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October 18, 2011

NL-11-119

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Proposed Change to the Technical Specification Requirement for Containment Sump Level Indication
Indian Point Unit Number 2
Docket No. 50-247
License No. DPR-26

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Entergy Nuclear Operations, Inc, (Entergy) hereby requests an amendment to the Operating License for Indian Point Nuclear Generating Unit No. 2 (IP2). The proposed change to Technical Specification 3.3.3, Table 3.3-1, revises the existing requirement for two channels of the Containment Water Level (Containment Sump) function and two channels of the Containment Sump Water Level (Recirculation Sump) function to two Containment Water Level channels. This is consistent with the Standard Technical Specification NUREG 1431.

Attachment 1 provides a description and assessment of the proposed change in accordance with 10 CFR 50.91 (a)(1) using the criteria of 10 CFR 50.92 (c). Entergy has determined that this proposed change involves no significant hazards considerations. The marked-up pages showing proposed changes to the Technical Specification are shown in Attachment 2. Planned changes to the Bases are in Attachment 3 for information. A copy of this letter and the associated attachments are being submitted to the designated New York State official in accordance with 10 CFR 50.91.

This submittal contains no new commitments. If you have any questions, please contact Mr. Robert Walpole, Licensing Manager, at (914) 734-6710

A001
NRR

I declare under penalty of perjury that the foregoing is true and correct. Executed on October 18, 2011.

Sincerely,

for J.P.

JEP/sp

Attachments:
1. Analysis of Proposed Technical Specification Change Regarding Containment and Recirculation Sump Water Level Indication
2. Markup of Technical Specification Page Regarding Containment Water Level Indication
3. Markup of Technical Specification Bases Pages Regarding Containment and Recirculation Sump Water Level Indication

cc: Mr. John P. Boska, Senior Project Manager, NRC NRR DORL
Mr. William Dean, Regional Administrator, NRC Region 1
NRC Resident Inspector, IP2
Mr. Francis J. Murray, Jr., President and CEO, NYSERDA
Mr. Paul Eddy, New York State Dept. of Public Service

ATTACHMENT 1 TO NL-11-119

ANALYSIS OF PROPOSED TECHNICAL SPECIFICATION CHANGE REGARDING CONTAINMENT AND RECIRCULATION SUMP WATER LEVEL INDICATION

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

1.0 DESCRIPTION

The proposed change to Section 3.3.3, Table 3.3-1 of the Indian Point 2 Technical Specifications revises the existing requirement for two channels of the Containment Water Level (Containment Sump) function and two channels of the Containment Sump Water Level (Recirculation Sump) function to require two Containment Water Level channels as a single function.

PROPOSED CHANGE

Proposed changes to Section 3.3.3, Table 3.3-1 of the Indian Point 2 Technical Specifications are identified below:

Indian Point 2 Technical Specification 3.3.3, Table 3.3-1 currently says:

"5. Containment Sump Water Level (Recirculation Sump)	2	E
6. Containment Water Level (Containment Sump)	2	E"

The proposed amendment will revise Table 3.3-1 to say:

"5. Containment Water Level (Containment and Recirculation Sump)	2	E
6. NOT USED"		

Proposed changes to the Bases associated with the proposed change are provided in Attachment 3, for information.

2.0 BACKGROUND

The original plant design provided Containment Sump water level indicators LT-940 and LT-941 and Recirculation Sump water level indicators LT-938 and LT-939. The initial requirements for qualified water level indicators were contained in the TMI Short Term Lessons Learned requirements (NUREG-0578). NUREG-0578 required narrow range instruments (from the bottom of the sump to the top of the sump) and wide range instruments (bottom of the sump to a containment level equivalent to 600,000 gallons). The narrow range instruments were to be environmentally qualified to Regulatory Guide (RG) 1.89 (Reference 1). In response to NUREG-0578 (Reference 2), Indian Point 2 (IP-2) indicated that the four original level indicators would be credited to meet the NRC requirement for narrow range instrumentation and that two new indicators to monitor wide range system would be added. The four original indicators were not seismically or environmentally qualified but the basis for considering them qualified was provided.

The TMI Short Term Lessons Learned requirements were clarified in Generic Letter 80-90, which forwarded NUREG-0737. These requirements were subsequently incorporated into the requirements of Regulatory Guide (RG) 1.97, Revision 2. The RG identified Containment Sump Water Level (narrow range and wide range) as a Type B variable and required the wide range to be qualified to Category I requirements while the narrow range had to be qualified to Category 2 requirements. The Category 2 instruments did not have all of the requirements of a Category 1 instrument (e.g., seismic). A 1985 IP2 response (Reference 3) to the Generic Letter identified Containment Water Level as a Type A variable (required for operator action) and referenced the B.11 instruments which were the Containment Water Level wide range. These and the narrow range monitors in C.6 were to meet the Type B variable requirements. The instruments provided were the following:

- Instruments (LT-939, LT-940, and LT-941 for narrow range and LT-3300 and LT-3301 for wide range) would be qualified seismically and environmentally;
- instruments would be redundant (LT-3300 in the containment sump and LT-3301 in the recirculation sump are electrically separated, LT-940 and LT-941 in the containment sump are electrically separated, and LT-939 has no redundant counterpart in the recirculation sump);
- instruments would display in the CCR (lights for LT-939, LT-940, and LT-941, LR-3300, and LI-3301), the Technical Support Center (LI-3300 and LI-3301), and the Emergency Operations Facility (LI-3300 and LI-3301);
- the original float type LT 940 and 941 design would be replaced with a thermal design while LT-939 would not be changed;
- all the instruments read from bottom of sump to above peak water level but only LT-3300 and LT-3301 are continuous.

