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ILLINOIS POWER

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Docket No. 50-461

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Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Clinton Power Station Response to Request for Additional Information Related to Proposed Amendment of Facility Operating License No. NPF-62 (LS-95-007)

Dear Sir:

By letter dated December 14, 1995 (letter number U-602520), Illinois Power (IP) submitted an application for amendment of the Clinton Power Station (CPS) Operating License (License No. NPF-62) to incorporate proposed changes to the CPS Technical Specifications (Appendix A). That request proposed changes to eliminate periodic response time testing of Analog Trip Modules (ATMs) associated with selected Reactor Protection System (RPS) and Main Steam Line (MSL) isolation instrument channels. Elimination of periodic response time testing of the pressure transmitter sensors associated with these instrument channels was previously proposed in IP letter U-602376 dated January 27, 1995 and subsequently approved by the NRC via Amendment No. 98 dated March 9, 1995.

The above-noted requests were supported by analyses documented in NEDO-32291, "System Analyses for Elimination of Selected Response Time Testing Requirements," dated January 1994. That Topical Report was developed by the Boiling Water Reactor Owners' Group (BWROG), of which IP is a member, and demonstrated that other periodic tests required by Technical Specifications, such as channel calibrations, channel functional tests and logic system functional tests, are adequate to ensure channel response times remain within acceptable limits. By letter dated December 28, 1994, the NRC staff provided their acceptance of NEDO-32291(-A), subject to certain conditions, for reference in license amendment submittals.

IP's January 27, 1995 request was based directly on NEDO-32291-A while the December 14, 1995 request was merely supported by the analyses in the Topical Report. Extension of the Topical Report analyses to analog trip modules (ATMs) in the RPS and

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MSL isolation instrument channels previously addressed in IP's January 27, 1995 request prompted a number of questions by the NRC staff reviewer. By letter dated April 17, 1996, the NRC staff transmitted these questions to IP in the form of a request for additional information (RAI). IP's response to each of the questions contained in the RAI is provided in the attachment to this letter.

As a reminder, due to the resource savings that can be realized by implementation of the proposed Technical Specification changes associated with this request, IP is requesting that this application be reviewed on a schedule sufficient to support the sixth refueling outage which is currently scheduled to begin October 13, 1996.

Sincerely yours,

Michael W. Lyon
Director-Licensing

DAS/csm

Attachment

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

By letter dated April 17, 1996, the NRC staff requested additional information related to Illinois Power's (IP's) December 14, 1995 request (letter number U-602520) to amend the Operating License for Clinton Power Station (CPS). In its request IP proposed changes to eliminate periodic response time testing of Analog Trip Modules (ATMs) associated with selected Reactor Protection System (RPS) and Main Steam Line (MSL) isolation instrument channels. Elimination of periodic response time testing of the pressure transmitter sensors associated with these instrument channels was previously proposed in IP letter U-602376 dated January 27, 1995 and subsequently approved by the NRC via Amendment No. 98 dated March 9, 1995. IP's response to each of the questions contained in the NRC staff's April 17, 1996 request for additional information (RAI) is provided below.

Questions and Responses

1. **"[Provide] a detailed FMEA of the trip unit showing each component's failure modes, and the effect that failure mode will have on the performance of the trip unit. This should show that for each failure mode which has the possibility of affecting response time, the calibration of the unit is also affected, and the failure will thereby be detected. It will be important to note in this analysis that the failure is such that a mere adjustment of the calibration is insufficient, but that replacement or repair of the system will be required in the event of this failure. If mere adjustment will be sufficient to mask the problem, it is highly likely that a technician will not notice a small change in response time of under 5 seconds, and only adjust the instrument until it is within calibration, rather than replace the instrument as failing to meet its required response time."**

Response: IP's request to eliminate periodic response time testing of ATMs in selected RPS and MSL isolation instrument channels is based on analyses documented in NEDO-32291-A, "System Analyses for Elimination of Selected Response Time Testing Requirements," October 1995. As discussed in Section 4.0 of NEDO-32291-A and acknowledged in Section 3.0 of the NRC staff's safety evaluation of NEDO-32291(-A), the approach taken by the Boiling Water Reactor Owners' Group (BWROG) in NEDO-31229-A utilized lead plants as the basis for the analyses. After the Technical Specification trip functions were identified for the lead plants, a detailed listing of specific loop components was compiled for each loop. All components in the affected instrumentation loops which could potentially affect the loop response time were identified. Detailed failure mode evaluations were then conducted for all instrumentation loop components in order to determine whether failures could affect response time. When it was determined that failure modes could affect instrument

loop response times, the consequences of such failures were evaluated. An analysis was then made to determine whether other surveillance testing would identify these potential response time degradations. As part of the failure mode evaluations, component experts and vendors were contacted to assist with and verify the analysis.

