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M. J. COONEY
MANAGER
NUCLEAR PRODUCTION
ELECTRIC PRODUCTION DEPARTMENT

September 12, 1986

Docket No. 50-352

Mr. Robert Bernero, Director
Division of Boiling Water Reactor Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Limerick Generating Station Unit 1
Fuel Surveillance Program

References:

1) J. S. Charnley (GE) to C. H. Berlinger (NRC), "Post-Irraidation Fuel Surveillance Program", November 23, 1983.

2) J. S. Charnley (GE) to L. S. Rubenstein (NRC), "Fuel Surveillance Program", February 29, 1984.

3) J. S. Charnley (GE) to L. S. Rubenstein (NRC), "Additional Details Regarding Fuel Surveillance Program", May 25, 1984.

4) L. S. Rubenstein (NRC) to R. L. Gridley (GE), "Acceptance of GE Proposed Fuel Surveillance Program", June 27, 1984.

Dear Mr. Bernero:

Section 4.2.4.3 of the NRC's Safety Evaluation Report (SER) for Limerick Station states that routine visual inspection of representative (usually discharged) fuel will be performed in connection with each refueling outage.

We wish to advise your on our intent to comply with section 4.2.4.3, by using the General Electric (GE) Post-Irradiation Surveillance Program. As you are aware, GE has accepted responsibility for post-irradiation surveillance of GE designed and manufactured fuel assemblies and has provided the NRC with a full description and evaluation of its surveillance program in References 1, 2 and 3. The GE program has been found

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acceptable by the NRC as stated in the letter dated June 27, 1984 from L. S. Rubenstein (NRC) to R. L. Gridley (GE) (reference 4). Since only fuel designed and manufactured by GE is used in Limerick Unit 1, it is our intent to participate in the GE Fuel Surveillance Program and to utilize this program to comply with SER Section 4.2.4.3.

If you have any questions or require further information, please do not hesitate to contact us.

Very truly yours,

Attachments

cc: T. E. Murley, Administrator, USNRC, Region #1
E. M. Kelly, Senior Resident Site Inspector
See Attached Service List

cc: Troy B. Conner, Jr., Esq.
Benjamin H. Vogler, Esq.
Mr. Frank R. Romano
Mr. Robert L. Anthony
Ms. Maureen Mulligan
Charles W. Elliott, Esq.
Barry M. Hartman, Esq.
Mr. Thomas Gerusky
Director, Penna. Emergency Management Agency
Angus Love, Esq.
David Wersan, Esq.
Robert J. Sugarman, Esq.
Kathryn S. Lewis, Esq.
Spence W. Perry, Esq.
Jay M. Gutierrez, Esq.
Atomic Safety & Licensing Appeal Board
Atomic Safety & Licensing Board Panel
Docket & Service Section (3 Copies)
E. M. Kelly
Timothy R. S. Campbell

July 21, 1986

MFN-218-83
JSC-072-83

GENERAL ELECTRIC

NUCLEAR POWER SYSTEMS DIVISION
GENERAL ELECTRIC COMPANY • 175 CURTNER AVENUE • SAN JOSE, CALIFORNIA 95125

MC 682, (408) 925-3697

November 23, 1983

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: C. H. Berlinger, Chief
Core Performance Branch

Gentlemen:

SUBJECT: POST-IRRADIATION FUEL SURVEILLANCE PROGRAM

Reference: Letter, J. S. Charnley (GE) to F. J. Miraglia (NRC), "Proposed Revision to GE Licensing Topical Report NEDE-24011-P-A", February 25, 1983

The NRC has recently required that newly licensed plants adopt a post-irradiation fuel surveillance program that consists essentially of routine visual inspection of discharged fuel at each refueling outage. The purpose of this letter is to propose the use of the fuel surveillance program described in the attachment, in place of the program required by the NRC at newly licensed plants. General Electric believes that its program meets the intent of Section II, Part D, of Standard Review Plan (SRP) 4.2 (NUREG-0800), regarding fuel surveillance. Because of the number of plants coming on-line in the near future that will be affected by this issue, GE requests that the NRC expedite consideration of this matter.