IP-2 clarified the instrumentation that would be used to meet RG 1.97 requirements for water level monitoring in a subsequent letter (Reference 4). The clarification concluded that there was no unique purpose served by the narrow range instruments since the wide range and narrow range instruments covered the same range (i.e., bottom of sump to the design flood level). This was acceptable because the wide range instruments are redundant (separate power sources), have the range (bottom of sumps to above design basis flood level), and have the required accuracy to aid the operator on switch over from injection to recirculation as well as flood detection. LT-3300 and LT-3301 were these monitors.

The supplemental safety evaluation for the RG 1.97 instrumentation (Reference 5) approved the proposed instrumentation for Containment Sump water level monitoring. The SER noted that the Category 1 wide range instruments covered from the bottom of the sump to the design basis flood level and concluded the entire range of expected post accident water levels were therefore covered. The SER also concluded that the sump level is adequately monitored by the wide range instrumentation to preclude the need for narrow range instrumentation.

The current TS Section 3.3.3, Table 3.3-1 reflects a change made during the conversion to standard technical specifications (Reference 6). The change was the addition of RG 1.97 Type A variables in the Post Accident Monitoring TS 3.3.3. The existing TS did not have sump monitoring identified as a post accident monitoring function so this function was added to the TS. The change identified the water level monitors for the Containment Sump and the Recirculation Sump as separate functions and reflected the number of installed instruments (three transmitters in the

Containment Sump and two transmitters in the Recirculation Sump). Amendment 249 (Reference 7) subsequently removed monitor LT 940.

3.0 TECHNICAL ANALYSIS

The Standard Technical Specification (STS) requires two channels of Containment Sump wide range water level indicators. The Bases says the water level indicators are to allow accident diagnosis based on sump level, a determination to enter the recirculation procedure, and a determination to cease safety injection if still in progress. The IP2 Post Accident Monitors (PAM) perform similar purposes: determine whether the pipe rupture is inside or outside of containment; determine whether adequate NPSH exists for recirculation (time when recirculation can be initiated); and, determine whether equipment in containment was being submerged (allow suction from Refueling Water Storage Tank to be terminated).

IP2 has a somewhat unique design for post accident recirculation. The primary means of recirculation is to take suction from the Recirculation Sump using the recirculation pumps inside containment. The recirculation pumps are redundant pumps of 100% capacity. The alternative means of recirculation is to take suction from the Containment Sump using the Residual Heat Removal (RHR) pumps. The RHR pumps are redundant pumps of 100% capacity. The floor elevations of the two sumps are different. The minimum water level for the Recirculation pump to have adequate NPSH is a function of the specific type of LOCA and the peak water level to keep equipment from flooding is elevation 50' 5". The specific water levels can be monitored by instrumentation in either sump since the top of both sumps is at 46'.

The continuous level indicators LT-3300 and LT-3301 provide both narrow range and wide range functions, they are independently powered (Instrument Bus 22 associated with power train 2A/3A and Instrument Bus 21 associated with power train 5A, respectively), and both are qualified in accordance with RG 1.97 Category 1 requirements (Reference 8 and 9). Instrument accuracy was judged acceptable based on information provided in Reference 10. Therefore, they provide the instrumentation functions to satisfy RG 1.97 requirements for Type A and Type B instruments.

The non continuous level indicators LT-939 and LT-941 provide both narrow range and wide range functions, they are independently powered (Instrument Bus 22 associated with power train 2A/3A and Instrument Bus 21A associated with power train 5A, respectively), and LT-939 had been qualified and the new LT-941 was qualified in accordance with RG 1.97 Category 1 requirements (Reference 11). The LT 939 and LT 941 transmitters indicate containment level using 5 indicator lights located on Central Control Room (CCR) Panel SB-1. The level indicator LT 941 consists of thermal type detectors that energize the lights as a preset level is reached. The level indicator LT 939 consists of magnetic float / switch type sensors that energize the lights as a preset level is reached. The current settings have lights go on in series as the sump and containment water levels rise or fall. LT 939 lights currently go on at elevations 35', 46' 7", 47' 10", 49' 8" (flood level), and 51' 9" and have an 6" loop error. LT 941 lights currently go on at elevations 40' 5.125", 42' 10.5", 46' 8.5", 48' 9", and 51' 7.5" (flood level), and have a 0.5" loop error. The transmitters do not meet the requirements of RG 1.97 Revision 2 with respect to the Category 1 requirement for continuous monitoring but they were previously reviewed and accepted as PAM without this capability (Reference 7). The display is continuous in the sense that the lights associated with each level stay on as long as the level remains above the setpoint and goes off when it falls below the setpoint. They do provide clear indication when a specific set point has been

reached and this provides level sufficient for operator action considering the required levels and the instrument loop error. LT 939 also provides continuous indication to the plant computer over its entire range and LT 941 provides indication to the plant computer using 9 discrete step inputs which provides increased trending capability. Therefore, they provide adequate instrumentation functions to satisfy RG 1.97 requirements for Type A and Type B instruments.

The proposed TS change eliminates the requirement for 2 level monitors in the Containment Sump and 2 level monitors in the Recirculation Sump and instead requires two level monitors for sump level monitoring. This will make the TS consistent with the Standard Technical Specification. This change involves no significant reduction in the margin of safety because the TS requirements are being changed from four to two detectors to reflect the Standard Technical Specifications and two level transmitters (i.e., LT 3300 and LT 3301) will each have a backup post accident level detector (i.e., LT 939 for LT 3300 and LT 941 for LT 3301) that are currently identified as post accident monitors and will continue to be subject to the required surveillance testing to assure operability. Note LT 939 and LT 3300 are powered from instrument buses supplied by 2A/3A and LT 941 and LT 3301 are powered from instrument buses supplied by 5A.

