

March 3, 2000

Mr. Garry L. Randolph  
Vice President and Chief Nuclear Officer  
Union Electric Company  
Post Office Box 620  
Fulton, MO 65251

SUBJECT: APPLICATION OF WCAP-14036-P-A FOR RESPONSE TIME TESTING  
ELIMINATION AT CALLAWAY PLANT, UNIT 1 (TAC NO. MA7283)

Dear Mr. Randolph:

In your letter of December 3, 1999, (ULNRC-04159), you requested that the NRC staff review and approve the application of Westinghouse Topical Report WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," dated October 1998 at Callaway Plant, Unit 1 (Callaway). This is required by the definitions of engineered safety features (ESF) and reactor trip system (RTS) response time in the improved Technical Specifications (ITSs) in that the definitions require NRC approval of any methodology used to allocate response times in lieu of measuring them. As you stated in your letter, approval by the staff of this methodology would only require changes to the Bases of the ITSs, which you enclosed in your letter. You stated that the Bases changes have been approved by the staff in its safety evaluation dated November 3, 1998, for WCAP-14036-P-A and in the generic change to the Improved Standard Technical Specifications for Westinghouse plants designated TSTF No. 111, Revision 6.

Your application of December 3, 1999, was supplemented by letters of January 19 and February 24, 2000 (ULNRC-04178 and 04189, respectively). The two letters provided, respectively, a description of how the ESF response time is demonstrated at Callaway and a revision to the allocated response times for the EFS and RTS functions that was submitted in your application letter.

As addressed in the enclosed safety evaluation, the staff concludes that WCAP-14036-P-A, Revision 1, is acceptable methodology for allocating response times for selected components of ESF and RTS instrumentation channels in lieu of measuring the response times. The components approved for the application of the WCAP, are those components listed in the revised table of allocated response times without a note 1, note 2, or note 3.

This approval relies on your commitment that if future component replacements require the use of equipment not covered by WCAP-14036-P-A, either Westinghouse will be asked to certify that there is no impact or response time testing shall be performed before their release for initial service. In the phone call with your staff on February 24, 2000, your staff stated that this is a commitment and will be put in the commitment tracking system for Callaway after the approval

Mr. Garry L. Randolph

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March 3, 2000

of the use of the WCAP is received by your staff. You are requested to inform the staff in writing when this commitment is put in the tracking system, and your procedures for informing the staff if the commitment is revised in the future.

If you have any questions, please contact me at 301-415-1307 or through the internet at [jnd@nrc.gov](mailto:jnd@nrc.gov).

Sincerely,

*/RA/*

Jack Donohew, Senior Project Manager, Section 2  
Project Directorate IV & Decommissioning  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosure: Safety Evaluation

cc w/encl: See next page

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Jack Donohew, Senior Project Manager, Section 2  
 Project Directorate IV & Decommissioning  
 Division of Licensing Project Management  
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Docket No. 50-483

Enclosure: Safety Evaluation

cc w/encl: See next page

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Callaway Plant, Unit 1

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO WCAP-14036 FOR RESPONSE TIME TESTING ELIMINATION

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By application dated December 3, 1999, Union Electric Company (the licensee) requested the NRC staff to review and approve the application of Westinghouse Topical Report WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," dated October 1998, at Callaway Plant, Unit 1 (Callaway). This approval is required by the definitions of engineered safety features (ESF) and reactor trip system (RTS) response time in Section 1.1 of the improved Technical Specifications (ITSs) in that the definitions require NRC approval of any methodology used to allocate response times for the ESF and RTS instrumentation in lieu of measuring them. The licensee submitted the changes to the Bases, for surveillance requirements (SRs) 3.3.1.16 and 3.3.2.10 of the ITSs, to reflect the use of the methodology in WCAP-14036-P-A. There are no changes to the ITSs.

The application of December 3, 1999, was supplemented by letters of January 19 and February 24, 2000 (ULNRC-04178 and 04189, respectively). The two letters provided, respectively, a description of how the ESF response time is demonstrated at Callaway and a revision to the allocated response times for the EFS and RTS functions that was submitted in the application letter.

The proposed methodology in WCAP-14036-P-A, Revision 1, will eliminate the response time testing (RTT) requirements for the complete instrument channels of the RTS and ESF protection functions in accordance with the staff-approved methodology in the WCAP and the licensee will revise the associated Bases sections of the ITSs for SR 3.3.1.16 and SR 3.3.2.10 for periodic RTT for RTS and ESF protection channel instruments in accordance with the staff-approved Technical Specification Task Force (TSTF) No. 111, Revision 6. Approved TSTFs are changes to the improved Standard Technical Specifications, such as the standard in NUREG-1431 for Westinghouse plants as Callaway.

