



Carolina Power & Light Company

December 31, 1982

Office of Nuclear Reactor Regulation
ATTN: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
United States Nuclear Regulatory Commission
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
ENVIRONMENTAL QUALIFICATION

Dear Mr. Vassallo:

On November 30, 1982, a meeting was held with representatives from Carolina Power & Light Company (CP&L), Raychem Corporation, and the Nuclear Regulatory Commission (NRC) concerning the use of certain Raychem/Flamtrol cable at the Brunswick Steam Electric Plant, Unit Nos. 1 and 2. Specifically, the Raychem cable in question is unshielded multiconductor cable rated at 1000 V having a combined insulation thickness of 120 mils or greater.

As outlined by our December 15, 1982 letter, CP&L is committed to the performance of qualification testing for the Raychem cable that is on question and in use at the Brunswick Plant. We would like to meet with the Staff in January 1983 to review and discuss our proposed cable qualification test program. In addition, CP&L will provide the Staff with periodic updates of the progress of the cable qualification test program.

On December 15, 1982, the NRC transmitted to CP&L Technical Evaluation Report (TER) Items 164 and 165 on Raychem cable. TER Item 165 does not refer to the cable type in question; thus, CP&L considers the cable covered by TER Item 165 to be qualified based on previously referenced and supplied Raychem test reports. TER Item 164 discusses the cable types in question, and these cable types are listed in Enclosure 1. Based on the technical justifications provided in Enclosure 2 and our commitment to perform qualification testing as described in our December 15, 1982 letter, CP&L believes that continued operation of the Brunswick Plant is justified.

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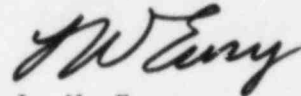
Mr. D. B. Vassallo

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December 31, 1982

If you should have any questions on this response, please contact our staff.

Yours very truly,



L. W. Eury
Senior Vice President
Power Supply

WRM/kjr (5896C10T2)
Enclosures

cc: Mr. S. D. MacKay
Mr. D. O. Myers (NRC-BSEP)
Mr. J. P. O'Reilly (NRC-RII)
Mr. J. A. Van Vliet (NRC)

ENCLOSURE 1

BURNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
RAYCHEM CABLE TYPES IN QUESTION

1.	7	conductor	# 12	AWG
2.	10	conductor	# 12	AWG
3.	12	conductor	# 12	AWG
4.	2	conductor	# 2	AWG
5.	4	conductor	# 2	AWG
6.	2	conductor	# 6	AWG
7.	4	conductor	# 6	AWG
8.	4	conductor	# 4	AWG
9.	2	conductor	# 8	AWG

ENCLOSURE 2

JUSTIFICATION FOR CONTINUED OPERATION BRUNSWICK STEAM ELECTRIC PLANT

TER ITEM 164 -- RAYCHEM/FLAMTROL CABLE

The cable in question is unshielded multiconductor Flamtrol control and power cable manufactured by Raychem Corporation, rated at 1000V with combined conductor and jacket insulation thickness of 0.12 inches or greater.

Flamtrol cable is a fire-retardant, radiation cross-linked cable utilized as control and power cable for certain safety-related electrical equipment at Carolina Power & Light Company's Brunswick Steam Electric Plant. It has been theorized that the use of an electron beam of insufficient energy by the manufacturer (References 1 and 2, hand delivered to Carolina Power & Light Company at the November 30, 1982 meeting with the Nuclear Regulatory Commission) resulted in inadequate penetration of the assembled cable to complete the cross-linking process and, as a direct consequence, caused a space charge buildup within some areas of the conductor insulation. The subsequent release of the space charge resulted in possible damage to the conductor insulation. (The space charge phenomenon and possible damage mechanism occurring in radiation cross-linked cable are discussed in detail in Appendix A to Reference 2).

The Franklin Research Center was tasked by the Nuclear Regulatory Commission to evaluate the possible detrimental effects of the space charge phenomenon (References 1 and 2). This evaluation resulted in a recommendation that Carolina Power & Light Company establish the functional capability of the suspect cable through applicable qualification testing.

This enclosure provides justification for continued operation until that functional capability has been established.

