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 FACIL:50-261 H. B. Robinson Plant, Unit 2, Carolina Power and Ligh 05000261
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UTLEY,E.E.   Carolina Power & Light Co.
  RECIP.NAME   RECIPIENT AFFILIATION
ROSS,D.F.   Division of Project Management

SUBJECT: Forwards response to 791227 ltr requesting info re mods to
         small break loca operator guide lines.Procedures will be
         revised to require 40 F min subcooling margin.Supporting
         data encl.

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January 23, 1980

FILE: NG-3514(R)   SERIAL NO.: NO-80-112

Mr. Denwood F. Ross, Jr., Acting Director
Division of Project Management
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, D.C. 20555

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H. B. ROBINSON STEAM ELECTRIC PLANT UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
MODIFICATIONS OF SMALL-BREAK LOSS-OF-COOLANT ACCIDENT OPERATOR GUIDELINES

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Dear Mr. Ross:

In your letter of December 27, 1979 to Mr. Cordell Reed of Commonwealth Edison, Chairman of the Westinghouse Owners' Group, you requested that each utility utilizing the Westinghouse small break LOCA guidelines as revised on December 21, 1979, supply certain information associated with the guidelines. In accordance with that request, Carolina Power & Light Company (CP&L) hereby provides the required information for its H. B. Robinson Unit No. 2 plant.

With regard to auxiliary feedwater flow, addressed in paragraph two of your letter, CP&L has verified that the Technical Specification value of 300 gpm is applicable following a transient requiring operation of auxiliary feedwater. No restrictions are placed on this flow value due to water hammer or other considerations until the plant is well toward a shutdown or cooldown condition. The Robinson plant procedures do not include the AFW flow requirement stated in the December 21, 1979 guideline revision since it is a low pressure HPI plant. Thus, current procedures require steam generator level to be within the narrow range instrumentation prior to HPI termination.

With regard to documentation of errors and their source used to develop subcooling criterion, the attached information describes the calculational methods used to determine the minimum subcooling required for safety injection termination. The present plant procedures require a 65°F minimum subcooling due to the lateness of revised guidelines arriving on site, which necessitated using conservative assumptions for instrumentation errors. In accordance with the calculated error value in the attachment of 17.5°F and the stated requirement in paragraph four of your letter to maintain 20°F actual subcooling, we intend to revise our procedures to use a value of 40°F minimum subcooling.
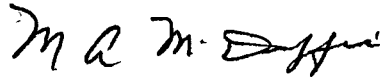
With regard to documentation and justification of revisions to procedures for timely termination of HPI for non-LOCA events, the following applies: Currently, the non-LOCA transients and Emergency Operating Instructions are being reviewed for the purposes of incorporating a subcooling criterion in the HPI termination criteria. These activities will be completed and transmitted to the NRC by the Westinghouse Owners' Group Chairman by January 23, 1980.

With regard to IE Bulletin 79-27, CP&L's review of that bulletin is continuing, and we will report the results of our review by the required date.

We trust the above information is suitable for your use.

Yours very truly,

for E. E. Utley
Executive Vice President
Power Supply & Customer Service

JJS/jcb

cc: Mr. J. D. Neighbors (NRC)

JUSTIFICATION OF RCS SUBCOOLING SETPOINTS

ASSUMPTIONS:

    1.   The operator will be using narrow range (1700-2500 psig) reactor coolant system pressure (pressurizer pressure) when referring to the saturation tables.

    2.   The temperature indication used will be wide range T_{Hot} RTD or incore thermocouples.

Note: The errors and calculations shown are based on the Rosemount Model 1153 Series "A" pressure transmitter. These transmitters will be installed to replace the existing transmitters which cannot be proven to meet qualification requirements for the expected containment environment conditions during accidents. All errors associated with the transmitter (except post accident environmental performance characteristics) are the same for both types of transmitters. These transmitters are being replaced as part of a previous commitment to the NRC.

I. ERRORS IN INDICATED NARROW RANGE PRESSURE

Normal transmitter reference accuracy (includes linearity, hysteresis and repeatability) (Rosemount model 1153A specification PAM ET)	±.25% of span. ±.25% of 800 psi. ±2 psi.
Accuracy of dead weight pressure testor used in calibration (Mansfield & Green type T-50 specification PAM ET)	±.1% of full scale. ±.001 of 5000 psi. ±5 psi.
Allowed calibration tolerance (H. B. Robinson Maintenance Instructions and Practices)	±.5% of span. ±.005 of 800 psi. ±4 psi.
Ambient temperature effects on transmitter (mounted in a cubicle maintained at 140°F)	Negligible. ±0 psi.
Maximum transmitter drift (Rosemount model 1153 A specification PAM ET)	±.25% of span. ±.0025 of 800 psi. ±2 psi.
Isolation amplifier accuracy (Control and Protection Instrumentation System Manual)	±.1% of span. ±.001 of 800 psi. ±.8 psi.
Ambient temperature effects on isolation amplifier (mounted in an air conditioned room)	Negligible. ±0
Normal indicator accuracy (International Instruments model 2520)	±2.0% of span. ±.02 of 800. ±16 psi.

Indicator reading error $\pm 1/4$ of smallest
                                                                     division.
                                                               $\pm .25$ of 20 psi.
                                                               ± 5 psi.

