

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

April 16, 1990

NRC INFORMATION NOTICE NO. 90-25: LOSS OF VITAL AC POWER WITH SUBSEQUENT REACTOR COOLANT SYSTEM HEAT-UP

Addressees:

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

Purpose:

This information notice is being provided to inform addressees of a significant operating event which occurred at the Georgia Power Company's Vogtle Nuclear Plant on March 20, 1990. The event took place while Unit 1 was in mid-loop in operational mode 6 and demonstrates the need for operating personnel to be prudent in removing equipment from service or establishing atypical equipment alignments during shutdown. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On March 20, 1990, a loss of vital ac power occurred while Vogtle Unit 2 was operating at 100 percent power and Unit 1 had been in a refueling outage for about 4 weeks. Unit 1 was in mid-loop in operational mode 6 with plant equipment conditions as follows:

- o The Unit 1 B reserve auxiliary transformer (RAT) was tagged out of service for maintenance
- o The Unit 1 B emergency diesel generator (EDG) was tagged out of service and disassembled for maintenance
- o The Unit 1 A RAT was supplying offsite power to the crosstied Unit 1 A and B vital buses
- o The reactor coolant system (RCS) temperature was being maintained at around 90 degrees Fahrenheit (F) via the train A residual heat removal (RHR) pump, the train B pump was in standby
- o The vessel head was in place with the bolts not fully tensioned
- o The pressurizer manway cover was removed

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- o The manways for steam generators 2 and 3 were partially bolted in place and the manways for steam generators 1 and 4 were in place with bolts fully tensioned
- o The inboard charging line check valve and an accumulator isolation valve were open for inspection
- o The containment equipment hatch and the containment personnel hatch were open

At about 9:20 a.m., a truck carrying fuel and lubricants in the plant low voltage switchyard backed into a support column for the feeder line supplying power to the Unit 1 A RAT and the Unit 2 B RAT. The insulator for the C phase of the feeder line fractured and initiated a phase-to-ground electrical fault. The fault resulted in a loss of power to the Unit 1 A RAT and the Unit 2 B RAT. The Unit 2 B EDG started and loaded to the deenergized Unit 2 B vital bus. However, a Unit 2 turbine trip and reactor trip occurred because of an improperly connected (wrong tap) differential current transformer (DCT). The DCT initiated the trip when the current surge associated with the phase-to-ground fault was sensed. The Unit 2 trip was uncomplicated.

Because both of the Unit 1 vital buses were crosstied and being supplied by the Unit 1 A RAT, the loss of the transformer deenergized both vital buses. Deenergizing these buses resulted in the loss of power to the operating RHR pump. Since the Unit 1 B EDG was tagged out of service and disassembled for maintenance, the emergency power supply for the B vital bus was unavailable and the standby B RHR pump could not be started.

The available Unit 1 A EDG started on bus undervoltage, but for unknown reasons, it shut down automatically after 1 minute and 20 seconds. At 9:40 a.m., plant operators declared a site area emergency. A loss of all onsite and offsite ac power at Vogtle for more than 15 minutes is classified as a site area emergency. The licensee made their declaration because all vital ac power was lost for greater than 15 minutes. Approximately 18 minutes after the first start of the A EDG, the operators locally reset the load sequencer which automatically restarted the A EDG on undervoltage. However, after 1 minute and 10 seconds, the diesel again shut down automatically. At 9:56 a.m., plant operators performed an "emergency" manual start of the diesel, which bypassed most of the diesel's protective trips. The diesel started and loaded to the bus, the A RHR pump was restarted, and core cooling was reestablished to Unit 1. With the start of the diesel, the site area emergency was downgraded to an "alert" at 10:15 a.m. Containment integrity was established at 11:03 a.m.

Plant personnel returned the Unit 1 B RAT to service after completing formal tagout removal procedures. However, attempts to energize the transformer were delayed for several minutes because of a sticking mechanical interlock in the control circuitry for a motor-operated disconnect switch on the high side of the B RAT. Power was restored to the B vital bus via the B RAT at 11:40 a.m. At 12:38 a.m., core cooling was shifted to the B RHR train to facilitate subsequent electrical alignment changes.

According to control room indication, RCS temperature increased from 90 to 136 degrees F during the 36 minutes required to reenergize the A bus (1.3 degrees F/min).

Throughout the event, non-vital power was continuously provided to Unit 1 from offsite sources, via backfeed through the main generator transformer. Also, the Unit 2 electrical distribution system remained energized (aside from the momentary loss of power before the reactor trip). However, the Vogtle electrical system was not designed to permit easy interconnection of the Unit 1 vital buses to nonvital power or to the Unit 2 electrical buses. Therefore, there were no procedures in place to provide guidance on interconnecting the Unit 1 vital and nonvital buses or for interconnecting the Unit 1 electrical distribution system with the distribution system at Unit 2. (There are no regulatory requirements that direct the licensee to develop interconnection procedures.)

