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BGE

A Member of the Constellation Energy Group

January 25, 2000

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
License Amendment Request: Revision to Technical Specification Definition of Response Time Testing

Pursuant to 10 CFR 50.90, Baltimore Gas and Electric Company (BGE) hereby requests an amendment to Operating License Nos. DPR-53 and DPR-69 to incorporate the changes described below into the Technical Specifications for Calvert Cliffs Units 1 and 2.

DESCRIPTION

The proposed amendment requests a revision to the definition of Response Time Testing (RTT) for the Reactor Protective System (RPS) and Engineered Safety Features Actuation System (ESFAS). The revision allows use of either an allocated sensor response time or a measured sensor response time for pressure sensors used in channels of RPS and ESFAS. The summary description and safety analysis provided in Attachment (1), is based on Combustion Engineering NPSD-1167, Revision 1, "Elimination of Pressure Sensor Response Time Testing Requirements – CEOG Task 1070." Baltimore Gas and Electric Company has evaluated the proposed revision to the Calvert Cliffs Technical Specifications and has determined that it does not involve a significant hazards consideration as defined in 10 CFR 50.92 (refer to Attachment 2 for a complete discussion).

REQUESTED CHANGES

Revise Unit 1 and 2 Technical Specification definitions in Section 1.1 as shown in the marked-up Technical Specification pages in Attachment (3).

SCHEDULE

The 2000 Unit 1 refueling outage is currently expected to begin in March 2000 and end in April 2000. In order to fully benefit from the requested change for the next outage, we request approval of the License Amendment by March 10, 2000. If the License Amendment Request is not approved by the requested date, we request that it be approved at the earliest opportunity since we are the Combustion Engineering Owner's Group lead plant for revising the definition of RTT and we plan to use it for future outages.

ASSESSMENT AND REVIEW

We have evaluated the significant hazards considerations associated with this proposed amendment, as required by 10 CFR 50.92, and have determined that there are none (see Attachment 2 for a complete

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discussion). We have also determined that operation with the proposed amendment will not result in any significant change in the types or significant increases in the amounts of any effluents that may be released offsite, and no significant increases in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment is eligible for categorical exclusion as set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed change. The Plant Operations and Safety Review Committee and the Offsite Safety Review Committee have reviewed this proposed change and concur that operation with the proposed change will not result in an undue risk to the health and safety of the public.

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

Charles H. Cruse

STATE OF MARYLAND :
: **TO WIT:**
COUNTY OF CALVERT :

I, Charles H. Cruse, being duly sworn, state that I am Vice President, Nuclear Energy Division, Baltimore Gas and Electric Company (BGE), and that I am duly authorized to execute and file this License Amendment Request on behalf of BGE. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other BGE employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.

Charles H. Cruse

Subscribed and sworn before me, a Notary Public in and for the State of Maryland and County of Calvert, this 25th day of January 2000.

WITNESS my Hand and Notarial Seal: Denise B. Snukis
Notary Public

My Commission Expires: 2/1/2002
Date

CHC/JMO/bjd

Attachments: (1) Summary Description and Safety Analysis
(2) Determination of Significant Hazards
(3) Technical Specification Marked-Up Pages

cc: R. S. Fleishman, Esquire
J. E. Silberg, Esquire
Director, Project Directorate I-1, NRC
A. W. Dromerick, NRC
H. J. Miller, NRC
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R. I. McLean, DNR
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ATTACHMENT (1)

SUMMARY DESCRIPTION AND SAFETY ANALYSIS

Baltimore Gas and Electric Company requests revising the definition of response time testing (RTT) for the Reactor Protective System (RPS) and Engineered Safety Features Actuation System (ESFAS). This request is based on Reference (1). Response time testing is testing that is performed on safety systems to ensure system response times are within the limits assumed in the plants safety analysis. For safety system pressure and differential pressure transmitters located in the Containment and Auxiliary Buildings, this testing has proven to be both a resource burden and a candidate for outage dose reduction. The revision allows substitution of an allocated sensor response time instead of a measured sensor response time for the sensor in channels of RPS and ESFAS that use pressure and differential pressure sensors. The following functional units are affected:

- Reactor Protective System (RPS)
  - High Pressurizer Pressure
  - Thermal Margin/Low Pressure
  - High Containment Pressure
  - Asymmetric Steam Generator
  - Low Steam Generator Pressure
  - Low Steam Generator Level
  - Low Reactor Coolant System Flow
- Engineered Safety Features Actuation System (ESFAS)
  - High Containment Pressure for Containment Isolation Signal
  - High-High Containment Pressure for Containment Spray Actuation Signal
  - High Containment Pressure for Safety Injection Actuation Signal
  - Low Pressurizer Pressure for Safety Injection Actuation Signal
  - Low Steam Generator Pressure for Steam Generator Isolation Signal
  - High Penetration/Letdown Heat Exchanger Room Pressure for Chemical and Volume Control System Isolation Signal
  - Low Steam Level for Auxiliary Feedwater Actuation Signal
  - High Steam Generator Pressure Differential for Auxiliary Feedwater Block Actuation Signal

The requested change only applies to RPS and ESFAS sensor channels that use pressure or differential pressure transmitters. There are other RPS and ESFAS channels that are not affected by the requested change.

DESCRIPTION OF REACTOR PROTECTIVE SYSTEM

General

The RPS consists of sensors, amplifiers, logic, and other equipment necessary to monitor selected Nuclear Steam Supply System conditions and to effect reliable and rapid reactor shutdown if any one or a combination of conditions deviates from a preselected operating range. The system functions to protect the core and Reactor Coolant System pressure boundary.

Design Basis

The RPS is designed on the following bases to assure adequate protection for the core:

1. Instrumentation conforms to the provisions of the proposed guidance of Institute of Electrical and Electronics Engineers (IEEE), "Criteria for Nuclear Power Plant Protection Systems" (IEEE 279, August 1968).
2. No single component failure can prevent safety action.
3. Four independent measurement channels are provided for each parameter that can initiate safety action.
4. Channel independence is assured by separate connection of the sensors to the process systems and of the channels to vital instrument busses.
5. The four measurement channels provide trip signals to six independent logic matrices, arranged to effect a two-out-of-four coincidence logic having outputs to four independent trip paths.
6. A trip signal from any two-out-of-four protective channels causes a reactor trip.
7. When one of the four channels is taken out-of-service, the protective system logic can be changed to a two-out-of-three coincidence for a reactor trip by bypassing the removed channel.
8. The protective system AC power is supplied from four separate vital instrument busses.
9. Open circuiting, or loss of power supply for the channel logic, initiates an alarm and a channel trip.
10. The trip logic matrices assume the nonconducting state to provide a tripping function.
11. The RPS can be tested with the reactor in operation or shut down.
12. The manual trip system is independent of the automatic trip system.
13. Trip signals are preceded by pretrip alarms to alert the operator of undesirable operating conditions in cases where operator action can correct the abnormal condition and avoid a reactor trip.
14. The RPS components are independent of the control system.
15. All equipment, including panels, components, and cables associated with the RPS, are marked with colored markers or nameplates in order to facilitate identification. The cabinets of the RPS are appropriately tagged A, B, C, and D, respectively, to distinguish between channels. Internal wiring in the RPS cabinets is not color coded. External to the RPS cabinets, the RPS uses color coded cable within the main control panels to ease identification of these channels. At termination points the incoming and outgoing cables of the RPS are appropriately tagged to identify the channel.
16. Electrical circuit isolation is provided between the RPS and the annunciators and plant computer.
17. The RPS is designed such that the de-energized state initiates a channel trip. This feature ensures that if channel continuity is lost, that channel will fail in a safe condition. The modules are not interlocked to prevent withdrawal but are designed such that withdrawal of one module causes a channel trip, associated channel trip annunciation and pretrip annunciation. Withdrawal of any other module of that parameter will cause a full trip since the system is in the two-out-of-four trip mode. A unique key is available at the plant, allowing only one of the four channels of any one parameter to be bypassed at any time. Strict administrative control ensures that this requirement is not violated. This bypass produces a two-out-of-three trip logic for the remaining three channels.

DESCRIPTION OF ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

General

The ESFAS controls equipment which protects the public and plant personnel from the accidental release of radioactive fission products in the unlikely event of a loss-of-coolant, main steam line break, or loss of feedwater incident. The safety features function to localize, control, mitigate, and terminate such incidents in order to minimize radiation exposure levels for the general public.