A review of component failure experience was also performed by conducting BWR-specific surveys, and by researching the Nuclear Plant Reliability Data System (NPRDS), NRC Bulletins, NRC Information Notices, and General Electric Company (GE) Service Information Letters (SILs). This review was used to determine if actual response time testing failures could be reasonably detected by surveillance testing other than response time testing.

As discussed in Section 4.0 of NEDO-32291-A, plant-specific verifications were subsequently performed for each of the other participating plants following completion of the lead plant baseline response time testing analyses. Component and instrumentation loop differences were identified and dispositioned either by showing that the baseline analyses adequately cover the differences or by conducting additional failure mode and effects analyses.

With respect to the ATMs within the scope of IP's December 14, 1995 request, the applicable lead plant component is the Rosemount 710DU trip unit. (See Figure 1 attached.) Section 7.3 of NEDO-32291-A summarizes the results of the failure modes analyses for the trip units in general and Appendix D identifies the results of performance history reviews. The results of detailed failure modes analyses for the Rosemount trip units is provided in Section K.1.1 of Appendix K of NEDO-32291-A. The latter section states that "Rosemount Models 510DU/710DU are very fast devices with respect to response time. The nominal response time for this master trip unit is of the order of 2 milliseconds. The master trip unit is designed such that it either trips or does not trip. When the circuitry associated with the master trip unit fails, it does not provide the normal observable trip function indication. Furthermore, there were no failure modes identified that lead to a degraded condition that significantly affects the response time of the trip function." That section concludes that "no failure modes were identified within the master trip unit that could potentially increase its response time above the millisecond range." Section 7.3 of NEDO-32291-A also concludes that "no failure modes that delay the

normal response time were identified without also affecting calibration or causing misoperation detected in functional tests" and "failure modes (resistance increase) which can extend the response time, can be detected by loss of DC performance and misoperation during functional tests."

The plant-specific ATMs within the scope of IP's December 14, 1995 request are GE Model 147D805G004 as indicated on Table G-2 of NEDO-32291-A. (See Figure 2 attached.) As shown on Table G-2 (note 3), it was intended that NEDO-32291-A provide a plant-specific failure modes analysis for these ATMs since they are a non-lead plant component. However, an incorrect reference to Section 5.3.1.2 was provided on Table G-2. The correct reference is Section K.1.2 of Appendix K to NEDO-32291-A. Notwithstanding, Section K.1.2 refers to a GE Model 184C5988 master trip unit. Thus, it was not clear to the NRC reviewer that the GE Model 147D805G004 ATM used at CPS was in fact addressed by the failure modes analyses of NEDO-32291-A. Discussions with GE at the time of IP's January 27, 1995 request, and again at the time of IP's December 14 1995 request, confirmed that the GE Model 147D805G004 ATM used at CPS was specifically evaluated by GE during the development of NEDO-32291-A, via the evaluation for the GE Model 184C5988 trip unit contained in Section K.1.2. Notwithstanding, and to avoid any further confusion, IP has performed a direct comparison of the GE Model 147D805G004 ATM used at CPS with the Rosemount Model 710DU trip unit for which a detailed failure modes analysis was performed and documented in NEDO-32291-A for the lead plants. The results of that comparison are presented below.

As discussed in the December 14, 1995 request, the RPS and MSL isolation logic used at CPS is a two-out-of-four "solid-state" design. As described in Section 7.2.1.1.4.8 of the CPS Updated Safety Analysis Report, the solid-state logic is automatically tested by the self-test system (STS). Because the STS test pulses are less than 1 millisecond in duration, the response time of the STS-tested portion of the ATM must be less than 1 millisecond or the STS will report a logic fault. In Section 7.2.3.3 of Supplement No. 2 to the CPS Safety Evaluation Report (SSER 2), the NRC found the CPS STS to be acceptable for use in performing surveillance testing required by the Technical Specifications, including response time testing. As shown on Figure 2, some, but not all, of the ATM circuitry is tested by the STS. Any failures of the ATM circuitry within the scope of the STS that can result in a response time degradation above the millisecond range will automatically be detected. Those ATM

components that are not within the scope of the STS are identified on Table 1, attached, along with the corresponding components of the Rosemount Model 710DU trip unit.

