Safety Analysis of Proposed Modification of Pressurizer Instrument Terminal Blocks Presented to PORC and NSARB on Jan. 31, 1978.

1.0 SCOPE OF ANALYSIS

This analysis addresses the effects on plant safety of replacing the existing Buchanan terminal blocks used in the pressurizer pressure and level indication circuits with Westinghouse Type 542247 (805432) terminal blocks. The reason for making this change of components is to provide a terminal block which has demonstrated capability to function in the containment environment resulting from a LOCA or MSLB. The existing Buchanan terminal blocks have no qualification documentation. The subject terminal blocks are located in the Containment Vessel basement, elevation 236', outside the pressurizer shield wall. The circuits involved are those associated with PT's-429, 480, 431, and 449, and LT's 428, 426, 427, 433.

2.0 REFERENCES

2.1 IE Bulletin No. 78-02, January 30, 1978.

2.2 R.E. Ginna FSAR, Appendix 6-E.

2.3 Connecticut Yankee Atomic Power Company.
Letter to L.D. Davison from C.R. Pitman, dated January 28, 1978; Subject, Franklin Institute (FI) Test on Westinghouse Terminal Block.

2.4 Connecticut Yankee, Plant Design Change Request No. 270, Technical Review, signed by L.D. Davison

2.5 Westinghouse Electric Corp., Test Report on the Effect of a LOCA on the Electrical Performance of Four Terminal Blocks, Report # PEW-TR-83, dated September 13, 1977.

2.6 Memo from R. Mattson, Director, Division of Systems Safety, ONRR, USNRC, et al, from R. Tedesco, Assistant Director for Plant Systems, DDS, USNRC.

3.0 SAFETY ANALYSIS

3.1 A review has been made of all events analyzed in the Ginna Station FSAR and the events requiring analysis by USNRC R.G. 1.70. The events related to this modification are:

1. Major and minor fires
2. Seismic events
3. The loss of coolant accident
4. The Main Steam Line Break Accident

3.2 The modification does not increase the possibility of or impact of a fire.

3.3 The modification is designated seismic Category I and therefore operability during and following the SSE must be assured. This is implemented by properly securing the new terminal blocks in a workmanlike fashion. The terminal blocks are lightweight and therefore seismic stresses are negligible.

3.4 Loss of coolant accident. The pressurizer pressure and level indication circuits are not required to function following a large break. Typically, containment pressure initiates safety injection and no credit is taken for reactor trip.

For smaller breaks, the pressurizer instrumentation may be required for system control. The instrumentation, in any case, is required for trip initiation, within the first half hour of a break. Qualification for this time period is assured as is described in the following paragraphs.

3.4.1 Pressure, temperature, radiation. The following table provides a comparison of test results from Connecticut Yankee (refs. 2.3 and 2.4) and Westinghouse (ref. 2.5) with the Ginna environmental design parameters (ref. 2.2).

	C.Y.	W	RG&E
Pressure, psig	40	106 to 91	60
Temperature, °F	285	340 to 329	286
Radiation, rad	---	2×10^7	2×10^7 rads no reached until 14 hours

The C.Y. tests were of 24 hours duration while the W tests were of 5 hours duration. Thus, the tests performed by Westinghouse provide assurance that the instrumentation will survive the pressure, temperature, and radiation levels for a sufficient length of time to perform their intended function.

3.4.2 Steam environment. References 2.3, 2.4, and 2.5 provide assurance that the terminal strips will function for the required length of time in the Ginna steam environment. A review of Reference 2.5 indicates that the terminal strips to be installed, Westinghouse Type 542247, have functioned for 2 hours at 340°F and subsequently functioned under borated spray water.

3.4.3 Chemical spray. The installation at Ginna will be in enclosed cabinets, thereby providing protection against spray. Assurance is provided in the installation that sufficient cabinet vent area exists so that the cabinet will not collapse due to the sudden external pressure. The cabinets will be thoroughly inspected to assure that there are no openings in the cabinets at a level which would subject the terminals to caustic spray.

