

cc A. C. Cullen
CO: I

UNITED STATES GOVERNMENT

Memorandum

TO : Roger S. Boyd, Assistant Director
for Reactor Projects, DRL
(THRU) Robert L. Tedesco, Chief, RPB-2, DRL

FROM : V. Stello, Jr. *v Stello*
Reactor Project Branch 2, DRL *RS*

DATE: January 31, 1968

SUBJECT: MINUTES OF MEETING ON QUALITY ASSURANCE FOR OYSTER CREEK
DOCKET NO. 50-219

Summary

As a result of this meeting some progress was made toward understanding the quality assurance program followed during the design, fabrication, and construction of the Oyster Creek plant.

The procedure to be used to repair the cracks on the control rod drive stub tubes was explained. A clad overlay on the 304 SS stub tubes will be proposed. All of the field welds are to be ground out and several housings may be removed in order to gain access to the stub tubes. The extent of cracking on the instrument thimbles was not yet known. A schedule for the repair program has not been established; however, it is expected that a report will be made available to us in the near future.

Discussion

A meeting was held on January 26, 1968 at the Oyster Creek site to discuss the quality control and assurance program. A list of attendees is attached. An agenda for the meeting was transmitted to the applicant one week prior to the meeting.

G. Ritter explained that Jersey Central relied on GE and its subcontractors to establish and follow an adequate quality assurance* program. GE described the organization, at San Jose and in the field, responsible for following the systems and equipment manufactured or directly procured by GE. This quality control* organization provides input in the design, establishing criteria and preparation of detailed specifications as well as follow up during the design and construction of Oyster Creek. It should be noted, however, that certain important systems were designed, manufactured and installed under the supervision of Burns & Roe, the A/E for the Oyster Creek plant. It was not possible to acquire an understanding of the quality control program followed by Burns & Roe or its subcontractors. Much of the

*Quality control and quality assurance are used interchangeably whereas "control" is normally applied to the features incorporated into the design via specifications, analysis, codes, etc., and "assurance" to that aspect associated with follow up of these areas.



B502070466 840524
PDR FOIA
BELL84-318 PDR

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

systems for which Burns & Roe and its subcontractors were responsible for were required to meet certain codes (ASME, ASA piping, etc.). These codes require that certain records be kept which were, in certain cases, reviewed by GE and Burns & Roe. Amendment No. 27 indicated that Burns & Roe had the responsibility for a number of major plant systems; however, a list of these systems was not available, although it was specifically requested on the agenda. Apparently, some complex relationship exists between GE, Burns & Roe and the various subcontractors. ||

CO related a number of problem areas (to be discussed in detail in a forthcoming CO report), uncovered to date as part of their task force review of the quality control program. All of the problems identified are not yet resolved but it is anticipated that they will be in the immediate future. A concern was raised about whether or not the number of problems found was symptomatic of an inadequate quality control program. The problems uncovered were found as a result of a sampling program on six plant systems. CO indicated that their review might have to be expanded to include all plant systems before that could make a finding that the plant was constructed in accordance with the application. A statement as to the possibility of the applicant conducting such a program was also made.

The status of the crack repair program was discussed. A decision has been made by GE and JC to use a clad overlay technique to repair the stub tubes and to replace all of the field welds. The machine to remove the field welds has been installed and is ready for operation. A strike at the site has temporarily curtailed operations. A number of control rod housings may have to be removed in order to gain access to the guide tubes. Recently reported crack indications on the instrument thimbles are still being reviewed by GE. A report covering the details of the analyses and testing to support the stub tube repair program will be made available. A schedule for this report as well as the repair program has not been finalized.

We informed the applicant that additional information would be requested from them. The information request would be directed at the overall quality control program as well as a request for data with regard to certain of the problem areas as related by CO.

Distribution:

Suppl.