As can be seen from Table 1 and a comparison of Figures 1 and 2, the only circuitry that exists in the GE Model 147D805G004 ATMs used at CPS that does not also exist in the Rosemount Model 710DU trip units is the gain adjustment circuit. This circuit is composed of components (i.e., resistors) that are contained in the Rosemount Model 710DU trip units. CPS has confirmed that the individual components of the GE Model 147D805G004 ATMs not within the scope of the STS can only fail in the same manner as the corresponding components in the Rosemount Model 710DU trip units. Since the gain adjustment circuit is in series with the remaining ATM input circuits, it has been concluded that there are no additional failure modes for the GE Model 147D805G004 ATMs that were not previously evaluated in NEDO-32291-A for the Rosemount Model 710DU trip units. Therefore, the detailed failure modes analyses documented in Section K.1.1 of Appendix K of NEDO-32291-A and the component failure history evaluations provided in Appendix D of NEDO-32291-A for the Rosemount Model 710DU trip units are directly applicable and envelope the potential failure modes for the GE Model 147D805G004 ATMs used at CPS.

Since the noted failure modes analyses do not identify any failure modes that could significantly affect ATM response time without also resulting in a failure being detected by the STS or routine surveillance, the concerns identified in the remainder of Question 1 are not applicable to CPS.

2. **"Since the response time requirements for the systems in which the trip unit is being used is rapid compared to the 5 second technician awareness limit, [provide] an analysis of each accident where this unit is required, and a determination that an additional 5 seconds added to the response time will not introduce a safety problem, and that there is no added increase in the risk of release of radiation to the public."**

Response: As discussed above, the ATMs within the scope of this request are associated with selected RPS and MSL isolation instrumentation channels for which periodic response time testing was previously eliminated. That testing was eliminated based on IP's request dated January 27, 1995 (letter number U-602376) which was subsequently approved by the NRC via Amendment No. 98 dated March 9, 1995. IP's January 27, 1995 letter affirmed the applicability NEDO-32291-A to CPS, including the overall

conclusion of the realistic safety evaluations presented in Appendix J of NEDO-32291-A that elimination of periodic response time testing of the selected instrument channels does not result in a significant impact on plant safety. The basis for that conclusion is presented more fully below.

Appendix J of NEDO-32291-A provided a realistic evaluation of the effects of a five-second delay in the response of associated systems and their mitigation functions. As recognized in Section 2.0 of the NRC staff's safety evaluation of NEDO-32291(-A), that evaluation was a "realistic" assessment and was not intended to be a rigorous, bounding analysis. As such, the evaluation was not based on the very conservative assumptions that are required for design basis accident and transient analyses. In addition, a five-second delay in any particular actuation signal would require a delay to occur simultaneously in multiple channels.

With respect to RPS and MSL isolation instrument channel(s), the logic for the RPS and MSL isolation instrumentation at CPS is two-out-of-four for each actuation parameter. As a result, the response time of at least three channels for a single parameter would have to be delayed in order to result in a delay in the system response time. As noted in Section 3.0 of the NRC staff's safety evaluation of NEDO-32291(-A) (and as supported in response to Question 1 above), a response time failure without a corresponding channel failure is unlikely. The possibility of such an undetected failure occurring in two channels for the same parameter at the same time is even more unlikely. IP believes that the simultaneous failure of yet a third undetected RPS or MSL isolation channel failure for the same parameter is exceedingly unlikely. This occurrence concurrent with a postulated accident or transient is not credible.

Notwithstanding, the conclusion of Appendix J of NEDO-32291-A and the NRC staff's safety evaluation of NEDO-32291(-A) that there is no significant impact on overall plant safety as a result of the changes proposed in NEDO-32291-A was based on the realistic evaluation of a 5-second delay in the instrument channel response time. Sections 3.0 and 4.0 of the NRC staff's safety evaluation of NEDO-32291(-A) specifically state that this "includes the selected RPS and MSIV actuation features which have overall Technical Specification response time requirements of 0.33 to 2 seconds." This evaluation was performed for automatic actuation based on the specific parameters identified in NEDO-32291-A. Because the instrument channels within the scope of IP's December 12, 1995 request are within the scope of IP's January 27, 1995 request, NEDO-32291-A, and the NRC staff's safety evaluation of NEDO-32291(-A), the above

conclusion remains valid whether the channel delay is caused by a delay in the transmitter response, ATM response, or a combination of the transmitter and ATM. Further, as stated in IP's December 12, 1995 request, the channel response being monitored at CPS during calibration includes the ATM response in addition to the transmitter response.

Based on the above, IP has concluded that the proposed elimination of periodic response time testing of the selected ATMs does not result in a significant impact on plant safety, consistent with the overall conclusions of Appendix J of NEDO-32291-A.

