

NORTHEAST UTILITIES



THE CONNECTICUT LIGHT AND POWER COMPANY
THE HARTFORD ELECTRIC COMPANY
THE NEW HAVEN ELECTRIC COMPANY
THE WATERBURY ELECTRIC COMPANY
THE WINDY HILL ELECTRIC COMPANY
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May 20, 1981

Docket No. 50-245
B10210



Director of Nuclear Reactor Regulation
Attn: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

- References: (1) W. G. Council letter to D. M. Crutchfield, dated September 10, 1980.
(2) A. D. Vaughn letter to M. T. Pitek/W. C. Mihal, dated May 8, 1981.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 1
Revision to Segmented Test Rod Bundle Submittal

In Reference (1), Northeast Nuclear Energy Company (NNECO) submitted a proprietary document, NEDE-20592-5P, "STR Bundle Submittal, Millstone 1 Segmented Test Rod Bundle, Supplement 5", June 1980. This document updated the original report submitted October 3, 1974.

General Electric (G.E.) has informed NNECO of certain discrepancies in the proposed fifth reconstitution of the bundle which were discovered upon receipt of a shipment of discharged test rod segments at the Vallicitos Nuclear Center. A more complete description of the deviations is contained in Reference (2) which is attached to this letter.

G.E. has performed detailed analyses of the deviations to determine the procedural cause as well as the safety significance of the rod loading error on plant operation and on the recent shipment. To summarize the problem, two rod segments intended for reinsertion into the STR bundle were exchanged with two segments from an adjacent fuel rod. This resulted in the shipment of two segments different from those planned as well as the inclusion in the reconstituted bundle of two segments different from those proposed.

Since the segment pairs were virtually identical in initial weight and enrichment, and their irradiation history was very similar, the impact on the shipment is negligible. Similarly, the worst of the two scenarios by which the exchange could have occurred shows a very small change in the bundle maximum local peaking factor (slight improvement) and minor variations for the individual rod locations involved.

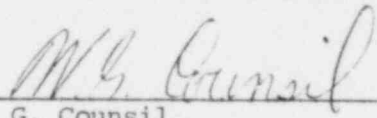
As a corrective measure, G.E. will visually verify all segment serial numbers during future reconstitutions each time the segmented rod is handled. Also, second party visual checks of rod location within the bundle will be emphasized to be independent and deliberate. NNECO feels that these changes provide adequate assurance that future site reconstitution work will be done without similar errors. It is significant to note that this is the first problem detected involving 255 segments shipped as part of the program.

The revision to the STR Bundle Submittal, Supplement 5, is being forwarded under separate cover. We have been informed by the General Electric Company that this report is considered proprietary by them. Additionally, nuclear material accounting records will be revised as appropriate.

If you have any questions regarding the revised supplement or the rod loading error description attached, do not hesitate to contact us.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY



W. G. Council
Senior Vice President

Attachment

cc: I&E Region I

GENERAL ELECTRIC

NUCLEAR FUEL
AND SERVICES
DIVISION

GENERAL ELECTRIC COMPANY, 175 CURTNER AVE., SAN JOSE, CALIFORNIA 95125

May 8, 1981
ADV:81- 070

Messrs. M. T. Pitek
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Northeast Utilities Service Co.
P. O. Box 270
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CC: L. D. Albert
J. S. Armigo
O. A. de Diego
G. N. Gundersen
R. A. Hanvelt
S. Y. Ogawa
J. D. Leaser
J. L. Rash

Subject: Notification of Millstone-1 STR Bundle Loading Error

Dear Marty and Bill:

Introduction:

An error was made in the recent retrieval and shipment of Segmented Rod Program (SRP) developmental fuel from Millstone 1 Nuclear Power Station to the Vallecitos Nuclear Center (VNC). The shipment contained two (2) segments that were not scheduled for return to VNC. These were substituted for two (2) SRP segments that should have been returned.

Discussion:

1. Details of the Shipment Deviations

The shipment of 28 irradiated SRP fuel segments was received at the Vallecitos Nuclear Center (VNC) on April 9, 1981. All the segments had been removed from the SRP-3 (STR) bundle (S/N MSB-125), as part of the fifth reconstitution completed in October, 1980.

The error was discovered during the process of unloading the cask in the VNC hotcells, and of verifying the contents against the shipment listing. The cask contained the correct total number of 28 segments scheduled to be shipped. However, two of the segments were not the correct ones.

Note: Conventions: Segment: individual, 38 inch long fuel rod:

Segmented Rod: full-length rod consisting of the four segments screwed together, and the lower and upper extensions.

Segment String: The order in which the segments are assembled in the rod.

The serial numbers of the SRP segments that should have been returned are:

DTB 2402
DTB 2404

The serial numbers of the SRP segments that were actually returned are:

DTC 2310
DTC 2311

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For complete details on the four segments see Table 1

2. Safety Implications from Shipment Deviation

The segments that were actually returned to Vallicitos were similar to the segments that should have been returned, in their exposures, isotopic contents, watts, and curies.

3. Details of the Bundle Deviation

As a result of the shipment deviation, the SRP-3 Bundle in Millstone 1, Reload 7, Cycle 8 Core Plan, contains two rods whose relative locations are not known. The affected bundle is MSB 125 and the affected rod positions are D4 and E4, in which Rod Segments DTB 2402 and DTB 2404 were inadvertently substituted for Rod Segments DTC 2310 and DTC 2311. Specific details follow:

A review of the SRP bundle reconstitution history showed that the four segments involved were inserted as fresh, unirradiated replacement segments, during the third reconstitution activity in April, 1978. They were part of the string of segments in two segmented, full-length rods, occupying interior and adjacent positions in the fuel bundle. The next time that these segments/rods were handled was during the fifth reconstitution, in October 1980. The site documentation of the rod and segment moves during these two reconstitution periods evolve two possible situations that explain the error. These had equal probability of happening. The actual one cannot be determined with the available information.

