

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

December 8, 1993

NRC INFORMATION NOTICE 93-93: INADEQUATE CONTROL OF REACTOR COOLANT SYSTEM
CONDITIONS DURING SHUTDOWN

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 of recent plant events that involved inadequate control of the reactor coolant system (RCS) conditions while the plant was shut down. 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

During refueling or periods of cold shutdown, technical specifications allow licensees to remove from service equipment required to be operable during power operations. At these times, surveillance tests and maintenance activities may result in unusual plant configurations not encountered during power operations. The events described below demonstrate the importance of controlling plant activities during shutdown operations to ensure continued operability of plant equipment, RCS inventory control, and adequate shutdown cooling.

Description of Circumstances

Opening of the Residual Heat Removal Pump Suction Relief Valve

On November 21, 1992, the Joseph M. Farley Nuclear Plant had been in cold shutdown for 27 days. The "B" and "C" reactor coolant pumps were running, and the operators were monitoring RCS pressure using the "C" loop wide range pressure transmitter, which indicated 2,861 kPa [415 psia]. At 6:16 a.m., the "C" reactor coolant pump was secured for maintenance. Normal thermal and hydraulic characteristics caused the system pressure at the loop "C" hot leg to increase. A drag pointer recorder indicated that RCS pressure had reached 3,516 kPa [510 psia]. The increased pressure caused the "A" train residual heat removal relief valve on loop "C" to lift, relieving 6,435 liters [1,700 gallons] of RCS inventory to the pressurizer relief tank and causing

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the level in the pressurizer to drop to zero. The relief valve reseated approximately 4 minutes later and pressurizer level indication was regained after another 2 minutes using normal makeup from the refueling water storage tank.

The Alabama Power Company (the licensee) investigated and found that the output of pressure transmitter "C" was consistently 172 kPa [25 psi] lower than the output of pressure transmitter "A", which had been monitored in the past for this configuration. This discrepancy indicates that the system pressure before the event was approximately 3,034 kPa [440 psia] and rose to approximately 3,206 kPa [465 psia] when the reactor coolant pump "C" was secured. The drag pointer recorder was found to be out of calibration by 338 kPa [49 psi] indicating that the actual pressure attained was 3,178 kPa [461 psia]. The setpoint for the relief valve that lifted was 3,172 kPa [460 psia] so the actual liftpoint was within tolerance for the relief valves. The licensee later imposed a more restrictive band on allowable system pressure for this configuration.

Reactor Coolant Spill in Containment

On September 28, 1992, Palo Verde Nuclear Generating Station, Unit 3, had been in Mode 6 (Refueling) for three days. Personnel testing the safety injection tank 2B outlet motor-operated valve inadvertently released nitrogen from the tank to the RCS, causing a large wave in the refueling cavity. The wave splashed 5,678 liters [1,500 gallons] of water over the sides of the refueling cavity, contaminating large areas of the containment building. The cause of this event was inadequate venting of the safety injection tank before testing the outlet valve.

Loss of Shutdown Cooling

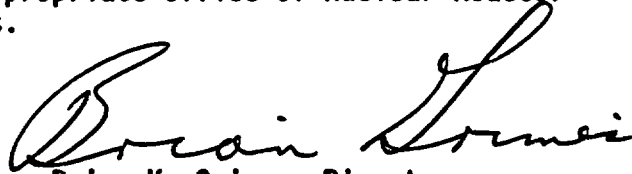
On January 25, 1993, GPU Nuclear Corporation (the licensee for the Oyster Creek Nuclear Generating Station) experienced a degradation of shutdown cooling due to a failure to incorporate shutdown cooling flow in accordance with a licensee engineering evaluation for the current plant recirculation loop configuration. This event is discussed fully in NRC Information Notice 93-45, "Degradation of shutdown Cooling System Performance," June 16, 1993.

Discussion

These events were caused by deficiencies in human performance that include: inadequate development and review of procedures, inadequate monitoring and trending of plant parameters, and inadequate work practices. These types of events are of concern because they indicate that, with the reactor in a shutdown condition, personnel may have a decreased awareness of the safety consequences of their actions and may not realize the importance of careful control of plant activities to ensure continued operability of plant equipment, RCS inventory control, and adequate shutdown cooling. Because plant systems are not in usual operating configurations while the plant is in a refueling or cold shutdown condition, proper human performance is important

in maintaining safety and controlling plant parameters such as RCS temperature and configuration.

