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November 15, 1994

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
US Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555

SUBJECT: Steam Generator Wide Range Level Indication Upgrade
(Regulatory Guide 1.97, Revision 2)

REFERENCES:
1) Letter dated August 30, 1985, J.D. O'Toole (Con Edison) to H.L. Thompson, Jr. (NRC)
2) Letter dated September 12, 1986, M. Selman (Con Edison) to H.L. Thompson, Jr. (NRC)
3) Letter dated November 26, 1986, M. Selman (Con Edison) to M. Slosson (NRC)
4) Letter dated October 26, 1988, S.B. Bram (Con Edison) to Document Control Desk (NRC)
5) Letter dated October 27, 1989, S.B. Bram (Con Edison) to Document Control Desk (NRC)
6) Letter dated September 27, 1990, D.S. Brinkman (NRC) to S.B. Bram (Con Edison)
7) Letter dated August 7, 1991, S.B. Bram (Con Edison) to Document Control Desk (NRC)
8) Letter dated August 31, 1992, Francis J. Williams (NRC) to S.B. Bram (Con Edison)
9) Letter dated November 19, 1992, S.B. Bram (Con Edison) to Document Control Desk (NRC)
10) Letter dated August 27, 1993, Francis J. Williams (NRC) to S.B. Bram (Con Edison)

In response to NUREG-0737, Supplement 1, Con Edison submitted, in references 1 through 5, our evaluation of the degree of compliance of the Indian Point Unit No. 2 design basis with the guidance contained in Regulatory Guide 1.97, Revision 2. Where our review determined that instruments meeting the criteria contained in the regulatory guide for the various types and categories of variables were not required, supporting justifications and alternatives were provided. These submittals included exceptions for not providing Category 1 instrumentation for wide range steam generator level, neutron flux, and accumulator level and pressure.

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Reference 6 transmitted the Safety Evaluation regarding conformance to Regulatory Guide 1.97, which found that the instrumentation provided for Indian Point Unit No. 2 was acceptable except for the variables wide range steam generator level, neutron flux, and accumulator level and pressure. No further action was required on the latter as permitted by Reference 8 and verified by Reference 9. We were requested, however, to develop and propose an appropriate implementation schedule for the installation of neutron flux and wide range steam generator level instrumentation that meets the Category 1 criteria of Regulatory Guide 1.97, Revision 2 and 10CFR50.49.

Further justification for not upgrading the wide range steam generator level and neutron flux instrumentation was provided in Reference 7, along with a request for concurrence on clarifications to the Safety Evaluation and a request for concurrence on unreviewed exceptions. In a Supplemental Safety Evaluation Report (SSER) provided in Reference 10, the staff concluded that the clarifications and exceptions were acceptable with regard to conformance to Regulatory Guide 1.97, Revision 2, acknowledged resolution of the accumulator tank level and pressure issue, and indicated that the neutron flux monitoring issue would be included in a separate SSER. However, the August 27, 1993 SSER concluded that information which would be provided by the wide range steam generator level instrumentation may be needed by the operator in the evaluation of the operation of the steam generators, and restated the staff position that this instrumentation should conform to Regulatory Guide 1.97, Category 1 criteria.

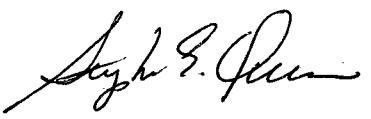
On February 25, 1994, a telephone conference was held between Con Edison and the NRC concerning Con Edison's plans for resolving the steam generator wide range level instrumentation issue. A conceptual train approach of providing two separate power supplies that would each power two channels of indication, one instrument for each steam generator, was presented and discussed.

The attachment to this letter provides the design details and a failure modes and effects analysis for the proposed upgrade of wide range level indication to a four channel, two train system. The approach taken is to use existing cables and equipment as much as possible, and to provide new equipment and cabling for qualification and separation purposes. It is believed that the train concept meets the intent of the regulatory guidance and will provide wide range level indication in at least one steam generator for any credible single failure concurrent with an initiating event. This upgraded wide range instrumentation, in conjunction with narrow range level instrumentation and auxiliary feedwater flow indication for each steam generator will provide the required post-accident information. The modification to

accomplish this appropriate upgrade is scheduled for installation during the 1995 refueling outage.

Should you or your staff have any questions, please contact Mr. Charles W. Jackson, Manager, Nuclear Safety & Licensing.

