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U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Perry Nuclear Power Plant
Docket No. 50-440
Technical Specification
Change Request - RCIC Equipment
Room Differential Temperature
Isolation Actuation Instrumentation

Gentlemen:

The Cleveland Electric Illuminating Company (CEI) hereby requests amendment of Facility Operating License NPF-58 for the Perry Nuclear Power Plant, Unit 1. In accordance with the requirements of 10CFR50.91(b)(1), a copy of this request for amendment has been sent to the State of Ohio as indicated below.

This letter requests revision of Technical Specification Table 3.3.2-2, Item 5e, the RCIC Equipment Room Differential Temperature Isolation Actuation Instrumentation Trip Setpoint and Allowable Value.

The request is a followup to the previously submitted and approved change to the RCIC Equipment Room Differential Temperature Trip Setpoint and Allowable Value, documented in Amendment 26 issued January 30, 1990. Because that Amendment is only valid until the Lake Erie water temperature reaches 55 degrees F, CEI has considered alternatives which would establish year-round values for the Trip Setpoint/Allowable Value. Since historically Lake Erie has reached 55 degrees F in early May it is requested that this change request be approved on or before May 8, 1990. Attachment 1 includes the Summary, Safety Analysis, Significant Hazards and Environmental Considerations. Attachment 2 includes the proposed markup of the Technical Specifications.

This requested amendment will provide a significant improvement in RCIC reliability when responding to transients, however, CEI requests that the NRC continue to consider issuance of the amendment request submitted on January 19, 1990 to remove the isolation function of the delta-T instruments. If you have any questions, please feel free to call.

Very truly yours,

A Kaplan

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Vice President
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Attachments
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Summary/History

On January 19, 1990 CEI submitted an Emergency Technical Specification change request (PY-CEI/NRR-1124L) to delete the isolation function of the RCIC Equipment Room differential temperature (delta-T) instrumentation. The original request was submitted because the RCIC system had isolated on January 7, 1990 due to a false differential temperature signal (no actual steam system break had occurred) when RCIC had been responding to deliver water to the Reactor Vessel. As discussed in that letter CEI felt that deletion of the automatic trip function of the RCIC Equipment Room delta-T was acceptable and the preferred position, since retention of the trip function would potentially have a negative effect on RCIC reliability, and since there appears to be a regulatory basis for removal of the isolation function provided the alarm function is retained. It also appeared that determining a valid Trip Setpoint and Allowable Value would be difficult due to the wide variety of parameters which affect the RCIC Equipment Room Differential Temperature Instrumentation. In order to process the change under the conditions which existed in January (i.e. RCIC inoperable due to the RCIC delta-T instrumentation requiring a reactor plant shutdown by February 1, 1990), the NRC staff issued Amendment 26 on January 31, 1990 providing a new trip setpoint and allowable value. This amendment is only effective as long as Lake Erie water temperatures remain less than 55 degrees F. Historically lake water temperatures reach this value in early to mid-May.

In the time period since submittal of the previous amendment request, CEI has performed analyses to determine if a year-round trip setpoint and allowable value was feasible, or whether multiple values would need to be proposed. It was concluded that year round single values for the isolation setpoint and allowable value were feasible and contained certain advantages over the use of multiple seasonal setpoints. If a multiple setpoint approach was used the plant would be required to physically change the isolation setpoint on the instrumentation at least twice a year. In the spring when the Lake Erie water temperature reached the crossover temperatures (55°F) the delta-T trip setpoint would be revised to account for the higher Lake temperature, and in the fall when Lake Erie water temperature again reached the crossover temperature, the delta-T isolation setpoint would be revised to account for the lower Lake temperature. Since there are two delta-T instruments (one for each trip system) this would result in four trip setpoint changes being made each year to the instrumentation.

Therefore, the only reason why a multiple setpoint approach would be considered would be if it was necessary for these delta-T instruments to be isolating steam leakage at an upper bound of 25 gpm versus utilizing an upper bound isolation value between 30 to 35 gpm. As noted in our previous correspondence, the sensitivity of the delta-T instruments to various size leaks varies as the temperature of the cooling water entering the room cooler varies. For any given setpoint value, as the water temperature entering the room cooler gets colder, the size of the steam leak which will isolate the RCIC system gets smaller. If an attempt is made to restrict the maximum leak size isolated by these delta-T instruments to 25 gpm at any time of the year (and therefore with any lake temperature between 32°F and 80°F), then multiple setpoints would have to be used. This multiple setpoint approach would result in a much more important disadvantage than just the additional setpoint

changes it would require; it would impact directly on RCIC system reliability/availability to respond to plant transients. The RCIC system availability would be decreased during three significant portions of the year, first during the entire winter at very cold lake water temperatures, and again in the late spring and early fall when the lake temperatures are just above the crossover temperature of 55 degrees F. This availability reduction would occur during these periods of time because leak rates of 5 gallons per minute (gpm) or less would isolate the RCIC system. Leak rates of this size could result from a simple gasket leak rather than an actual crack of concern, and the proper course of action in response to this small leak is an alarm with subsequent operator investigation, rather than the indiscriminate isolation of the RCIC system when it is injecting coolant to the reactor vessel.