Based upon review of the site documentation of the rod moves during the third and fifth reconstitution periods, the probability is very low that the segments involved were put into rods other than only two that occupied the two adjacent/interior bundle positions.

The total bundle inventory of the segments is known, by serial number and rod positions, except for the two interior/adjacent positions, D-4 and E-4.

W-W	A	B	C	D	E	F	G	H
1								
2								
3								
4				X	X			
5								
6								
7								
8								

BUNDLE MATRIX

N-N

TABLE 1
ORIGINAL SRP FUEL CHARACTERISTICS

<u>Serial No.</u>	<u>Original Enrichment, % U-235</u>	<u>Original Total U, g</u>	<u>Original U-235, g</u>
DTB 2402	2.84	598	17.0
DTB 2404	2.84	598	17.0
DTC 2310	2.84	595	16.9
DTC 2311	2.84	594	16.9

SRP ISOTOPICS AT THE END OF CYCLE 7

<u>Serial No.</u>	<u>Total (gms)</u>	<u>U-235 (gms)</u>	<u>Total PU (gms)</u>	<u>PU-239 & 241 (gms)</u>
DTB 2402	589	11	3	2
DTB 2404	589	11	3	2
DTC 2310	586	11	3	2
DTC 2311	585	11	3	2

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For the rods in these two positions, the identification of the eight segments (total) and the string make-up of these two rods are known. However, the exact location of the rods (D4 or E4) remain unknown. Visual verification during the next bundle reconstitution is the only positive method for verification and establishing the exact locations of the two rods.

4. Safety Implications on Bundle Deviation

The substitution has caused no bundle power peaking problems that would adversely affect reactor operation or reactor safety. The substitution occurred during reconstitution activities on the SRP-3 bundle. As a result, the bundle contains two rods, whose relative locations are not known. Because both rods are very similar in their exposures, isotopic contents, and power peaking factors, their operational characteristics are similar, regardless of relative position.

The potential effects of the deviation on the bundle and reactor operation are considered to be very small and to create no safety related problems. If the rod/segment insertion error occurred during the third reconstitution, when the rods/segments were put into the bundle for the first time, the rod swap (bundle position error) would have negligible effect on the STR bundle. This results from all the affected segments being virtually identical in their original characteristics. The maximum difference in the total uranium weight of these segments was 4 grams. With a maximum enrichment difference of 0.01%, the U-235 contents in the segments were essentially identical. On the other hand, if the rod removal error occurred during the fifth reconstitution, a slightly different nuclear environment in the bundle would have resulted. Detailed nuclear calculations showed that the power peaking factors of the two rods remained below the average for the bundle. Other peaking factors did not exceed any bundle limits.

5. History of Visual Verification in Segmented Rods

Administrative control, by visual checks of the rod grappled for removal, and of the open bundle-position for rod insertion by the rod handler with second party observations, was the primary method followed. Visual verification of the rod/segment serial numbers was to be made when the borescope/periscope was available as part of the poolside equipment inventory specified for other types of visual examination but this requirement was ambiguous in the procedures.

The 26 segments that were correctly selected and shipped after the fifth reconstitution, and the proper retrieval of 70 segments during the previous 4 shipments from the Millstone site demonstrate the overall effectiveness of such administrative control. To date, a total of 255 SRP segments have

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been shipped from the three reactor sites where SRP bundles are being irradiated, and 253 were correct. The error at this site was a unique, first time experience.

Review of the site documentation has shown that visual verification of the segment serial numbers was done during the third and fourth reconstitutions. The verifications were made at the time specific rods were removed from the bundle. Verification of the segment serial numbers immediately before insertion of the two rods, D-4 and E-4, was not made. This is the extent of the site visual verification.

Note: Definitions: Visual Verification: examination using a boroscope (2 3/4 in. diameter) or a periscope (6 in. diameter).

Visual Checks: No magnification; direct observation through the window on the pool water surface.

6. Procedural Changes

The site poolside procedures are being changed to:

- 1) Require visual verification using a borescope or periscope (eliminates the implied option);
- 2) Visually verify the complete segment string by serial numbers, each time a segmented rod is handled, i.e. immediately upon removal of the rod from the bundle, and immediately before the insertion of the rod into the bundle (specifies the critical time when the verifications are to be made).
- 3) Strongly re-emphasize the required second party visual checks of the bundle position into which a rod is inserted. This requires the second party visual check to be separate and deliberate.

7. Conclusions

A detailed review of the site documentation and of the circumstances that lead to the substitution of the SRP Segments resulted in the following conclusions:

- 1) The Shipment Limits were not exceeded.
- 2) The substitution has caused no bundle power peaking problems that would adversely affect the reactor and/or require reportable occurrence actions defined in Section 6.9.1.7 of the Technical Specifications for Millstone 1.

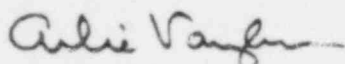
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General Electric will forward a Supplemental Reload License Submittal for the Segmented Test Rod during the week of May 11, 1981.

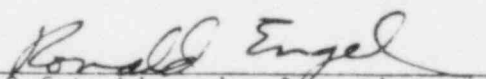
If you have any questions on this letter, please contact me.

Very truly yours,



A. D. Vaughn
Fuel Project Manager
Millstone 1
M/C 174 925-1618

j

Approved: 
Safety Licensing Operation