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



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

Technical contact: Eric J. Benner, NRR
(301) 504-1171

Attachment:
List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-92	Plant Improvements to Mitigate Common Dependencies in Component Cooling Water Systems	12/07/93	All holders of OLs or CPs for nuclear power reactors.
91-21, Supp. 1	Inadequate Quality Assurance Program of Vendor Supplying Safety-Related Equipment	12/07/93	All holders of OLs or CPs for nuclear power reactors and all recipients of NUREG-0040, "License Contractor and Vendor Inspection Status Report" (White Book).
89-77, Supp. 1	Debris in Containment Emergency Sumps and Incorrect Screen Configurations	12/03/93	All holders of OLs or CPs for nuclear power reactors.
93-91	Misadjustment Between General Electric 4.16-KV Circuit Breakers and Their Associated Cubicles	12/03/93	All holders of OLs or CPs for nuclear power reactors.
93-90	Unisolatable Reactor Coolant System Leak Following Repeated Applications of Leak Sealant	12/01/93	All holders of OLs or CPs for nuclear power reactors.
93-89	Potential Problems with BWR Level Instrumentation Backfill Modifications	11/26/93	All holders of OLs or CPs for boiling water reactors.
93-88	Status of Motor-Operated Valve Performance Prediction Program by the Electric Power Research Institute	11/30/93	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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orig /s/'d by BKGrimes
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 Office of Nuclear Reactor Regulation

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Via E-mail on 7/28/93, received concurrence from:
 ADromerick Oyster Creek Project Manager
 JRogge Oyster Creek Regional Section Chief
 SHoffman Farley Project Manager
 FCantrell Farley Regional Section Chief
 CTrammell Palo Verde Project Manager
 HWong Palo Verde Regional Section Chief

*SEE PREVIOUS CONCURRENCES.

OFC	OEAB:DORS	OEAB:DORS	ADM:PUB	SC/OEAB:DORS
NAME	EBenner*	JCarter*	Tech Ed*	EGoodwin*
DATE	08/9/93	05/7/93	02/12/93	03/10/93
OFC	SC/OEAB:DORS	C/OEAB:DORS	SC/SRXB:DSSA	C/SRXB:DSSA
NAME	RDennig*	AChaffee*	MCaruso*	RJones*
DATE	04/28/93	09/17/93	09/14/93	09/14/93
OFC	HHFB:DRCH	SC/HHFB:DRCH	C/HHFB:DRCH	
NAME	DDesaulniers*	REckenrode*	WSwenson*	
DATE	08/17/93	08/17/93	08/17/93	
OFC	OGCB:DORS:NRR	C:/OGCB:DORS	D/DORS	
NAME	JLBirmingham*	GHMarcus*	BKGrimes	
DATE	10/13/93	10/13/93	12/2/93	

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HWong Palo Verde Regional Section Chief

THIS IS A CONCURRENCE PAGE FOR THE SHUTDOWN.JLB INFORMATION NOTICE
*ALSO SEE THE ATTACHED PAGE FOR PREVIOUS CONCURRENCES.

OFC	OEAB:DORS	OEAB:DORS	ADM:PUB	SC/OEAB:DORS
NAME	EBenner*	JCarter*	Tech Ed*	EGoodwin*
DATE	08/9/93	05/7/93	02/12/93	03/10/93
OFC	SC/OEAB:DORS	C/OEAB:DORS	SC/SRXB:DSSA	C/SRXB:DSSA
NAME	RDennig*	AChaffee*	MCaruso*	RJones*
DATE	04/28/93	09/17/93	09/14/93	09/14/93
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NAME	DDesauIniers*	REckenrode*	WSwenson*	
DATE	08/17/93	08/17/93	08/17/93	
OFC	OGCB:DORS:NRR	C:/OGCB:DORS	D/DORS	
NAME	JLBirmingham*	GHMarcus*	BKGrimes <i>di</i>	
DATE	10/13/93	10/13/93	11/ /93	

