

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

1630 Chestnut Street Tower II

July 9, 1985

BLRD-50-438/85-11

BLRD-50-439/85-11

U.S. Nuclear Regulatory Commission

Region II

Attn: Dr. J. Nelson Grace, Regional Administrator

101 Marietta Street, NW, Suite 2900

Atlanta, Georgia 30323

Dear Dr. Grace:

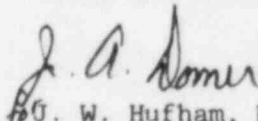
BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2 - CRACKED CYLINDER BLOCK ON TDI
DIESEL GENERATORS - BLRD-50-438/85-11 AND BLRD-50-439/85-11 - FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector Al Ignatonis on March 18, 1985 in accordance with 10 CFR 50.55(e) as NCR 4030. This was followed by our first interim report dated April 12, 1985. Enclosed is our final report. We consider 10 CFR Part 21 applicable to this deficiency.

If you have any questions, please get in touch with R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY



J. W. Hufham, Manager

Licensing and Risk Protection

Enclosure

cc (Enclosure):

Mr. James Taylor, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Records Center
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ENCLOSURE

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2
CRACKED CYLINDER BLOCK ON TDI DIESEL GENERATORS
BLRD-50-438/85-11 AND BLRD-50-439/85-11
NCR 4030
10 CFR 50.55(e)
FINAL REPORT

Description of Deficiency

Upon the recommendation of the TDI Diesel Generator Owners Group, TVA implemented an extensive inspection and maintenance program that revealed cracks in components that would not ordinarily require inspection. Diesel generator 1B contained two cracks in the cylinder block extending 1-1/2-inches up the lip of the cylinder liner landing surface and 5/8-inch across the top of the block.

The exact cause of the cylinder block cracks cannot be determined. Trace casting contaminants leading to degenerate graphite structure and reduced fatigue resistance properties have been identified by the TDI Diesel Generator Owners Group as the most likely root cause of block cracking in TDI engines. However, since the cracked block at Bellefonte Nuclear Plant (BLN) exhibited only a relatively minor amount of degenerate graphite structure and had cracks only in the area of one cylinder, we feel that this is not the cause of cylinder block cracking. The cylinder block cracking is probably due to the very small cylinder liner to block clearance and a galled wrist pin and piston skirt assembly.

Safety Implications

This type of cylinder block cracking has been analyzed by Failure Analysis Associates for the TDI Diesel Generator Owners Group and is considered to be a ligament crack. Extensive operating experience at other plants demonstrates that ligament cracks arrest at the cylinder liner landing and have no effect on engine operation because the cracks are fully contained between the liner and the block material beyond the cylinder head stud holes. Based on this, the condition is not considered to be detrimental to the safe operation of the plant.

Corrective Actions

Corrective actions are not required to be taken since the cylinder block cracking is not detrimental to the diesel engine and the cracks are not expected to propagate.

TVA and Transamerica Delaval have implemented the following actions to prevent the recurrence of future cracking in the diesel engine cylinder blocks.

1. TVA has increased the clearance between the cylinder block and liner to reduce stress in the cylinder block on all BLN engines.
2. TVA has replaced the galled piston skirt assembly and wrist pin in the affected cylinder.
3. TVA will monitor the existing cracks for propogation.
4. TVA will periodically inspect the cylinder block for additional cracks.
5. TDI has incorporated production changes to decrease stress in the cylinder block. These changes were to increase the cylinder block to liner clearance and increase the depth of cylinder stud bosses and the depth of stud hole threads.
6. TDI has incorporated product enhancements to increase the cylinder block top thickness and improve material from the original class 40 to class 45 cast iron. These changes will increase the allowable stress of the cylinder block.