The licensee has proposed to apply the methodology in WCAP-14036-P-A to the 7300 process protect system (PPS), nuclear instrumentation system (NIS), and solid state protection system (SSPS).

## 2.0 BACKGROUND

At Callaway, the staff approved the ITSs in Amendment No. 133 in its letter of May 28, 1999; however, the current Technical Specifications (CTSs) will remain in effect until the ITSs are implemented. The ITS will be implemented by April 30, 2000.

The definitions in ITS Section 1.1 for ESF and RTS response times have the following two sentences: "The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology have been previously reviewed and approved by the NRC." The licensee has requested NRC approval for the use of the methodology in WCAP-14036-P-A, Revision 1, to be used in lieu of measuring the response time for selected components.

The staff has approved the use of WCAP-14036-P-A in its letters of October 6 and November 3, 1998. The latter letter amended the staff's earlier approval of the use of the methodology in the WCAP.

Because the staff approved WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," elimination of RTT for pressure sensors was also approved by the staff with the ITS amendment. Also, the staff has approved WCAP-14036-P-A, Revision 1, which justifies eliminating RTT for the full channel, including all devices; therefore, application of WCAP-14036-P-A, Revision 1, which satisfies the wording of the ITS definition in Section 1.1, is being requested by the licensee in its application.

In accordance with SR 4.3.2.2 of the CTSs, the response time of each RTS and ESF function must be demonstrated; but, in accordance with the current licensing basis of Callaway, RTT is not required if functional testing could detect unacceptable response time degradation. During a conference call with the licensee on January 14, 2000, the licensee provided the following information relating to its current practice of response time demonstration, which was later docketed by the licensee in the letter dated January 19, 2000.

At Callaway, ESF response times are currently demonstrated by a combination of response time testing and functional testing. Functional testing is relied upon for the SSPS master and slave relays. These relays are not response time tested per se, rather allocated response times of 40 msec and 100 msec for the master and slave relays, respectively, have been assigned. The currently allocated response times were based on several years of test data, with the longest response times ever witnessed at Callaway (20 msec and 50 msec) doubled for conservatism. Any significant degradation of the relay response time would be accompanied by an outright failure of the relay, which would be detected during periodic functional testing. Therefore, the response time of these relays is demonstrated during functional testing required by the technical specifications (e.g., master relay tests, slave relay tests), with acceptable performance of the functional test proving the acceptability of the response time.

The licensee revised its table of ESF and RTS allocated response times that was submitted in its application of December 3, 1999. The revised table was submitted in the letter of February 24, 2000.

The fact that licensees use data from functional testing to monitor the status of the device response time, whether acceptable or not, is the basis for the staff-approved WCAP-13632-P-A, Revision 2 (which justifies eliminating RTT requirements for pressure sensors), and WCAP-14036-P-A, Revision 1 (which justifies eliminating RTT requirements for full channels, including all devices). Allocating the response time twice that was observed by historical data is conservative and is acceptable to the staff. In addition, the licensee stated that its 10 CFR 50.59 evaluation concluded that it was justified in allocating response times for solid-state protection system (SSPS) master and slave relays associated with several ESF functions and allocating a bounding response time to the SSPS master and slave relays in lieu of RTT and also concluded that they met the current licensing basis, satisfied the definition in the CTSs, and fulfilled the CTS SR 4.3.2.2 requirement to demonstrate response time. Therefore, in accordance with the Institute of Electrical and Electronic Engineers (IEEE) Standard 338-1977, which was endorsed by the staff in Regulatory Guide 1.118, "Periodic Testing of Electric Power and Protection Systems," the licensee allocated the above-stated bounding response time for each of these master and slave relays and continued RTT for the remaining devices of the string of the affected channel. The proposed change by revising the ITS Section 1.1 definitions to include application of WCAP-14036-P-A, Revision 1, will eliminate periodic RTT requirements for the remaining devices of the 7300 PPS, NIS, and SSPS.

### 3.0 PROPOSED CHANGES

The following changes to the Bases of the ITSs for SR 3.3.1.16 and SR 3.3.2.10 are described in Attachment 1 to the licensee's application dated December 3, 1999. Attachment 2 contains marked-up pages for the changes.

The Bases for the ITS SR 3.3.1.16 and SR 3.3.2.10 will be revised to indicate that the system response time shall be verified utilizing the methodology described in WCAP-14036-P-A, Revision 1. The ITS Bases changes include the markups approved in the staff's safety evaluation on WCAP-14036-P-A, Revision 1, and by the staff approval of TSTF No. 111, Revision 6.

