

UNION ELECTRIC COMPANY

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March 7, 1983

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Mr. R. L. Spessard, Director
Division of Project and Resident Programs
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
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ULNRC-611

Dear Mr. Spessard:

10 CFR 50.55(e) Report - Wide Range Reactor
Coolant System Pressure Transmitters

- Ref: 1. ULNRC-569, dated July 21, 1982, from
D. F. Schnell, U.E., to J. G. Keppler, NRC.
2. NS-EPR-2586, dated April 21, 1982, from
E. P. Rake, Westinghouse, to R. C. DeYoung, NRC

Attachment: The Effect of Potential Post-Accident Errors in the
Wide Range Reactor Coolant System Pressure
Instruments on the SNUPPS Plants.

Reference 1 provided an interim report on a 10 CFR
50.55(e) matter concerning the potential, post-accident errors in
the reactor coolant system wide range pressure instruments.
Westinghouse reported this matter to the NRC on a generic basis
in Reference 2 and the NRC disseminated the subject in IE
Information Notice No. 82-11.

Westinghouse determined that the post-accident accuracy
of the wide range pressure instruments may not meet functional
requirements. Union Electric has reviewed this matter with
Westinghouse and has determined that, for most functions
dependent on wide range instruments, the potential inaccuracies
do not constitute a significant deficiency for the Callaway
Plant, Unit 1. A summary of the evaluation that leads to this
conclusion is provided in the attached report. The effects of
the potential inaccuracies on the reactor vessel level
instrumentation system and core cooling monitor system are still
being evaluated. The results of that evaluation will be provided
in the final report by July 1, 1983.

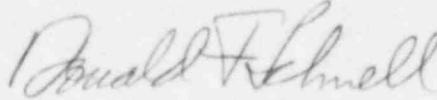
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If there are any questions on this matter, please contact me or Mr. Donald Capone of my staff.

Very truly yours,

A handwritten signature in cursive script that reads "Donald F. Schnell". The signature is written in dark ink and is positioned above the printed name.

Donald F. Schnell

RD/msc

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ATTACHMENT:

THE EFFECT OF POTENTIAL
POST-ACCIDENT ERRORS IN THE
WIDE RANGE REACTOR COOLANT
SYSTEM PRESSURE INSTRUMENTS
ON THE SNUPPS PLANTS

Introduction

In early April 1982, Westinghouse informed SNUPPS of a potential significant deficiency, as defined by 10 CFR 50.55(e), for the SNUPPS plants concerning the potential, post-accident inaccuracy of the reactor coolant system (RCS) wide range pressure instrument. This Westinghouse determination was based on a review of the results of equipment qualification testing and of design/operational requirements placed on the instrument. Westinghouse also recognized that due to the complexity of the issue and plant-specific differences, the issue may affect individual plants differently. The SNUPPS plants (Callaway and Wolf Creek) are identical insofar as this issue affecting, or being affected by, plant design and operation. Therefore the SNUPPS Utilities jointly reviewed this matter. The review included Westinghouse and the architect/engineer for SNUPPS, Bechtel Power Corporation.

Normal Plant Operations and Evolutions

In a normal plant environment, the RCS wide range pressure instrument has an indication accuracy of ± 90 psi (3% of span) and a trip and actuation accuracy of ± 63 psi (2.1% of span). During plant operation, the instrumentation is used to monitor RCS pressure outside of the narrow range pressurizer pressure measurement. The indication accuracy provided is acceptable for this function.

For initiation of Residual Heat Removal System (RHRS) operation, the instrumentation provides an open permissive signal to the RHRS isolation valves. The system pressure requirements are based on precluding overpressurization of the RHRS and yet maintaining a sufficient RCS pressure to maintain the required differential pressure on the #1 Reactor Coolant Pump seals. The actual allowance in the SNUPPS design is ± 117 psi. Therefore the ± 90 psi indication and ± 63 psi trip accuracies are acceptable.

The RCS wide range pressure transmitter provides an input signal to the overpressure mitigation system (OMS) in the SNUPPS design. Analyses of the OMS have shown that the ± 63 psi trip accuracy is acceptable.

