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

June 3, 1991

NRC INFORMATION NOTICE NO. 91-34: POTENTIAL PROBLEMS IN IDENTIFYING CAUSES OF EMERGENCY DIESEL GENERATOR MALFUNCTIONS

Addressees:

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

Purpose:

This information notice is intended to alert addressees of problems that could occur in identifying the cause(s) of malfunctions in emergency diesel generators (EDGs). 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 offsite power to the vital buses occurred at the Alvin W. Vogtle Nuclear Plant, Unit 1. EDG 1A, the only available EDG, automatically started and energized its associated 4.16 kilovolt (kV) safety bus. The EDG tripped after operating for approximately 1 minute, leaving the plant with no Class 1E ac electrical power. The operators could not determine the cause of the EDG trip. The operators did not record the EDG trip conditions that were annunciated before resetting the annunciator panels. Annunciated conditions for the EDGs are not automatically recorded. Operators attempted a second start of the EDG approximately 18 minutes later. The EDG started, ran for approximately 1 minute, and tripped again. The operators observed a number of alarms on EDG annunciator panels but could not determine which signal had actually tripped the EDG. Approximately 36 minutes into the event, operators again restarted the EDG, this time using a manual emergency start, which bypasses many of the EDG protective trips. The EDG started, loaded, and continued to run without further incident, thereby restoring power to one Class 1E bus. The licensee later identified a spurious high jacket water temperature trip as the most probable cause of the EDG trip, although this protective trip was not bypassed by the manual emergency start. The licensee has taken action to prevent spurious high jacket water temperature trips in the future by installing a bypass for this trip signal.

IDAR-11C

Discussion:

Annunciators and control panels for EDGs are located in the EDG room and in the control room. In most cases, the annunciators and EDG parameters are not automatically recorded during operation and testing. Operators usually record EDG parameters manually during operation, but do not generally record annunciators. Following an EDG trip, a number of annunciators are illuminated. These annunciators include both the alarms associated with the cause of the trip and the alarms that result from the trip. Operators can often determine the cause of a trip only if an effective "first out" indication is installed. An effective "first out" feature indicates the first cause of an abnormal condition. Regulatory Guide 1.9, "Selection, Design, and Qualification of Diesel Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," recommends the installation of such a feature, but there is no regulatory requirement associated with it. Although a "first out" feature was available locally at Vogtle, it was not effective because its existence was not generally recognized by the operators, and its operation was confusing.

Analyzing EDG incidents on the basis of alarm indications, operator memory and observations, and the manual recording of data may not provide an accurate assessment of an event, especially if the alarm system does not have an effective "first out" capability. Monitoring systems have been installed or are being considered by some licensees to better analyze EDG parameters. These are computer-driven on-line monitoring and diagnostic systems that have been developed to support and supplement the EDG instrumentation and control systems that are generally supplied by the EDG manufacturer. This type of system can significantly enhance the licensee's capability to monitor the operation of an EDG, to troubleshoot EDG problems, and to provide the information necessary to restore an EDG to operation.

The licensee for North Anna Power Station has installed such a computer-driven monitoring and diagnostic system to support the EDG preventive maintenance program. The system processes signal inputs from approximately 50 sensors and provides a digital output for viewing and recording in several formats. While the EDG is operating, data is continuously stored in memory and may be transferred to a hard disk to be retrieved later for trend analysis. At any time, the on line data may be viewed from a local terminal. The system allows the user to perform plotting and trending analyses to determine the limits and guidelines for establishing or predicting inspection or maintenance requirements. The licensees for the Prairie Island Nuclear Generating Plant and the Crystal River Nuclear Plant, Unit 3, are also considering the acquisition of computer-driven monitoring systems primarily for the EDG preventive maintenance program to enhance EDG performance by the early identification of areas that could become problems.