To eliminate these disadvantages, CEI concluded that one trip setpoint and allowable value should be determined for use year-round. This will provide a significant reduction in the threat to RCIC reliability while the NRC is reviewing our January 19, 1990 request to delete this automatic isolation. Analyses were performed in order to determine which trip setpoint/allowable value would provide for sufficient margin during all anticipated ranges of lake temperature to prevent spurious RCIC isolations, yet would provide automatic isolation if a steam leak of any significance in the RCIC Equipment Room should occur. In order to accomplish this with one trip setpoint, the size of steam leaks isolated by the delta-T instrumentation will vary as the lake water temperatures vary, from approximately 15 gpm when the lake temperature is cold to approximately 35 gpm when the lake temperature is at its warmest. This arrangment provides delta-T generated isolation signals for a range of leaks centered around a nominal 25 gpm leak size. This range of leakage remains completely bounded by the USAR Analysis of the Main Steam Line Break (MSLB) outside containment discussed in the USAR Section 15.6.4. The differential temperature trip setpoint and allowable value determined by the analyses were 95.9 degrees F and 97.2 degrees F respectively. This is based on a safety limit value of 102 degrees F.

Safety Analysis

As discussed above, analyses were performed to determine one trip setpoint which could be used throughout the range of expected Lake Erie water temperatures, to provide automatic RCIC isolation if actual steam leaks of sufficient amount occur, but to prevent spurious RCIC isolation. First, a series of calculations were completed to determine the temperature rise in the RCIC Equipment Room following postulated steam leaks of various sizes. The calculations were performed using the personal computer version of the COMPARE computer code.* Some of the key input parameters used by the code were room volumes, initial room temperatures/pressures, initial relative humidity, steam leak rates, and relief areas from the rooms. Two flow models were used - Inertial Model, which is flow with inertia based on a solution of the one dimensional momentum equation, and Moody Flow Model, which is two phased water critical flow based on F.J. Moody, "Maximum Flow Rate of a Single Component,

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* "COMPARE-MOD 1: A code for Transient Analysis of Volumes with Heat Sinks, Flowing Vents, and Doors", LA-7199-MS, NRC-4, Los Alamos Scientific Laboratory, March, 1978.

Two Phase Mixture" February 1965. Sensitivity analyses were performed, varying the flow model, initial relative humidity, room cooling, and the flow path to the environment. For those calculations run with room coolers operating it was assumed that the RCIC room cooler cooling water exhaust valve was positioned to supply approximately 15 gpm flow from the Emergency Closed Cooling (ECC) system at all times, even with cold lake temperatures. This was done so that repositioning of this valve would not be required seasonally due to lake water temperatures. The previous submittal (PY-CEI/NRR-1124 L) had discussed that repositioning of this valve was difficult, and could have played a part in the undesired RCIC isolation on January 7. The conclusion was that the Moody flow model yields the most conservative results while the other parameters varied in the sensitivity analyses do not have a significant effect on the analysis.

From these calculations, RCIC room temperature rise versus time graphs were generated for various steam leak rates. These graphs indicated that for each steam leak rate the RCIC room temperature would reach a maximum temperature within 1 to 5 minutes (these graphs assumed no isolations of the RCIC system occur, in order to examine room temperature responses). Since this maximum RCIC air temperature would be sensed by the wall mounted temperature detector (T_{hot}) of the RCIC room delta-T circuit, this value could be used in determining valid delta-T trip setpoints for various lake water temperatures. Two extreme cases had to be considered - cold winter conditions, with only RCIC heat loads on ECC, and hot summer conditions, with other "post LOCA" heat loads on ECC conditions. For the cold winter conditions, the temperature instrument located in the RCIC room cooler exhaust (T_{cold}) would sense a minimum of 54°F based on a lake temperature of 33°F. For the hot summer conditions, the T_{cold} instrument would sense a maximum temperature of 101°F based on a lake temperature of 80°F. Having established T_{cold} for hot and cold conditions and using the T_{hot}'s discussed above, a series of delta-T's for various steam leak rates was developed for both cold and hot water temperature conditions.

