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ComEd

January 7, 2000

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

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

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

Subject: Implementation of WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests."

References: (1) Westinghouse WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," approved October 6, 1998.

(2) Letter from T. H. Essig (NRC) to L. Liberatori (Westinghouse Owners Group), "Safety Evaluation Related to Topical Report WCAP-14036, Revision 1, Elimination of Periodic Protection Channel Response Time Tests," dated October 6, 1998.

The purpose of this letter is to notify the NRC that we intend to fully implement Westinghouse WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," (Reference 1), at Braidwood Station and Byron Station. The application of Reference 1, during performance of Technical Specification (TS) Surveillance Requirement (SR) 3.3.1.15, "Verify RTS RESPONSE TIME is within limits," and TS SR 3.3.2.11 and SR 3.3.2.12, "Verify ESFAS RESPONSE TIMES are within limit," is expected to first occur at Braidwood Station, Unit 1, during the spring 2000 refueling outage, and at Byron Station, Unit 1, during the fall 2000 refueling outage.

In Reference 2, the NRC concluded that periodic Response Time Testing (RTT) requirements for the selected protection equipment identified in Reference 1 can be eliminated from the TS. Upon elimination of these RTT requirements, the total Reactor Trip System (RTS) or Engineered Safety Features Actuation System (ESFAS) channel response time would be verified by summing the bounding response time being allocated for the signal conditioning and logic equipment with the measured response

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time of the remainder of the channel. Reference 2 indicated that because the performance of RTT is a TS requirement, licensees must submit a TS change request to implement this change. As explained below, we do not consider that any further TS changes are required to fully implement Reference 1.

A portion of the TS and TS Bases changes identified in Reference 1 were previously incorporated into the TS at Braidwood Station in TS Amendment Number 76, and at Byron Station in TS Amendment Number 84, which implemented Westinghouse WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements." Since that time, all of the TS and some of the TS Bases changes identified in Reference 1 have been implemented with the conversion to the Improved Standard TS (ISTS) for the Byron and Braidwood Stations. During the TS conversion to ISTS, all of the specific changes to the TS identified in Reference 1 were incorporated into the Braidwood Station and Byron Station TS. Therefore, we have determined that no further TS changes are required. Reference 1 also included revisions to the TS Bases, some of which were implemented during the conversion to ISTS. Attachment A provides the marked-up TS Bases pages showing the remaining changes being made for both Braidwood Station and Byron Station. Attachments B and C provide the associated pages with the changes incorporated for Braidwood Station and Byron Station, respectively. The changes are provided for information only, and will be finalized under 10 CFR 50.59 to fully implement the provisions of Reference 1.

Reference 2 indicated that the licensee must verify that the Failure Modes and Effects Analysis (FMEA) in Reference 1 is applicable to the equipment actually installed in the licensee's facility, and that the analysis is valid for the versions of the printed circuit cards used in their protection system. We confirm that the FMEA presented in Reference 1 is valid for and applicable to the installed RTS and ESFAS equipment at Braidwood Station and Byron Station, with the exception of one newer loop power supply card. Our in-house evaluation and testing demonstrate that the Reference 1 response time allocation is applicable to this newer card. Attachment D contains documentation of our evaluation and associated conclusions.

Should you have any questions concerning our planned implementation of WCAP-14036-P-A, Revision 1, please contact Ms. K. M. Root, at (630) 663-7292.

Respectfully,

R. M. Krich
Vice President - Regulatory Services

Attachments:
Attachment A: Marked-up Proposed Bases Changes for Braidwood and Byron Stations
Attachment B: Incorporated Proposed Bases Changes for Braidwood Station
Attachment C: Incorporated Proposed Bases Changes for Byron Station
Attachment D: Failure Modes and Effects Analysis Applicability

cc: Regional Administrator - NRC Region III
NRC Senior Resident Inspector - Braidwood Station
NRC Senior Resident Inspector - Byron Station

ATTACHMENT A

MARKED-UP PROPOSED BASES CHANGES FOR BRAIDWOOD STATION AND BYRON STATION

The following marked-up pages describe the TS Bases changes being proposed to fully implement Westinghouse WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests." These changes will be implemented under 10 CFR 50.59 at Braidwood Station and Byron Station, and are provided for information only.