The licensee will change the ITS Bases to do the following:

- (a) Clarify the response time assumptions used in the safety analyses, noting that process delay times are not testable. The licensee stated that this is not a new change but a clarification to the ITS Bases.
- (b) Add a reference to the channel calibration that verifies the time constants for lag, lead/lag, and rate lag cards used in the 7300 PPS. The licensee stated that this is another clarification to the ITS Bases.
- (c) Add a discussion to the Bases for ITS SR 3.3.1.16 on the testing overlap between RTS response time testing and rod drop testing. The licensee stated that like items (a) and (b) above, this is not a new change; it is an ITS Bases change made to reflect current plant practices.

In Attachment 3 to its application, the licensee provided the allocated response times tables for RTS and ESF actuation systems. The licensee explained that these tables demonstrate the allocated response times assigned to the various pressure and differential pressure sensors and devices of the 7300 PPS card strings, the NIS, and the SSPS. The allocated times were taken by using the conservative method of vendor engineering specifications in Section 9 of WCAP-13632-P-A, Revision 2. Tobar and Barton transmitter response times were taken from Table 9-1 of WCAP-13632-P-A, Revision 2. The allocated response times for PPS cards were taken from Tables 4-7 through 4-10 and Table 4-12 of WCAP-14036-P-A, Revision 1, and allocated times for the NIS and the SSPS were taken from FMEAs discussed in Sections 4.6 and 4.8 of WCAP-14036-P-A, Revision 1.

#### 4.0 EVALUATION

WCAP-14036-P-A, Revision 1, provides the justification for elimination of periodic RTT, which is based upon the judgement that any failure that significantly degrades response time will be detectable during surveillance testing, such as channel calibrations, channel functional tests, and channel checks. The licensee stated that: "Our current licensing basis on response time testing (RTT) is expressed by the FSAR Appendix 3A position on NRC Regulatory Guide 1.118, which endorses IEEE 338-1977. Section 6.3.4 of IEEE 338-1977 (third paragraph) says that response time testing is not required if functional testing would detect unacceptable response time degradation." The concept of detecting degradation in response time by functional testing in lieu of performing RTT is the basis behind the staff-approved WCAP-14036-P-A, Revision 1.

The program described in the WCAP is built upon failure modes and effects analyses (FMEA) to provide justification for elimination of RTT requirements for several systems utilized in the derivation of a reactor trip or an ESF actuation function from the sensor output to the final device input. The staff's safety evaluation for WCAP-14036-P-A, Revision 1, amended on November 3, 1998, stipulates that a licensee's submittal for TS amendment request shall verify that the "FMEA in WCAP-14036, Revision 1, is applicable to the equipment installed in the licensee's facility, and that the analysis is valid for the versions of the boards used in their protection system." The licensee stated that the FMEAs in WCAP-14036-P-A, Revision 1, are applicable to the equipment installed at Callaway and the analysis is valid for the versions of the boards used in the protection systems. The licensee further stated that WCAP Tables 4-7, 4-8, 4-9, 4-10, and 4-12 were used for allocating response times for the NLP, NSA, NAL, NCH, and NRA cards of the Callaway 7300 PPS. Also, allocated response times for the NIS and the SSPS were taken from the FMEAs discussed in Sections 4.6 and 4.8 of WCAP-14036-P-A, Revision 1. This is acceptable to the staff.

The scope of WCAP-14036-P-A, Revision 1, does not include the lead-lag family of cards (NLL) used in the 7300 PPS because the response time of the dynamic function is verified during periodic calibration testing. In its submittal of February 24, 2000, the licensee stated that for an NLL card whose time-constant has been set to any value other than "zero," its time response will be verified during channel calibrations in accordance with SRs 3.3.1.10 and 3.3.2.9. However, for those NLL cards whose time-constant have been set to zero and are not dynamically calibrated, the WCAP stipulates that either a bounding response time contribution for each of such cards have to be determined or each card has to be tested periodically. At Callaway, the licensee chose to perform periodic RTT for 7300 card strings with NLL cards that have a zero time constant and are configured as lag cards. In addition, the licensee will

continue to perform RTT for all card strings monitoring the low-low level condition in the steam generators for RTS and ESFAS.

In line with other requirements of the staff's safety evaluation for WCAP-14036, Revision 1, the licensee has confirmed the following:

- Field walk down inspections at Callaway verified that all installed 7300 cards and warehoused spare cards are within the scope of WCAP-14036-P-A, Revision 1. This verification demonstrated that installed and spare cards were 4NCH, 4NRA, 6NLP, 4NSA, and 9NAL, or older artwork levels. There are no NMD cards used at Callaway in protection circuits. Also, installed relays and a review of the materials database for spare relays in the warehouse for SSPS and spare NIS components with an impact response time are found to be within the scope of WCAP-14036-P-A, Revision 1.
- If future component replacements require the use of equipment not covered by WCAP-14036-P-A, Revision 1 (e.g., new 7300 card artwork levels not included in the WCAP), either Westinghouse will be asked to certify that no RTT impact would be introduced or response time testing shall be performed before their release for initial service.
- The following additional cards installed at Callaway were not addressed in WCAP-14036-P-A, Revision 1; however, they have no impact on the protection signal path, are used for testing only, or will continue to be response time tested.

