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ComEd

November 12, 1996

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Subject: Response to a Request for Information Regarding Dynamic Testing of Instrument Channels

Byron Nuclear Power Station, Units 1 and 2
Facility Operating Licenses NPF-37 and NPF-66
NRC Docket Nos. 50-454 and 50-455

Braidwood Nuclear Power Station, Units 1 and 2
Facility Operating Licenses NPF-72 and NPF-77
NRC Docket Nos. 50-456 and 50-457

References: See Attachment 1

Although instrumentation setpoints and methodology for Commonwealth Edison Company's (ComEd's) Braidwood Nuclear Power Station, Units 1 and 2 (Braidwood), and Byron Nuclear Power Station, Units 1 and 2 (Byron), have been previously reviewed and approved by the United States Nuclear Regulatory Commission (NRC) Staff, a concerned NRC Staff member has raised several issues regarding dynamic testing of instrument channels using the MESAC system at Braidwood. These concerns were reviewed by the NRC Staff Instrumentation and Controls Branch (HICB). HICB concluded that the health and safety of the public is not affected by the use of the MESAC system at Braidwood and that ComEd is in compliance with its licensing bases and Technical Specifications (TS). Nevertheless, the concerned NRC Staff member requested that ComEd review the HICB analyses and conclusions and confirm that Braidwood and Byron are being operated within their licensing bases and TS. That request and abbreviated HICB analyses were transmitted in Reference 1.

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A conference call was held on June 21, 1996, between ComEd and the NRC Staff (Reference 2) to clarify the concerns. During the conference call, ComEd stated that it agreed with the HICB analyses and conclusions. At the conclusion of the conference call, ComEd understood that the heart of the NRC staff member's concern was whether or not the ±3 (±10) percent deviation in the lead/lag time constants in the thermal overtemperature ΔT (OTΔT) reactor trip setpoint at Braidwood (Byron) was bounded by the Updated Final Safety Analysis Report (UFSAR) Chapter 15 accident analyses.

For Braidwood and Byron, the OTΔT trip function is credited for two UFSAR Chapter 15 accident analyses; uncontrolled rod cluster control assembly (RCCA) withdrawal at power and uncontrolled boron dilution. The uncontrolled RCCA withdrawal at power is more limiting with respect to departure from nucleate boiling (DNB).

The OTΔT trip function at Braidwood and Byron was designed in accordance with WCAP-8745-P-A, an NRC reviewed and approved topical report (Reference 3).

The following is the OTΔT equation described in the Braidwood and Byron TS:

$$OT\Delta T = \Delta T_o * \{K_1 - K_2 *(1 + \tau_4 S)/(1 + \tau_5 S)[T/(1 + \tau_6 S) - T'] + K3(P-P') - f(\Delta I)\}$$

where ΔT_o is indicated ΔT at Rated Thermal Power and $K_1 = 1.325$, $K_2 = 0.0297$, $\tau_4 = 33$ seconds, $\tau_5 = 4$ seconds, and $\tau_6 = 0$ seconds.

To ensure that the OTΔT trip setpoint delay for the trip actuation to be the maximum value, τ_6 is set to 6 seconds in the accident analyses. This added 6 second delay in the accident analyses was to account for any additional or unknown errors such as uncertainty in τ_4 and τ_5.

For the purpose of illustrating the effect of the lead/lag dynamic term, the above equation can be simplified to perform a sensitivity study since the pressure and f(ΔI) terms do not have lead/lag or rate functions:

$$\text{Normalized } OT\Delta T \text{ trip setpoint} = K_1 - K_2 *(1 + \tau_4 S)/(1 + \tau_5 S)[T/(1 + \tau_6 S) - T']$$

Figure 1 shows the normalized OTΔT setpoint as a function of time for various τ uncertainties while ramping input in over 30 seconds. Case 1 has no τ uncertainty with a lead/lag ratio of 8.25 and will reach the trip setpoint at 6.74 seconds. Case 2 has a –3 percent τ uncertainty for lead and a +3 percent τ uncertainty for lag resulting in a lead/lag ratio of 7.77. Case 2 will reach the trip setpoint at 7.25 seconds. Case 3 has a –10

percent τ uncertainty for lead and a +10 percent τ uncertainty for lag resulting in a lead/lag ratio of 6.75. Case 3 will reach the trip setpoint at 8.57 seconds. Case 4 has the nominal lead/lag time constant with an additional lag component with time constant of 6 seconds in the Tavg function of OTΔT equation and reaches the trip setpoint at 14.04 seconds. Table 1 summarizes the time to trip for each of these cases. The additional lag time constant was set at 6 seconds in all applicable Braidwood and Byron UFSAR Chapter 15 accident analyses.

Table 1. Summary of Lead/Lag time constant effect

Case	τ_4 seconds	τ_5 seconds	τ_6 seconds	Trip Time seconds
1. Nominal Tech Spec	33	4	0	6.74
2. Tech Spec +/- 3%	32.01	4.12	0	7.25
3. Tech Spec +/- 10%	29.7	4.4	0	8.57
4. Safety Analysis*	33	4	6	14.04

* In the actual safety analysis, the gain for the OTΔT setpoint K_1 is set at 1.5 versus the TS value of 1.325 to include all other deviations as described below.

The OTΔT calibration setpoint at Braidwood and Byron includes additional conservatisms similar to other protection setpoints. The calibrated setpoint includes allowances, where applicable, for process measurement accuracy, primary element accuracy, sensor calibration accuracy, sensor temperature effects, sensor pressure effects, sensor drift allowances, 7300 rack calibration accuracy, measurement & test equipment accuracy, 7300 rack comparator setting accuracy, 7300 rack temperature effects, 7300 rack drift allowances, and appropriate environmental and bias allowances.

