UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

April 8, 1993

NRC INFORMATION NOTICE 93-27: LEVEL INSTRUMENTATION INACCURACIES OBSERVED DURING NORMAL PLANT DEPRESSURIZATION

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to inaccuracies in reactor vessel level indication that occurred during a normal depressurization of the reactor coolant system at the Washington Nuclear Plant Unit 2 (WNP-2) and to the fact that errors in level indication may result in a failure to automatically isolate the residual heat removal (RHR) system under certain conditions. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Background

As discussed in NRC Information Notice 92-54, "Level Instrumentation Inaccuracies Caused by Rapid Depressurization," and Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(f)," noncondensible gas may become dissolved in the reference leg of water level instrumentation and lead to false indications of high level after a rapid depressurization event. Reactor vessel level indication signals are important because these signals are used for actuating automatic safety systems and for guidance to operators during and after an event. While Information Notice 92-54 dealt with potential consequences of rapid system depressurization, this information notice discusses level indication errors that may occur during normal plant cooldown and depressurization.

Description of Circumstances

On January 21, 1993, during a plant cooldown following a reactor scram at WNP-2, "notching" of the level indication was observed on at least two of four channels of the reactor vessel narrow range level instrumentation. "Notching" is a momentary increase in indicated water level. This increase occurs when a gas bubble moves through a vertical portion of the reference leg and causes a temporary decrease in the static head in the reference leg. The notching at

WNP-2 was first observed on channel "C" at a pressure of approximately 827 kPa [120 psig]. Channel "B" experienced notching starting at approximately 350 kPa [50 psig]. At these pressures, the level error was on the order of 10 to 18 centimeters [4 to 7 inches] and persisted for approximately one minute.

Beginning at a pressure of approximately 240 kPa [35 psig], the level indication from channel "C" became erratic and, as the plant continued to depressurize, an 81-centimeter [32-inch] level indication error occurred. This depressurization was coincident with the initiation of the shutdown cooling system. The 81-centimeter [32-inch] level error was sustained and was gradually recovered over a period of two hours. The licensee postulated that this large error in level indication was caused by gas released in the reference leg displacing approximately 40 percent of the water volume. The licensee also postulated that the slow recovery of correct level indication was a result of the time needed for steam to condense in the condensate chamber and refill the reference leg. The licensee inspected the "C" reference leg and discovered leakage through reference leg fittings. This leakage may have been a contributing factor for an increased accumulation of dissolved noncondensible gas in that reference leg.

The licensee determined that the type of errors observed in level indication during this event could result in a failure to automatically isolate a leak in the RHR system during shutdown cooling. The design basis for WNP-2 includes a postulated leak in the RHR system piping outside containment while the plant is in the shutdown cooling mode. For this event, the shutdown cooling suction valves are assumed to automatically isolate on a low reactor vessel water level signal to mitigate the consequences of the event. For the January 21, 1993 plant cooldown, the licensee concluded that, with the observed errors in level indication, the shutdown cooling suction valves may not have automatically isolated the RHR system on low reactor vessel water level as designed. The licensee has implemented compensatory measures for future plant cooldowns to ensure that a leak that occurs in the RHR system during shutdown cooling operation would be isolated promptly. These measures include touring the associated RHR pump room hourly during shutdown cooling and backfilling the water level instrument reference legs after entry into mode 3 (hot shutdown). The licensee is also evaluating measures to minimize leakage from the "C" reference leg.

Discussion

The event described above is different than events previously reported because of the large magnitude and sustained duration (as opposed to momentary notching) of the level error that occurred during normal plant cooldown. A large sustained level error is of concern because of the potential for complicating long-term operator actions. In addition, the scenario of a postulated leak in the RHR system evaluated by WNP-2 suggests that some safety systems may not automatically actuate should an event occur while the reactor is in a reduced pressure condition. Generic Letter 92-04 requested, in part, that licensees determine the impact of potential level indication errors on

automatic safety system response during licensing basis transients and accidents. The information in this notice indicates that sustained level instrument inaccuracies can occur during a normal reactor depressurization. Therefore, events occurring during low pressure conditions may also be complicated by level indication errors.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Brian K. Grimes, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical contact: Amy Cubbage, NRR
(301) 504-2875

