

NOV 8 1967

Mr. John T. Conway  
Executive Director  
Joint Committee on Atomic Energy  
Congress of the United States

Dear Mr. Conway:

This letter describes a current problem at the Jersey Central Power and Light Company, Cyster Creek Plant, that may cause some delay in the construction schedule.

During the field hydrostatic pressure test of the pressure vessel and connected primary piping, a small leak was detected coming from one of the 137 control rod guide tubes. Inspection of the interior of the pressure vessel disclosed a circumferential crack approximately six inches in length in an Inconel seal weld between the control rod stub tube and the pressure vessel. The stub tube is basically an alignment tube for the control rod guide tube. The pressure vessel was fabricated by Combustion Engineering, Incorporated.

Dye penetrant examination of the other stub tube welds in the vessel following the discovery of the crack revealed positive indications of at least surface cracking in 107 of the remaining 136 welds. The cause and depth of the cracks have not been fully determined at this time; however, 13 of the welds have been ground and all of the cracks disappeared after less than one-fourth of an inch of the weld metal had been removed.

Since the cause and magnitude of the problem have not yet been determined, it is not known to what extent, if any, repairs will delay construction. As a minimum, corrective action will involve grinding out all of the observed cracks to determine their depth and direction. Furthermore, metallurgical examinations of weld samples and additional stress analyses must be conducted and evaluated. The General Electric Company and Combustion Engineering, Incorporated, are actively investigating this problem.

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Mr. John T. Conway

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Division of Compliance representatives and their metallurgical consultant were at the site on October 31 and November 1, 1967, for the purpose of reviewing the problem. Preliminary information indicates that the Niagara Mohawk Power Corporation has checked fifty percent of these welds in its pressure vessel and no cracks were detected. The Niagara Mohawk vessel was also fabricated by Combustion Engineering and the design and fabrication methods of the stub tubes are identical with the Oyster Creek vessel.

We will keep you informed of significant developments concerning this matter.

Sincerely yours,

Harold L. Price  
Director of Regulation

- bcc: Office of the Chairman (2)
- Commissioner Ramey
- Commissioner Tape
- Commissioner Johnson
- General Manager (2)
- General Counsel (2)
- Secretariat (2)
- R. D. O'Neill, OCR (2)
- P. A. Morris, DRL
- H. K. Shapar, GC
- W. G. Dooly, REG
- REG Reading File
- H. L. Price, REG
- C. A. Nelson, INS
- R. W. Kirkman, CO:I
- R. F. Fraley, ACRS
- E. G. Case, DRS
- J. J. Fouchard, PI
- M. Shaw, RDT
- L. Kornblith, Jr., CO
- L. D. Low, CO

*Handwritten:* Ward

*Handwritten:* See earlier concurrences

OFFICE ▶	CO	CO	DRL	GC	REG	REG	OCR
SURNAME ▶	JPO <sup>3</sup> Reilly:ej	LDLow	PAMorris		MMann	HLPrice	
DATE ▶	11/6/67	11/6/67	11/6	11/6		11/6/67	

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 G. H. Kelly

NOV 8 1967

MEMORANDUM FOR CHAIRMAN SHADORS  
 COMMISSIONER RUSBY  
 COMMISSIONER TATE  
 COMMISSIONER JOHNSON

SUBJECT: JERSEY CENTRAL POWER AND LIGHT COMPANY  
 OYSTER CREEK PLANT

Attached is a letter to the JC&E notifying them of the discovery of cracks in seal welds between the control and stub tubes and the pressure vessel of the Oyster Creek Plant of the Jersey Central Power and Light Company. This letter supplements the information which I gave you in our meeting on Wednesday, November 1, 1967.

