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AEP:NRC:00271

Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
Response to IE Bulletin No. 79-21

Mr. James G. Keppler, Regional Director
U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region III
Glen Ellyn, Illinois 60137

Dear Mr. Keppler:

The attachment to this letter contains the information requested in IE Bulletin No. 79-21 concerning the effects of containment temperature on safety-related level monitoring systems. The item numbers utilized in our response correspond to those used in the Bulletin.

As the information contained herein is being submitted in response to a written request for information by the NRC staff, IMPCo interprets 10 CFR 170 as requiring that no fee accompany this submittal.

Very truly yours,

R. S. Hunter
Vice President

RSH:em

cc: R. C. Callen
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ATTACHMENT TO AEP:NRC:00271

RESPONSE TO IE BULLETIN NO. 79-21

"TEMPERATURE EFFECTS ON LEVEL MEASUREMENTS"

Response to Item No. 1

The liquid level monitoring systems inside containment used to initiate safety functions or to provide post-accident monitoring information are the Steam Generator Narrow-Range Water Level (SG Level) and Pressurizer Level (PZR Level) systems.

The SG level reference leg is a conventional condensing pot open column system contained entirely within the lower volume of the containment. The PZR level high side reference leg is a sealed bellows type filled with distilled water and is contained partially in the lower volume and partially in the upper volume of the containment. The PZR level low side reference leg is a conventional open column system entirely contained in the lower volume of the containment.

Response to Item No. 2

The effects of post-accident temperatures on the indicated versus actual water levels have been evaluated. These effects are shown in the attached tables. The biases shown in these tables account for the heatup of the level system reference legs and the resulting change in reference leg fluid density at various system pressures.

The effect of boiling or flashing in the reference leg has been evaluated by Westinghouse on a generic basis for ice condenser plants, such as the Cook Plant, which have spray capability in the lower containment volume.

The results of the Westinghouse evaluation show that reference leg boiling will not occur.

Response to Item No. 3

Two safety actuation functions are derived from the SG narrow-range level monitoring system. The "SG Level Low-Low" setpoints were modified from 11% to 15% and from 17% to 21% of narrow-range instrument span for Unit Nos. 1 and 2, respectively. These setpoint modifications were completed during unit outages in June, 1979. The level bias associated with reference leg heatup is of insufficient magnitude to have any adverse effects during periods of high SG water level operation.

The 4% increase in the "SG Level Low-Low" setpoints are based on an evaluation performed by Westinghouse. The Westinghouse evaluation shows that the peak containment temperature prior to Containment pressure reaching the "Containment Pressure-High" setpoint is approximately 200^{o}F.

As stated by Westinghouse in their 10 CFR 21 report, the only design basis event for which "SG Level Low-Low" is the initiating signal is the Feedwater Line Rupture. It should be pointed out that several other trip setpoints might be reached prior to "SG Level Low-Low", such as: "Pressurizer Pressure-High" (not assumed operable in the safety analysis for "calculational convenience"), "Containment Pressure-High", and Differential Pressure in Two Steam Lines-High". It should also be noted that the peak containment temperature of 328°F shown on Table No. 1 corresponds to an instantaneous double-ended rupture of a main steam pipe.

The peak containment temperature following a Feedwater Line Rupture would be somewhat less than 328°F. Furthermore, in an Ice Condenser containment, temperature peaks are of short duraction due to the large heat removal capability of approximately two and one-half million pounds of ice.

The "Pressurizer Level High-High" function is part of the Reactor Protection System logic. However, no credit was taken for this actuation function in the safety analyses and no setpoint revisions are necessary. An acceptable range of indicated Pressure Level has been established to accommodate the level bias discussed herein. Adherence to these limits will assure that the pressurizer heaters remain covered and that the pressurizer does not go water solid.

Response to Item No. 4

The operators have been informed of the potential for non-conservative bias in indicated water level due to increased containment temperature. The existing procedures governing maintenance of SG level following an accident are adequate and have not been revised. The procedures governing maintenance of PZR level have been revised to incorporate the limits discussed above. No further procedural revisions are planned.

TABLE 1

Correction to indicated water level for Reference Leg Heatup effects due to post-accident containment temperatures.