It should be noted that the suspect cable is not subject to immediate catastrophic failure when exposed to loss-of-coolant accident (LOCA) conditions. An increase in leakage current could be realized through the defective areas of the conductor insulation; however, IR measurements of the cable would have to decrease below 50K ohms resistance prior to possible failure of the cable's control and/or power function. Additionally, the cables are currently utilized at less than 50% rated voltage at the Brunswick Steam Electric Plant.

An extensive surveillance program was established by Carolina Power & Light Company in 1978 to monitor for degradation of the in-plant Flamtrol cable. This program consisted of making and recording annual IR measurements with a 1000 V dc megger on cable spares located throughout the Brunswick Steam Electric Plant. Each conductor was tested to all other conductors and ground. Investigation action was taken for any IR measurement less than 500 megohms.

From 1978 through 1980, there were a total of 12 cables with measured IR values less than 500 megohms. It was observed in each case that the conductors of these cables were wet or shorted together outside the jacket insulation, i.e. the bare ends of individual spare conductors were in contact. In 1981, all cables had IR values of 1000 megohms or greater.

An evaluation of this historical IR measurement test data on the 81 samples of spare Raychem Flamtrol cables indicate that no degradation in dielectric strength has occurred since program establishment. Additionally, a review of plant maintenance records revealed no failures attributable to cable insulation degradation.

The IR measurement program and maintenance record review confirms Franklin Research Center's "...engineering opinion that insulated Flamtrol cable having combined insulation thickness of 0.12 inches or greater can perform adequately under normal service conditions,..." (Reference 2).

For accident conditions, each Brunswick unit should be considered as having two separate areas, the reactor building and primary containment (drywell).

For LOCA conditions, Class 1E equipment within the reactor building would be subjected to an increase in radiation exposure only. The increase in radiation exposure without sustained high levels of moisture would not create the conditions necessary for cable failure through the suspected defect.

The LOCA conditions within the drywell could be contributory to cable degradation. The suspect cables used in safety related systems within the drywell are 7 conductor 12 AWG, 10 conductor 12 AWG, and 12 conductor 12 AWG only.

All Class 1E safety related equipment within the drywell serviced by the suspect cable has been reviewed with the following results:

1. None of the valves in the Automatic Depressurization System (ADS) are controlled or supplied power by the suspect cable and, therefore, can be considered continuously available for accident mitigation.
2. The components actually serviced by this cable perform their safety related function within a short time of sensing the accident parameter. There are 24 valves located within the drywell that are serviced by the suspect cable; all 24 of these are inboard isolation valves. Of the 24 valves four (4) have been rendered permanently inoperable and locked in position (due to other considerations), eight (8) are passive (not required to change position), and ten (10) valves actuate in less than 4 minutes after the accident is detected. The remaining two (2) valves (HPCI steam supply isolation inboard and RCIC steam supply isolation inboard) will stay open for accident mitigation (less than 12 hours) and then will be required to close. Failure of any of these 24 valves to operate upon demand will not adversely affect plant safety due to backup (outboard) isolation valves which would not be affected by these conditions.

Therefore, the suspect cable will not impede the mitigation of a loss-of-coolant accident at the Brunswick Steam Electric Plant.

In the event the plant is subjected to a high energy line break, only the equipment within the reactor building would be affected. The conditions would consist of a temperature peak of approximately 295°F decreasing rapidly to near normal conditions, a maximum pressure peak of 7 psig, and relative humidity of 100% for only a short period of time. The peak pressure and humidity combination are not sustained sufficiently to produce enough moisture intrusion through the cable insulation such that degradation of the insulation is significant.

Therefore, based upon the IR measurement program, maintenance record review, and evaluation of safety related functions, the suspect Raychem Flamtrol cable is justified for continued operation pending the establishment of the functional capability of the cable by qualification testing of representative specimens from the Brunswick plant.

REFERENCES

1. Investigation of Raychem Cable installed in the Brunswick Plant, Phase 1 - Preliminary Evaluation and Test Plan, Franklin Research Center Report No. 1-C-5260-3012-1 of October 23, 1981.
2. Investigation of Raychem Cable installed in the Brunswick Plant, Phase 2 - Evaluation and Test Recommendation, Franklin Research Center Report No. F-C-5569-3002 of June 30, 1982.