(Signed) HLP

Harold L. Price  
 Director of Regulation

Attachment:  
 Copy JC&E Letter

cc: Secretariat (2), w/att  
 General Manager (2), w/att  
 General Counsel (2), w/att

bcc: R. D. O'Neill, OCR (2)      bcc: (continued)  
 P. A. Morris, DRL                      E. G. Cast, DRS  
 H. K. Shapar, GC                      J. J. Fouchard, PI  
 W. G. Dooly, REG                      M. Shaw, RDT  
 H. L. Price, REG                      L. Kornblith, Jr., CO  
 C. A. Nelson, INS                      L. D. Low, CO  
 R. W. Kirkman, CO:I                      REG Reading File  
 R. F. Fraley, ACRS

OFFICE ▶	CO JPO Reilly:ej	CO LDLow	DRL PAMorris	GC W	REG MMann	REG HLPrice
SURNAME ▶	RHengelken	LDLow	PAMorris	W	MMann	HLPrice
DATE ▶	11/2/67	11/2	11/3/67	11/2	11/3	11/6/67

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*LAST to Carline*  
*MOA*  
*G. [unclear]*

*Reck*

bcc: R. D. O'Neill, OCR (2)  
P. A. Morris, DRL  
H. K. Shapar, GC  
W. G. Dooly, REG  
H. Price, REG  
C. A. Nelson, INS  
R. W. Kirkman, CO:I  
R. F. Fraley, ACRS  
E. G. Case, DRS  
J. J. Fouchard, PI  
M. Shaw, RDT  
L. Kornblith, Jr., CO  
L. D. Low, CO  
REG Reading File

NOV 24 1967

DEPARTMENT FOR CHEMISTRY AND PHYSICS  
COMMISSIONER BERRY  
COMMISSIONER WARD  
COMMISSIONER JOHNSON

SUBJECT: JERSEY GENERAL POWER AND LIGHT COMPANY  
OYSTER CREEK PLANT

The attached letter to the JOAE provides additional information concerning the cracks in the control rod seal tubes in the pressure vessel of the Jersey General Power and Light Company, Oyster Creek Plant. The letter includes the information which I gave you in our meeting on Thursday, November 9, 1967.

(Signed) Marvin M. Mann *for*

Harold L. Price  
Director of Regulation

Attachments:  
Copy of JOAE Letter

cc: Secretariat (2), w/att  
General Manager (2), w/att  
General Counsel (2), w/att

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OFFICE >	CO	CO	DEL	GC	REG	REG
	JPO'Reilly:e	LDLow	PaMorris		MMann	HLPrice
SURNAME >	RHEngelken					
DATE >	11/16/67					

NOV 24 1967

Mr. John T. Conway  
Executive Director  
Joint Committee on Atomic Energy  
Congress of the United States

Dear Mr. Conway:

This letter provides you with current information concerning the cracks in the control rod stub tubes of the Jersey Central Power and Light Company's Oyster Creek Plant. This problem was brought to your attention in my letter of November 7, 1967.

The information at this time is still preliminary; however, certain additional facts have been ascertained from further investigation of the matter by the Division of Compliance during visits to the reactor site and to the metallurgical laboratory of Combustion Engineering, Incorporated. The additional information is as follows:

1. The cracks are not in the Inconel shop welds which join the stub tubes to the pressure vessel as it appeared during preliminary on-site inspections. Laboratory examinations of boat samples taken from the weld area of the stub tubes reveal that the cracks are in the stainless steel stub tubes.
2. The metallurgical examinations indicate that the cracks are intergranular and typical of cracks associated with stress corrosion. Additional information concerning the cause of the cracking is not yet available.
3. Seventy of the 108 positive indications of cracking in the stub tubes have been ground out. Corrective measures have not yet been established.
4. The source of the leak detected during the field hydrostatic test is now believed to be the field weld which joins the stub tube to the control rod guide tube. Porosity and lack of fusion have been detected in the field weld of the control rod guide tube which leaked during the test.
5. Sixty of the 137 field welds which join the stub tubes to the

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guide tubes have been reinspected with dye penetrant techniques. Fifty percent of the welds inspected have indications of porosity. The field weld on the tube that leaked has been ground down to the bottom of the weld. The indications of porosity and lack of fusion persisted through the entire depth of the weld.