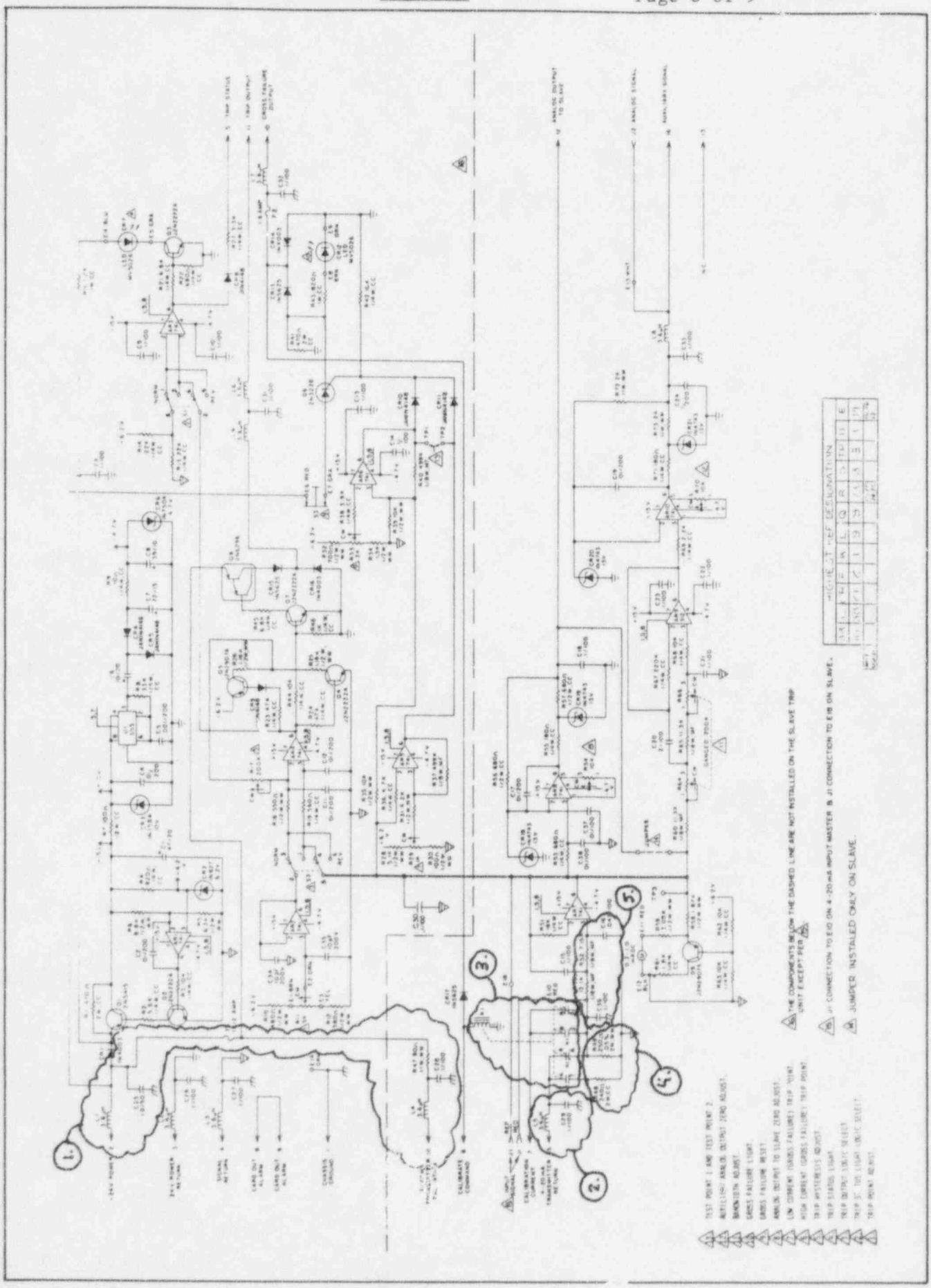
Table 1

Comparison of Input Circuitry for GE and Rosemount Trip Units

(circuitry just prior to isolation amplifier)

Number		Rosemount 710DU	GE 147D8505
1	Transmitter Excitation Filter	L1,C25,F1,R47,C28,L4	F3,R150,C51,L3
2	Transmitter Return Filter	L5,C29	L4,C50
3	Calibration Relay	K1	K1
4	Precision Dropping Resistors	R48,R49	R172,R173
5	Low Pass Input Filter	R50,R52,C36,C16	R170,R171,C56,C57
6	Gain Adjustment Circuit	N/A	R15,R28

Figure 1



Schematic Diagram - 710DU Master Slave Trip Unit (4-20 mA Input).

Figure 2