Very truly yours,



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ATTACHMENT

Proposed Steam Generator Wide Range
Level Indication Upgrade

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
INDIAN POINT UNIT NO. 2
DOCKET NO. 50-247
NOVEMBER, 1994

PROPOSED STEAM GENERATOR WIDE RANGE LEVEL INDICATION UPGRADE

DESCRIPTION

To upgrade Steam Generator Wide Range Level Indication, it is proposed to provide 4 channels of indication using a train approach. The intent is to provide two diverse power sources which each supply two channels of indication, such that any credible single failure will result in wide range level indication being available in at least one steam generator. This indication will supplement the existing 4 channel indication for the Category 1 variables of Auxiliary Feedwater Flow and Steam Generator Narrow Range Level, which will remain unchanged.

The proposed configuration is comprised of Train "A", which consists of 21 steam generator (SG) and 22 SG supplied by 21 auxiliary feedwater pump (AFP) and the wide range instrument loops powered by 23 I/B, and Train "B", which consists of 23 SG and 24 SG supplied by 23 AFP and the wide range instrument loops powered by 24 I/B (See Figure 1). Separation of the two trains is in accordance with original plant electrical separation criteria.

Each of the four steam generators currently has one wide range level transmitter mounted on instrument rack 21 inside containment. All four existing transmitters will be replaced with environmentally qualified and seismically qualified transmitters, and the existing seismically installed process impulse tubing will be reused.

The transmitters for 21 SG (LT-417D) and 24 SG (LT-447D) are wired to a terminal box (EPC3) in rack 21. From this box, field cables run through containment Penetration H39 to the Central Control Room (CCR). The cable for the 21 SG transmitter terminates in the CCR in analog Instrument Control Rack B5. The cable from the 24 SG transmitter terminates in analog Instrument Control Rack B4 and a new cable will be added to continue the run to analog Instrument Protection Rack B10 in the CCR.

The transmitters for 22 SG (LT-427D) and 23 SG (LT-437D) are wired to a terminal box (EPC4) in rack 21. From this box, field cables run through containment Penetration H41 to the CCR. The cable for the 22 SG transmitter terminates in analog Instrument Control Rack B5. The cable from the 23 SG transmitter terminates in analog Instrument Control Rack B4 and a new cable will be added to continue the run to analog Instrument Protection Rack B10 in the CCR.

At each penetration inside the containment, existing splices will be upgraded to reduce instrument channel error and to improve the environmental qualification of the splices.

New loop power supplies and I/I isolators for the 21 SG and 22 SG transmitters will be located in CCR rack B5. 23 Instrument Bus (I/B)

supplies 120 VAC power to all the equipment in rack B5 through rack B4. Class 1E fuse isolations will be used to protect the power supplies for the transmitters from the rest of the control grade equipment in racks B4 and B5.

New loop power supplies and I/I isolators for the 23 SG and 24 SG transmitters will be located in CCR rack B10. 24 I/B supplies 120 VAC power to all the equipment in rack B10 through Instrument Protection Rack B9. No control grade equipment is located in racks B9 and B10, thus no additional isolation devices are needed.

New cables will be added to transmit signals to the existing seismically qualified recorders on the CCR Supervisory Panel "SC". From the output of the I/I isolators, other cables will transmit signals to the Safety Assessment System (SAS) computer and local field indicators. 23 I/B will provide the power for the recorders for 21 SG (LR-417) and 22 SG (LR-427). The recorders for 23 SG (LR-437) and 24 SG (LR-447) will be powered from 24 I/B.

FAILURE MODES AND EFFECTS ANALYSIS

1. Failure to Start of Auxiliary Feedwater Pump

   If either motor-driven 21 AFP or 23 AFP fails to start, auxiliary feedwater flow will be lost to two steam generators (turbine-driven 22 AFP would still be available to supply all four steam generators). An initiating event is assumed to fail auxiliary feedwater flow to a third steam generator or result in it boiling dry. Wide range level indicators will be operable on all four steam generators, with one indication providing meaningful information.

2. Failure of an Instrument Bus

   If either 23 I/B or 24 I/B fails, wide range level indication will be lost on two steam generators. An initiating event is assumed to fail auxiliary feedwater flow to a third steam generator or result in it boiling dry. Wide range level indication will be operable on two steam generators, with one indication providing meaningful information.

3. Electrical Short or Ground Fault from Existing Equipment

   The transmitter power supplies for 23 SG and 24 SG are in a protection rack and do not require fuse protection. Class 1E fuses in control racks B4 and B5 will protect the transmitter power supplies for 21 SG and 22 SG from any electrical short or ground from existing control grade equipment. Considering the failure of

the Class 1E fuse to protect the circuit, wide range level indication will be lost on 21 SG and 22 SG. An initiating event is assumed to fail auxiliary feedwater flow to either 23 SG or 24 SG or result in one boiling dry. Wide range level indication will be operable on two steam generators, with one indication providing meaningful information.