#### Discussion:

The NRC has previously identified concerns with the operability of necessary equipment in shutdown modes. In Information Notice (IN) 80-20, "Loss of Decay Heat Removal Capability at Davis-Besse Unit 1 While in a Refueling Mode" an extended loss of decay heat removal capability was attributed to a number of factors, including inadequate procedures, inadequate administrative controls, and the conduct of extensive maintenance activities.

Information Notice 84-42, "Equipment Availability for Conditions During Outages Not Covered by Technical Specifications," describes an event at the Palisades Nuclear Plant involving the total loss of all ac power. The Palisades event was precipitated by personnel performing actions during a refueling outage without an appreciation for the effect of those actions on the plant as it was configured. Many pieces of equipment were tagged out of service for maintenance. Personnel intentionally interrupted offsite power. This action caused the loss of the only available service water pump. As a result, cooling water was interrupted to the only available (and operating) diesel generator. The diesel overheated and was manually tripped. As a result, all station ac power was interrupted, causing the loss of fuel pool cooling. (The reactor had been defueled, and its fuel was being stored in the spent fuel pool).

The recent Vogtle event reemphasizes the need for careful planning of equipment outages during shutdown. Licensees, in general, have considerable latitude in removing equipment from service and altering normal system lineups while in shutdown modes if only the minimum technical specification requirements are considered. The desire to return nuclear units to service as quickly as possible can result in maintenance being conducted on redundant, safety-related systems, concurrently. The appropriateness of conducting parallel maintenance activities should be considered in light of the availability of alternate equipment and procedures to mitigate the consequences of potential operational problems. It is important that plant outage plans assure that an adequate complement of equipment capable of responding to potential events remains available throughout the outage. Particular care is needed when the reactor pressure boundary is not intact or the reactor coolant system is at mid-loop.

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A special investigation of the Vogtle event is being conducted by an NRC Incident Investigation Team (IIT). The information contained in this notice is preliminary and is subject to change, pending the findings made by the IIT. This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRR project manager.

*Charles E. Rossi*  
Charles E. Rossi, Director  
Division of Operational Events Assessment  
Office of Nuclear Reactor Regulation

Technical Contacts: N. Fields, NRR  
(301) 492-1173

E. Trager, AEOD  
(301) 492-4496

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
90-24	Transportation of Model Spec 2-T Radiographic Exposure Device	4/10/90	All NRC licensees authorized to use, transport, or operate radiographic exposure devices and source changers.
90-23	Improper Installation of Patel Conduit Seals	4/4/90	All holders of OLs or CPs for nuclear power reactors.
90-22	Unanticipated Equipment Actuations Following Restoration of Power to Rosemount Transmitter Trip Units	3/23/90	All holders of OLs or CPs for nuclear power reactors.
90-21	Potential Failure of Motor-Operated Butterfly Valves to Operate Because Valve Seat Friction was Under-estimated	3/22/90	All holders of OLs or CPs for nuclear power reactors.
90-20	Personnel Injuries Resulting from Improper Operation of Radwaste Incinerators	3/22/90	All NRC licensees who process or incinerate radioactive waste.
90-19	Potential Loss of Effective Volume for Containment Recirculation Spray at PWR Facilities	3/14/90	All holders of OLs or CPs for PWRs.
90-18	Potential Problems with Crosby Safety Relief Valves Used on Diesel Generator Air Start Receiver Tanks	3/9/90	All holders of OLs or CPs for nuclear power reactors.
90-17	Weight and Center of Gravity Discrepancies for Copes-Vulcan Valves	3/8/90	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
CP = Construction Permit

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\*SEE PREVIOUS PAGE FOR CONCURRENCE

OFC NAME DATE	*OEAB:DOEA NFields 4/11/90	*TECH ED  4/11/90	*REGION I (IIT) WLazarus 4/11/90	*PD23 TReed 4/11/90
OFC NAME DATE	*OEAB:DOEA DFISCHER 4/11/90	*C:OEAB:DOEA PSwetland 4/11/90	*C:GCB:DOEA CBERLINGER 4/11/90	B:DOEA ERoss1 4/13/90

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Document Name: VOGTLE RFT DUPLICATE

OFC	OEAB:DOEA	TECH ED	REGION I (IIT) PD
NAME	NFields		NLAZARUS
DATE	4/11/90	4/11/90	4/11/90
OFC	OEAB:DOEA	C:OEAB:DOEA	With noted C:OEAB:DOEA
NAME	DFISCHER	PSwetland	CBERLINGER EROssi
DATE	4/11/90	4/11/90	4/11/90 / /90

*Comments incorporated as appropriate*

*APL Klean*  
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