DRL Reading

RPB-2 Reading

Orig: V. Stello

Branch Chiefs, DRL

R. L. Tedesco

L. Poise

F. Liederbach

R. A. Birkel

J. O'Reilly, CO (2) *ullk*

R. Carlson *✓*

JERSEY CENTRAL (OYSTER CREEK) QUALITY CONTROL MEETING

JANUARY 26, 1968

V. Stello	DRL
R. Tedesco	DRL
L. Porse	DRL
R. S. Boyd	DRL
F. Liederbach	DRL
R. A. Birkel	DRL
G. Ritter	Jersey Central Power & Light
T. J. McCluskey	Jersey Central Power & Light
G. A. Lari	Burns & Roe
E. Nobile, Jr.	Burns & Roe
J. Barnard	Burns & Roe
J. Archer	Burns & Roe
W. Schmidt	MPR Associates
J. Barnard	General Electric
J. Fox	General Electric
N. C. Moseley	AEC - CO
R. T. Carlson	AEC - CO
G. W. Reinmuth	AEC - CO
J. P. O'Reilly	AEC - CO
J. G. Keppler	AEC - CO
F. Nolan	AEC - CO

F. A. Morris, Director
Division of Reactor Licensing

February 14, 1968

Roger S. Boyd, Assistant Director
for Reactor Projects, DRL

Original signed by:
Roger S. Boyd

JERSEY CENTRAL POWER AND LIGHT - STUB TUBE CRACKS PROBLEM

Mr. Lou Roddis of GPU called me on February 13 to state that Jersey Central had received at the site the equipment needed to repair the stub tubes in the Oyster Creek pressure vessel. (I am not sure whether the equipment on site is only for removing the field welds or whether the welding machine for repairing the stub tubes is also on site.) Mr. Roddis indicated that GE would be ready to cut the field welds on the two stub tubes that they were saving at our request within a few days. His specific question regarding this information was "What can we do to release the two stub tubes and allow GE to begin their repair?" I told Lou that I was not prepared to give him an answer on this at this time and that I would have to discuss it with you and Mr. Price before we could give him a definitive answer. In this regard, he wondered if as a minimum they could be allowed to at least remove the field welds on the two stub tubes. He had indicated that if we told him to continue to hold the stub tubes he would have them saved.

As a preface to his second question he noted that 10 weld and repair procedures had been developed. Eight of these have been finalized and he asked if he could informally submit one set of the eight now to allow us to continue our review. He indicated that the whole package on the problem would be submitted in early March. This is consistent with the information we received in Jersey Central's February 9 letter. I told Lou that I was not willing to comment on our attitude on receiving this information informally since, in my opinion, it interacted strongly with his first question. I agreed to talk to Don Rees about this on February 14.

As additional information he told me that regarding all the other items outstanding in our review, he expected to submit information on the existing half of these the first part of next week. The difficult half would be supplied in early March about the same time as the crack report program information. He finished the conversation by saying that they were filing this information in this manner in hopes of going to the April ACRS meeting.

cc: H. Mann
S. Levine
R. Tedesco
V. Stallo
R. Engelken

8 C:74

~~8304080108~~

in Roseley
Carlson

Jersey Central Power & Light Company

MADISON AVENUE AT PUNCH BOWL ROAD • MORRISTOWN, N. J. 07960 • 539-6111

February 9, 1968

Dr. Peter A. Morris, Director
Division of Reactor Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Subject: Oyster Creek Reactor Vessel Repair Program

Dear Dr. Morris:

We have, throughout the past several weeks, discussed on several occasions with you and your staff, as well as the ACRS, the problems associated with the reactor vessel at Oyster Creek. These discussions, which have been in the nature of interim status reports, supplemented by Amendment 29, Status Report on Reactor Vessel Repair Program, have been aimed at maintaining communication with the Commission and its consultants relative to this problem.

Our contractor, the General Electric Company, has developed a repair program along the lines set forth in the attached summary report which, you will note, General Electric states will be amplified by its detailed report submitted within about one month. We have advised General Electric that we have no objection to their proceeding with the repair program, and we understand that initial activities have begun.

REINFORM - REVIEW RESULTS OF THEIR REVIEW.

We and our consultants plan to review very carefully the detailed implementation of that repair program, including the quality control, inspection and test procedures employed by General Electric Company. We plan to submit, in the form of an amendment to the Oyster Creek operating license application, the detailed report submitted by General Electric Company.