General Electric Fuel Performance Verification Program

The General Electric fuel performance verification program is described in the proprietary attachment to this letter. The attachment is considered proprietary because it contains information which GE customarily maintains in confidence and withholds from public disclosure. This information has been handled and classified as proprietary as indicated in the affidavit provided in the reference letter. We hereby request that this information be withheld from public disclosure in accordance with the provisions of 10CFR2.790.

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GE Program and SRP 4.2

Regarding post-irradiation fuel surveillance, SRP 4.2 states that a program "should be described for each plant to detect anomalies or confirm expected fuel performance...For a fuel design like that in other operating plants, a minimum acceptable program should include a qualitative visual examination of some discharged fuel assemblies from each refueling."

GE defines expected fuel performance as "the fuel will not fail". Failure criteria used in the design process contain conservatisms that adequately bound conditions that may exist at any plant, and provide margin to actual fuel failure limits. Additionally, operating limits are established such that sufficient margins are maintained to the design limits during normal operation and transients (in accident analyses, all fuel is conservatively assumed to fail).

Expected fuel performance as defined above is confirmed on a generic basis for a fuel design through the inspection of LTA's, and on a plant-specific basis through offgas surveillance. The LTA program detects anomalies that may arise, with the added advantage of accomplishing this prior to the time that the anomaly might appear in production fuel. As discussed earlier, a visual examination of some of the discharged fuel from two early applications of a new fuel design will also be performed, in order to confirm the expected performance of that fuel design.

Discussion of GE Program

GE believes that the program it proposes meets or exceeds the intent of SRP 4.2 and is also more cost effective. The numerous benefits of the GE program are presented below.

Inspection of LTA's of new designs provides timely, detailed, and useful information that can be fed back into fuel design, analysis, and manufacture. LTA's of new designs are usually placed in operation at least a year before in-reactor introduction of production fuel. Prior to irradiation, these LTA's may undergo detailed visual, nondestructive, and dimensional characterization. Key measurements may be taken of specific bundle features and additional detailed examinations may be performed on specific fuel rods. Interim examinations may be performed at the end of each operating cycle. Upon discharge, a final inspection is performed on the previously characterized fuel rods and final measurements may be taken of key bundle features. As required, more extensive evaluations may be performed, including destructive testing. This detailed surveillance of LTA's for new designs provides: (1) early identification of potential fuel performance concerns; (2) continuous knowledge of overall fuel

performance; and (3) systematic acquisition of detailed behavioral data allowing a comparison of predicted versus observed performance characteristics, thus providing feedback into the design process from fuel operated in a commercial reactor.

As discussed previously, the detection of fuel failures results in an investigation into the cause, and corrective actions where appropriate.

A general visual inspection of the exterior surfaces of a statistically significant number of fuel bundles (24 total - twelve at each of two plants) to confirm the absence of any anomalous behavior at end-of-life discharge for a new fuel design represents ample additional confirmation of the design.

Because fewer bundles are examined in greater depth (LTAs) than in the program required by the NRC of newly licensed plants, and because the visual inspections are limited to 24 bundles at end-of-life for a new design rather than at the end of every cycle in perpetuity, the GE program leads to a significant reduction in the total costs to utilities, while simultaneously providing more valuable data. If a utility were to contract for the type of visual examination the NRC is proposing the cost to the utility would be on the order of $60,000 per reload (assuming 12 bundles are inspected at each outage), in addition to personnel and dechanneling costs. If the utility were to perform the visual inspection itself, the cost in terms of training personnel, procuring proper equipment, performing the inspection, and exposing workers to radiation, would also be substantial.

The proposed GE program will allow the NRC to maximize the utilization of its resources by eliminating routine, repetitive review. Legitimate concerns will be easily recognized under the program proposed by GE.

Summary

GE proposes a fuel performance verification program consisting of inspection of LTA's, offgas surveillance and visual examination of a limited but statistically significant number of fuel bundles of two early commercial applications of new fuel designs. GE believes that this program meets or exceeds the intent of SRP 4.2 regarding fuel surveillance, and in addition is cost-effective for GE and the utilities as well as the NRC, while providing timely, detailed, and useful information that will be of benefit in enhancing fuel performance.