The ESFAS was supplied by Vitro Laboratories, Division of Vitro Corporation of America. Additional features were provided to the ESFAS with components supplied by Vitro Corporation. These features are maintenance bypass switches and bypass module, isolation module fault indication, and auctioneered 15 Volt DC power supplies for the logic modules, which are sequenced with the actuation relays' 28 Volt DC power supply. They were installed to minimize the potential for inadvertent actuations during maintenance and test activities. The ESFAS provides independent (from RPS) actuation for the Auxiliary Feedwater Actuation System. Implementation of Diverse Scram System provides independent (from RPS) actuation of a Diverse Turbine Trip and provides independent (from RPS) actuation of a reactor trip. This satisfies the 10 CFR 50.62 requirements for mitigation of Anticipated Transient Without Scram events.

Design Basis

Conformance to Standards

The design of the ESFAS and component parts was based on the applicable guidance of IEEE, "Criteria for Nuclear Power Plant Protection Systems" (IEEE 279). Maximum consideration has been given to the following criteria consistent with the objectives of this document:

1. Single Failure

   Any single failure within the protection system will not prevent proper protection system action when required.

2. Quality of Components and Modules

   Components and modules used in the manufacture of the actuation systems exhibit a quality consistent with nuclear power plant design objectives and with minimum maintenance requirements and low failure rates.

3. Channel Independence

   The actuation systems include four redundant sensor subsystems and two redundant actuation subsystems. Independence has been provided between redundant subsystems or channels to accomplish decoupling of the effects of unsafe environmental factors, electric transients, and physical accident consequences and to reduce the likelihood of interactions between channels during maintenance operations or in the event of channel malfunction.

TECHNICAL EVALUATION

Electric Power Research Institute Efforts

Electric Power Research Institute (EPRI) Report NP-7243, "Investigation of Response Time Testing Requirements," evaluated the response time test data for various pressure sensors to determine whether such testing is needed to justify assumptions used in Updated Final Safety Analysis Report Chapter 14 safety analyses. The report concluded that "... response time testing is not a concern but that overall sensor degradation is important. In reviewing approximately 4200 response time testing data points, the EPRI researchers did not identify any response time failures."

Technical Specifications for all Combustion Engineering Owners Group (CEOG) plants licensed after 1975 currently require that RTT be performed on safety systems to ensure system response times are within the limits assumed in the plants safety analysis. For safety system pressure and differential pressure transmitters located in the Containment and Auxiliary Buildings, this testing has been a resource burden as well as an unnecessary dose burden.

The EPRI Report NP-7243 serves as the technical basis for elimination of these RTT requirements by performing an evaluation of the expected performance of pressure sensors used in response time applications. The results demonstrate that overall sensor performance rather than individual failure modes, such as response time, should be the primary acceptance criterion. This report provides the basis for eliminating measured response time test requirements for selected safety system pressure and differential pressure transmitters in use at Calvert Cliffs Nuclear Power Plant (CCNPP) and other participating CEOG plants.

The Westinghouse Owners Group submitted Reference (2) for Nuclear Regulatory Commission (NRC) review in August 1995, with NRC approval received in September 1995 [Reference (3)]. In their approval, the NRC stated, "... any sensor failure that significantly degrades sensor response time can be detected during the performance of other surveillance tests, principally calibration." The NRC further stated that "... the performance of periodic RTT for the selected pressure and differential pressure sensors identified in the topical report can be eliminated from Technical Specifications (TS) and that allocated sensor response times may be used to verify acceptable RTS [Reactor Trip System] and ESFAS channel response times." Similarly, the B&W Owners Group submitted a topical report [Reference (4)] to the NRC in January 1994 justifying the elimination of selected RTT requirements; the NRC approved this report in December 1994.

Response time testing of reactor trip systems has been required since 1975. The requirements for this testing were established by IEEE Standard 338-1975, "Criteria for the Periodic Testing of Nuclear Power Generating Station Safety Systems." The guidelines for periodic testing of safety system response times established by this standard were endorsed by the NRC in Regulatory Guide 1.118, "Periodic Testing of Electric Power and Protection Systems," Revision 1, November 1977.

In the discussion on response time in IEEE Standard 338-1987, the case is made for not performing RTT if an alternate means of verifying equipment response time can be shown. The IEEE standard states "response time testing of all safety-related equipment is not required if, in lieu of response time testing, the response time of safety system equipment is verified by functional testing calibration checks or other test, or both. This is acceptable if it can be demonstrated that changes in response time beyond acceptable limits are accompanied by changes in performance characteristics that are detectable during routine periodic test."

