THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

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PERRY NUCLEAR POWER PLANT

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SR. VICE PRESIDENT
NUCLEAR

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PY-CEI/NRR-0712 L

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

Perry Nuclear Power Plant
Docket No. 50-440
Technical Specification
Change Request

Gentlemen:

Pursuant to 10 CFR 50.90, the Cleveland Electric Illuminating Company hereby requests amendment to Appendix A to the Perry Nuclear Power Plant operating license (NPF-58).

Summary

CEI conducted a Plant-specific evaluation of NUREG 1169, "An Evaluation of Boiling Water Reactor Main Steam Isolation Valve Leakage and Effectiveness of Leakage Treatment Methods." This evaluation was transmitted to the NRC by letter dated July 31, 1987 (PY-CEI/NRR-0678 L) and was discussed at a meeting with NRC staff members on September 2, 1987.

NUREG 1169 evaluates the effectiveness of the MSIV Leakage Control System (LCS), specifically addressing concerns with LCS capacity limitations and reliability. Alternatives to LCS operation are also presented. By allowing MSIV leakage to pass to the condenser via steam drain lines, offsite doses are shown to be reduced several orders of magnitude. Due to the fact that no operator action or active component function is required, system availability is also increased substantially, and there is no inherent limitation on system capacity.

We have applied specific portions of this NUREG 1169 study to determine the relative advantages of the "isolated condenser" configuration. The Perry-specific analysis demonstrates significant offsite dose reduction, improved reliability, and reduced operator actions post accident by operating in the isolated condenser mode.

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It is therefore proposed that the attached pages from the Perry Technical Specifications be amended as shown. In addition, CEI proposes to maintain the system, and to perform periodic tests at the frequency in the Technical Specifications. Subject to NRC approval of the requested amendment, Perry emergency instructions will be revised to give first priority to isolated condenser operation, using LCS as a backup only.

Pending final resolution of generic issue C-8, CEI will request a further license amendment to eliminate the leakage control system.

As discussed at our meeting, we are also requesting that total MSIV leakage of 100 scfh be allowed through any combination of main steam lines, as opposed to the present limit of 25 scfh/MSIV line.

Safety Analysis

The Main Steam Isolation Valve Leakage Control System (MSIV-LCS) is designed to direct MSIV leakage to the secondary containment volume, which is processed by mixing in a split recirculation/exhaust mode, with exhaust air charcoal filtered to reduce offsite releases. This analysis will address an alternative to the Leakage Control System as allowed by part D of Regulatory Guide 1.96, "Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants."

NUREG 1169 evaluates the effectiveness of alternate BWR MSIV leakage treatment methods, including a comparison of post-accident performance between LCS operation and a mode of operation described as "isolated condenser." Along with an improvement in net availability from 80% to 93%, respectively, the isolated condenser mode reduced public exposure from MSIV leakage by several orders of magnitude in the reference plant. The NUREG concludes that there are relatively low public risks from MSIV leakage without leakage control systems, even at relatively high leak rates.

A comparison of plant design parameters, control room and offsite dose results between the Perry Nuclear Power Plant and the reference plant in NUREG 1169 was conducted. This comparison concluded that NUREG 1169 methodology and results could be applied to Perry, and that the LCS could be eliminated with a net reduction in offsite dose.

The isolated condenser leakage treatment method, using open drain valves described in Section 4.3.1. of NUREG 1169, is applicable to the Perry design. The Perry main steam drain valves open on a turbine trip, and also on loss of power or air supply. Thus, as determined in Section 4.3.1, this approach qualifies as a completely passive method since no operator action is required to use this pathway.

Perry FSAR Section 15.6.5 defines the present design-basis accident (DBA) and computes control room and offsite doses using the LCS. The doses caused solely by the MSIV leakage path are shown in Attachment 1. The proposed alternative to using the LCS is to operate in the isolated condenser mode as described in NUREG 1169. For this comparison, calculation assumptions are the same except for the processing of the MSIV leakage. Therefore, only the dose contribution from the MSIV leakage path was analyzed.