Containment Temperatures °F	Correction to Level % Span		
	Pressurizer Units 1 & 2	Steam Generator Unit 1	Steam Generator Unit 2
120(1)	- 0.45	- 0.45	- 0.45
213(2)	- 4.3	- 4.4	- 4.5
280	- 8.1	- 8.65	- 8.75
328(3)	-10.68	-11.65	-11.77

Basis:

	Calibration Pressure psia	Calibration Temperature Ref. Leg °F	Height of Ref. Leg X Level Span
Pressurizer	2250	90	1.0058
Steam Generator			
Unit 1	758	106	1
Unit 2	830	106	1

Notes:

(1) Maximum Limiting Condition for Operation Containment Temperature

(2) Containment Temperature at which Reactor Trip is Initiated

(3) Highest Containment Temperature for Double-Ended Steam Line Break

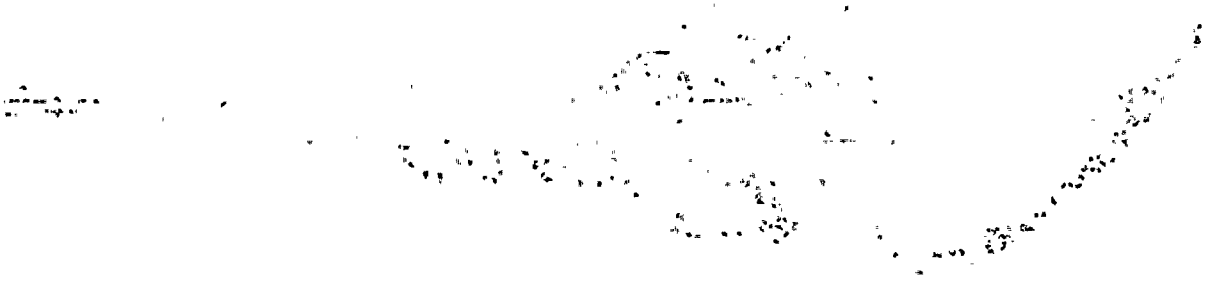

TABLE 2

Corrections to allowable indicated pressurizer water level for Reference Leg Heatup and Pressure changes following a high-energy line break.

Indicated Pressurizer Pressure Psia	Minimum Allowed Indicated Level[2] % of Span		Maximum Allowed Indicated Level[3] % of Span
	10 Min. to 10 Days	After 10 Days	
500	5.4	3.9	- 4.0
1000	5.4	3.9	- 4.0
1750	3.6	2.0	- 4.0
2500[1]	0.0	0.0	- 4.0

Basis:

Calibration Pressure	2250 psia	
Calibration Temperature	90°F	
Height of Ref. Leg	1.0058 X Level Span	
Maximum Temperature °F	10 min. to 10 days	168
	After 10 days	116

Notes:

(1) Safety Valve Actuation Pressure

(2) To Maintain Level Above Heaters

(3) To Prevent Actual Water Level Causing Water-Solid Conditions

TABLE 3

Correction to allowable indicated steam generator water level for Reference Leg Heatup and Pressure changes following a high-energy line break.

Indicated Steam Generator Pressure Psia	Minimum Allowed Indicated Level[2] % of Span		Maximum Allowed Indicated Level[3] % of Span
	10 Min. to 10 Days	After 10 Days	
	Unit 1/Unit 2	Unit 1/Unit 2	
15	2.5/2.5	0.5/0.5	- 4.0
100	4.0/4.0	2.0/2.0	- 4.0
500	2.5/4.0	0.5/2.0	- 4.0
1100[1]	0.0/0.0	0.0/0.0	- 4.0

Basis:

	Unit 1	Unit 2
Calibration Pressure - psia	758	830
Calibration Temperature, °F	106	106
Height of Ref. Leg x Level Span	1	1
Maximum Temperature °F 10 Min. to 10 Days	168	168
After 10 Days	116	116

Notes:

(1) Safety Valve Actuation Pressure

(2) To Maintain Water Level Above Tube Sheet

(3) To Prevent Actual Water Level Causing Water-Solid Conditions