Sincerely,

J. E. Logan

J. E. Logan
Vice President

JEL:ep
Enclosure

~~2301080102~~



GENERAL ELECTRIC COMPANY

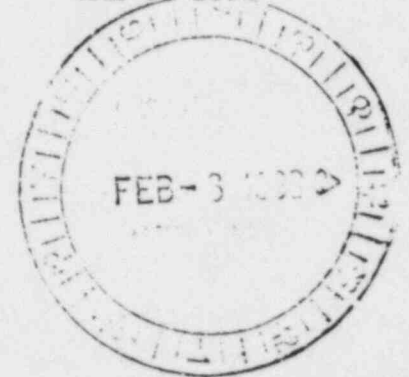
NUCLEAR ENERGY
DIVISION

175 CURTNER AVE., SAN JOSE, CALIF. 95125 . . AREA CODE 408, TEL. 297-3000, TWX NO. 910-338-0116

February 2, 1968

RAH-68-105

Jersey Central Project: Req. 303-91700
Subject: Oyster Creek Reactor Vessel Repair Program



Mr. G. H. Ritter, Vice President
Jersey Central Power & Light Company
Madison Avenue at Punch Bowl Road
Morristown, New Jersey

Dear Mr. Ritter:

General Electric investigation of the Oyster Creek reactor vessel problem has now developed to a point where we have completed the evaluation phases and are embarking on actual repair activities based upon the findings from such earlier activity. Our investigations conclude that the problem is, in fact, in the nature of that stated in earlier reports to you; namely, chemical activation of the surface of sensitized stainless steel stub tube material contained generally within high stress areas of the stub tube, the presence of defect containing field welds between the stub tubes and control rod housings, and minor defects contained within the welds between several of the in-core instrument tubes and the vessel.

Investigations

Careful and extensive examination of all areas of the reactor vessel have been carried out using liquid dye penetrant, ultrasonic and visual techniques. The scope and result of these examinations are summarized as follows:

1. Performance of carefully controlled dye penetrant examinations have revealed localized intergranular cracking in 123 stub tubes at the point of maximum stress, which is adjacent to the shop weld between the pressure vessel wall and the stub tube. Preliminary tests reported in Amendment 29 identified crack indications in 108 stub tubes at this location; the additional indications were minor in nature and were located near the center of the vessel where inspection is difficult and were of the type previously detected and reported.
2. Indications of shallow linear and non-linear rounded type defects have been found on the surfaces of 43 stub tubes by careful dye penetrant examination. These indications do not correlate with stress profiles, do reveal grain boundary attack, penetrate to a 5/32 inch depth in the maximum case and are extremely fine.

3. The field welds joining the stub tube and the control rod drive housings have been thoroughly surveyed using both dye penetrant and ultrasonic techniques. These studies indicate some level of defect--either porosity or localized lack of complete fusion--in each of the 137 field welds.
4. While not a major problem, slag inclusions were detected in a number of the welds attaching the flux monitor tubes to the reactor vessel bottom head through dye penetrant examinations and probe-grinding operations.
5. Subsequent to investigation of the aforementioned problem areas in the reactor vessel, further investigation of highly stressed areas or locations in which contaminants could potentially collect were initiated. These areas, which included recirculation suction piping, instrument nozzles, head spray welds, and various areas in the shroud support cone to the vessel welds, displayed no indications of defects through dye penetrant and ultrasonic examinations with the exception of three (3) minor surface indications located on internal surfaces of the vessel recirculation suction nozzle transition weld which were removed by shallow surface grinding. No defects were found in any other areas of the reactor vessel, with the exception of some minor localized weld lap indications at the intersection of the stub tube shop weld and the cladding which will be removed.

Evaluations

Based upon the facts set forth above, intensive evaluation of the reactor vessel defect problem was initiated by General Electric, its technical consultants, and Combustion Engineering, the reactor vessel supplier. These evaluations were broken down into specific functional phases aimed at investigation of metallurgical factors and performance of chemical and design analyses.

In the area of metallurgy, physical samples were taken from representative reactor vessel stub tube shop welds, stub tubes proper, and field welds. These samples were taken in locations indicating major defects, as well as locations which were expected to be representative of general stub tube conditions. Metallography relating to these samples was evaluated by both General Electric and Combustion Engineering and their respective consultants. Results of this metallography indicated the presence of intergranular attack of the stub tube areas both adjacent to the shop weld locations and in localized areas of the stub tubes proper. Metallography of the field welds which join the stub tube to drive housings showed indication of lack of complete fusion and, in some cases, porosity within the weld proper.

Mr. G. H. Ritter

- 3 -

February 2, 1968

The preliminary evaluation set forth in Amendment 29 which indicated that the subject problem appeared to be a combination of problems associated with welding of the field welds and stress assisted corrosion of the stub tubes has been fully verified by studies and evaluations conducted since issuance of the Amendment. A comprehensive survey has been conducted of the environment to which the vessel was subjected during its fabrication and field installation history. Although it has not been possible to establish a specific corrodant responsible for the problem, several chemicals which potentially have been in contact with the reactor vessel have been evaluated. Among these were those associated with shop fabrication operations, both shop and field hydrostatic testing, and field assembly and cleaning activities.