Available systems have various capabilities including some or all of the following:

1. Performing general surveillance, recording alarms, and reporting (local and remote) EDG parameters.

2. Automatically determining the trends of recorded data points and analyzing EDG parameters in three different operating modes:

    * Standby (keep-warm conditions)
    * The first 30 or 60 seconds after a start
    * Engine running (collecting data at preset intervals)

3. Determining the trends of EDG operating parameters to monitor performance and predict required maintenance.

These systems may be installed to supplement the existing EDG annunciator system rather than as a redundant system.

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 NRR project manager.

Charles E. Rossi

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

Technical Contact: S. N. Saba, NRR
(301) 492-0781

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
91-33	Reactor Safety Information for States During Exercises and Emergencies	05/31/91	All holders of OLs or CPs for nuclear power reactors.
91-32	Possible Flaws in Certain Piping Systems Fabricated by Associated Piping and Engineering	05/15/91	All holders of OLs or CPs for nuclear power reactors.
91-31	Nonconforming Magnaflux Magnetic Particle (14AM) Prepared Bath	05/09/91	All holders of OLs or CPs for nuclear power reactors.
91-30	Inadequate Calibration of Thermoluminescent Dosimeters Utilized to Monitor Extremity Dose at Uranium Processing and Fabrication Facilities	04/23/91	All fuel cycle licensees and other licensees routinely handling unshielded uranium materials.
86-21, Supp. 2	Recognition of American Society of Mechanical Engineers Accreditation Program for N Stamp Holders	04/16/91	All holders of OLs or CPs for nuclear power reactors and all recipients of NUREG-0040, "Licensee Contractor and Vendor Inspection Status Report" (White Book).
91-29	Deficiencies Identified During Electrical Distribution System Functional Inspections	04/15/91	All holders of OLs or CPs for nuclear power reactors.
91-28	Cracking in Feedwater System Piping	04/15/91	All holders of OLs or CPs for pressurized water reactors (PWRs).
91-27	Incorrect Rotation of Positive Displacement Pump	04/10/91	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

FIRST CLASS MAIL
POSTAGE & FEES PAID
USNRC
PERMIT No G 67

2. Automatically determining the trends of recorded data points and analyzing EDG parameters in three different operating modes:

    * Standby (keep-warm conditions)
    * The first 30 or 60 seconds after a start
    * Engine running (collecting data at preset intervals)

3. Determining the trends of EDG operating parameters to monitor performance and predict required maintenance.

These systems may be installed to supplement the existing EDG annunciator system rather than as a redundant system.

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 NRR project manager.

Original Signed by
Charles E. Rossi

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

Technical Contact: S. N. Saba, NRR
(301) 492-0781

Attachment: List of Recently Issued NRC Information Notices

Document Name: VOGTLEIN

*SEE PREVIOUS CONCURRENCES

	D/DOEA:NRR	*C/OGCB:DOEA:NRR	*RPB:ADM	*D/DST:NRR
	CERossi	CHBerlinger	TechEd	AThadani
	05/31/91	05/29/91	05/16/91	05/30/91
*OGCB:DOEA:NRR	*SELB:DST:NRR	*SELB:DST:NRR	*C/SELB:DST:NRR	*SPLB:DST:NRR
AJKugler	NSaba	ASGill	FRosa	REArchitzel
05/16/91	05/17/91	05/29/91	05/29/91	05/29/91

2. Automatically determining the trends of recorded data points and analyzing EDG parameters in three different operating modes:

   * Standby (keep-warm conditions)
   * The first 30 or 60 seconds after a start
   * Engine running (collecting data at preset intervals)

3. Determining the trends of EDG operating parameters to monitor performance and predict required maintenance.

These systems may be installed to supplement the existing EDG annunciator system rather than as a redundant system.

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 NRR project manager.