RTS Surveillance Requirement 3.3.1.15

Marked-up Page B 3.3.1-59
Marked-up Page B 3.3.1-60
Marked-up Page B 3.3.1-61

ESFAS Surveillance Requirement 3.3.2.11 and 3.3.2.12

Marked-up Page B 3.3.2-55
Marked-up Page B 3.3.2-56
Marked-up Page B 3.3.2-57

BASES

SURVEILLANCE REQUIREMENTS (continued)

The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the trip setpoint value at the sensor to the point at which the equipment reaches the required functional state.

For channels that include dynamic transfer Functions (e.g., lag, lead/lag, rate/lag, etc.), the response time test may be performed with the transfer Function set to one, with the resulting measured response time compared to the appropriate UFSAR response time. Alternately, the response time test can be performed with the time constants set to their nominal value, provided the required response time is analytically calculated assuming the time constants are set at their nominal values. The response time may be measured by a series of overlapping tests such that the entire response time is measured.

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing, and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) inplace, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications. Reference 8 provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the WCAP. Response time verification for other sensor types must be demonstrated by test.

INSERT HERE ⇒

Reference 12 provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. The allocations for sensor**, signal conditioning, and actuation logic** response times must be

BASES

SURVEILLANCE REQUIREMENTS (continued)

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verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. **Specific components identified in the WCAP may be replaced without verification testing.** One example where response time could be affected is replacing the sensing assembly of a transmitter.

As appropriate, each channel's response must be verified every 18 months on a STAGGERED TEST BASIS. Testing of the final actuation devices is included in the testing. Response times cannot be determined during unit operation because equipment operation is required to measure response times. Experience has shown that these components usually pass this surveillance when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.3.1.15 is modified by a Note stating that neutron detectors are excluded from RTS RESPONSE TIME testing. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response.

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1. UFSAR, Chapter 7.

2. UFSAR, Chapter 6.

3. UFSAR, Chapter 15.

4. IEEE-279-1971.

5. Technical Requirements Manual.

6. WCAP-12523, "RTS/ESFAS Setpoint Methodology Study," October 1990.

7. WCAP-10271-P-A, Supplement 2, Rev. 1, June 1990.

8. WCAP-13632, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," August 1995.

9. UFSAR, Section 7.2.

10. WCAP-12583, "Westinghouse Setpoint Methodology For Protection Systems, Byron/Braidwood Stations," May 1990.

11. Commonwealth Edison Procedure NES-EIC-20.04, Revision 0, "Analysis of Instrument Channel Setpoint Error and Instrument Loop Accuracy," October 14, 1997.

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12. WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," October 1998.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.11 and SR 3.3.2.12

These SRs ensure the individual channel ESF RESPONSE TIMES are less than or equal to the maximum values assumed in the accident analysis. Response Time testing acceptance criteria are included in the USFAR, Section ~~7.2~~ **7.3**, (Ref. 9). Individual component response times are not modeled in the analyses. The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the Trip Setpoint value at the sensor, to the point at which the equipment reaches the required functional state (e.g., pumps at rated discharge pressure, valves in full open or closed position).

For channels that include dynamic transfer functions (e.g., lag, lead/lag, rate/lag, etc.), the response time test may be performed with the transfer functions set to one with the resulting measured response time compared to the appropriate UFSAR response time. Alternately, the response time test can be performed with the time constants set to their nominal value provided the required response time is analytically calculated assuming the time constants are set at their nominal values. The response time may be measured by a series of overlapping tests such that the entire response time is measured.

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SURVEILLANCE REQUIREMENTS (continued)

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Reference 11 provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time. The allocations for sensor, **signal conditioning, and actuation logic** response times must be verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. **Specific components identified in the WCAP may be replaced without verification testing.** One example where response time could be affected is replacing the sensing assembly of a transmitter.

ESF RESPONSE TIME tests are conducted on an 18 month STAGGERED TEST BASIS with the exception of Function 6.d. Testing of the final actuation devices, which make up the bulk of the response time, is included in the testing of each channel. The final actuation device in one train is tested with each channel. Therefore, staggered testing results in response time verification of these devices every 18 months. Function 6.d is associated with the start of the motor-driven auxiliary feedwater pump only (Train A). Therefore, a Frequency of 18 months is specified. The 18 month Frequency is consistent with the typical refueling cycle and is based on plant operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

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9. USFAR, Section ~~7.2~~ **7.3**.