Accident consequences will not be increased since redundant sump level monitors continue to be required by TS and the Refuel Water Storage Tank level indicators provide diverse means to control the manual action for switchover to internal recirculation. There is no change to design or operation of the plant so there can be no increase in the probability or an accident or the possibility of a new or different kind of accident.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

Entergy Nuclear Operations, Inc. (Entergy) has evaluated the safety significance of the proposed change regarding the consolidation of the Sump Water Level monitors according to the criteria of 10 CFR 50.92, "Issuance of Amendment". Entergy has concluded that the subject changes do not involve a Significant Hazards Consideration as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No. The proposed change will revise the requirements for water level monitors from 4 to 2. These level indicators are provided for monitoring the post-accident water level in the bottom of the containment to aid operator action to initiate recirculation and to assess the potential for excessive level. The presence or absence of these instruments has no bearing on accident precursor conditions or events. The proposed requirement will maintain redundancy and, utilizing the RWST level indication, diversity to continue to provide information to the plant operators to monitor and manage accident conditions. Therefore, the proposed change does not involve a significant increase in the probability or consequences of previously evaluated accidents.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No. The proposed change will revise the requirements for water level monitors from four to two. The change reduces the number of channels required but retains redundancy and, coupled with the RWST level indication, diversity of indication. The Technical Specification does not require the instruments for normal plant operations and does not affect how the plant is operated. The removal of the two indicators does not create the possibility of any equipment failure or effect on other equipment. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No. The proposed change will revise the required number of water level monitors. The revised requirement will remain consistent with the requirements found in the Standard Technical Specification for level monitors provided for monitoring the post-accident water level. The level monitors no longer required by the TS will continue to serve as backup instrumentation for the instruments on the same power supply as long as they continue to meet surveillance requirements. Other instrument channels will remain in service and provide diverse indication for operator response and to support existing accident mitigation strategies. The proposed change does not involve changes to existing setpoints for automatic or operator actions. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, Entergy Nuclear Operations, Inc. concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92 (c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements / Criteria

The proposed changes have been evaluated to determine whether applicable requirements continue to be met. IP2 is not a GDC plant. However, compliance with RG 1.97 is maintained due continued capability to monitor sump level indication to allow the performance of operator action using redundant and electrically separated instruments. The use of the LT-939 and LT-941 sump monitors as backup instruments provides an additional margin of safety. Diverse instruments, the RWST level indicators, provide sufficient information to validate these levels. Therefore continued compliance is maintained with GDC 13 requirements to monitor variables over their anticipated ranges for accident conditions and continued compliance is maintained with GDC 19 requirements for providing a Control Room from which actions can be taken under accident conditions.

5.3 Environmental Considerations

The proposed changes to the IP2 Technical Specifications regarding containment sump monitoring do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 PRECEDENCE

The proposed change is consistent with the requirements for redundant channels in the Standard Technical Specifications.

7.0 REFERENCES

1. Regulatory Guide 1.89 "Qualification of Class IE Equipment of Nuclear Power Plants."

2. Indian Point 2 letter NL-79-91A, dated December 31, 1979.

3. Indian Point Letter NL-85-204 dated August 30, 1985.

4. IP2 letter to NRC regarding Clarification of Information Regarding NUREG-0737 Supplement 1 (Regulatory Guide 1.97, Revision 2), dated October 27, 1989.

5. NRC Letter regarding "Conformance to Regulatory Guide 1.97, Revision 2, (TAC No. 51098) dated September 27, 1990.

6. NRC Letter to IP2 regarding Technical Specification Amendment 238, dated November 3, 2003.

7. NRC letter to IP2 regarding Amendment of Containment Sump Indication (TAC No MD2655) dated July 28, 2006.

8. EC-00003714, to replace Barton with Weed transmitters.

9. Weed Qualification Reports QA0AAC10, QA0AAC11, and QA0AAC12'

10. IP2 Letter to NRC regarding instrument accuracy, dated April 29, 1983.

11. FCI Qualification Test Reports 708093 dated June 28, 1982 and 7087009 dated March 14, 1978.

ATTACHMENT 2 TO NL-11-119

MARKUP OF TECHNICAL SPECIFICATION PAGE REGARDING

CONTAINMENT AND RECIRCULATION SUMP WATER LEVEL INDICATION

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ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

Table 3.3.3-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

	FUNCTION	REQUIRED CHANNELS	CONDITION REFERENCED FROM REQUIRED ACTION D.1
1.	Reactor Coolant System (RCS) Hot Leg Temperature (Wide Range)	1 per loop [(a)]	E
2.	RCS Cold Leg Temperature (Wide Range)	1 per loop [(b)]	E
3.	RCS Pressure (Wide Range)	2	E
4.	Reactor Vessel Level Indication System (RVLIS)	2	F
5.	Containment ~~Sump~~ Water Level (Containment and Recirculation Sump)	2	E
6.	~~Containment Water Level (Containment Sump)~~NOT USED	~~2~~	~~E~~
7.	Containment Pressure	2	E
8.	Containment Pressure (High Range)	2	E
9.	Containment Area Radiation (High Range)	2	F
10.	NOT USED		
11.	Pressurizer Level	2	E
12.	Steam Generator (SG) Water Level (Narrow Range)	2 per steam generator	E
13.	Steam Generator Water Level (Wide Range)	4	E
14.	Condensate Storage Tank level	2	F
15.	Core Exit Temperature - Quadrant 1	2 trains[(c)]	E
16.	Core Exit Temperature - Quadrant 2	2 trains[(c)]	E
17.	Core Exit Temperature - Quadrant 3	2 trains[(c)]	E
18.	Core Exit Temperature - Quadrant 4	2 trains[(c)]	E
19.	Auxiliary Feedwater Flow	4	E
20.	Steam Generator Pressure	2 per steam line	E
21.	RCS Subcooling Margin Monitor	2	E
22.	RWST Level	2	E

(a) The required redundant channel for each of the four loops of RCS hot leg temperature is a qualified Core Exit Temperature train in the quadrant associated with that loop.

(b) The required redundant channel for each of the four loops of RCS cold leg temperature is any channel of steam generator pressure for that loop.