As illustrated in the above example, even though current Braidwood and Byron UFSAR Chapter 15 accident analyses do not explicitly include a ±3 percent (Braidwood) or ±10 percent (Byron) time constant deviation for the OTΔT reactor trip function, an additional 6 second delay function (lag function to measured Tavg) in the accident analyses bounds this deviation. The actual performance of the Reactor Protection System (RPS) in the field results in a trip of the reactor earlier than the FSAR accident analysis. This methodology is consistent with current Westinghouse accident analysis methodology.

In summary, ComEd agrees with the HICB analyses and conclusions and believes that Braidwood and Byron are being operated within their licensing bases and TS.

Please address any comments or questions regarding this matter to Harry Pontious, Braidwood Nuclear Licensing Administrator, at (630) 663-7205.

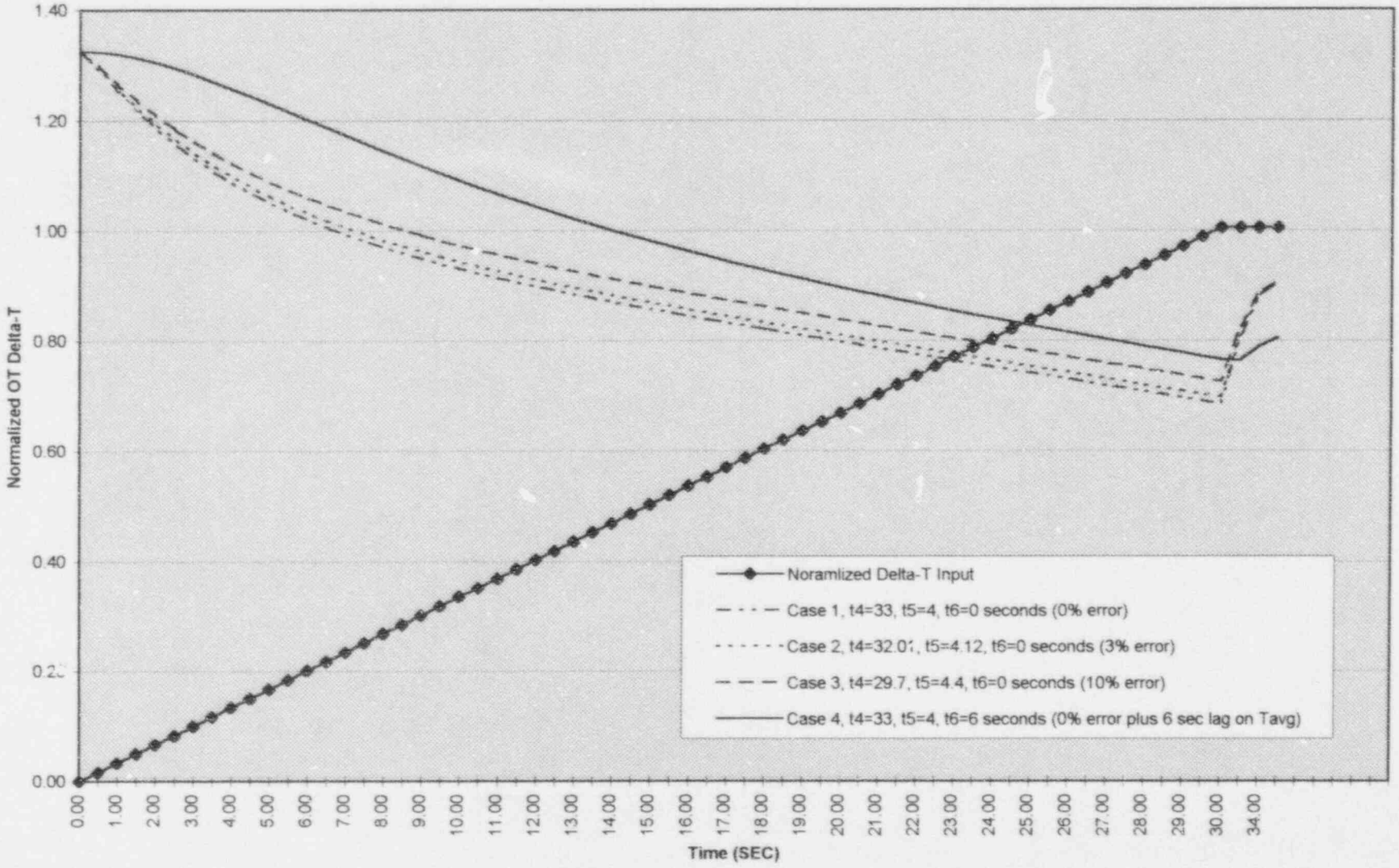
Sincerely,

John B. Hosmer
Engineering Vice President

Attachments

cc: A. B. Beach, Regional Administrator - RIII
R. R. Assa, Braidwood Project Manager - NRR
G. F. Dick Jr., Byron Project Manager - NRR
C. J. Phillips, Senior Resident Inspector - Braidwood
S. D. Burgess, Senior Resident Inspector - Byron
Office of Nuclear Facility Safety - IDNS

Figure 1. OTΔT Lead/Lag Time Constant Sensitivity τ4=33 sec, τ3=4 sec for 30 seconds ramping



Attachment 1

References

1. Ramin R. Assa (NRC) letter to D. L. Farrar (ComEd), "Request for Information - Dynamic Testing of Instrument Channels at Braidwood and Byron (TAC Nos. M95341 and M95340)," dated May 22, 1996

2. Teleconference between the United States Nuclear Regulatory Commission Staff and Commonwealth Edison Company regarding the Request for Information - Dynamic Testing of Instrument Channels at Braidwood and Byron held on June 21, 1996

3. WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions," dated September, 1986