Table 1 shows the delta-T values determined using this method for various steam leak rates. As shown on the Table, for any given steam leak rate, the differential temperature sensed by the delta-T instrumentation would vary widely from the anticipated cold weather conditions to the hot weather conditions. For example, Table 1 shows that a 5 gpm steam leak would result in a 29°F delta-T during maximum anticipated summer conditions, but would result in a 76°F delta-T during minimum winter temperature conditions.

In order to establish one trip setpoint, CEI determined a range of steam leak rates which were considered acceptable to meet all regulatory requirements, and yet establish a trip setpoint large enough to prevent spurious trips even under various lake temperatures conditions. It was determined that establishing a Safety Limit differential temperature of 102°F would establish the bounding leak rates for automatic isolation as a range from just above 15 gpm in winter to under 35 gpm in summer (see Table 1). From this safety limit value, an allowable value and trip setpoint were calculated taking into account instrument loop accuracies, instrument calibration accuracies, and instrument loop drift. These calculations established the allowable value at 97.2°F and the trip setpoint at 95.9°F.

Several important points were considered in the process of selecting the isolation setpoint and the 15-35 gpm range of leakage which it will serve to isolate. First, the primary method provided in the RCIC Equipment Room for detection and isolation of small leaks is the RCIC Equipment Room Ambient Temperature isolation instrumentation. The ambient room temperature isolation is the primary method of detecting small steam leaks in the RCIC Equipment Room because it isolates the RCIC system on a steam leak of approximately 15 gpm irrespective of lake temperature. The RCIC Equipment Room Ambient Temperature instruments are independent, redundant instruments also monitoring for small steam leaks in the RCIC Equipment Room. The Technical Specification Trip Setpoint for the Ambient instrumentation is 143.4°F. This is based on a Safety Limit value of 152°F. Based on the analysis described above for determining temperature rises in the RCIC equipment room for various steam leak rates, a leak of just above 15 gpm would increase the RCIC room temperature to the ambient safety limit value, regardless of the season. The delta-T instrumentation is consistent with this sensitivity level in the winter, and remains adequately sensitive in the summer to remain bounded by the USAR analysis of the Main Steam Line Break outside containment discussed in USAR Section 15.6.4.

The RCIC room temperature rise analyses discussed above indicated that RCIC Equipment Room differential temperature would exceed the delta-T safety limit value of 102°F within 45 seconds with cold lake temperatures, and within 2.5 minutes with hot lake temperatures for a 35 gpm leak. The ambient detectors respond to provide an isolation even faster, with the ambient safety limit temperature being exceeded within 35 seconds for a 35 gpm leak. Even so, if it was assumed that a leak of 35 gpm continued for as long as 20 minutes prior to isolation, the resultant leakage released would be less than 4% of the leakage calculated in the MSLB analysis. Therefore, the whole body dose and the inhalation dose would be approximately 1.32% and .11% of 10CFR100 limits.

It is also noted that operators would respond to investigate either ambient or delta-T alarms in the RCIC Equipment Room, alarms which have setpoints lower than the isolation setpoints. The alarm setpoint for both the RCIC Equipment Room ambient and delta-T instrumentation will be established at approximately the 5 gpm range (as discussed above, for the delta-T Trip Setpoint, the alarm setpoint for delta-T will actually cover a range of steam leaks based on lake water temperature while the ambient alarm setpoint will detect at 5 gpm year-round). The operators alarm response instruction notes that both of these alarms (ambient or differential) are caused by either steam leaks from piping or components in the RCIC pump room, or by loss of ventilation in the room. The operators would respond to these alarms by taking actions to determine if a steam leak exists in the RCIC pump room. Depending upon the plant conditions existing at the time of the ambient or delta-T alarm, the operator would take appropriate action to best protect the health and safety of the public. In determining the appropriate action, operators would take into account whether the RCIC system was currently responding to perform its design function, and if so, what other systems were available to perform a similar function. If the leak rate increased prior to the operator taking any manual action, the system would isolate at approximately 15 gpm due to the ambient temperature trip and at 15-35 gpm for the delta-T trip. As stated above all cases would be bounded by the MSLB analysis in USAR Section 15.6.4.