(c) A CET train consists of two core exit thermocouples (CETs).

ATTACHMENT 3 TO NL-11-119

MARKUP OF TECHNICAL SPECIFICATION BASES PAGES REGARDING

CONTAINMENT AND RECIRCULATION SUMP WATER LEVEL INDICATION

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ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET NO. 50-247

B 3.3 INSTRUMENTATION

B 3.3.3 Post Accident Monitoring (PAM) Instrumentation

BASES

BACKGROUND The primary purpose of the PAM instrumentation is to display unit variables that provide information required by the control room operators during accident situations. This information provides the necessary support for the operator to take the manual actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for Design Basis Accidents (DBAs).

The OPERABILITY of the accident monitoring instrumentation ensures that there is sufficient information available on selected unit parameters to monitor and to assess unit status and behavior following an accident.

The availability of accident monitoring instrumentation is important so that responses to corrective actions can be observed and the need for, and magnitude of, further actions can be determined. These essential instruments are identified by unit specific documents (References 1 and 4) addressing the recommendations of Regulatory Guide 1.97 (Ref. 2) as required by Supplement 1 to NUREG-0737 (Ref. 3).

The instrument channels required to be OPERABLE by this LCO include two classes of parameters identified during unit specific implementation of Regulatory Guide 1.97 as Type A and Category I variables.

Type A variables are included in this LCO because they provide the primary information required for the control room operator to take specific manually controlled actions for which no automatic control is provided, and that are required for safety systems to accomplish their safety functions for DBAs.

Categories I, II and III define the design and qualification criteria for the instrumentation used to monitor the variables.

This LCO requires that the plant maintain the ability to monitor the key variables deemed risk significant because they are needed to:

- Determine whether other systems important to safety are performing their intended functions,
- Provide information to the operators that will enable them to determine the likelihood of a gross breach of the barriers to radioactivity release, and

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BACKGROUND (continued)

- Provide information regarding the release of radioactive materials to allow for early indication of the need to initiate action necessary to protect the public, and to estimate the magnitude of any impending threat.

These key variables are identified by the Indian Point 2 specific Regulatory Guide 1.97 analyses (Ref. 4). These analyses identify the Indian Point 2 specific Type A and Category I variables and provide justification for deviating from the NRC proposed list of Category I variables.

The specific instrument Functions listed in Table 3.3.3-1 are discussed in the LCO section.

APPLICABLE SAFETY ANALYSES

The PAM instrumentation ensures the operability of Regulatory Guide 1.97 Type A and Category I variables so that the control room operating staff can:

- Perform the diagnosis specified in the emergency operating procedures (these variables are restricted to preplanned actions for the primary success path of DBAs), e.g., loss of coolant accident (LOCA),
- Take the specified, pre-planned, manually controlled actions, for which no automatic control is provided, and that are required for safety systems to accomplish their safety function,
- Determine whether systems important to safety are performing their intended functions,
- Determine the likelihood of a gross breach of the barriers to radioactivity release,
- Determine if a gross breach of a barrier has occurred, and
- Initiate action necessary to protect the public and to estimate the magnitude of any impending threat.

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APPLICABLE SAFETY ANALYSES (continued)

PAM instrumentation that meets the definition of Type A in Regulatory Guide 1.97 satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Category I, non-Type A, instrumentation must be retained in TS because it is intended to assist operators in minimizing the consequences of accidents. Therefore, Category I, non-Type A, variables are important for reducing public risk.

LCO

The PAM instrumentation LCO provides OPERABILITY requirements for Regulatory Guide 1.97 Type A monitors, which provide information required by the control room operators to perform certain manual actions specified in the unit Emergency Operating Procedures. These manual actions ensure that a system can accomplish its safety function, and are credited in the safety analyses. Additionally, this LCO addresses Regulatory Guide 1.97 instruments that have been designated Category I, non-Type A.

The OPERABILITY of the PAM instrumentation ensures there is sufficient information available on selected unit parameters to monitor and assess unit status following an accident. This capability is consistent with the recommendations of Reference 2.

LCO 3.3.3 requires at least two OPERABLE channels for most Functions. However, some functions, such as the RCS hot leg temperature and RCS cold leg temperature, require only one channel because they credit a required diverse function as a redundant channel. Two OPERABLE channels ensure no single failure prevents operators from getting the information necessary for them to determine the safety status of the unit, and to bring the unit to and maintain it in a safe condition following an accident.

Furthermore, OPERABILITY of two channels allows a CHANNEL CHECK during the post accident phase to confirm the validity of displayed information. More than two channels may be required for some functions if the IP2 Regulatory Guide 1.97 analyses (Ref. 4) determined that failure of one accident monitoring channel results in information ambiguity (that is, the redundant displays disagree) that could lead operators to defeat or fail to accomplish a required safety function.

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Table 3.3.3-1 provides a list of variables typical of those identified by the IP2 Regulatory Guide 1.97 (Ref. 4) analyses. Table 3.3.3-1 includes all Type A and Category I variables identified by the unit specific Regulatory Guide 1.97 analyses, as amended by the NRC's SER (Ref. 1).

Type A and Category I variables are required to meet Regulatory Guide 1.97 Category I (Ref. 2) design and qualification requirements for seismic and environmental qualification, single failure criterion, utilization of emergency standby power, immediately accessible display, continuous readout, and recording of display. Specific exceptions to these requirements are described and justified in documents listed in Reference 4.

Listed below are discussions of the specified instrument Functions listed in Table 3.3.3-1.

1, 2. Reactor Coolant System (RCS) Hot and Cold Leg Temperatures

RCS Hot and Cold Leg Temperatures are Type A, Category I variables provided for verification of core cooling and long term surveillance.