The rate circuitry (Assembly 3359C41G01) was not evaluated in the NIS FMEA of the WCAP-14036-P-A, Revision 1, but this circuitry has no response time testing requirements at Callaway (reference FSAR Table 16.3-1).

NMT master test cards were not evaluated in WCAP-14036-P-A, Revision 1, but these cards at Callaway are used only for interrupting the protection signal for testing purposes and do not have any impact on response time.

NAI annunciator interface cards and NSC signal converter cards were not evaluated in WCAP-14036-P-A, Revision 1, but these cards do not affect the protection signal path and do not have any impact on response time.

NPL- PROM logic cards were not evaluated in WCAP-14036-P-A, Revision 1. In its submittal, the licensee stated that the function of these cards is to delay reactor trip, feedwater isolation, and actuation of auxiliary feedwater at low power levels and their delay response times are measured during channel calibrations.

The licensee stated that its 10 CFR 50.59 evaluation for RTT elimination through the application of WCAP-14036-P-A, Revision 1, indicated that it does not result in a condition in which the design, material, and construction standards that were applicable before the change are altered. The time response modeling assumptions used in accident analyses addressed in FSAR Chapter 15 remain the same. Only the method of demonstrating the response time is being changed, and the demonstration method is based on the staff-approved WCAP-14036-P-A, Revision 1. The proposed change will not modify any system interface. There are no hardware changes, nor are there any changes in the method by which any

safety-related plant system performs its safety function. The licensee further added that the proposed change does not affect the total response time assumed in the safety analyses. The periodic system response time verification method for the 7300 PPS, the NIS, and the SSPS is modified to allow use of allocated response times. The method of verification still provides assurance that the total system response is within that defined in the safety analyses, because calibration and operational tests will continue to be performed to detect any degradation that might cause the response time to exceed the total allowance. The licensee's conclusions are acceptable to the staff.

Also, TSTF No. 111, Revision 6, which revises the Bases for the improved standard of the Westinghouse ITSs (i.e., NUREG-1431) for RTS and ESF response time surveillance is approved by the staff. The changes to the Bases for the Callaway ITSs agree with TSTF No. 111, Revision 6. Therefore, the staff agrees with the proposed revision to ITS Bases sections for including applicability of WCAP-14036-P-A, Revision 1, to eliminate full-channel RTT requirements of RTS and ESF channels. Realignment of the Bases and definitions of the ITSs in line with the licensing basis is acceptable to the staff since it removes anomalies and clarifies Bases statements.

## 5.0 CONCLUSION

Based on the above evaluation, the staff concludes that WCAP-14036-P-A, Revision 1, is an acceptable methodology for allocating response times for ESF and RTS instrumentation in lieu of measuring the response times for Callaway. The selected components approved for this methodology are the following: the components listed in the table of ESF and RTS allocated response times in the letter of February 24, 2000, for the 7300 PPS, NIS, and SSPS instrumentation channels without a note 1, note 2, or note 3.

The staff also concludes that it is in agreement with the licensee's proposed changes to the ITS Bases for SR 3.3.1.16 and SR 3.3.2.10 that are in line with the staff-approved WCAP 14036-P-A, Revision 1, and TSTF No. 111, Revision 6.

As discussed in the above evaluation, the staff is relying on the licensee's statement that if future component replacements require the use of equipment not covered by WCAP-14036-P-A, Revision 1 (e.g., new 7300 card artwork levels not included in the WCAP), either Westinghouse will be asked to certify that no RTT impact would be introduced or response time testing shall be performed before their release for initial service. In the phone call with the licensee on February 24, 2000, the staff was informed that this is a commitment and will be put in the commitment tracking system for Callaway after the approval of the use of the WCAP. This commitment is not a requirement to the licensee because there is no regulation that controls changes to this commitment; however, the staff was also informed during this telecon that the licensee is following the NEI guidance on licensee regulatory commitments (i.e., not a requirement) and would, therefore, inform the staff in writing of any changes to this commitment. The licensee will be requested to inform the staff in writing when

this commitment is put in the tracking system, and their procedures for informing the staff if the commitment is revised in the future.

Principal Contributor: S. V. Athavale

Date: March 3, 2000