Abnormal/Accident Conditions

In the worst case accident environment, the RCS wide range pressure instrument accuracies are ± 390 psi (13% of span) for

indication and ± 363 psi (12.1% of span) for trip and actuation. These values assume a $\pm 10\%$ sensor environmental allowance based on the environmental testing described above and also reflect normal sensor and signal processing allowances for calibration accuracy, drift, comparator setting, temperature effect, indicator accuracy, and indicator readability. During accident conditions the RCS wide range pressure signal is relied upon in several of the emergency response guidelines developed by the Westinghouse Owners' Group and provides an input to the Reactor Vessel Level Instrumentation System (RVLIS) and the Core Cooling Monitor System (CCMS).

The emergency operating procedures for the SNUPPS plants have not been completed. However, they will be based on Westinghouse Owners' Group Emergency Response Guidelines (ERG). ERGs E-1 (Loss of Reactor Coolant) and E-2 (Loss of Secondary Coolant) use RCS pressure for the operator evaluation of safety injection (SI) termination. The purpose of the evaluation is to minimize the number of demands on the pressurizer power-operated relief valves and yet maintain subcooling following a small LOCA or steam system break. Westinghouse has determined that an accuracy of ± 325 psi is required for the function and thus it is not met by the ± 390 psi accuracy of the RCS wide range pressure instrument. However, narrow range pressure instrumentation has a post-accident accuracy of about ± 144 psi and its range (1700 to 2500 psig) includes the SI termination value (RCS pressure greater than 2000 psig). Use of the narrow range instrument for this post-accident function has the advantage that the operator uses the same instrument that is used during normal plant operation and that is most familiar to him. If, during the finalization of the emergency operating procedures for the SNUPPS plants, (a) the accuracy requirement for the SI termination function is not reduced, or (b) the accuracy of the wide range pressure instrument is not improved, the procedures will specify use of the narrow range instrument for SI termination; and equipment qualification documentation will show that the required accuracy is met.

ERG E-2 also uses wide range pressure for SI termination to minimize reactor vessel thermal shock while maintaining subcooling. The accuracy requirement for this function is ± 520 psi and the post-accident accuracies are acceptable.

ERG E-3 (Steam Generator Tube Rupture) uses the RCS wide range pressure instrument for a variety of functions. However the ERG requires only that a pressure increase be read. A specific accuracy is not required. In addition, the tube rupture accident would not result in a harsh post-accident environment that could cause the large inaccuracies.

ERG E-0 (Reactor Trip or Safety Injection) requires that the operators evaluate the need to trip the reactor coolant pumps.

This step ensures that pumps are kept running for accident conditions in which decay heat removal via the steam generators is preferred. For SNUPPS, the allowed instrumentation accuracy is about ± 530 psi. Therefore the wide range RCS pressure instrument meets this requirement.

The CCMS compares core outlet thermocouple temperatures and hot and cold leg RTD temperatures based on the lowest of three pressure signals. One of the three pressure signals for each of the redundant portions of the CCMS is the RCS wide range pressure. The effect of the uncertainty of the wide range pressure signal is still under evaluation.

The RVLIS measures the differential pressure between the bottom and top of the reactor vessel. To provide accuracy for level measurement, temperature of the impulse lines, RCS temperature, and RCS wide range pressure are used to compensate the differential pressure transmitter outputs for differences in system and reference leg density. The effect of the wide range pressure instrument accuracy for RVLIS is also still under evaluation.

As described in the SNUPPS FSAR Appendix 5.4A, the SNUPPS plants are designed to attain a cold shutdown condition using only safety-grade equipment. Part of the safety-grade cold shutdown scenario is the use of the RHRS. The post-accident accuracies of the RCS wide range pressure transmitter are greater than ± 117 psi. However, the SNUPPS design and licensing commitments do not require that the RHRS be initiated in a normal mode following a design basis accident. For a postulated accident scenario in which the RHRS is eventually used in its normal cooling mode, other pressure instruments can be used to insure the safe initiation of the RHRS. Specific instruments available for this purpose are the third RCS wide range channel, for which the pressure transmitter is located on one of the RVLIS lines outside containment, and RCS pressure instruments in the nuclear sampling system. Therefore, post-accident accuracies of the instrument in question do not apply to RHRS initiation.

Conclusions

There are no concerns about RCS pressure measurement during normal plant environmental conditions. Several of the guidelines that will be used as a basis for the operating procedures call for operator use of RCS wide range pressure. In all cases, either the required accuracy meets the demonstrated accuracy or a more accurate instrument will be used. The RCS wide range pressure instrument provides an input to other instrumentation systems that may be used in a post-accident situation. In these

cases, the safety effects of the wide range pressure transmitter inaccuracies are currently under evaluation.