In a letter to the Jersey Central Power and Light Company dated November 7, 1967, we requested a complete and comprehensive report on the results of their investigations into this matter. In addition, the Division of Compliance and their metallurgical consultant are directly involved in following this problem at the reactor site and at the Combustion Engineering metallurgical laboratory.

At this time a full evaluation of the significance of this problem is not possible. It does appear, however, that some delay in the completion of construction of this facility could result. We will continue to inform you of significant developments.

Sincerely yours,

(Signed) Marvin M. Mann *for*

- bcc: Office of the Chairman (2)
- Commissioner Ramey
- Commissioner Tape
- Commissioner Johnson
- General Manager (2)
- General Counsel (2)
- Secretariat (2)
- R. D. O'Neill, OCR (2)
- P. A. Morris, DRL
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- E. G. Case, DRS
- J. J. Fouchard, PI
- M. Shaw, RDT
- L. Kornblith, Jr., CO
- L. D. Low, CO

Harold L. Price  
Director of Regulation

OFFICE ▶	CO	CO	DRL	GC	REG	REG	OCR
SURNAME ▶	JPO'Reilly RHengelken	LDLow	HAMorris	MMann	MMann	HLPrice	
DATE ▶	11/16/67						

Dak R. Carlson

UNITED STATES GOVERNMENT

# Memorandum

TO : Robert L. Tedesco, Chief  
Reactor Project Branch 2, DRL

DATE: November 30, 1967

FROM : G. Lainas, RPB#2, DRL

*G. Lainas*

SUBJECT: MEETING WITH JERSEY CENTRAL POWER & LIGHT COMPANY - DOCKET NO. 50-219  
(DEFECTS IN REACTOR VESSEL CONTROL ROD DRIVE PENETRATIONS)

A meeting was held on November 22, 1967, with representatives of Jersey Central Power & Light Company, General Electric, Combustion Engineering and members of the staff. A list of persons attending is attached. The meeting was held to brief the staff as to the proposed method of repair of the defects found in the reactor vessel CRD stub tubes and associated field weldments. Leakage was noted from the CRD penetration during the field hydrostatic testing of the reactor vessel. The leak was traced to a field weld of the CRD stub tube to CRD housing. Subsequent inspection indicated cracks in the stub tube at the border of the stub tube to vessel shop weld.

## A. Stub Tube-To-Housing Weld

The failure of this field weld is attributed to faulty welding, i.e., a lack of fusion to the base metal. The remaining welds will be dye penetrant leak tested and spot and linear indications will be explored by grinding to a depth of 1/16 to 1/8 of an inch. If linear or spot indications remain, the weld will be completely removed and rewelded. (Note that the extent of spot indication was not clarified). A method of ultrasonic testing of the weld is being developed but it is not certain that it will be effective in detecting leaks for this configuration.

## B. Stub Tube Cracks

Intergranular cracks were detected in 108 of the 137 stub tubes at the toe of the shop weld (stub tube to reactor vessel). The cause of the cracks (some as deep but less than 1/4 inch) has not been completely evaluated. Complete penetration was not noted. Six samples were taken by "trepanning" and metallurgical and chemical analyses are being conducted. Investigation up to this time has not been conclusive although GE/CE feel that it is a form of stress corrosion.



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November 30, 1967

Other reactor vessels (Tarapur and Nine Mile Point) have been inspected, subsequent to their hydrostatic testing, and the stub tubes were found to be sound. These vessels utilize the same material and design of the stub tubes although they may not be dimensionally identical to the Oyster Creek tubes.

The cracks appear on one side of the stub tube where residual stresses due to welding are the highest. According to GE/CE, the residual stresses, however, cannot be calculated.

