NSP

NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

September 14, 1979

Mr. James G. Keppler
Director - Region III
Office of Inspection and Enforcement
United States Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Mr. Keppler:

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Dockets No. 50-282 and No. 50-306

In response to IE Bulletin 79-21, the following is offered:

1. The following liquid level measuring systems inside containment are used to initiate safety actions or are used to provide post-accident monitoring information:

   a. Steam Generator Narrow Range Water Level (Three Channels per Steam Generator)

      The narrow range channels employ an open reference leg with condensate pot located at the elevation of the upper tap. A Foxboro Model E13DH-SAM1 transmitter measures differential pressure and provides initial level signals. These channels provide the following safety action inputs for either steam generator:

      - Turbine trip and feedwater isolation on high-high steam generator water level (2/3 logic).

      - Reactor trip on low steam generator water level in coincidence with steam flow - feed flow mismatch (1 of 2 level plus 1 of 2 flow logic).

      - Reactor trip on low-low steam generator water level (2 of 3 logic).

      - Auxiliary feedwater pump initiation on low-low steam generator water level (2 of 3 logic).

      - Post-accident monitoring function.

b. Steam Generator Wide Range Water Level

The wide range channels also employ an open reference leg with condensate pot located at upper tap level. A Foxboro Model 13DH-SAH1 transmitter measures differential pressure and provides initial level signals. The only safety function of these channels is to provide post-accident monitoring.

c. Pressurizer Water Level (Three channels)

The pressurizer level channels employ a sealed reference leg with an open condensate pot located at the level of the upper tap. A Barton Model 386/351 sealed reference leg DPU and transmitter provides initial level signals. These channels provide a high level reactor trip signal (2/3 logic) and may be used for post-accident monitoring.

2. Evaluation of the effect of post-accident conditions on indicated water level (See Section 1 for Safety Functions)

a. Reference Leg Heatup

High energy line breaks inside containment can result in heatup of level measurement reference legs. Increased reference leg water column temperature will result in a decrease of the water column density with a consequent apparent increase in the indicated water level (i.e., apparent level exceeding actual level). Results of our analysis are shown in Table 1 (for Steam Generator Narrow and Wide Range) and 2 (for Pressurizer).

b. Reference Leg Boiling

Boiling cannot occur in a sealed reference leg (Pressurizer); and, according to Westinghouse, recent containment analyses indicate such boiling would not occur in Steam Generator reference legs.

c. Coolant Density Changes

A bias in indicated water level may also be introduced by changes in Pressurizer or Steam Generator pressure due to changes in the density of saturated water and steam within those vessels. While prediction of the effects of rapid depressurization requires complex calculations for each specific case, the bias which would exist at low power under quiescent conditions was calculated and is shown in Figures 1 (for Steam Generator Narrow and Wide Range) and 2 (for Pressurizer).

3. Safety Function Setpoints

a. Steam Generator Narrow Range Water Level Trip Setpoints

The only high-energy line rupture within the containment for which the steam generator water level provides the primary trip function is a feedline rupture. For such a case, the low or low-low water level trip must be actuated when the pressure difference between the narrow range level taps corresponds to a zero-level value. Thus the trip setpoints must be at or above the value that would be indicated at zero true level. Because large steam generator pressure changes are not expected before trip, only the reference leg heatup effects need be considered and not the effects of system pressure changes.

The accident analysis at Prairie Island was based on a low-low trip value of 0% narrow range level. Plant Technical Specifications require a 5% trip setpoint in order to take into account channel and process measurement accuracy. Because SI is initiated at 4 psig (corresponding containment temperature is less than 160°F), primary protection (Rx trip) is provided by high containment pressure signals at temperatures above 160°F. Therefore, temperature bias is considered in order to trip reactor before containment high-pressure setpoint is reached. Temperature bias at 160°F containment temperature is 2% (See Table 1). Because channel accuracy is approximately 1% and temperature bias is 2%, our present low-low level trip setpoint of 13% is quite conservative. The same analysis holds true for low-level trip -- our present setpoints are 25%; Tech Specs require 16% or greater. Therefore, no changes to setpoints are planned as a result of IE Bulletin 79-21.

b. Pressurizer Water Level Trip Setpoint

No credit is taken for this reactor trip function following a high energy line rupture inside containment. Thus the trip setpoint need not be revised to include environmental errors.

4. A review of emergency procedures referring to steam generator and pressurizer level indications was made. The only revisions planned are to statements requiring operators to maintain visible (and in some cases specific) levels in steam generators or pressurizers. Because of possible confusion generated by constant revisions to emergency procedures, we will revise such procedures after a commonly agreeable Post-Accident Monitoring

position is established between NSP, Westinghouse PWR Owners Group, and NRC Standards personnel (Reg Guide 1.97 Working Group). It is expected that these discussions will better itemize required post-accident monitoring equipment and will require other revisions to emergency procedures. Operator training concerning reference leg heating effects will be incorporated.