3.4.4 Submergence. Inasmuch as the transmitters and terminal strips are located in the basement, submergence is addressed. The terminal blocks are located above the lowest transmitter. The bottom of the lowest transmitter is approximately 23" above the floor level. The volume of the containment sumps is 4050 ft^3. Since the total pressurizer volume is 800 ft^3 (steam plus water volume) and based upon a review of pressure transient data, in the event of a major loss of coolant accident low level and low pressure trips would be actuated well before submergence would occur. For very small leaks, sump level would provide the operator with sufficient time to take appropriate action prior to submergence. For example, a 70 gpm leak, the maximum flow of the changing pumps, would not fill the sumps for 8 hours.

3.5 Steam line break inside containment. Pressurizer pressure and level trips are required for certain trips following a steam line break. Qualification for a period of time sufficient to initiate the trips is assured as described in the following paragraphs.

3.5.1 Pressure. The Ginna FSAR demonstrates that the peak pressure from a steam break is less than the peak pressure from a loss of coolant accident. The discussion in paragraph 3.4.1 assures acceptable performance.

3.5.2 Radiation. Since no fuel failures or release of primary coolant is predicted for a steam break, paragraph 3.4.1 assures acceptability of the terminal strips.

3.5.3 Steam and chemical sprays. The discussion in paragraph 3.4.2 and 3.4.3 is applicable and bounds the steam break conditions. Therefore, acceptability of the terminal strips is assured.

3.5.4 Submergence. Calculations have shown that the entire water volume of the secondary side, including hot wells, feedwater heaters, piping, air ejector, and steam generators, at normal operation, is 103,315 gallons. If one assumes a basement floor free area of 6000 ft^2 (a lower bound on the best estimate of 6667 ft^2), the water level in the containment basement is below the lowest transmitter even after the entire secondary side inventory is dumped to containment. Prior to emptying the secondary side, the transmitters will have performed their function.

3.5.5 Temperature. A recent NRC memo (ref 2.5) indicates that peak containment temperature following steam line break may exceed, for a brief period of time (about 100 secs.), the LOCA peak temperature. Ref 2.5 reports that this temperature may, for Westinghouse PWR's, be as high as 340°F. Paragraph 3.4.1 and

ref 2.5 provide assurance that the transmitter will function for the required period of time. Additional assurance of acceptable operation is obtained as follows. The pressurizer instrumentation is located remotely from the steam lines. Thus, temperatures in the vicinity of the pressurizer instrumentation should be lower than those near the steam lines. Heat transfer consideration will cause the temperature of the terminal strips to lag the steam-air mixture temperature in the immediate vicinity of the terminal block, which in turn should lag the temperature outside the cabinet. Finally, the trip signals may be generated early in the temperature transient. Thus, there is reasonable assurance that the terminal blocks will provide their necessary function in the post steam break temperature environment.

3.6 Exposure to other hazards. It has been confirmed by inspection that there is no chemical or water piping close to the pressurizer instrument enclosures which could result in a spray or deluge. Effects from containment spray are addressed in section 3.4.3.

3.7 Alternative indication. If necessary, a standard pressure gauge can be installed on the primary coolant sample line, in the sampling room outside of containment, to display primary pressure directly. The wide range pressurizer level indication circuit (LT 433) is functionally independent of the three pressurizer control system level transmitters (LT 426, LT 427, LT 428), but is located in one of the enclosures

(with PT 431) and utilizes a terminal block similar to the others.

Sample lines from both liquid and steam space in the pressurizer are accessible outside containment. If necessary these sample lines could be used to monitor pressurizer level and pressure.

4.0 PRELIMINARY SAFETY EVALUATION

The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety, previously evaluated in the safety analysis report will not be increased by the proposed modification.

The possibility of an accident or malfunction of a different type than any evaluated previously in the safety analysis will not be created by the proposed modification.

The margin of safety as fefined in the basis for any technical specification will not be reduced by the proposed modification.

The proposed modification does not involve an unreviewed safety question or require a Technical Specification change.