated with domestic operating PWR's. As indicated in Table 1 of NUREG-0523, Surry Units 1 and 2, Turkey Point Units 3 and 4 and San Onofre Unit 1 have experienced the most extensive tube denting.

The safety implications associated with the denting phenomenon relate to potential radioactive releases during normal and accident conditions since denting can lead to tube cracking and leaking. Minor leaks have occurred in steam generators which have severe tube denting, resulting in contamination of the secondary system and in small radioactive releases to the environment. Experience has shown that the leaks caused by tube denting have generally been small and are quickly detected, permitting orderly reactor shutdown.

If leakage through cracked steam generator tubes were to increase substantially concurrent with a postulated accident, e.g., a main steam line break (MSLB) or a loss of coolant accident (LOCA), both the severity of those accidents and their dose consequences would be increased. Therefore, it is very important to maintain a high degree of assurance that there will be no substantial increase in tube leakage due to accident conditions. This assurance is achieved by imposition of the licensing condition discussed in the response to Question 2.

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2. How has NRC dealt with the problem in the past, and what future activities (and levels of effort) are planned to resolve this safety issue?

Answer: In addition to approving the replacement of the Surry steam generators with ones designed to minimize the potential for tube denting, the NRC has also taken several steps to identify plants that develop denting and to be assured that this denting does not become an actual safety problem. For plants now operating with severely degraded steam generator tubes, NRC has imposed additional licensing conditions that require (1) augmented steam generator tube inservice inspections (i.e., increased inspection frequency and expanded inspection sample), (2) preventive tube plugging, and (3) more stringent Technical Specification limits on the allowable reactor coolant leakage rate during normal operation.

In the most severely dented steam generators, all tubes in the innermost two rows have been plugged even though most of them have not leaked. This action has eliminated the potential for the occurrence of large, fast developing leaks at the top of the U-bend region which is considered most vulnerable to cracking. For detailed discussions on other plant specific remedial actions that have been required by NRC, NUREG-0523, Section 4 provides typical preventive tube plugging criteria that must have been implemented. The stringent leakage rate limit imposed by NRC was chosen to detect leaks from cracks that are very small. Early detection and plugging are a means to prevent a crack from propagating and weakening the tube such that it could suddenly rupture during postulated accidents.

With regard to further resolution of this safety issue, the NRC staff has formulated Task Action Plans (TAPs) A-3 and A-4 for the Generic Technical Activities which address Westinghouse and Combustion Engineering steam generator tube integrity (Appendix B of NUREG-0523). Results from NRC and industry research efforts will provide additional bases for confirming or revising current tube repair or plugging criteria. For new designs, specific features are being incorporated to minimize the potential for tube denting. These generic tasks have been given high priority by NRC and will require approximately six man years of staff effort. Completion of these tasks is scheduled for FY 1980.

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3. Please describe the NRC environmental and safety review procedure which led to the authorization of this repair work. Were these reviews subject to public hearings or comment?

Answer: Following receipt of VEPCO's letter dated August 17, 1977, which transmitted the report entitled "Steam Generator Repair Program, Surry Power Station, Unit Nos. 1 and 2", the staff determined that the proposed program required its review, approval and issuance of license amendments. A Federal Register Notice of Proposed Issuance was published on October 27, 1977 (42 Fed. Reg. 56652). The staff's environmental review included an appraisal of occupational radiation exposure, public radiation exposure, accidents, cost, land use, noise, traffic and materials. Various alternatives to the repair effort (such as plant shutdown) were evaluated. The staff's safety review included steam generator design changes, effects of repair activities, transient and accident analyses, radiological considerations and security. The results of the staff review are presented in the Environmental Impact Appraisal (EIA) and a Safety Evaluation Report (SER).