10. WCAP-12583, "Westinghouse Setpoint Methodology For Protection Systems, Byron/Braidwood Stations," May 1990.

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11. WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," October 1998.

ATTACHMENT B

INCORPORATED PROPOSED BASES CHANGES FOR BRAIDWOOD STATION

REVISED PAGES

RTS Surveillance Requirement 3.3.1.15

Incorporated Page B 3.3.1-59
Incorporated Page B 3.3.1-60
Incorporated Page B 3.3.1-61
Incorporated Page B 3.3.1-62

ESFAS Surveillance Requirement 3.3.2.11 and 3.3.2.12

Incorporated Page B 3.3.2-55
Incorporated Page B 3.3.2-56
Incorporated Page B 3.3.2-57

BASES

SURVEILLANCE REQUIREMENTS (continued)

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SR 3.3.1.15 is modified by a Note stating that neutron detectors are excluded from RTS RESPONSE TIME testing. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response.

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SURVEILLANCE REQUIREMENTS (continued)

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ATTACHMENT C

INCORPORATED PROPOSED BASES CHANGES FOR BYRON STATION

REVISED PAGES

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Incorporated Page B 3.3.1-59
Incorporated Page B 3.3.1-60
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11. WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," October 1998.

ATTACHMENT D

FAILURE MODES AND EFFECTS ANALYSIS APPLICABILITY

WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," (Reference 1), provides technical justification for deletion of periodic Response Time Testing (RTT) of the electronic signal processing between the primary sensors and the final actuated devices for the Reactor Trip System (RTS) and the Engineered Safety Features Actuation System (ESFAS). Bounding circuit response times were established by Westinghouse to replace the currently measured RTT values. These bounding values were established through Failure Modes and Effects Analysis (FMEA) and through testing of the 7300 Process Protection and Control System printed circuit cards and of the Solid State Protection System (SSPS) and relay logic.

The following provides documentation that the Westinghouse FMEA and analysis provided in Reference 1 is valid for and applicable to the installed RTS and ESFAS equipment at Braidwood Station and Byron Station.

Westinghouse FMEA and Analysis Applicability

System Level: 7300 Process Protection and Control System

The evaluation for the 7300 Process Protection and Control System consisted of a FMEA on the following cards as described in Reference 1, used at Braidwood Station and Byron Station:

7	NMD	– Multiplier / Divider	4	NCH	– Function Generator
4	NRA	– RTD Amplifier	4	NSA	– Summing Amplifier
	NAS	– Solid State Relay	9	NAL	– Comparator
	NPC	– Potentiometer Card		NCI	– Computer Input
	NCT	– Channel Test		NRC	– Relay Card
	NTC	– Temperature Channel Test		NTP	– Test Point

A numeral preceding the card mnemonic is the artwork revision level addressed in Reference 1. Where Reference 1 specifies an artwork level for the above cards, the cards at Braidwood Station and Byron Station have artwork levels in accordance with the limits defined in Reference 1.

One card utilized at Braidwood Station and Byron Station, whose artwork level does exceed those tested in Reference 1, is 11NLP – Loop Power Supply. Commonwealth Edison (ComEd) Company has performed in-house response time testing on artwork revision 11 NLP cards under card-in-rack conditions which closely resemble installed in-plant conditions. The test results obtained are documented in the ComEd Nuclear Design Information Transmittal (NDIT) No. BRW-DIT-99-0131 / BYR-99-218, (Reference 2), which provides justification for the application of the response time allocation for the 6NLP card from Reference 1 to the 11NLP card used at Braidwood Station and Byron Station.

The NLL cards, used in dynamic transfer functions, will be allocated a response time of zero seconds as described in Reference 1, Sections 4 and 8, and TS Bases 3.3.1.15, 3.3.2.11, and 3.3.2.12. This is based on these cards being calibrated at a frequency of 18 months, and verified to exhibit the proper dynamic response.

In conclusion, response times as stated for the card modules described in Reference 1 are applicable to the 7300 Process Protection and Control System installed at Braidwood Station and Byron Station.

System Level: Nuclear Instrumentation System

A review of the Nuclear Instrumentation System (NIS) Power Range equipment used at Braidwood Station and Byron Station shows no differences between the currently installed equipment and the equipment described in Reference 1. In conclusion, isolation amplifier, level trip and rate trip response times as stated in Reference 1 are applicable to the Power Range NIS installed at Braidwood Station and Byron Station.