RCS hot and cold leg temperatures are used to determine RCS subcooling margin. RCS subcooling margin will allow termination of safety injection (SI), if still in progress, or reinitiation of SI if it has been stopped. RCS subcooling margin is also used for unit stabilization and cooldown control.

This LCO is satisfied by the OPERABILITY of one RCS hot leg channel and one RCS cold leg channel in each of the four RCS loops:

Hot Leg Loop No. 1 (TE-411A/1)	Cold Leg Loop No. 1 (TE-413)
Hot Leg Loop No. 2 (TE-422A/1)	Cold Leg Loop No. 2 (TE-423)
Hot Leg Loop No. 3 (TE-431A/1)	Cold Leg Loop No. 3 (TE-433)
Hot Leg Loop No. 4 (TE-440A/1)	Cold Leg Loop No. 4 (TE-443)

Requirements for RCS hot leg and RCS cold leg temperature are designated as one channel per loop because each channel is considered a separate function.

Only one channel per loop of hot leg temperature is required because redundant indication is provided by a diverse Function (either of the Core Exit Temperature (CET) trains) in the quadrant associated with the loop (Functions 15, 16, 17 and 18). Therefore, separate entry into Condition

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A (one required hot leg temperature channel inoperable) is allowed for each leg. If a hot leg temperature channel is inoperable at the same time both required CET trains in the associated quadrant are inoperable, entry into Condition C (two or more required channels inoperable) is required because the combination of the hot leg temperature channel and a CET train in the associated quadrant are used to satisfy requirements for redundancy as specified in Note (a) to Table 3.3.3-1.

Only one channel per loop of RCS cold leg temperature is required because redundant indication for the RCS cold leg temperature is provided by the Steam Generator Pressure (Function 20). Therefore, separate entry into Condition A (one required cold leg temperature channel inoperable) is allowed for each leg. If a cold leg temperature channel is inoperable at the same time both required steam generator pressure channels in the associated loop are inoperable, entry into Condition C (two or more required channels inoperable) is required because the combination of the cold leg temperature channel and a steam generator pressure channel in the associated loop are used to satisfy requirements for redundancy as specified in Note (b) to Table 3.3.3-1.

Each hot leg and cold leg channel provides indication over a range of 0°F to 700°F.

3. Reactor Coolant System Pressure (Wide Range)

RCS wide range pressure is a Type A, Category I variable provided for verification of core cooling and RCS integrity long term surveillance.

RCS pressure is used to verify delivery of SI flow to RCS from at least one train when the RCS pressure is below the pump shutoff head. RCS pressure is also used to verify closure of manually closed spray line valves and pressurizer power operated relief valves (PORVs).

In addition to these verifications, RCS pressure is used for determining RCS subcooling margin. RCS subcooling margin will allow termination of SI, if still in progress, or reinitiation of SI if it has been stopped. RCS pressure can also be used:

- to determine when to reset SI and shut off low head SI,
- to manually restart low head SI,
- as reactor coolant pump (RCP) trip criteria, and

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- to make a determination on the nature of the accident in progress and where to go next in the procedure.

RCS subcooling margin is also used for unit stabilization and cooldown control.

RCS pressure is also related to three decisions about depressurization. They are:

- to determine whether to proceed with primary system depressurization,
- to verify termination of depressurization, and
- to determine whether to close accumulator isolation valves during a controlled cooldown/depressurization.

A final use of RCS pressure (and pressurizer level) is to determine whether to operate the pressurizer heaters.

RCS pressure is a Type A variable because the operator uses this indication to monitor the cooldown of the RCS following a steam generator tube rupture (SGTR) or small break LOCA. Operator actions to maintain a controlled cooldown, such as adjusting steam generator (SG) pressure or level, would use this indication. Furthermore, RCS pressure is one factor that may be used in decisions to terminate RCP operation.

The LCO requirement for RCS Pressure (wide range) indication is satisfied by pressure transmitters designated PT-402 and PT-403.

4. Reactor Vessel Level Indication System (RVLIS)

RVLIS is a Type B, Category I function that is provided for verification and long term surveillance of core cooling. It is also used for accident diagnosis and to determine reactor coolant inventory adequacy.

RVLIS provides a direct measurement of the collapsed liquid level from the bottom to the top of the reactor vessel and under different coolant flow conditions with and without reactor coolant pumps operating. The RVLIS automatically compensates for variations in fluid temperature and density in both the RCS and instrument capillary tubes. The collapsed level represents the amount of liquid mass that is in the reactor vessel above

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the core. Measurement of the collapsed water level is selected because it is a direct indication of the water inventory.

This LCO is satisfied by the OPERABILITY of two channels of RVLIS (RVLIS-A and RVLIS-B). RVLIS-A includes both a wide range and a narrow range transmitter (LT-1311 and LT-1312). RVLIS-B includes both a wide range and a narrow range transmitter (LT-1321 and LT-1322).

5. Containment ~~Sump~~ Water Level (***Containment and*** Recirculation Sump)

~~Recirculation Sump~~ ***Containment*** Water Level is a Type A, category I Function that is provided for verification and long term surveillance of RCS integrity.

~~Recirculation Sump~~ ***Containment*** Water Level is used to determine that water has been delivered to the containment following a LOCA, and subsequently show that sufficient water has been collected by the sump to permit recirculation to the reactor and/or to the spray headers. ~~Recirculation sump~~ ***Containment*** water level also provides a diverse indication for RWST level regarding when to begin the recirculation procedure.

