

Docket File



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

May 11, 1992

Docket Nos. 50-387
and 50-388

Mr. Harold W. Keiser
Senior Vice President-Nuclear
Pennsylvania Power and Light
Company
2 North Ninth Street
Allentown, Pennsylvania 18101

Dear Mr. Keiser:

SUBJECT: SAFETY EVALUATION OF THE EMERGENCY DIESEL GENERATOR (EDG) CRANKCASE OVERPRESSURIZATION EVENTS, SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2 (TAC NOS. M81347 AND M81348)

The EDGs at the Susquehanna Steam Electric Station (SSES) experienced a number of crankcase overpressurization events or explosions in the past several years. The 1989 events of the "B" and "C" engines led Pennsylvania Power and Light Company (PP&L) to conduct an extensive investigation to determine the root cause of the failures leading to the crankcase explosions. The staff has completed its review concerning the subject issue, attached is our safety evaluation (Enclosure).

The following potential root causes were discussed by PP&L during a meeting at the NRC Region I office on March 14, 1991.

- Cold Inlet air temperature
- Potential deficiencies in the lubrication oil being used at Susquehanna
- Piston and piston-pin fit

It was theorized that these factors individually or in combination degraded the lubrication on the liner walls causing overheating, piston-to-liner tin transfer and eventually lead to the crankcase explosions. These and additional potential root causes identified during the investigation are discussed in detail in the attached safety evaluation.

PP&L expanded their test program in an effort to determine the cause of the piston-to-liner tin transfer. A piston motion study was conducted to develop a model for piston-to-liner friction and piston pin-to-bushing friction. The Cooper Bessemer KSV engine located at the Sumner, Iowa Municipal Facility was selected for a test program. Data from the test engine was obtained during the week of May 5, 1991. The results of the test were presented during a meeting on November 13, 1991 at the Region I offices. PP&L's conclusion was that the crankcase explosions are the result of overheating of engine parts due to the synergistic effect of:

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- the high compression pressures that occur during starting and/or rapid loading,
- the load carrying capabilities of the local lubrication film at the piston liner interface,
- the design of the piston upper skirt.

PP&L has already taken the following corrective actions in response to the potential root causes identified during previous investigations.

- Change monthly testing to consist of starting and gradually increasing the load to the full load rating of the engine. Fast start and load to full rating in 90 seconds will be accomplished once each outage.
- Changed type of lubricating oil from Gulf Superduty 40 to Chevron Delo 400.
- Installed an automatic inlet air temperature control system in the summer of 1990.

Based on the numerous actions, both corrective and preventative measures taken during the extensive investigation, and the favorable reports from performance monitoring since overhauls and modifications were performed on the engines, it is concluded that the EDGs at the SSES facility are capable of performing their design function provided they are operated in strict accordance with limits specified in the manufacture's Technical Manual.

This concludes the staff's effort relative to TAC Nos. M81347 and M81348. If there are any questions regarding this letter please contact me on (301) 504-1447.

Sincerely,

^{/S/}
James J. Raleigh, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosure:
As stated

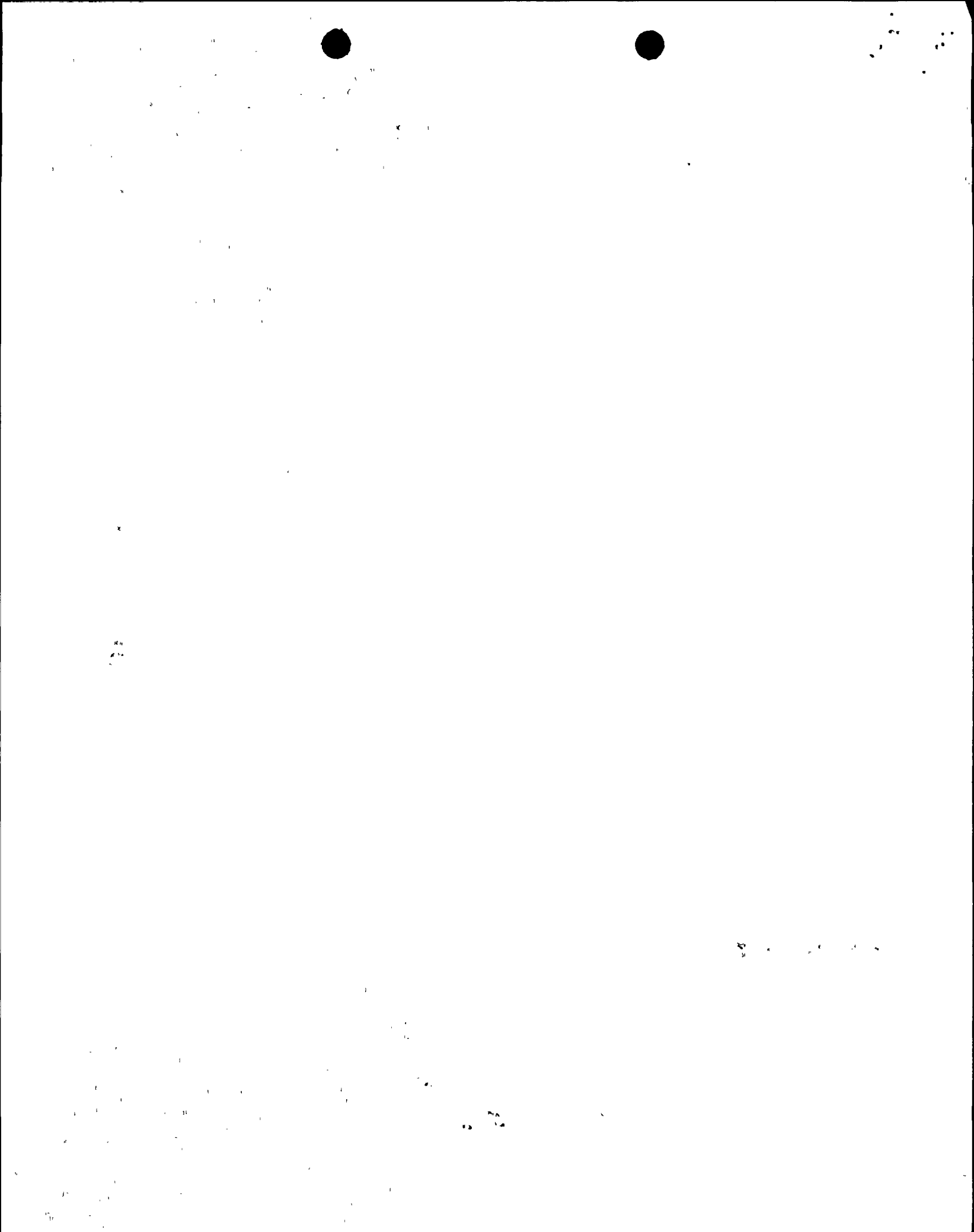
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Mr. Harold W. Keiser

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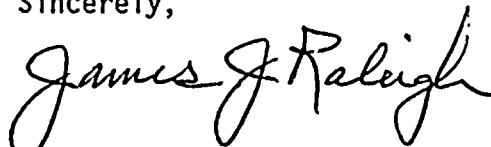
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James J. Raleigh, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

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Mr. Harold W. Keiser
Pennsylvania Power & Light Company

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