4. Failure of Two (2) Channels Using the Same Penetration:

Each containment penetration (H-39 and H-41) contains one channel of each train. Due to the low energy level (10-50 mADC) of the instrumentation cables and other cables in these penetrations, it is highly unlikely that an electrical fault would cause the loss of both instrument circuits through a penetration.

However, for design purposes, a failure of both instrument circuits at a penetration is assumed. Due to circuit protection and isolation features provided in the design, it is not considered credible for an assumed failure of both circuits in one penetration to propagate to or otherwise effect the availability of the remaining two redundant instrument circuits routed through the redundant instrument penetration. An electrical fault would be prevented from propagating to the other channel of each train by the internal fuse within each transmitter power supply. Therefore, no single failure is considered capable of causing the loss of both vital instrument power sources from 23 I/B and 24 I/B.

With a failure at a penetration, wide range level indication will be lost on two steam generators. An initiating event is assumed to fail auxiliary feedwater flow to a third steam generator or result in it boiling dry. Wide range level indication will be operable on two steam generators, with one indication providing meaningful information.

5. Loss Due to Fire

These channels of wide range level instrumentation are the primary means of indication and are routed within the same fire area. In the event of a postulated fire which disables these channels or renders the control room uninhabitable, separate pneumatic indicators located outside the control room are available for safe shutdown. 10 CFR 50, Appendix R does not require consideration of a fire concurrent with a design basis accident.

6. High Energy Line Break or Event-generated Missiles

High energy line break (HELB) or missile induced faults of the electrical components of the wide range level instrumentation need not be considered because cable trays, conduits, electrical panels

and the transmitters are located in areas which have previously been determined not to be affected by high energy line breaks or event-generated missiles. These are located either outside the crane wall or within a heavily shielded area inside the crane wall.

Instrument tubing from the steam generators to the transmitters runs inside the crane wall in the vicinity of the reactor coolant piping to the steam generators and from the reactor coolant pumps (RCPs). The tubing for 21 SG and 22 SG run together in the vicinity of 22 SG and 22 RCP, and the tubing for 23 SG and 24 SG run together in the vicinity of 24 SG and 24 RCP. Each pair could be susceptible to an HELB of the reactor coolant piping to the steam generator or from the reactor coolant pump. However, such an accident would not require steam generator level indication as core cooling is achieved through safety injection and recirculation. Portions of main steam and boiler feedwater piping located above elev. 95' are generally located and routed away from the instrument tubing, and these pipes are restrained to minimize pipe whip. Portions of main steam and boiler feedwater piping located below elev. 95' are shielded from lower elevations inside the crane wall and then run outside the crane wall. Therefore, it is not credible that failure of one of these lines would damage the tubing for a wide range level transmitter.

7. Electrical Faults Outside Containment

   a. In the run from the electrical penetration area to the cable spreading room, cables for the transmitters for 21 SG and 24 SG share a common tray channel with the pressure transmitter which provides flow control from 21 AFP to 21 SG and 22 SG. It is not credible that an electrical fault in one cable would cause the loss of function of the other two cables. These are low energy instrument cables which are safety grade, flame retardant and rated for 600 volts. The service voltage of these instrument loops is less than 90 volts. The power supplies at the control room analog instrument racks are current limited (70madc) which will not provide sufficient energy to sustain a short circuit that would cause insulation damage. This finding is supported by cable tray tests conducted by Sandia Laboratories which demonstrated that even with a sustained short the maximum current (15ma) generated would not burn through the insulation, thus, the fault would not propagate to another cable. Also, arcing due to a short to ground via defective insulation on a cable would not have sufficient energy to penetrate through the insulation of another cable and cause a second electrical short. The test report (SAND 77-1125C) further concludes that a small scale fire would not be caused by arcing due to a defective cable insulation. Therefore, there is no credible single failure that

will disable all three cables and which, combined with an initiating event, subsequently affects all four channels of wide range level indication.

b. In the electrical penetration and piping penetration areas, some cable separation is lost between redundant tray channels. One tray channel contains the cables for wide range level indication for 21 SG and 24 SG, and the other tray channel contains those for 22 SG and 23 SG.

As stated above, all cables in the two tray channels are low-energy instrumentation which would not cause a fault to propagate. Further, the cables that cross between the tray channels were installed from modifications to the plant. The cables for the wide range level instruments are from original plant installation and would be secured neatly in bottom layers of cable that are separated by dividers. Thus, an electrical fault that initiates in one wide range cable would not credibly propagate to the wide range cable in the same tray channel and also to the two wide range cables in the other tray channel. Similarly, it is not credible that an electrical fault in another instrument cable could propagate to four wide range cables. Therefore, a single failure will not disable all four wide range level indications.