Finally, routine plant inspection programs would most likely detect minor steam leaks in the RCIC Equipment Room prior to either the ambient temperature or delta-T circuits reaching an alarm setpoint. Plant equipment rounds require that the RCIC Equipment Room be checked at least once per shift for leaks. The procedure requires the operator to correct the problem if he is able, or initiate a work request and notify the Control Room if the problem cannot be immediately fixed. Other items checked during these rounds are room sumps which would be an indirect indication of leaks in the room. In addition, the Plant Rounds Instruction for Technical Specification Rounds requires that the RCIC Equipment Room Ambient temperature instruments and delta-T instrument readings be channel checked and recorded each shift in accordance with Technical Specification requirements. This procedure also requires that the Technical Specification rounds be reviewed for trends on a shift basis by the Unit Supervisor, and on a weekly basis by the Shift Supervisor and Operations Manager. Thus, steam leaks that would cause room temperatures to increase over a weekly period would be noted by these reviews, even if somehow missed by the operators performing the room inspections.

In conclusion, adjusting the delta-T Trip Setpoint and Allowable Value to 95.9°F and 97.2°F is considered acceptable due to the following:

a. The range of leaks which will cause the RCIC system to automatically isolate on a delta-T Signal is small, and the leaks are bounded by existing accident analyses.

b. The delta-T instrumentation is a backup to the ambient temperature instrumentation (the ambient temperature isolation is not being changed).

c. Existing procedures and programs monitor for steam leaks in the RCIC Equipment Room on a routine basis, and provide for operator response if alarms occur between routine inspection times.

No Significant Hazards Consideration

The Nuclear Regulatory Commission (NRC) has promulgated standards in 10CFR50.92(c) for determining whether a proposed amendment to a facility operating license involves no significant hazards considerations. A proposed amendment to an operating license involves no significant hazards considerations if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or
(2) Create the possibility of a new or different kind of accident than previously evaluated; or
(3) Involve a significant reduction in a margin of safety.

CEI has reviewed the proposed amendment with respect to these standards and has determined that the proposed changes do not involve a significant hazard because:

(1) The proposed change does not involve a significant increase in the probability or consequences of a previously evaluated accident.

The differential temperature isolation instrumentation provides monitoring for leaks. Therefore, the probability for leak initiation is not affected by the revision of the delta-T isolation setpoint.

The consequences of a previously evaluated accident also have not changed. The range of possible RCIC steamline breaks (up to and including a circumferential steamline break) is not affected by this proposed change. The leak detection isolation actuation instrumentation and alarms cover a wide range of steam piping breaks including both small leaks and large breaks in the RCIC line. As such any significant leak in the RCIC Equipment Room will continue to be sensed by redundant and diverse instrumentation with appropriate setpoints for alarm and/or isolation capability. As such the consequences of a RCIC steamline break will not change, and remain bounded by the steamline break outside of containment scenario analyzed in USAR Section 15.6.4. Thus, the consequences of a previously evaluated accident have not changed.

(2) The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated. As stated above the differential temperature isolation actuation instrumentation is a monitoring system. Revision of the isolation setpoint of this monitoring system cannot create a new type of accident, since breaks of the RCIC steamline, up to and including a circumferential break, are bounded by other accidents presently analyzed in USAR Section 15.6.4.

(3) The proposed change does not involve a significant reduction in the margin of safety. There will still exist sufficient redundant and diverse leak detection instrumentation with appropriate setpoints to detect steam leaks/breaks in the RCIC area. This change does not therefore affect any accident analysis nor does it have any adverse effect on performance characteristics of safety systems or accident consequences. As such it will not result in a reduction in the margin of safety. Also, since this change will increase the reliability of the RCIC system by reducing the possibility of an unnecessary isolation of RCIC when it is being called upon to restore reactor water level, overall plant safety will be slightly increased.

TABLE 1

DIFFERENTIAL TEMPERATURES CALCULATED FOR VARIOUS STEAM LEAK RATES

Leak Rate (GPM)	Calculated Ambient Temperatures	Calculated Differential Temperatures	
	Year-Round	Hot (Summer Conditions)*	Cold (Winter Conditions)*
5	130°F	29°F	76°F
10	146°F	45°F	92°F
15	150°F	49°F	96°F
25	166°F	65°F	112°F
35	226°F	125°F	172°F

* Hot summer conditions equate to a T_{cold} = 101°F, cold winter conditions equate to a T_{cold} = 54°F.

Environmental Consideration

The Cleveland Electric Illuminating Company has reviewed the proposed Technical Specification change against the criteria of 10 CFR 51.22 for environmental considerations. As shown above, the proposed change does not involve a significant hazards consideration, nor increase the types and amounts of effluents that may be released offsite, nor significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, CEI concludes that the proposed Technical Specification change meets the criteria given in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirement for an Environmental Impact Statement.