This LCO is satisfied by the OPERABILITY of two channels of containment ~~sump~~ water level ***instruments*** ~~(Recirculation Sump)~~. ***LT- 3300 and LT-3301, differential pressure transmitters, located in the Containment and Recirculation Sumps, respectively, are used to meet LCO requirements for the two channels. These provide a calibrated sump level span that is continuously indicated.*** LT-939, a magnetic switch/float type detector, ***and LT-941, a thermal type detector are additional qualified detectors and may be*** ~~is~~ used to meet LCO requirements for ~~one of~~ the ~~two~~ ***associated*** channels ***(i.e., the instrument buses for LT-3300 and LT-939 are powered by bus 2A/3A and the instrument buses for LT-3301 and LT-941 are powered by bus 5A).*** ~~This~~ ***The LT-939 and LT-941*** channels provide~~s~~ a series of five lights each energized from the associated instrument as a preset level is exceeded. ~~LT-3301, a differential pressure transmitter, is used to meet LCO requirements for the second channel. This channel provides a calibrated sump level span that is continuously indicated. The TS has been determined to be non-conservative and TRM 3.3.L provides guidance per Administrative Letter 89-10.~~

6. ~~Containment Water Level (Containment Sump)~~ NOT USED

~~Containment sump water level is a Type A, Category I Function that is needed because the residual heat removal pumps, taking suction from the~~

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~~containment sump, may be used if backup capacity to the internal recirculation loop is required.~~

~~This LCO is satisfied by the OPERABILITY of two channels of containment sump water level. LT-941, thermal type detector, is used to meet LCO requirements for one of the channels. This channel provides a series of five lights that are energized from the associated instrument when a preset level is exceeded. LT-3300, a differential pressure transmitter, is used to meet LCO requirements for the second channel. This channel provides a calibrated sump level span that is continuously indicated. The TS has been determined to be non-conservative and TRM 3.3.L provides guidance per Administrative Letter 89-10.~~

7. Containment Pressure

Containment Pressure (narrow range) is a Type A, Category I Function that is needed for determination of whether a steam line break is inside or outside containment. This Function is also used for the verification of the need for and effectiveness of containment spray and fan cooler units.

This LCO is satisfied by the OPERABILITY of any 2 of the 6 channels supported by PT-948A, PT-948B, PT-948C, PT-949A, PT-949B or PT-949C. Each channel provides indication in the control room over a range of –5 psig to 75 psig.

8. Containment Pressure (High Range)

Containment Pressure (High Range) is a Type C, Category I Function that is provided for verification of RCS and containment OPERABILITY. This Function would be used for the assessment of the potential for a containment boundary breach.

This LCO is satisfied by the OPERABILITY of PT-3300 and PT-3301. Each channel provides indication in the control room over a range of -10 psig to 150 psig.

9. Containment Area Radiation (High Range)

Containment Area Radiation is a Type A, Category I Function that is provided to monitor for the potential of significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans. Containment radiation level is used to determine if a high energy line break (HELB) has occurred, and whether the event is inside or outside of containment.

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This LCO is satisfied by the OPERABILITY of High Range Containment Radiation Monitors R-25 and R-26. Each channel has a range of 1 R/hour to 10^7 R/hour. Acceptable criteria for calibration are provided in Table II.F-13 of NUREG-0737.

10. Not Used

11. Pressurizer Level

Pressurizer Level is a Type A, Category I Function that is used to determine whether to terminate SI, if still in progress, or to reinitiate SI if it has been stopped. Knowledge of pressurizer water level is also used to verify the unit conditions necessary to establish natural circulation in the RCS and to verify that the unit is maintained in a safe shutdown condition.

This LCO is satisfied by the OPERABILITY of any two of the pressurizer level instruments designated LT-459, LT-460 and LT-461. Each channel has a range from the upper tap to the lower tap of the pressurizer which covers 85% of the pressurizer span.

12. Steam Generator Water Level (Narrow Range)

SG Water Level (narrow range) is a Type A, Category I Function. This Function is provided to monitor operation of decay heat removal via the SGs.

Each SG has three narrow range transmitters which span a range from the top of the tube bundles up to the moisture separator.

The LCO requirement for SG Level (narrow range) is satisfied by any two of the level instruments for each SG in the following list:

SG 21	SG 22	SG 23	SG 24
LT-417A	LT-427A	LT-437A	LT-447A
LT-417B	LT-427B	LT-437B	LT-447B
LT-417C	LT-427C	LT-437C	LT-447C

13. Steam Generator Water Level (Wide Range)

SG Water Level (wide range) is a Type B, Category I Function. Each SG has one wide range transmitter which spans a range from the tube sheet up to the moisture separator.

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SG Water Level (Wide Range) is used to:

- identify the ruptured SG following a tube rupture,
- verify that the intact SGs are an adequate heat sink for the reactor,
- determine the nature of the accident in progress (e.g., verify an SGTR), and
- verify unit conditions for termination of SI during secondary unit HELBs outside containment.

The requirement for Steam Generator Water Level (Wide Range) is OPERABILITY of 4 channels of SG Water Level (Wide Range) (not 1 channel per SG). This presentation of the requirement recognizes that two SGs are required to conduct a plant cooldown (i.e., one SG is unavailable as a result of the event and a second SG is assumed to be unavailable as a result of a single failure either before or after the event). Requiring one SG Water Level (Wide Range) instrument in each of the 4 SGs is conservative because, if the single failure is assumed to be a Steam Generator Water Level (Wide Range) instrument, the SG associated with the single failure will still be available because SG water inventory could be confirmed using Auxiliary Feedwater flow or either of the two Steam Generator Water Level (Narrow Range) instruments required for each SG. Therefore, entry into Condition A (one required channel inoperable) is required when one SG Water Level (Wide Range) channel is inoperable and entry into Condition C (two or more required channels inoperable) is required if the SG Water Level (Wide Range) channel is inoperable on more than one SG.

The LCO requirement for SG Level (wide range) is satisfied by the level instruments for each SG in the following list:

SG 21	SG 22	SG 23	SG 24
LT-417D	LT-427D	LT-437D	LT-447D

14. Condensate Storage Tank (CST) Level

CST Level is a Type A, Category I Function that is provided to ensure water supply for auxiliary feedwater (AFW). The CST provides the ensured safety grade water supply for the AFW System. CST Level is considered a Type A variable because the control room meter and annunciator are considered the primary indication used by the operator.