8. Electrical Faults Inside Containment

All four wide range level channels share a common laydown tray at the two penetrations where the cabling is crossed together. This modification will separate the cables here and restore channel separation to the original plant criteria.

CONCLUSIONS

The proposed modification will provide a second reliable power supply to the wide range level channels. Considering all credible failures concurrent with an initiating event, wide range level in at least one steam generator will be monitored. Auxiliary feedwater flow and steam generator narrow range level also provide indication of secondary heat sink availability as existing instruments qualified to Category 1 criteria remain unchanged.

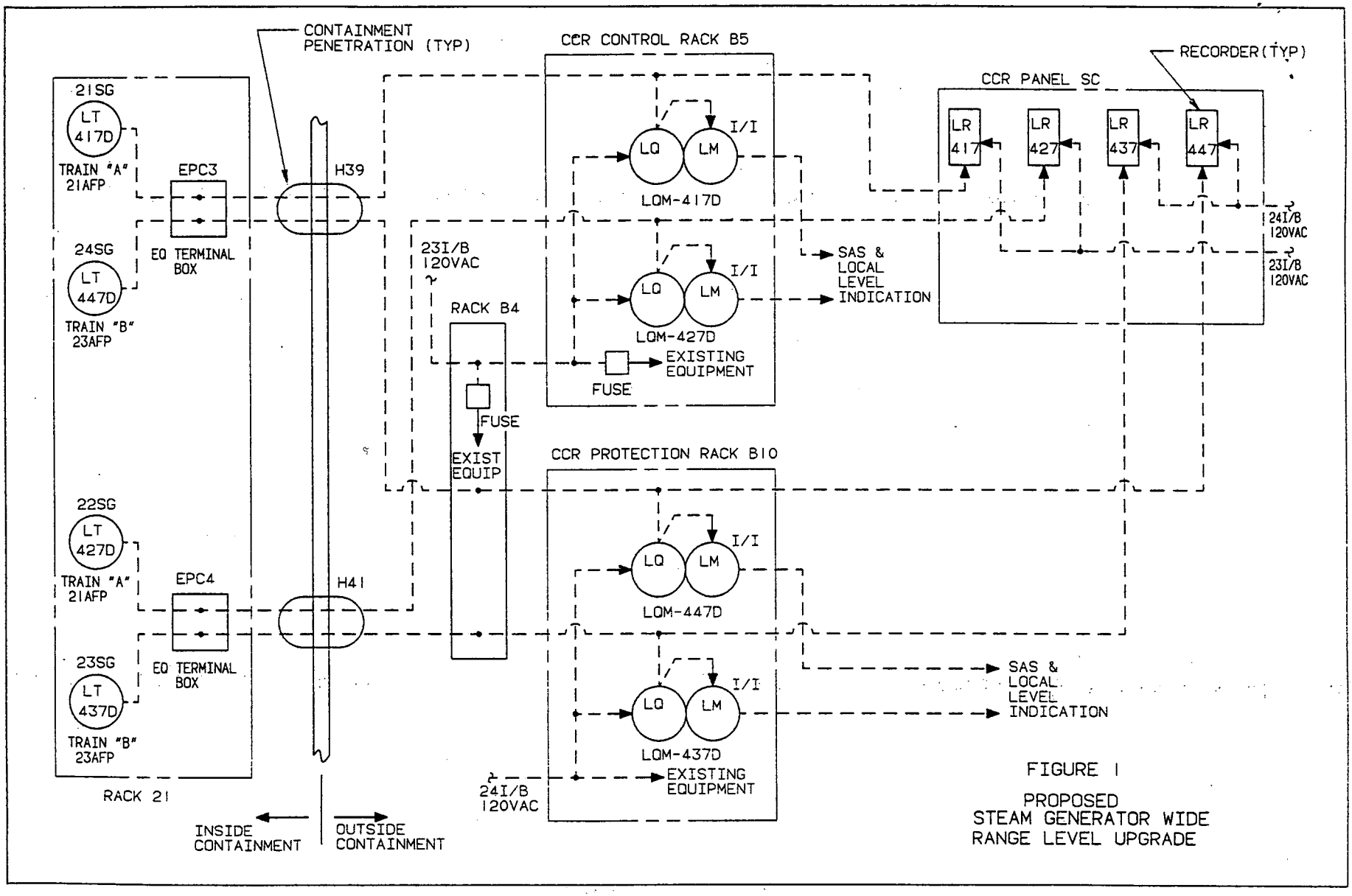

FIGURE 1

PROPOSED
STEAM GENERATOR WIDE
RANGE LEVEL UPGRADE