The EPRI project studied the RTT programs of 39 participating plants. Areas examined by EPRI included test methodology, including test equipment and setup, historical data results of RTT and cost in resources and exposure of performing the required testing. Electric Power Research Institute also performed failure modes and effects analysis (FMEA) on a variety of pressure and differential pressure transmitters. The transmitters evaluated by the FMEAs were supplied by six vendors. The transmitters evaluated are as follows:

Sensor Types Covered by EPRI Report NP-7243

- Barton 288/289 Differential Pressure Indicating Switches
- Barton 763 Gage Pressure Electronic Pressure Transmitter

- Barton 764 Differential Pressure Electronic Transmitter
- Foxboro N-E11DM Differential Pressure Transmitter
- Foxboro N-E13DM Differential Pressure Transmitter
- Foxboro N-E13DH Differential Pressure Transmitter
- Foxboro N-E11GH Gage Pressure Transmitter
- Foxboro N-E11GM Gage Pressure Transmitter
- Tobar 32PA1 Absolute Pressure Transmitter
- Tobar 32PG1 Gage Pressure Transmitter
- Tobar 32DP1 Differential Pressure Transmitter
- Rosemount Differential Pressure Transmitter Models 1151,1152,1153,1154
- Rosemount Pressure Transmitter Models 1151,1152,1153,1154
- Statham PD-3200 Differential Pressure Transmitter
- Statham PG-3000 Pressure Transmitter
- SOR Differential Pressure Switch
- SOR Pressure Switch

These transmitters were selected for evaluation because they represent the majority of safety-related transmitters currently being used by the industry. The transmitter vendors contributed to the FMEAs by supplying technical information on their products; these vendors also reviewed the completed FMEAs and agreed with EPRI's conclusions.

In summary, the EPRI study reached the following conclusions:

- Based on a review of historical data provided by the participating plants, RTT did not identify any transmitters that failed response time requirements. The study established that calibrations and other tests would detect transmitters with excessive response times.
- The limited amount of data generated and the variance in test conditions associated with RTT minimize the usefulness of the data for trending degrading response times and general sensor health.
- Current RTT methodology may not detect response time degradation due to the slow loss of fill fluid in some sensors.

Combustion Engineering Owners Group Effort

Based on the above findings, the CEOG initiated a program to eliminate the requirement to perform measured RTT of safety-related pressure and differential pressure transmitters. This program was conducted in two phases. Phase 1 consisted of reviewing and evaluating the participating plants' RTT programs. Phase 2 used the findings of Phase 1 as the basis for a Topical Report to eliminate the requirement to perform measured RTT for selected pressure and differential pressure transmitters. The Phase 2 effort included the evaluation of vendor specifications for response time. It also evaluated the historical data supplied by the CEOG plants in Phase 1 for cases where vendor data is not available.

The purpose of the Phase 1 review was to validate that the RTT programs at the participating plants were consistent with those evaluated by EPRI and that the conclusions of EPRI Report NP-7243, Revision 1 are applicable to the participating CEOG plants. Phase 1 was completed in December of 1998 with the issuance of Combustion Engineering (CE) NPSD-1135, "Review of Utility Response Time Test Results."

This report was subsequently revised in May 1999 [Reference (5)] to incorporate additional utility comments. The conclusions reached by the Phase 1 effort can be summarized as follows:

- A review of approximately 1400 data points supplied by the eleven participating plants indicated that no failures of RTT occurred. This review also verified that trending of sensor performance utilizing RTT data does not appear to provide dependable information for predicting future sensor performance. This is a result of the variance in test condition and methods at the time the data is collected as well as the limited number of data points available for each individual sensor due to only testing each sensor once every four cycles.
- The FMEAs performed for the EPRI effort evaluated all of the sensors currently being used in safety applications by the participants as described in Reference (1).
- The RTT methodologies currently utilized by the participants are in agreement with those evaluated by EPRI.

Based on the above, the CEOG effort determined that the conclusions reached by EPRI in NP-7243 are applicable to the RTT program for CCNPP Units 1 and 2.

Application of CEOG Effort at CCNPP

A fixed response time will be allocated to each safety system pressure or differential pressure sensor for which the requirement to perform RTT has been eliminated. This allocated response time will in turn be added to the measured response time of the remainder of the processing loop to confirm that the overall response time for the particular function is still within the bounds of that assumed in the safety analysis. The allocated sensor response time must be shown to be conservative with respect to expected sensor performance.