To determine the dose contributions from the isolated condenser leakage path, NUREG 1169 was used as a basis appropriately modified for Perry design differences:

(a) The isolated condenser configuration is described in NUREG 1169 Sections 4.3.1, 5.3.9, and Figures 5.9 and 5.10. Following automatic reactor shutdown at Perry, open drain paths are available from each main steam line to the condenser without the need for operator action. The net availability for isolated condenser would therefore be higher than calculated from Figure 5.10. No leakage paths to atmosphere, other than the assumed main turbine-generator shaft gland seals, exist at Perry.

(b) A summary of the important parameters which affect iodine transport and release through the isolated condenser are provided in Attachment 2. Based on plant similarities and greater condenser volume at Perry, it is concluded that NUREG 1169 decontamination factors can conservatively be applied to Perry as described below.

(c) For noble gases, whole body doses are conservatively based on isolated condenser holdup by normalizing NUREG 1169 results as described below.

CEI used the NUREG 1169 reference plant doses for isolated condenser operation, adjusted to arrive at Perry specific values. First, NUREG 1169 data was analyzed to determine the unprotected baseline dose for the reference plant. NUREG 1169, Table 4.10 lists the baseline dose assuming use of the Standby Gas Treatment System (SGTS) at the reference plant. In order to determine what the dose would be without using SGTS (unprotected dose), the SGTS reduction factor was eliminated by first duplicating the TACT III baseline calculation of NUREG 1169, then running the model without the SGTS reduction factor.

Next, NUREG 1169 Table 4.13 data was extrapolated to determine what isolated condenser doses would be at the reference plant with a total MSIV leakage rate of 100 scfh. Note that the present Technical Specification limit at Perry is 25 scfh/MSIV line. Since for the calculation it does not matter if the leakage is evenly distributed in all four lines (25 scfh/MSIV line) or concentrated in one line (100 scfh), Technical Specification 3.6.1.2.c is being changed to permit 100 scfh through any combination of main steam lines. This is consistent with numerous other operating BWR facilities.

To obtain a dose reduction factor applicable to Perry, the isolated condenser dose for 100 scfh leakage was divided by the unprotected dose determined previously. This resulted in a dose reduction factor for the NUREG 1169 reference plant when 100 scfh total MSIV leakage was used.

This dose reduction factor was finally applied to the Perry-specific unprotected dose based on the design basis accident analysis to obtain Perry doses using the isolated condenser pathway. These doses are shown in Attachment 3. Comparing the results in Attachment 3 to the LCS doses in Attachment 1, the isolated condenser is shown to reduce MSIV-related offsite doses by greater than 98% to the mR range. This is due to increased hold up time and iodine removal in the condenser.

Significant Hazards Analysis

The standards used to arrive at a determination that a request for amendment requires no significant hazards consideration are included in the Commission's regulations, 10 CFR 50.92, which state that the 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, (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. CEI has reviewed the proposed change with respect to these three factors.

It is concluded that processing of Perry MSIV leakage post-LOCA in the isolated condenser mode results in lower doses than previously reported for LCS operation due to iodine plateout in the pipes and condenser, and increased holdup time due to large condenser volume relative to leakage flow. In terms of significant hazard criteria:

(1) Accident probability or consequences of accidents previously evaluated are not adversely affected. Accident mitigation is enhanced, both in terms of success probability and dose consequences. Figure 5.10 of NUREG 1169 shows a net reduction in isolated condenser availability due to required operator action. At Perry no operator action is required for the isolated condenser mode. Drain valves on the main steam line will open automatically on a turbine trip (also would fail open upon loss of air, or power). Since no operator action is required, the availability of this leakage control path is higher. Comparison to the existing NUREG basis (Table 5.13) is more favorable for Perry.

(2) A different kind of accident is not created. No new accidents were addressed in NUREG 1169. The Perry Plant is consistent with the assumptions and analysis used in this document.

(3) Safety margins are not reduced. In terms of net effect on public radiation exposure, safety margins are increased.