Attachment:
List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-26	Grease Solidification Causes Molded Case Circuit Breaker Failure to Close	04/07/93	All holders of OLs or CPs for nuclear power reactors.
93-25	Electrical Penetration Assembly Degradation	04/01/93	All holders of OLs or CPs for nuclear power reactors.
93-24	Distribution of Revision 7 of NUREG-1021, "Operator Licensing Examiner Standards"	03/31/93	All holders of operator and senior operator licenses at nuclear power reactors.
93-23	Weschler Instruments Model 252 Switchboard Meters	03/31/93	All holders of OLs or CPs for nuclear power reactors.
93-22	Tripping of Klockner-Moeller Molded-Case Circuit Breakers due to Support Level Failure	03/26/93	All holders of OLs or CPs for nuclear power reactors.
93-21	Summary of NRC Staff Observations Compiled during Engineering Audits or Inspections of Licensee Erosion/Corrosion Programs	03/25/93	All holders of OLs or CPs for light water nuclear power reactors.
93-20	Thermal Fatigue Cracking of Feedwater Piping to Steam Generators	03/24/93	All holders of OLs or CPs for PWRs supplied by Westinghouse or Combustion Engineering.
93-19	Slab Hopper Bulging	03/17/92	All nuclear fuel cycle licensees.
93-18	Portable Moisture-Density Gauge User Responsibilities during Field Operations	03/10/93	All U.S. Nuclear Regulatory Commission licensees that possess moisture-density gauges.

OL = Operating License
CP = Construction Permit

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Original signed by
Brian K. Grimes

Brian K. Grimes, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical contact: Amy Cubbage, NRR
(301) 504-2875

Attachment:
List of Recently Issued NRC Information Notices

*See previous concurrence

*OGCB:DORS:NRR	*C/OGCB:DORS:NRR	D/DORS:NRR	*TECH:ED
JLBirmingham	GHMarcus	BKGrimes	RSanders
04/01/93	04/01/93	04/5/93	03/18/93

*SRXB:DSSA:NRR	*C/SRXB:DSSA:NRR	*D/DSSA:NRR
ACubbage	RJones	AThadani
03/19/93	03/26/93	03/26/93

Document name: 93-27.IN

errors on automatic safety system response during licensing basis transients and accidents. The information in this notice indicates that sustained level instrument inaccuracies can occur during a normal reactor depressurization. Therefore, events occurring during low pressure conditions may also be complicated by level indication errors.

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*See previous concurrence

OGCB:DORS:NRR	C/OGCB:DORS:NRR	D/DORS:NRR	*TECH:ED
JLBirmingham	GHMarcus	BKGrimes	RSanders
03/ /93	03/ /93	03/ /93	03/18/93
*SRXB:DSSA:NRR	*C/SRXB:DSSA:NRR	*D/DSSA:NRR	
ACubbage	RJones	AThadani	
03/19/93	03/26/93	03/26/93	

Document name: RVLEVEL.IN

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Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contact: Amy Cubbage, NRR
(301) 504-2875

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Document name: RVLEVEL.IN
*SEE PREVIOUS CONCURRENCE

OGCB:DORS:NRR	C/OGCB:DORS:NRR	D/DORS:NRR	*TECHED:ADM
JLBirmingham	GHMarcus	BKGrimes	RSanders
03/29/93	03/ /93	03/ /93	03/ /93

*SRXB:DSSA:NRR	C/SRXB:DSSA:NRR	D/DSSA:NRR
ACubbage	RJones	AThadani
03/ /93	03/ /93	03/ /931

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Office of Nuclear Reactor Regulation

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Attachment: List of Recently Issued NRC Information Notices

Document name: INFONOT2.RVL

OGCB:DORS:NRR	C/OGCB:DORS:NRR	D/DORS:NRR	TECHED:ADM
JLBirmingham	GHMarcus	BKGrimes	JMain RaySanders
03/ /93	03/ /93	03/ /93	03/18/93
SRXB:DSSA:NRR	C/SRXB:DSSA:NRR	D/DSSA:NRR	
ACubbage AC	RJones	AThadani	
03/19/93	03/ /93	03/ /93	