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The DBAs that require AFW are the loss of electric power, steam line break (SLB), and small break LOCA. The CST is the initial source of water for the AFW System. However, as the CST is depleted, manual operator action is necessary to replenish the CST or align suction to the AFW pumps to City Water.

The LCO requirement for CST level indication is satisfied by OPERABILITY of the level transmitters designated LT-1128 and LT-1128A.

15, 16, 17, 18. Core Exit Temperature

Core Exit Temperature is a Type A, Category III Function that is provided for verification and long term surveillance of core cooling.

Core exit temperature also serves as a redundant channel for the RCS Hot Leg Temperature (Function 1).

Core exit temperature is monitored by the core exit thermocouples (CETs). A total of 65 thermocouples are installed at preselected core locations to provide core exit temperature data up to 2300°F. There are two trains of CETs, one to process data for 34 thermocouples and the other for the remaining 31. The two trains receive power from redundant instrument busses. Two display units (one for each train) are provided on the central control room accident assessment panels. Each presents a graphic core location map with an alphanumeric display of core exit temperatures.

This LCO is satisfied by having 2 trains, each with a minimum of 2 qualified CETS (i.e., 4 CETs total) in each of the four quadrants. Requiring 2 qualified CETs in each train in each of the four quadrants provides assurance that sufficient CETs are available to support evaluation of core radial decay power distribution. Each pairing of 2 CETs from the same train in each quadrant is considered a separate function.

19. Auxiliary Feedwater Flow

AFW Flow is a Type A, Category II Function that is provided to monitor operation of decay heat removal via the SGs.

AFW flow is used three ways: to verify delivery of AFW flow to the SGs if SG narrow range level indicators are off scale low; to determine whether to terminate SI if still in progress, in conjunction with SG water level (narrow range); and to regulate AFW flow so that the SG tubes remain covered.

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The LCO requirement for AFW flow indication is satisfied by OPERABILITY of the following 4 flow transmitters:

SG 21	SG 22	SG 23	SG 24
FT-1200	FT-1201	FT-1202	FT-1203

Note that the requirement is for OPERABILITY of 4 channels of AFW flow indication (not 1 channel per SG). This presentation of the requirement assumes that one SG is rendered inoperable as a result of the event and that two SGs are required to conduct a plant cooldown. Therefore, entry into Condition A (one required channel inoperable) is required when one AFW flow indication channel is inoperable and entry into Condition C (two or more required channels inoperable) is required if more than one AFW flow indication channel is inoperable.

20. Steam Generator Pressure

Steam Generator Pressure is a Type A, Category I Function that is used to determine if a high energy secondary line rupture occurred and which steam generator is faulted. SG pressure is also used as the redundant channel of RCS cold leg temperature (Function 2) for natural circulation determination.

The LCO requirement for steam generator pressure indication is satisfied by any two of the following three channels for each of the four SGs:

SG 21	SG 22	SG 23	SG 24
PT-419A	PT-429A	PT-439A	PT-449A
PT-419B	PT-429B	PT-439B	PT-449B
PT-419C	PT-429C	PT-439C	PT-449C

Requirements for steam generator pressure are designated as two channels per SG because each SG is considered a separate function. Therefore, separate entry into Condition A (one required channel inoperable) and Condition C (two required channels inoperable) is separate for each SG.

21. RCS Subcooling Margin Monitoring

RCS Subcooling Margin Monitoring is a Type A, Category I Function provided for diagnosing early symptoms of inadequate core cooling, determining whether to terminate actuated SI or to reinitiate stopped SI.

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The system has two independent, redundant channels, each providing indication in the control room. The inputs of one subcooling margin monitoring channel (reactor coolant system pressure, hot-leg temperature, cold-leg temperature) are provided by a wide range reactor coolant system pressure transmitter in reactor coolant loop 21, and the reactor coolant system cold and hot leg resistance temperature detectors in loops 21 and 23. The redundant channel receives pressure input from a transmitter in loop 24, and temperature input from detectors in loops 22 and 24.

Two channels are required to be Operable for redundancy. The subcooling margin monitor readout on the plant computer can be used as a substitute for the control room panel readout of the RCS Subcooling Margin Monitor.

22. Refueling Water Storage Tank (RWST) Level

RWST Level is a Type A, Category II Function that is used to confirm RWST level prior to the manual switchover to the cold leg recirculation phase that is initiated when the RWST level has reached the low low alarm setpoint and sufficient coolant inventory to support pump operation in recirculation mode is verified in the containment.

Two channels of RWST Level indication are required consistent with LCO 3.5.4, "Refueling Water Storage Tank," requirements for OPERABILITY of two channels of the RWST level low low alarm. This is required because the IP2 ESFAS design does not include automatic switchover from the safety injection mode to the recirculation mode of operation based on low low level in the RWST coincident with a safety injection signal.

The LCO requirement for two channels of RWST level indication is satisfied by the OPERABILITY of LT-920 and LT-5751.

APPLICABILITY

The PAM instrumentation LCO is applicable in MODES 1, 2, and 3. These variables are related to the diagnosis and pre-planned actions required to mitigate DBAs. The applicable DBAs are assumed to occur in MODES 1, 2, and 3. In MODES 4, 5, and 6, unit conditions are such that the likelihood of an event that would require PAM instrumentation is low; therefore, the PAM instrumentation is not required to be OPERABLE in these MODES.

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ACTIONS

A Note has been added in the ACTIONS to clarify the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed on Table 3.3.3-1. The Completion Time(s) of the inoperable channel(s) of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function.