System Level: Solid State Protection System

A review of the Solid State Protection System (SSPS) used at Braidwood Station and Byron Station shows no differences between the currently installed equipment and the equipment described in Reference 1. Potter & Brumfield MDR relays which are installed in the SSPS are in compliance with the recommendations of WCAP-13878, "Reliability Assessment of Potter & Brumfield MDR Series Relays," (Reference 3), as required by Reference 1. In conclusion, reactor trip and ESF actuation response times as stated in Reference 1 are applicable to the SSPS installed at Braidwood Station and Byron Station.

Implementation of RTT Elimination

Based on the evaluation described herein and Reference 1, the RTS and ESFAS equipment that will be allocated response times are described in Table 1 and Table 2 provided below. The times shown are calculated equipment response times as described in Reference 1, Chapter 4. All calculated response times recorded in the tables are within the bounding generic response times set forth in Reference 1, Table 8-1. Braidwood Station and Byron Station will implement these generic response times, which bound the response times calculated as part of this analysis. The implementation of RTT Elimination is expected to first occur during the spring 2000 refueling outage at Braidwood Station, Unit 1, and during the fall 2000 refueling outage at Byron Station, Unit 1.

References

1. WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," October 1998.

2. ComEd Nuclear Design Information Transmittal (NDIT) No. BRW-DIT-99-0131 (Braidwood) / BYR-99-218 (Byron), "Response Time Test Allocation for the Westinghouse 7300 Artwork 11 NLP (G05) Circuit Card," October 1999.

3. WCAP-13878, "Reliability Assessment of Potter & Brumfield MDR Series Relays," June 1994.

Table 1 - Implementation of RTS RTT Elimination

(All times in milliseconds)

RTS Function	7300/NIS String	Time	SSPS/Relays	Time
NIS PR High	NIS FMEA	65	Input	20
NIS PR Neg Rate	NIS FMEA	200	Input	20
NIS SR Flux	N/A* **(See note)**	N/A	Input	20
OTΔT / ΔT	NRA+NSA+NSA+NAL	293	Input	20
OTΔT / Tavg	NRA+NSA+NSA+NSA+NAL	330.5	Input	20
OTΔT / Press.	NLP+NSA+NSA+NAL	140	Input	20
OTΔT / Flux	NIS FMEA+NSA+NCH+NSA+NAL	148.5	Input	20
OPΔT / ΔT	NRA+NSA+NSA+NAL	293	Input	20
OPΔT / Tavg	NRA+NSA+NSA+NSA+NSA+NAL	368	Input	20
Pzr. Low Press	NLP+NAL	65	Input	20
Pzr. High Press	NLP+NAL	65	Input	20
RC Low Flow	NLP+NAL	65	Input	20
S/G Level Lo-2	NLP+NAL	65	Input	20
UV RCP Bus	N/A* **(See note)**	N/A	Input	20
UF RCP Bus	N/A* **(See note)**	N/A	Input	20
Cnmt. Press 1/SI	NLP+NAL	65	Input	20
Lo Stm Press/SI	NLP+NAL	65	Input	20

*** This equipment will continue to be response time tested.**

Table 2 - Implementation of ESFAS RTT Elimination

(All times in milliseconds)

ESFAS Function	7300 String	Time	SSPS/Relays	Time
Cnmt Press 1/SI	NLP+NAL	65	Input+Master+Slave+Slave	124
Pzr. Press Lo/SI	NLP+NAL	65	Input+Master+Slave+Slave	124
Lo Stm Press/SI	NLP+NAL	65	Input+Master+Slave+Slave	124
Cnmt. Press 3	NLP+NAL	65	Input+Master+Slave	88
S/G Lvl Hi-2	NLP+NAL	65	Input+Master+Slave	88
S/G Lvl Lo-2	NLP+NAL	65	Input+Master+Slave	88
Cnmt Press 2	NLP+NAL	65	Input+Master+Slave	88
RWST Lo-2 w/SI	NLP+NAL	65	Input+Master+Slave	88
UV RCP Bus	N/A* **(See note)**	N/A	Input+Master+Slave	88
UV ESF Bus	N/A* **(See note)**	N/A	Input+Master+Slave	88
Stmline Neg Rate	NLP+NAL	65	Input+Master+Slave	88

*** This equipment will continue to be response time tested.**