Maximum Normal Instrument Error: Calculated using the square root of the sum
   of the squares method described in letters TMI-OG-132, dated December 27,
   1979; TMI-OG-131, dated December 27, 1979; and authorized in NRC letter
   from D. F. Ross, Jr. to Cordell Reed, dated December 27, 1979.

$$PE_N = \sqrt{2(2)^2 + 2(5)^2 + 4^2 + .8^2 + 16^2}$$

$$PE_N = \pm 18.2 \text{ psi}$$

Abnormal Environment Induced Transmitter Error: The maximum H. B. Robinson
   containment vessel temperature for the worst case LOCA is 265°F. For a
   small break, in which the RCS pressure could resonably be expected to
   remain above 2000 psi (this is a low head SI pump plant), the effect
   on containment temperature will be much less. Plus, the narrow range
   RCS pressure transmitters are located in heated cubicles and would not
   be directly exposed to spraying steam. For the above reasons the actual
   effect caused by abnormal containment environments is expected to be
   negligible.

   However, for conservatism an additional $\pm 2\%$ error will be added. This
   was selected based on Rosemount Inc., Nuclear Steam Test Performance
   Evaluation, model 1153 GA 9, RMT Report No. 37821, Rev. B. As shown
   in this test, the steady state error induced during long term exposure
   to a 250°F environment was $\pm 2.0\%$.

$$PE_A = \pm .02(800 \text{ psi})$$

$$PE_A = \pm 16 \text{ psi}$$

$$PE_T = E_N + E_A$$

$$= 18.2 + 16$$

$$PE_T = 34.2 \text{ psi}$$

As shown in Rosemount Inc., qualification test report for Rosemount
pressure transmitters, model 1153 series "A", RMT Report No. 3788, the
radiation induced error is negligible. For transmitters exposed to
5×10^5 R/HR for a total dose of 44×10^6 Rads the maximum error induced
was .46%. Therefore, for the radiation levels expected during a small
break LOCA, the radiation induced error can be assumed to be negligible.

II. ERRORS IN INDICATED TEMPERATURE

A. T_H Wide Range Instrument

Process measurement error (Robinson Plant Engineering Specifications)	3°F at 500°F ± 3°F
RTD Reference Calibration Curve Accuracy (Robinson Plant Engineering Specifications)	$\pm .2$°F
Accuracy of current testor used in calibration (Robinson Plant maintenance instructions)	$\pm .15$% of setting. $\pm .15$% of 700°F. ± 1.05°F
Allowed calibration tolerance (Robinson Plant maintenance practices)	$\pm .5$% of span. $\pm .005$ of 700. ± 3.5°F
Transmitter gain stability (Control and Protection System Technical Manual)	$\pm .1$% of span. $\pm .001$ of 700. $\pm .7$°F
Ambient temperature effects on instrument (located in air conditioned space)	Negligible.
Strip chart recorder error (information not available in technical manual. Thus this error assigned to be consistant with other Westinghouse design plants)	± 2.0% of full scale. $\pm .02$ of 700. ± 14°F.
Indicator readout error	$\pm 1/4$ of smallest division. $\pm .25$ of 10°F. ± 2.5°F.

Maximum Normal Temperature Error (T_H RTD)

$$TE_N = \sqrt{3^2 + .2^2 + 1.05^2 + 3.5^2 + .7^2 + 14^2 + 2.5^2}$$

$$TE_N = 15°F$$

Errors induced by abnormal containment environments and high radiation levels have been shown to be small for RTD's. Therefore, the error induced during the small LOCA situation, for which this evaluation is being done, is considered negligible.

B. Incore Thermocouple Accuracy

Thermocouple Reference Accuracy (TMI-OG-132)	± 3°F

Calibration Accuracy	$\pm.75\%$
(TMI-OG-132)	$\pm.0075$ of 700°F.
	±5.25°F.

Instrument Accuracy	$\pm1\%$ of span.
(TMI-OG-132)	$\pm.01$ of 700°.
	±7°F.

Maximum Instrument Drift	$\pm1\%$ of span.
(TMI-OG-132)	$\pm.01$ of 00°F.
	±7°F.

Maximum Normal Temperature Error (Incore T/C's)

$$IE_N = \sqrt{3^2 + 5.25^2 + 7^2 + 7^2}$$

$$IE_N = 11.6°F$$

Errors induced in indicated temperature by abnormal containment environment and high radiation levels have been shown to be small for thermocouples. Therefore, the error induced during the small LOCA situation, for which this evaluation is being done, is considered negligible.

III. CALCULATION OF SUBCOOLING MARGIN REQUIRED

Note: Calculated based on the calculated RTD error only, since the RTD error is larger.

Assumption: Indicated Pressure = 2000 psig.

Calculation of temperature error due to pressure error:

T_{SAT} (2015 psia)	=	636.9°F
T_{SAT} (2015 psia - 34.2 psi)	=	$-\underline{634.4}$
TE_S (Error)	=	2.5°F

(Saturation temperatures determined from 1967 ASME Steam Tables)

Total Temperature Error Affect for Subcooling:

$$TE_T = TE_N + TE_S$$

$$TE_T = 15°F + 2.5°F$$

$$TE_T = 17.5°F$$

Letter TMI-OG-131, dated December 27, 1979 requires that the minimum total error be no less than 30°F. However, the NRC in D. F. Ross' letter of December 27 required that 20°F of actual subcooling be assured prior to termination. As a result, a 40°F minimum subcooling cirteria will be used as a part of the safety injection termination criteria in the H. B. Robinson Plant Emergency Instructions.

Note: Letter TMI-OG-137, dated January 2, 1980 states that letter TMI-OG-131 is applicable to plants with low head safety injection pumps.