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Please contact W. A. Zarbis (408-925-5070) or myself if you have any questions.

Very truly yours,

J. S. Charnley
Fuel Licensing Manager
Nuclear Safety and Licensing Operation

JSC:csc/I09091*

cc: L. S. Gifford (GE-Beth)
L. S. Rubenstein (NRC)
G. G. Sherwood (GE)

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NUCLEAR POWER SYSTEMS DIVISION
GENERAL ELECTRIC COMPANY • 175 CURTNER AVENUE • SAN JOSE, CALIFORNIA 95125
MC 682, (408) 925-3697

February 29, 1984

MFN-024-84
JSC-10-84

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: L. S. Rubenstein, Assistant Director
Core and Plant Systems

Gentlemen:

SUBJECT: FUEL SURVEILLANCE PROGRAM

References:
1) L. S. Rubenstein (NRC) to R. L. Gridley (GE), "Post-Irradiation Fuel Surveillance," January 18, 1984
2) NEDE-24343-P, "Experience with BWR Fuel Through January 1981," May 1981
3) J. S. Charnley (GE) to C. H. Berlinger (NRC), "Post-Irradiation Fuel Surveillance Program," November 23, 1984

This letter provides additional details requested by the NRC on GE's fuel surveillance program, and replaces our letter of January 27 on this subject.

The fuel surveillance program presented in your letter of January 18 (Reference 1) assures adequate verification of safe fuel performance while still maintaining efficient use of industry resources, and is acceptable to General Electric. We would like to take this opportunity to provide additional information in order to address the points raised in your letter.

Reference 1 states that the fuel surveillance program described in NEDE-24343 (Reference 2) could be considered equivalent to that described in the Standard Review Plan if GE would: "(1) verify that this program includes post-irradiation visual inspection of standard design fuel bundles which have not been identified as leakers by sipping or other methods, and (2) that the current GE fuel surveillance program for standard fuel designs will continue at its present level of effort."

The first item is specifically considered in the GE program. However, inspection of non-leakers is not performed on a routine basis but only in cases when information of special interest can be obtained. In these cases, a total visual examination is performed. For instance, if GE desired technical information on a particular subject such as end plug

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wear or model verification data, then the inspections described in the first item would be performed. These inspections are performed at a variety of plants and include plants in which no fuel problems are expected.

Regarding the second item above, the GE fuel surveillance program is currently planned to continue at approximately its present level of effort. The number and type of inspections will vary from year to year, of course, depending on offgas measurements and the degree of technical interest as explained in the previous paragraph.

The next point raised in Reference 1 concerns the conditional aspect of GE's lead test assembly (LTA) program described in Reference 3. Detailed measurements of LTA's are not performed prior to irradiation in all cases. When the LTA's represent significant design changes, though, such as the advanced LTA's in Browns Ferry 3 and Peach Bottom 3, detailed measurements are performed prior to irradiation. In addition, detailed examinations are performed at the end of each operating cycle on specific LTA's and upon discharge of most LTA's, depending on the subsequent interest in implementing the design change demonstrated in the LTA.

The final point raised in Reference 1 addresses the threshold of offgas activity that would result in non-routine inspection of standard fuel designs. The offgas activity threshold would (a) vary from plant to plant, (b) be contingent on the amount of fuel failures predicted from the increase in offgas, and (c) depend on whether the cause of the failures could be identified without performing an examination. Inspections would generally be performed if the number of failures predicted is on the order of ten bundles, but this number could be more or less depending on the surrounding circumstances. For example, if offgas activity approaches technical specification limits and a cause cannot be assessed, fuel inspections could be performed even if the number of fuel bundles with failures is judged to be fewer than ten. On the other hand, if the cause is assessed - for instance, control blades were withdrawn at power - an inspection would not be performed even if the number of fuel bundle failures were greater than ten.

We hope that this response provides the clarification required to arrive at a mutually acceptable surveillance program.

Very truly yours,

J. S. Charnley

J. S. Charnley, Fuel Licensing Manager
Nuclear Safety and Licensing Operation

JSC:jg/b01231

cc: L. S. Gifford
G. G. Sherwood