Any cables or wires (including those used while testing) associated with the pressure and differential pressure sensors and the RPS/ESFAS signal processing electronics add a negligible response time (i.e., less than the minimum resolution assumed in Chapter 14) to the total channel response time. Therefore, the response time of cables and wires can be ignored for the purpose of determining total response time.

A review of the participating CEOG plants' installed transmitters was conducted to determine what types and model numbers are utilized in the RPS and ESFAS. This review showed that all of the participating CEOG plants use Rosemount, Barton, or WEED/Foxboro transmitters in their RPS and ESFAS protection loops. All of these transmitters are candidates for measured RTT elimination. As stated previously, they were all evaluated by EPRI Report NP-7243 with the exception of the Barton model 763A used at APS's Palo Verde units. The transmitter specifications for these vendors were reviewed to determine if a specification for transmitter response time was listed. From this review, we determined that both Rosemount and Barton do list a response time specification for their transmitters. Neither Foxboro nor WEED publish a response time specification for their qualified transmitters. Table 1 (below) lists the Rosemount and Barton pressure and differential pressure transmitters that were evaluated by EPRI and the vendor published response time specifications.

Table 1
Manufactures Response Time Specifications

Manufacture	Model Number	Range Code	Description	Response Time Spec.
Rosemount	1152 (DP,HP,AP,GP)	3	Differential Pressure or Pressure Transmitter	0.3 sec
Rosemount	1152 (DP,HP,AP,GP)	4,5	Differential Pressure or Pressure Transmitter	0.2 sec
Rosemount	1152 (DP,HP,AP,GP)	6,7,8,9,0	Differential Pressure or Pressure Transmitter	0.1 sec
Rosemount	1153 (D,H,A,G)	3	Differential Pressure or Pressure Transmitter	2.0 sec
Rosemount	1153 (D,H,A,G)	4	Differential Pressure or Pressure Transmitter	0.5 sec
Rosemount	1153 (D,H,A,G)	5,6,7,8,9	Differential Pressure or Pressure Transmitter	0.2 sec
Rosemount	1154 (DP,HP,GP)	4	Differential Pressure or Pressure Transmitter	0.5 sec
Rosemount	1154 (DP,HP,GP)	5,6,7,8,9,0	Differential Pressure or Pressure Transmitter	0.2 sec
Rosemount	1154H (D,H,S)	4	Differential Pressure or Pressure Transmitter	0.5 sec
Rosemount	1154H (D,H,S)	5,6,7,8,9	Differential Pressure or Pressure Transmitter	0.2 sec
Barton	763	N/A	Pressure Transmitter	0.18 sec
Barton	763A	N/A	Pressure Transmitter	0.18 sec
Barton	764	N/A	Differential Pressure Transmitter	0.18 sec

Calvert Cliffs Nuclear Power Plant currently uses Rosemount 1152, 1153, and 1154 transmitters, range codes 4, 5, 6 and 9, in the affected RPS and ESFAS applications:

Calvert Cliffs Units 1 & 2 Transmitters

Function	Instrument	Make / Model
RPS Transmitter	Reactor Coolant System Low Flow	Rosemount Model 1152
	Containment Pressure	Rosemount Model 1153
	Steam Generator Level	Rosemount Model 1154
	Pressurizer Pressure	Rosemount Model 1154
	Steam Generator Pressure (RPS & Asymmetric Steam Generator Transient)	Rosemount Model 1154
ESFAS and Auxiliary Feedwater Transmitter	Containment Pressure (ESFAS)	Rosemount Model 1153
	Steam Generator Level (Auxiliary Feedwater)	Rosemount Model 1154
	West Penetration Room Letdown Isolation	Rosemount Model 1154
	Steam Generator Pressure (ESFAS, Auxiliary Feedwater)	Rosemount Model 1154
	Pressurizer Pressure (ESFAS)	Rosemount Model 1154

The procedures used by CCNPP to perform RTT of RPS and ESFAS functions have been reviewed. For the RPS procedure, Surveillance Test Procedure (STP)-M-511, the recorded response time is currently measured from the input of the sensor to the tripping of the associated K relay. For the ESFAS procedure, STP-M-521, the recorded response time is currently measured from the input of the sensor to the tripping of the associated function trip bistable. For the Auxiliary Feedwater Actuation System procedure, STP-M-526, the recorded response time is currently measured from the input of the sensor to the tripping of the associated function trip bistable. We have recently completed changing our installed RPS and ESFAS transmitters to Rosemount models. The Rosemount sensors presently installed have all been identified as candidates for elimination of measured RTT by EPRI Report NP-7243. The data we supplied for CE NPSD-1135, Revision 01 consisted only of historical RTT data for the newly installed Rosemount transmitters. A review of the supplied data verified that no failures of the RTT requirements have been observed. All of these sensors have specified response times as published by their manufacturer.

