



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

REGION IV  
1600 E. LAMAR BLVD  
ARLINGTON, TX 76011-4511

January 27, 2017

MEMORANDUM TO: Ron Kopriva, Senior Reactor Inspector  
Engineering Branch 1  
Division of Reactor Safety

FROM: Kriss M. Kennedy, Regional Administrator */RA/*

SUBJECT: CHARTER FOR THE NRC SPECIAL INSPECTION TEAM AT PALO VERDE NUCLEAR GENERATING STATION – REVIEW OF LICENSEE ACTIONS RELATED TO THE FAILURE OF THE UNIT 3 TRAIN B EMERGENCY DIESEL GENERATOR

On December 15, 2016, the Unit 3 train B emergency diesel generator experienced a significant mechanical failure during testing that resulted in ejection of a connecting rod. That same emergency diesel generator previously experienced a significant mechanical failure on December 23, 1986, that also resulted in ejection of a connecting rod from the same cylinder. The cause of the failures may or may not be similar. Because of the potential generic implications, the potential that the failures may be repetitive, and the risk significance of the emergency diesel generator failure, a special inspection team is being chartered. You are hereby designated as the team leader.

A. Basis

On December 15, 2016, during a scheduled surveillance test run of the Unit 3 train B emergency diesel generator, with the emergency diesel generator loaded to approximately 50 percent of full load, the control room received a low lube oil emergency trip annunciator. The area operator reported a large amount of smoke and oil, and large metal debris that had been expelled from the engine. The licensee declared an ALERT at 0410 [MST] based on an explosion resulting in visible damage to a safety system required for safe shutdown (HA2.1).

Palo Verde Fire Department responded and no fire was observed. The Alert was terminated at 0636 [MST]. No other safety functions were impacted. No personnel injuries occurred.

The licensee determined there had been a catastrophic failure of a connecting rod for cylinder 9 causing crankcase damage and engine internal parts to be ejected from the crankcase.

This same emergency diesel generator experienced a catastrophic failure of the same cylinder (9) in 1986. Connecting rod 9R failed during the startup testing program in 1986, and the current failure is also being attributed to connecting rod 9R. This engine

has approximately 3500 run time hours since the repair in 1986. Palo Verde emergency diesel generators are Cooper-Bessemer Model KSV-20. Two other similar Cooper-Bessemer diesel generator failures have occurred, both at South Texas Project. In 1989, South Texas Project emergency diesel generator 22 had a connecting rod for cylinder 4 fail, and in 2003 emergency diesel generator 22 had a connecting rod for cylinder 9 fail. The Palo Verde licensee last performed ultrasonic testing of the connecting rods for Unit 3 train B emergency diesel generator in October 2013, and did not identify any deficiencies.

During a December 20, 2016, tele-conference with the Palo Verde licensee, NRR, and Region IV, the licensee stated their intent to identify the root cause of the failure, and to evaluate the extent to which the condition could affect the remaining emergency diesel generators at Palo Verde. On December 23, 2016, the NRC issued an emergency license amendment (ADAMS ML16358A676) to extend the allowed outage time for the Unit 3 train B emergency diesel generator to a total of 21 days based on compensatory measures implemented by the licensee. Subsequently, on January 4, 2017, the NRC issued a second emergency license amendment (ADAMS ML17004A020) to extend the allowed outage time for the emergency diesel generator to a total of 62 days based on the calculated overall plant risk with compensatory measures in place for the period of time needed to complete repairs to the engine.

A special inspection team will be dispatched to better understand the cause of the emergency diesel generator failure, the extent of condition, the potential generic implications, and the corrective actions proposed and taken by the licensee. The resident inspection staff at Palo Verde conducted considerable inspection effort during the review of the amendment requests and will provide additional inspection support as needed.

A preliminary risk analysis performed by a Senior Reactor Analyst resulted in an estimated Incremental Conditional Core Damage Probability greater than  $1 \text{ E-}06$ .

## B. Scope

The team is expected to perform data gathering and fact-finding in order to address the following:

1. Provide a recommendation to Region IV management as to whether the inspection should be upgraded to an augmented inspection team response. This recommendation should be provided by the end of the first day on site.
2. Develop a chronology of the emergency diesel generator failure and operator response.
3. Review and assess the adequacy of operator response to the emergency diesel generator failure.
4. Review the current status of the licensee's cause determination and determine whether it is being conducted at a level of detail commensurate with the safety significance of the event, including review of relevant plant-specific and industry (foreign and domestic) operating experience and previous diesel generator failures.

5. Review the circumstances associated with the emergency diesel generator failure to identify potential common failure modes and generic safety concerns.
6. Review records associated with the maintenance history for the emergency diesel generators at Palo Verde, including previous mechanical failures.
7. Review the licensee's program for periodic monitoring and maintenance of the emergency diesel generators, including inspection and assessment techniques and scope, periodicity, and the results of past inspections.
8. Review and assess the adequacy of the licensee's ongoing evaluation of extent-of-condition as it relates to the other emergency diesel generators in Units 1, 2, and 3.
9. Review and assess the licensee's prompt and long-term corrective actions to address the root and probable causes of the condition. Assess the adequacy of repair activities and independently verify information submitted in support of NRC review of any regulatory relief requests.
10. If applicable, review and assess the corrective actions for past similar failures, including vendor recommended actions to prevent such failures.
11. Review and assess the licensee's testing program to confirm the operability of the Unit 3 train B emergency diesel generator following repair activities.

C. Team Members

Ron Kopriva, Team Leader  
Dustin Reinert, Team Member

D. Guidance

This memorandum designates you as the special inspection team leader. Your duties will be as described in Inspection Procedure 93812, "*Special Inspection*." The team composition has been discussed with you directly. During performance of the special inspection activities assigned to them, designated team members are separated from their normal duties and report directly to you. The team is to emphasize fact finding in its review of the circumstances surrounding the event, and it is not the responsibility of the team to examine the regulatory process. Safety concerns identified that are not directly related to the event should be reported to the Region IV office for appropriate action.

You should notify the licensee and the team should begin inspection activities on or before February 6, 2017, based on the licensee's schedule of activities. You should conduct an entrance meeting with the licensee at the appropriate time at the site. A report documenting the results of the inspection, including findings and conclusions, should be issued within 45 days of the exit meeting conducted at the completion of the inspection. While the team is active, you will provide periodic status briefings to Region IV management.

This Charter may be modified should the team develop significant new information that warrants review. Should you have any questions concerning this Charter, contact Geoffrey Miller, Chief, DRP Branch D, at 817-200-1173.

CHARTER FOR THE NRC SPECIAL INSPECTION TEAM AT PALO VERDE NUCLEAR  
GENERATING STATION – REVIEW OF LICENSEE ACTIONS RELATED TO THE FAILURE  
OF THE UNIT 3 TRAIN B EMERGENCY DIESEL GENERATOR

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