A.1

Condition A applies when one or more Functions have one required channel or train that is inoperable. Required Action A.1 requires restoring the inoperable channel to OPERABLE status within 30 days. The 30 day Completion Time is based on operating experience and takes into account the remaining OPERABLE channel (or in the case of a Function that has only one required channel, other non-Regulatory Guide 1.97 instrument channels to monitor the Function), the passive nature of the instrument (no critical automatic action is assumed to occur from these instruments), and the low probability of an event requiring PAM instrumentation during this interval.

B.1

Condition B applies when the Required Action and associated Completion Time for Condition A are not met. This Required Action specifies initiation of actions in Specification 5.6.6, which requires a written report to be submitted to the NRC immediately. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. This action is appropriate in lieu of a shutdown requirement since alternative actions are identified before loss of functional capability, and given the likelihood of unit conditions that would require information provided by this instrumentation.

C.1

Condition C applies when one or more Functions have two or more inoperable required channels or trains (i.e., two channels or trains inoperable in the same Function). For Functions 1 and 2, Condition C applies when the one required channel is inoperable and there are no OPERABLE channels of the diverse Function that provides redundant indication. Required Action C.1 requires restoring one or more channel in the Function(s) to OPERABLE status within 7 days so that Condition C is no longer applicable. The Completion Time of 7 days is based on the

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relatively low probability of an event requiring PAM instrument operation and the availability of alternate means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM Function will be in a degraded condition should an accident occur.

Only one channel per loop of hot leg temperature is required because redundancy is provided by a diverse Function (i.e., either of the two trains of Core Exit Temperature (CET) Function in the core quadrant associated with the loop). If a hot leg temperature channel is inoperable and at least one of the two required trains of CET in the associated quadrant is OPERABLE, entry into Condition A is appropriate. If a hot leg temperature channel is inoperable at the same time both required CET trains in the associated quadrant are inoperable, entry into Condition C is appropriate because there is a loss of function for hot leg temperature for that loop. Additionally, entry into Condition C is also required when both required CET trains in a quadrant are inoperable regardless of the status of the hot leg temperature function in the associated loop because the CETs provide a function for which the hot leg temperature function does not provide redundancy.

Only one channel per loop of RCS cold leg temperature is required because redundancy for the RCS cold leg temperature is provided by either of the two channels of SG Pressure (Function 20). If a cold leg temperature channel is inoperable and at least one of the two required channels of SG Pressure in the associated SG is OPERABLE, entry into Condition A is appropriate. If a cold leg temperature channel is inoperable at the same time both required SG Pressure channels in the associated SG are inoperable, entry into Condition C is appropriate because there is a loss of function for cold leg temperature for that loop. Additionally, entry into Condition C is required when both required SG Pressure channels in a SG are inoperable regardless of the status of the cold leg temperature function in the associated loop because SG Pressure channels provide a function for which the cold leg temperature function does not provide redundancy.

D.1

Condition D applies when the Required Action and associated Completion Time of Condition C are not met. Required Action D.1 requires entering the appropriate Condition referenced in Table 3.3.3-1

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for the channel immediately. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met any Required Action of Condition C, and the associated Completion Time has expired, Condition D is entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1 and E.2

If the Required Action and associated Completion Time of Condition C are not met and Table 3.3.3-1 directs entry into Condition E, the unit must be brought to a MODE where the requirements of this LCO do not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and MODE 4 within 12 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

F.1

At Indian Point 2, Function 4 (Reactor Vessel Level Indication System) and Function 10 (Containment Hydrogen Monitor) are not classified as Type A variables based on the evaluations listed in Reference 1. Additionally, alternate methods or diverse variables providing adequate information to make required assessments are available to operators even if these functions are not available. Therefore, plant shutdown within 7 days is not warranted if more than one channel of these Functions are not OPERABLE.

Function 9 (Containment Area Radiation - High Range) and Function 14 (Condensate Storage Tank Level) are Type A variables; however, alternate methods for monitoring these variables are available. Therefore, plant shutdown within 7 days is not warranted if more than one channel of these Functions are not OPERABLE.

If these alternate means are used to monitor a parameter, the Required Action is not to shut down the unit but rather to follow the directions of Specification 5.6.6, in the Administrative Controls section of the TS. The report provided to the NRC should discuss the alternate means used, describe the degree to which the alternate means are equivalent to the installed PAM channels, justify the areas in which they are not equivalent, and provide a schedule for restoring the normal PAM channels.

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SURVEILLANCE REQUIREMENTS

A Note has been added to the SR Table to clarify that SR 3.3.3.1 and SR 3.3.3.3 apply to each PAM instrumentation Function in Table 3.3.3-1.

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SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.3.1

Performance of the CHANNEL CHECK once every 31 days ensures that a gross instrumentation failure has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION. The high radiation instrumentation should be compared to similar unit instruments located throughout the unit.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit. If the channels are within the criteria, it is an indication that the channels are OPERABLE.

As specified in the SR, a CHANNEL CHECK is only required for those channels that are normally energized. Instruments that are normally isolated or normally not in service are considered de-energized.

The Frequency of 31 days is based on operating experience that demonstrates that channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels.

SR 3.3.3.2 and SR 3.3.3.3

A CHANNEL CALIBRATION is performed every 92 days for the RWST level and every 24 months, or approximately at every refueling for all other Table 3.3.3-1 Functions. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that

the channel responds to measured parameter with the necessary range and accuracy. Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION of the Core Exit thermocouple sensors is accomplished by an in-place cross calibration that compares the other sensing elements with the recently installed sensing element.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Frequency is based on operating experience and consistency with the typical industry refueling cycle.

REFERENCES

1. Safety Evaluation by the Office of Nuclear Reactor Regulation Regarding Conformance to Regulatory Guide 1.97 for Consolidated Edison Company of New York, Inc. Indian Point Nuclear Generating Unit No. 2, Docket No. 50-247, September 27, 1990.

2. Regulatory Guide 1.97, December 1980.

3. NUREG-0737, Supplement 1, "TMI Action Items."

4. UFSAR, Section 7.1.5