Samples of the flushing-hydrostatic test water have been taken from the bottom of the vessel and will be analyzed in an attempt to isolate the vehicle (chemical) that contributed to the stress corrosion. Chemical analysis of the sample material will also be conducted.

Although intergranular cracking is not a characteristic of the stub tube material (type 304 ss), the tube was sensitized at the time of heat treating the vessel and/or at the time of welding which could alter its characteristics with respect to corrosion resistance. GE/CE contend that stress corrosion could therefore be the cause of the defect. A program is being conducted to simulate the cracking in an attempt to determine the cause. A prototype model representative of the stub tube is being built and will be subject to the same welding, heat treatment and environment of the actual tubes.

Four additional cracks of low penetration (a few thousandths) was noted in the low stressed area of the stub tubes that GE/CE considers minor. UT inspection was done at the outer surface of all the tubes and no other cracks were indicated.

The proposed repair will consist of grinding the area until all linear indications are removed and reshaping the stub tube and weld contour to reduce residual stresses. A stress analysis is being conducted to assure that the reduction in wall thickness will not decrease the integrity of the tube for all mechanical and thermal loadings.

#### C. GE/CE Action Plan

In summary, GE and CE feel that the defects in the stub tube are due to intergranular stress corrosion taking place in the sensitized region of the tube. They are conducting metallurgical and chemical analyses of the defective region to determine the vehicle contributing to the failure. Residual stresses due to welding will be reduced

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by reshaping the weld contour and extending the length between housing and vessel welds. The cracks will be removed by grinding.

The following schedule was proposed:

1. Complete P. T. Examination and UT (sample)
2. Initiate weld repair (stub tube)
3. Evaluate and/or repair field weld
4. Continue metallurgical evaluation and examination
5. Complete prototype
6. Simulation of crack
7. Reports (by mid-December)

D. Staff Recommendation

At the conclusion of the meeting, the following comments were made to Jersey Central:

1. Since there is so little information available for our review, we can not really make any decision as to the adequacy of the proposed repair procedure.
2. Additional means of determining the integrity of field welds over and above dye penetrant testing should be developed including UT techniques.
3. The remaining stub tube and weld material (nine remain to be ground) should be retained for additional sampling.
4. A written and comprehensive report should be written and submitted as requested in our letter dated November 7, 1967. This report should include a safety evaluation of the components involved in terms of leakage during plant operation.

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Distribution:

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- DRL Reading
- RFB#2 Reading
- Orig: GLainas
- Branch Chiefs, DRL
- Assistant Directors, DRL
- R. Engleton
- J. O'Reilly
- R. Carlson ←
- V. Stello
- CO (2)

ATTENDEES

MEETING WITH

JERSEY CENTRAL POWER & LIGHT COMPANY

OYSTER CREEK

NOVEMBER 22, 1967

G. Lainas	DRL
R. L. Tedesco	DRL
V. Stello Jr.	DRL
D. Thompson	DRL
A. J. Rizzo	DRL
John French	DRL
P. Morris*	DRL
F. J. Liederbach	DRL
S. Levine*	DRL
A. B. Holt	DRS
E. G. Case*	DRS
F. Clemenson	DRS
G. W. Reinmuth	CO
R. H. Engelken	CO
J. P. O'Reilly	CO
H. R. Denton	CO
F. Nolan	CO
M. L. Ernst	CO
M. Mann*	REG
J. J. Chyle	Parameter
R. A. Huggins	General Electric
A. M. Hubbard	GE - APED
W. R. Smith	GE - APED
L. C. Koke	GE - APED
T. F. Robinson	GE - APED
T. M. Snyder	GE - NTD
Jay Bland	GE Mfg. Services
S. Yukawa	GE Schenectady
W. B. Bunn	Combustion Engineering, Inc.
T. M. Pierson	Combustion Engineering, Inc.
G. F. Trowbridge	Jersey Central Power & Light
W. W. Lowe	JCP&L (PLA)
W. R. Schmidt	MPR Associates

\*Part Time