Environmental Impact

CEI has reviewed the proposed Technical Specification changes 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 result in a net increase in the types or amounts of effluents that may be released offsite, nor increase individual or cumulative occupational radiation exposures. Based on the foregoing, CEI concludes that the proposed Technical Specification changes meet the criteria given in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirement for an environment impact statement.

Administration

Pursuant to 10 CFR 170.12, the application fee of $150.00 is enclosed.

In accordance with 10 CFR 50.91(b)(1), the State of Ohio is included on distribution for this letter.

Marked up copies of Technical Specification pages are enclosed. Should you have any questions, please feel free to call me.

Very truly yours,

Murray R. Edelman
Senior Vice President

MRE:njc

Attachments/Enclosure

cc: T. Colburn
K. Connaughton
J. Harris (State of Ohio)

EXISTING PERRY DESIGN BASIS ACCIDENT DOSE CONTRIBUTION FROM MSIV'S

	Whole Body Gamma Dose (Rem)	Inhalation Dose (Rem)	Beta Skin Dose (Rem) (2)
Offsite Doses			
Acceptance Criteria Guidelines (1)	25	300	N/A
Exclusion Area (2 hours) (863 Meters)	1.05	10.2	---
Low population zone (30 days) (4,002 Meters)	0.36	2.8	---
Control Room Doses (30 days)			
Acceptance Criteria Guidelines (1)	5	30	75
Calculated	0.33	0.77	6.27

(1) The bases for evaluating maximum radiation exposures to Perry personnel and members of the general public are summarized in the USNRC Standard Review Plan (NUREG 0800) and the Perry FSAR Section 15.6.5. Criteria for evaluating radiological consequences to the general public are based on 10 CFR 100; calculated offsite doses totaled from all release paths are acceptable if resultant thyroid and whole body doses for the design basis accident fall within the guidelines values specified in 10 CFR 100.11. Acceptance criteria for Perry control room habitability are contained in 10 CFR 50 Appendix A Criterion 19, and Perry FSAR Section 15.0.3.1.3.

(2) Unprotected beta skin dose; no credit is taken for any reduction afforded by clothing.

IODINE REMOVAL PARAMETERS

PERRY VS NUREG 1169 REFERENCE PLANT

	PERRY	NUREG-1169
Plant Type	BWR-6 Mark III	BWR-5 Mark II
Propose MSIV Leakage Pathway	Isolated Condenser	Isolated Condenser
Steam Line Details		
Number/Pipe material	4/carbon steel	4/carbon steel
Pipe Size, in.	28	30
Wall Thickness, in.	2.406	1.375
Insulation Thickness, in.	3 1/2	4
Insulation Thermal Conductivity (Ambient), Btu/ft-hr	0.02	0.02
Number of Pipe Supports	19	29
Support Spacing, Ft.	1 min. 29 max.	8 min. 35 max.
Turbine Generator		
Supplier	GE	GE
Design Power, MWt	3,729	3,463
Design Power, MWe gross	1,250	1,205
Generator speed, rpm	1,800	1,800
Design steam flow, lb/hr	15.4×10^6	15.0×10^6
Turbine inlet pressure, psia	965	970
Main Condenser		
Heat removal capacity, Btu/hr	$7,847 \times 10^6$	$7,702 \times 10^6$
Condenser Free Volume, ft^3	130,000	120,000
Condenser horizontal deposition area, ft^2	280,000	252,000

DOSE CONTRIBUTION USING ISOLATED CONDENSER
(Same FSAR basis except MSIV leakage path)

	Whole Body Gamma Dose (Rem)	Inhalation Dose (Rem)	Beta Skin (*) Dose (Rem)
Offsite Doses			
Exclusion Area (2 hours) (863 Meters)	7.3E-5	1.2E-3	---
Low population zone (30 days) (4,002 Meters)	5.7E-3	4.8E-3	---
Control Room Doses (30 days)	2.1E-3	9.7E-4	3.7E-2

* Unprotected beta skin dose; no credit is taken for any reduction afforded by clothing.