In order to evaluate as effectively as possible the potential chemical contaminants associated with the observed intergranular attack of the vessel stub tube material, control samples were taken of liquids collected in various local areas of the reactor vessel, as well as samples of the chemical solutions utilized in reactor vessel cleaning operations. Investigation was also made of materials utilized during shop fabrication operations and other environments to which the vessel was subjected throughout both its shop and on-site life.

Samples exposed to chemical cleaning solutions comparable to those actually utilized at Oyster Creek displayed no evidence of intergranular attack after a period of 160 hours at a temperature of 180°F.

All samples tested indicated freedom from attack with the exception of those sensitized 304 stainless steel material samples stressed above yield and subjected to aqueous solutions containing chlorides as low as ten parts per million at a temperature of 180°F. Such cracking was incurred in laboratory samples after exposure to the above conditions for forty-eight hours.

A careful evaluation of stress profiles has been conducted by General Electric, Combustion Engineering, and the Teledyne Corporation. In general, these evaluations conclude that:

- THRU NMPC ??
1. The highest operating tensile stresses occur in the cold pressurized condition.
 2. The stresses tend to be compressive in nature at the hot operating condition.

The shop weld between the stub tube and the vessel head included weld metal in excess of that required by design. Experience and measurements of the distortion indicate that the field weld between the stub tube and the CRD housing applied fabrication induced strains which exceed the elastic limit of the material on the "free" length of the "hill side" on the outer rows of the stub tubes. Experience also indicates that increasing the "free" length of the stub tube will reduce the fabrication strains. As a result of this conclusion, excess weld metal will be removed in selected areas.

Repair Action

Based upon the investigative and evaluation actions set forth above, decisions have been made to effect repair of the Oyster Creek reactor vessel as follows:

1. The stress-assisted intergranular cracks in the stub tube at the shop weld to stub tube juncture have been removed by grinding. Even though stress analyses indicate that only those ground configurations which exceed 3/16 inch in depth require deposition of weld metal, all ground configurations will be restored with 308L weld metal.
2. The fine cracks observed in the stub surfaces have been removed. However, these cracks are extremely fine in many cases and it is not possible to guarantee that all such cracks have been removed. While remote, it is also possible that remaining undetected cracks could bear a corrodant which in time could further propagate. To provide insurance against this remote eventuality, stub tube surfaces will be clad with a 308L weld metal overlay. This material is significantly more resistant than sensitized 304 stainless steel to stress-assisted corrosion attack.
3. As stated previously, the tensile strains resulting from fabrication or the cold pressurized condition are reduced as the "free" length of the stub tube is increased. The shop welds will be contour-machined to provide a minimum of 1/2 inch between the top of the shop weld and the bottom of the field weld.
4. Some level of defect, porosity or lack of complete fusion, is indicated in the field welds through the combination of dye penetrant and ultrasonic testing methods. It is difficult to establish with assurance the real significance of these findings in each instance. In the interest of advancing the Oyster Creek program, all field welds attaching the thimble to the stub tubes will be removed and replaced.
5. Slag inclusions in the flux monitor guide tube welds will be removed and the welds repaired with application of Inco 182 weld material.

In the composite, this program of modification and repair consistently, we believe, reflects a conservative approach to the integrity of the Oyster Creek pressure vessel and fully restores the pressure vessel to at least the original design and design intent.

We are initiating immediately the aforementioned repair action at Oyster Creek excepting those two specific stub tube locations which the Commission previously requested be retained in their original state. At an appropriate time when the repair schedule demands, these two stub tubes will also be repaired.

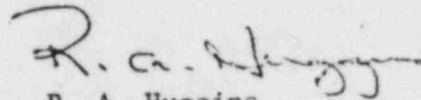
Mr. G. H. Ritter

- 5 -

February 2, 1968

Preparation of procedures and plans in support of this program is nearing completion. These procedures and plans, as developed, will be available for review with AEC Compliance personnel on site as the work progresses. We will further provide to the Commission and to the ACRS a final report in detail of the information supplied above. This report will be filed with the Commission in the form of an amendment to the Oyster Creek operating license application.

Sincerely,



R. A. Huggins
Principal Project Engineer
Oyster Creek Project

RAH:sa