The current CCNPP test procedures used to determine RPS and ESFAS response times will be revised to delete the measured RTT of the sensors and rewritten such that the response time for the remainder of the RPS and ESFAS loops, minus the sensors, is measured and recorded. An allocated response time will then be assigned to the RPS and ESFAS sensors. This allocated response time may be obtained from either the vendor published response time data as listed in Table 1 or from an analysis of the historical response time data for that sensor as utilized at Baltimore Gas and Electric Company. This allocated sensor response time will then be added to the measured response time for the remainder of the RPS or ESFAS protection loop and verified to meet the assumptions of the safety analysis.

CONSTRAINTS

The results of EPRI Report NP-7243, Revision 01 form the basis for justifying the elimination of measured response time test requirements in selected RPS and ESFAS pressure and differential pressure transmitters. In this report, EPRI makes several recommendations that are applicable to this effort to eliminate sensor RTT. Calvert Cliffs Nuclear Power Plant agrees with these recommendations:

- Perform a hydraulic RTT prior to installation of a new transmitter/switch or following refurbishment of the transmitter/switch (e.g., sensor cell or variable damping components) to determine an initial sensor-specific response time value.
- For transmitters and switches that use capillary tubes, RTT should be performed after initial installation and after any maintenance or modification activity that could damage the capillary tubes.
- Perform periodic drift monitoring on all Rosemount pressure and differential pressure transmitters, Models 1151, 1152, 1153, and 1154. Guidance on drift monitoring can be found in EPRI NP-7121 and Rosemount Technical Bulletins. Drift monitoring intervals should be based on utility response to NRC Bulletin 90-01. Note that the CCNPP response to the bulletin stated we would replace transmitters in lieu of performing drift monitoring [Reference (6)].
- If variable damping is used, implement a method to ensure that the potentiometer is at the required setting and cannot be inadvertently changed. This approach eliminates the need for RTT to detect a variable damping failure mode. Otherwise, RTT each transmitter by hydraulic or electronic white noise analysis methods, at a minimum, following each transmitter calibration.

If we replace any of the existing RPS or ESFAS sensors with one of a different manufacture or model number than that which is currently installed, we will review the sensor response time allocation. If the new sensor is one listed in Table 1, then the new sensor response time allocation can be made by utilizing the data available in Table 1. If the new sensor is not one of those listed in Table 1, then we will verify that the sensor is a candidate for response time elimination as defined in Reference (1). Once this determination is made we may allocate a response time based on historical data for that transmitter type and model if sufficient historical data is available.

FAILURE MODES AND EFFECTS CONSIDERATIONS

The FMEA performed by EPRI and documented in NP-7243 (May 1991) and NP-7243, Revision 1 (March 1994) form the basis for the justification of eliminating RTT surveillance requirements from CEOG plant Technical Specifications.

BENEFITS OF RTT ELIMINATION

Safety

A reduction in testing requirements, if done without compromising equipment reliability or functionality, provides the following improvements in plant safety:

- Reduction in challenges to the plant protection system due to improper test techniques. Testing requires placing the system to be tested in an abnormal line up. If initial test line up is performed incorrectly or if restoration from the test line up is not done properly, a plant trip signal may be generated or prevented from occurring.
- Reduction in challenges to the ESFAS due to improper test techniques. Testing requires placing the system to be tested in an abnormal line up. If initial test line up is performed incorrectly or if restoration from the test line up is not done properly, actuation of the engineered safety features may result or be prevented from occurring.

In addition to the above, elimination of certain response time test requirements will directly benefit dose reduction efforts. Most of the sensors that are candidates for RTT elimination are located in radiation areas. In some cases, the performance of RTT also requires the technicians to handle and dispose of radioactive fluids. The elimination of RTT requirements for these sensors will reduce worker exposure and radioactive waste.