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NAME	JLBirmingham*	GHEMarcus*	BKGrimes	
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NAME	RDennig*	AChaffee*	MCaruso*	RJones*
DATE	4/28/93	09/17/93	09/14/93	09/14/93
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NAME	DDesaulniers*	REckenrode*	WSwenson*	
DATE	8/17/93	08/17/93	08/17/93	
OFC	OGCB:DORS:NRR	C:/OGCB:DORS ^{oh}	D/DORS	
NAME	JLBirmingham	GHMarcus ^{for}	BKGrimes ^{oh}	
DATE	10/5/93	10/13/93	10/ /93	

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DATE	4/28/93	1 / 93	9/14/93	9/14/93
OFC	HHFB:DRCH	SC/HHFB:DRCH	C/HHFB:DRCH	C/OEAB:DORS
NAME	DDesaulniers*	KKeckrode	WSwenson	AChaffee
DATE	8/17/93	8/17/93	8/17/93	9/17/93
OFC	C:/OGCB:DORS	D/DORS		
NAME	GMarcus	BGrimes		
DATE	/ / 93	/ / 93		

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*See previous concurrence *(see notes below)*

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NAME	EBenner*	JCarter*	Tech Ed*	EGoodwin*
DATE	08/9/93	05/7/93	02/12/93	03/10/93
OFC	SC/OEAB:DORS	C/OEAB:DORS	SC/SRXB:DSSA	C/SRXB:DSSA
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DATE	04/28/93	09/17/93	09/14/93	09/14/93
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OFC	OGCB:DORS:NRR	C:/OGCB:DORS	D/DORS	
NAME	JLBirmingham*	GHMarcus*	BKGrimes	
DATE	10/13/93	10/13/93	10/ /93	

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The original concurrence package for this draft information notice was lost. I certify that each of the above witnessed concurrences had been obtained. JLB Birmingham 11-16-93

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OFC	OEAB:DORS	OEAB:DORS	ADM:PUB	SC/OEAB:DORS
NAME	EBenner <i>EJB</i>	JCarter*	Tech Ed*	EGoodwin*
DATE	8/9/93	5/7/93	2/12/93	3/10/93

OFC	SC/OEAB:DORS	SC/SRXB:DSSA	C/SRXB:DSSA	SC/HHFB:DRCH
NAME	RDennig*	MCaruso	RJones	DD <i>DR</i> <i>Summers</i>
DATE	4/28/93	/ /93	/ /93	8/17/93

OFC	C/HHFB:DRCH	C/OEAB:DORS	C/OGCB:DORS	D/DORS
NAME	WSwenson	AChaffee	GMarcus	BGrimes
DATE	/ /93	/ /93	/ /93	/ /93

OEAB:DORS
EBenner *EJB*
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EGoodwin
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PUB:ADM
Tech Ed
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AChaffee
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GMarcus
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BGrimes
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OFC	OEAB:DORS	OEAB:DORS	SC/OEAB:DORS	SC/OEAB:DORS
NAME	EBenner <i>EJB</i>	JCartter <i>JC</i>	EGoodwin*	RDennig*
DATE	04/03/93	04/17/93	03/10/93	04/28/93

OFC	ADM:PUB	C/OEAB:DORS	C/OGCB:DORS	D/DORS
NAME	Tech Ed*	AChaffee	GMarcus	BGrimes
DATE	02/12/93	03/ /93	03/ /93	03/ /93

Discussion

These events are examples of deficiencies in human performance with the reactor in a shutdown condition. These types of events are of concern because, with the reactor in a shutdown condition, many pieces of emergency safeguards equipment can be removed from service with valves in unusual configurations. Human performance is vital in maintaining safety and controlling the system configuration.

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OEAB:DORS
EBenner *EJB*
3/10/93

SC/OEAB:DORS
EGoodwin *G*
3/6/93

PUB:ADM*
Tech Ed
2/12/93

C/OEAB:DORS
AChaffee
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C/OGCB:DORS
GMarcus
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D/DORS
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/ /93

*see previous concurrence

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NAME	EBenner	JCarter	EGoodwin*	RDennig
DATE	03/ /93	03/ /93	03/10/93	03/28/93

OFC	ADM:PUB	C/OEAB:DORS	C/OGCB:DORS	D/DORS
NAME	Tech Ed*	AChaffee	GMarcus	BGrimes
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NAME	EBenner <i>EB</i>	JCarter*	Tech Ed*	EGoodwin*
DATE	7/27/93	5/7/93	2/12/93	3/10/93

OFC	SC/OEAB:DORS	C/OEAB:DORS	C/OGCB:DORS	D/DORS
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