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

Technical Contact: S. N. Saba, NRR
(301) 492-0781

Attachment: List of Recently Issued NRC Information Notices

Document Name: VOGTLEIN

*SEE PREVIOUS CONCURRENCES

	D/DOEA:NRR	C/OGCB:DOEA:NRR	*RPB:ADM	D/DST:NRR
	CERossi	CHBerlinger	TechEd	AThadani
	05/ /91	05/29/91	05/16/91	05/30/91
*OGCB:DOEA:NRR	*SELB:DST:NRR	#SELB:DST:NRR	#C/SELB:DST:NRR	#SPLB:DST:NRR
AJKugler	NSaba	ASGill	FRosa	REArchitzel
05/16/91	05/17/91	05/29/91	05/29/91	05/29/91

2. Automatically determining the trends of recorded data points and analyzing EDG parameters in three different operating modes:

    * Standby (keep-warm conditions)
    * The first 30 or 60 seconds after a start
    * Engine running (collecting data at preset intervals)

3. Determining the trends of EDG operating parameters to monitor performance and predict required maintenance.

These systems may be installed to supplement the existing EDG annunciator system rather than as a redundant system.

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 NRR project manager.

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

Technical Contact: S. N. Saba, NRR
(301) 492-0781

Attachment: List of Recently Issued NRC Information Notices

Document Name: VOGTLEIN

*SEE PREVIOUS CONCURRENCES

	D/DOEA:NRR	C/OGCB:DOEA:NRR	*RPB:ADM	D/DST:NRR
	CERossi	CHBerlinger	TechEd FR	AThadani
	05/ /91	05/ /91	05/16/91	05/ /91
*OGCB:DOEA:NRR	*SELB:DST:NRR	SELB:DST:NRR	C/SELB:DST:NRR	SPLB:DST:NRR
AJKugler	NSaba	ASGill ASG	FRosa	REArchitzel
05/16/91	05/17/91	05/29/91	05/29/91	05/ /91

2. Automatically determining the trends of recorded data points and analyzing EDG parameters in three different operating modes:

    * Standby (keep-warm conditions)
    * The first 30 or 60 seconds after a start
    * Engine running (collecting data at preset intervals)

3. Determining the trends of EDG operating parameters to monitor performance and predict required maintenance.

These systems may be installed to supplement the existing EDG annunciator system rather than as a redundant system.

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 NRR project manager.

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

Technical Contact: S. N. Saba, NRR
(301) 492-0781

Attachment: List of Recently Issued NRC Information Notices

Document Name: VOGTLEIN

*SEE PREVIOUS CONCURRENCES

	D/DOEA:NRR	C/OGCB:DOEA:NRR	*RPB:ADM	D/DST:NRR
	CERossi	CHBerlinger	TechEd	AThadani
	05/ /91	05/ /91	05/16/91	05/ /91
*OGCB:DOEA:NRR	*SELB:DST:NRR	SELB:DST:NRR	C/SELB:DST:NRR	SPLB:DST:NRR
AJKugler	NSaba	ASGill	FRosa	REArchitzel
05/16/91	05/17/91	05/ /91	05/ /91	05/21/91

3. Determining the trends of EDG operating parameters to monitor performance and predict required maintenance.

These systems may be installed to supplement the existing EDG annunciator system rather than as a redundant system.

This information notice requires no specific action or written response. If you have any questions about this matter, please contact the technical contact listed below or the appropriate NRR project manager.

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

Technical Contact: S. N. Saba, NRR
(301) 492-0781

Attachment: List of Recently Issued NRC Information Notices

OGCB:DOEA:NRR	RPB:ADM	SELB:DST:NRR	SELB:DST:NRR
AJKugler AJK	TechEd JM	NSaba SNS	ASGill
05/16/91	05/16/91	05/17/91	05/ /91

SPLB:DST:NRR	C/SELB:DST:NRR	C/OGCB:DOEA:NRR	D/DOEA:NRR
REArchitzel	FRosa	CHBerlinger	CERossi
05/ /91	05/ /91	05/ /91	05/ /91