Cost

Response time testing is costly in man-hours, exposure, and critical outage time. The CEOG plants estimate that it requires approximately 30 man-hours per sensor to perform each response time test. Depending on the plant and the number of sensors tested per outage, the total time required to perform this testing can range from 400 to 1200 man-hours. Assuming $30 per man-hour, the cost of this testing on a per-outage basis can range from $12,000 to $36,000. Such costs do not include the additional savings associated with the reduction in worker exposure and radioactive waste that the elimination of this testing will generate. We estimate that the revision will reduce the worker exposure by approximately 250 mRem per refueling cycle. Based on this analysis, the option to eliminate measured pressure sensor RTT is cost beneficial.

SAFETY ANALYSIS

The RPS functions to protect the core and Reactor Coolant System pressure boundary. The ESFAS controls equipment which protects the public and plant personnel from the accidental release of radioactive fission products in the unlikely event of a loss-of-coolant, main steam line break, or loss of feedwater incident. The safety features function to localize, control, mitigate, and terminate such incidents in order to minimize radiation exposure levels for the general public.

Both systems are required to sense process events (pressure, level, etc.), perform signal processing (bistable functions), and actuate control elements via relays in order to accomplish their safety functions. The accident analysis credits these safety functions, and it assumes a certain total response time for each process event.

Current CCNPP Technical Specifications require validation of RPS and ESFAS response times to ensure that the protective function performance is consistent with assumptions used in plant safety analyses. Reference (1) provides justification for eliminating the requirement to perform RTT of pressure and differential pressure transmitters used in these systems.

Combustion Engineering NPSD-1135 Revision 1, "Review of Utility Response Time Test Results;" validated the findings of EPRI Report NP-7243, Revision 01, "Investigation of Response Time Testing Requirements" as it pertains to CCNPP and other participating CEOG plants. Based on an evaluation of response time measurements performed and a failure modes analysis of qualified pressure transmitters used in United States nuclear plants, EPRI concluded that "... response time testing is redundant to other periodic testing for all cases except slow loss of fill fluid and variable damping potentiometer misadjustment."

Approximately 1400 data points comprising all the available response time test data for CCNPP and other participating CEOG plants were reviewed during this study. This review verified that none of the tested pressure and differential pressure transmitters had failed a response time test. This review also confirmed that all of the presently installed RPS and ESFAS transmitters that currently require RTT were evaluated by the EPRI report. The test methodology employed by the CEOG plants to perform response time tests is consistent with the test methodologies evaluated by EPRI.

Reference (1) documents the technical justification for eliminating measured sensor RTT for pressure and differential pressure transmitters in RPS and ESFAS applications at CCNPP as well as other participating CEOG plants. It applies technical bases developed in EPRI NP-7423.

CONCLUSION

Eliminating measured RTT pressure and differential pressure transmitters for RPS and ESFAS applications is acceptable at CCNPP. Transmitter response time measurements are not required to demonstrate satisfactory transmitter performance. Routine surveillance such as calibration and drift monitoring is sufficient to demonstrate satisfactory transmitter performance.

Therefore, Baltimore Gas and Electric Company requests a Technical Specification change to revise the definitions of RPS and ESFAS RTT to allow using an allocated transmitter response time in lieu of a measured transmitter response time for pressure and differential pressure transmitters in these systems.

REFERENCES

1. CE NPSD-1167, Revision 1, "Elimination of Pressure Sensor Response Time Testing Requirements – CEOG Task 1070
2. Westinghouse Owners Group Topical Report WCAP-13787, Revision 02, "Elimination of Pressure Sensor Response Time Testing Requirements," August 1995 (Approved by the NRC in January 1996)
3. Letter from B. Boger (NRC) to R. Newton, "Review of Westinghouse Electric Corporation Topical Report WCAP-13632, Revision 02, 'Elimination of Pressure Sensor Response Time Testing Requirements,' dated August 1995 – Westinghouse Owners Group Program MUHP-3040, Revision 1," September 5, 1995
4. B&W Owners Group Topical Report NEDO-32291, "Systems Analysis for Elimination of Selected Response Time Testing Requirements," January 1994
5. CE NPSD-1135, Revision 01, "Review of Utility Response Time Test Results," May 1999
6. Letter from Mr. R. E. Denton (BGE) to NRC Document Control Desk, dated March 4, 1993, "Response to NRC Bulletin No. 90-01, Supplement 1: Loss of Fill-Oil in Transmitters Manufactured by Rosemount"