Yours very truly,

L. J. Wachter
Vice President
Power Production and
System Operation

cc: Mr. G. Charnoff
NRC Office of Inspection and Enforcement
Washington, D.C.

Enclosure

TABLE 1

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

Containment Temperature (°F)	Correction to S/G Level (% of Span)
106°	0
160°	2.0
200°	3.9
250°	6.6
280°	8.5
300°	9.8

TABLE 2

Correction to indicated Pressurizer Water Level for Reference Leg Heatup effects due to post-accident containment temperature.

Containment Temperature (°F)	Correction to Prsr Level (% of Span)
106°	0
160°	3.0
200°	5.8
250°	9.9
280°	12.7
300°	14.7

Note: It is expected that bias due to temperature will be less than shown above due to the inability of the sealed reference leg to absorb large volume changes.

Figure 1

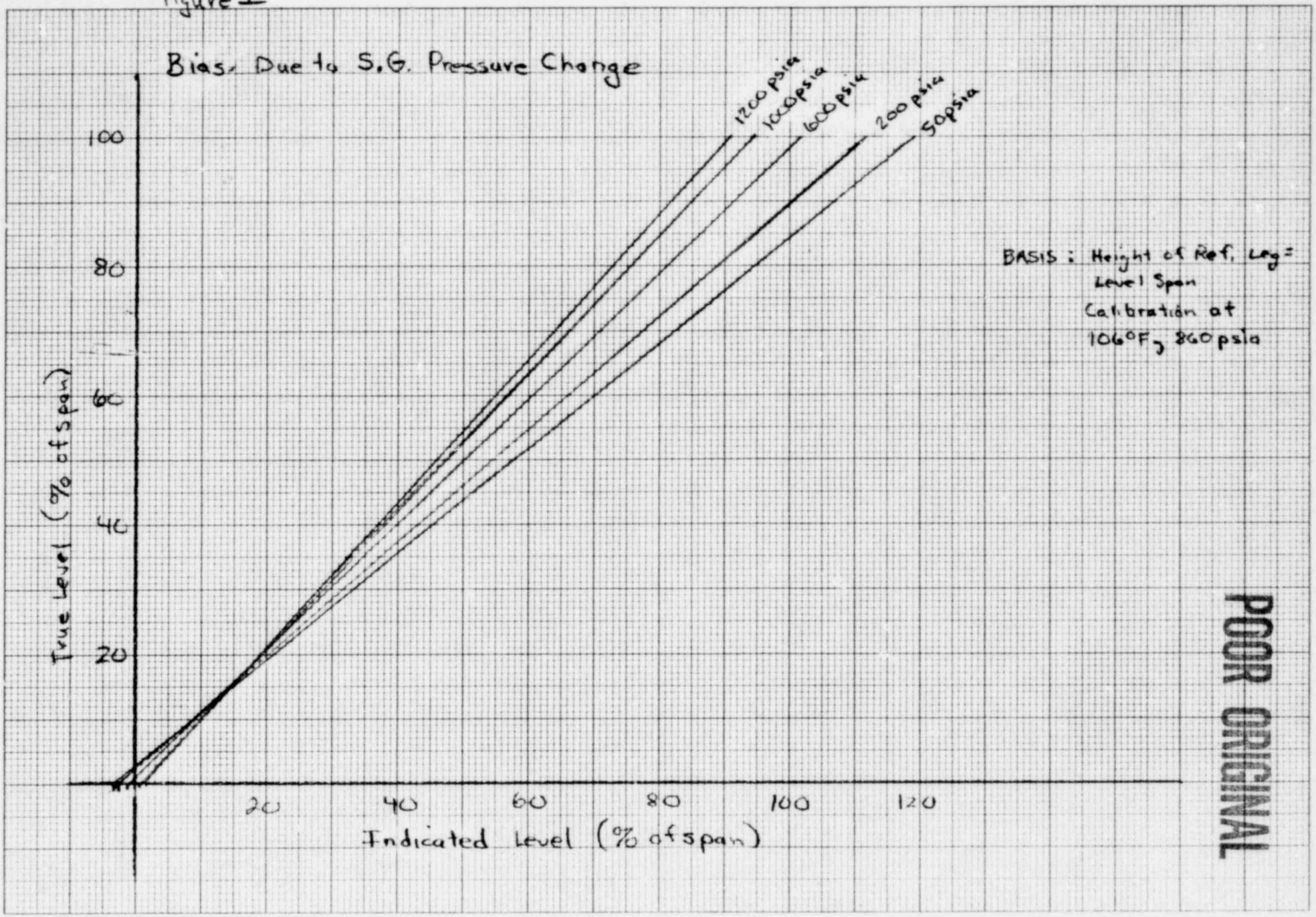

Figure 2