A Federal Register Notice of Proposed Issuance published October 27, 1977, provided for a request for hearing within 30 days of publication of the notice. No request for a hearing was received. However, in response to that notice, the Commonwealth of Virginia requested that it be allowed until 10 days after the issuance of the staff SER to decide whether it would request a hearing. The Commonwealth's request was granted. The Commonwealth stated, following issuance of the SER, that it would not request a hearing in the proposed licensing action.^{1/}

^{1/} On February 1, 1979 a December 29, 1978 request for hearing on this matter under 10 CFR 2.206 of the Commission's Regulations from Ms. June Allen, on behalf of the North Anna Environmental Coalition, was denied by the Director of the Office of Nuclear Reactor Regulation. A copy of that decision is enclosed for your information. In accordance with the Commission's rules, the Commission is presently considering whether or not to take review of the Director's denial.

4. Please describe the steam generator replacement procedure which is being employed.

Response: Briefly, the procedure consists of defueling the reactor, draining the reactor coolant loops, cutting each steam generator from its reactor coolant loop and secondary system, removing the top portion from the steam generator lower assembly including the shell and tube bundle. A new lower assembly will be installed for each removed lower assembly. The old lower assemblies will be stored in a specially designed facility. Further details are provided in the SER.

5. What environmental and safety precautions is NRC requiring prior to and during replacement activities? To what extent will NRC review and monitor this effort?

Answer: The Surry Power Station Unit Nos. 1 and 2 licenses have been amended to incorporate several requirements to be met during the repair program. Among these are that all fuel will be removed from the reactor pressure vessel and stored in the spent fuel pool and temporary containment and ventilation areas will be established for cutting and grinding operations. The EIA and SER describe additional environmental and safety precautions to which VEPCO is committed.

The repair activities will be inspected and monitored by the NRC Office of Inspection and Enforcement. In addition to the resident inspector assigned to the Surry site, approximately eight additional inspectors have been assigned to follow this repair effort on a part-time basis. This additional effort will be equivalent to approximately four full-time inspectors.

6. What will be done with the defective steam generator parts? What are the associated environmental and safety risks involved in the storage and/or disposal of these parts?

Answer: The removed steam generator parts will be sealed and stored on site in a separate shielded facility constructed for this purpose until the Surry reactors are decommissioned. A detailed account of this disposal along with the associated risks is presented in the SER and EIA. Briefly, the risks are those of exposure to the residual radioactive materials in the sealed parts. Because of the sealing, shielding and periodic monitoring for any airborne or liquid pathway releases from this special storage facility, the risks are considered minimal and not environmentally significant.

7. Will the steam generator supplier, Westinghouse, pay for this damage repair or are the costs to be passed on the VEPCO consumer?

Answer: It is our understanding that the costs for the repair will not be paid by Westinghouse. The total costs for the repair will consist of the costs for the repair effort itself (materials and labor) plus the differential fuel costs that will be experienced while the nuclear plants are down for the repair. We understand that the repair effort itself is being handled by VEPCO as an improvement and will be financed mainly but not entirely through stocks, bonds and other financial mechanisms. We understand that part of the repair effort itself and all of the differential fuel costs will be passed on to the VEPCO consumer.

8. Are other nuclear power plants scheduled to undergo similar replacement repairs? If so, which ones, and when?

Answer: The Florida Power and Light Company has requested NRC approval of similar repairs for its Turkey Point Nuclear Plant Unit Nos. 3 and 4. The NRC review, similar to that performed for the repair program at the Surry Station, is almost complete. The Turkey Point repairs are likely to follow the Surry repairs by at least one year.

Consumers Power Company is considering replacement of the steam generators in its Palisades Plant, although at this time it is not definite that it will decide that it is necessary to do so. Although over 20 percent of its steam generator tubes have been plugged, it has experienced only minor tube denting problems. The major cause of plugging has been the phenomenon of tube wastage, a problem that has generally been arrested.

We are not aware of any of the other 16 plants considering similar repairs in the near future. Tube plugging required to date (see Table 2 of NUREG 0523) at these plants has been considerably less than at the Surry and Turkey Point Plants, indicating that the impact on plant operation has also been much lower.