ATTACHMENT (2)

DETERMINATION OF SIGNIFICANT HAZARDS

The proposed change has been evaluated against the standards in 10 CFR 50.92 and has been determined to not involve a significant hazards consideration, in that the operation of the facility in accordance with the proposed amendment:

1. *The proposed licensing basis change does not involve a significant increase in the probability or consequences of an accident previously evaluated in the safety analysis report.*

   This change to the licensing basis does not result in a condition where the design, material, and construction standards that were applicable prior to the change are altered. The same Reactor Protective System and Engineered Safety Features Actuation System instrumentation is being used; the time response allocations/modeling assumptions in Updated Final Safety Analysis Report Chapter 14 analyses remain the same; only the method of verifying time response is changed. The proposed change will not modify any system interface and could not increase the likelihood of an accident since these events are independent of this change. The proposed activity will not change, degrade or prevent actions or alter any assumptions previously made in evaluating the radiological consequences of an accident described in the Updated Final Safety Analysis Report. Therefore, the proposed amendment does not result in any increase in the probability or consequences of an accident previously evaluated.

2. *The proposed licensing basis change does not create the possibility of a new or different kind of accident from any accident previously evaluated in the safety analysis report.*

   This change does not alter the performance of the pressure and differential pressure sensors used in the plant protection systems. These sensors will still have their response time verified before they are placed in operational service and after any maintenance to them that could affect their response time. Changing the method of periodically verifying instrument response for certain sensors (assuring equipment operability) from time response testing to calibration, use of actual data, and channel checks will not create any new accident initiators or scenarios. Periodic surveillance of these instruments will detect significant degradation in the sensor response characteristic. Implementation of the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. *The proposed licensing basis change does not involve a significant reduction in margin of safety.*

   The total Reactor Protective System and Engineered Safety Features Actuation System response time assumed in the safety analysis is not affected by this change. The periodic system response time verification method for selected pressure and differential pressure sensors is modified to allow the use of allocated data based on actual test results or other verifiable response time data. Verification methods and calibration tests assure that any degradation sufficient to significantly affect sensor response time will be detected before the total system response time exceeds that defined in the safety analysis. Therefore, it is concluded that the proposed change does not result in a significant reduction in margin with respect to plant safety.

Conclusion

Based on the preceding analysis, we conclude that the option to allow using an allocated transmitter response time in lieu of a measured response time for pressure and differential pressure sensors is acceptable and the proposed licensing basis change does not result in a finding of any significant hazards as defined in 10 CFR 50.92.

ATTACHMENT (3)

TECHNICAL SPECIFICATION MARKED-UP PAGES

Section 1.0

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
January 25, 2000

1.1 Definitions

DOSE EQUIVALENT I-131

DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites."

$\bar{E}$-AVERAGE DISINTEGRATION ENERGY

$\bar{E}$ shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MeV) for isotopes, other than iodines, with half lives > 15 minutes, making up at least 95% of the total non-iodine activity in the coolant.

ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME

The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. ~~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.~~

The response time may be verified by any sequence of sequential, overlapping, or total steps such that the entire response time is measured, or by the summation of allocated sensor response times with the results of actual measured response times for the remainder of the channel.

L_a

The maximum allowable containment leakage rate, L_a, shall be 0.20% of containment air weight per day at the calculated peak containment pressure (P_a).

1.1 Definitions

capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

PHYSICS TESTS	PHYSICS TESTS shall be those tests performed to measure the fundamental nuclear characteristics of the reactor core and related instrumentation. These tests are: a. Described in Chapter 13, Initial Tests and Operation of the Updated Final Safety Analysis Report; b. Authorized under the provisions of 10 CFR 50.59; or c. Otherwise approved by the Nuclear Regulatory Commission.
RATED THERMAL POWER (RTP)	RTP shall be a total reactor core heat transfer rate to the reactor coolant of 2700 MWt.
REACTOR PROTECTIVE SYSTEM (RPS) RESPONSE TIME	The RPS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its RPS trip setpoint at the channel sensor until electrical power to the CEAs drive mechanism is interrupted. ~~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.~~ The response time may be verified by any sequence of sequential, overlapping, or total steps such that the entire response time is measured, or by the summation of allocated sensor response times with the results of actual measured response times for the remainder of the channel.
SHUTDOWN MARGIN (SDM)	SDM shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition