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 BYRAM, R.G. Pennsylvania Power & Light Co.
 RECIP. NAME RECIPIENT AFFILIATION
 MILLER, C.L. Project Directorate I-2

SUBJECT: Provides info re cracks discovered in number of inch ASME Class 1 hex bolts used at plant.

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Director of Nuclear Reactor Regulation
Attention: Mr. C. L. Miller, Project Director
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SUSQUEHANNA STEAM ELECTRIC STATION
CRACKED 1 INCH ASME CLASS 1 BOLTS
PLA-4116 **FILE R41-2A**

Docket Nos. 50-387
& 50-388

Dear Mr. Miller:

This letter serves to provide information regarding cracks discovered in a number of 1 inch ASME Class 1 Hex Bolts used at Susquehanna Steam Electric Station. The bolts were manufactured by Cardinale Industrial Products Corporation in 1985 from ASME SA-193, GR.B7 material, heat #111890. The affected bolts are 1 inch diameter 8UNC hex head bolts of lengths 3.5", 5", and 6". Cardinale Industrial Products Corporation's current address is 3873 Oquendo Road, Las Vegas, Nevada 89118.

The subject 1 inch bolts are used in a number of varied applications (safety and non-safety) at Susquehanna. The bolts were first discovered in a storage bin in the Susquehanna warehouse after Mechanical Maintenance returned one of the bolts to the warehouse upon discovery of a longitudinal linear indication that extended through the bolt head and approximately one third down the bolt shank. Further inspection in the warehouse revealed a total of 27 bolts with cracks similar to those found by Mechanical Maintenance in the original bolt.

The PP&L System Facilities Center laboratory examined three bolt samples, two longitudinally cracked bolts and one bolt cracked both longitudinally and circumferentially. Seven additional bolts, with and without cracks, were sent to an independent testing laboratory for hardness, mechanical, and chemical testing. All results from the test met the SA-193 GR.B7 specification requirements except the specimens that were cracked. The metallurgical evaluation concluded that longitudinally cracked bolts do not have reduced strength. However, circumferentially cracked bolts have reduced holding strength and may not be acceptable for service depending upon the type and magnitude of loadings on the bolt. These tests have confirmed our initial conclusion that the cause of the cracking was due to a phenomenon called "quench cracking" that occurred during the original manufacturing cycle.

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All safety-related applications of the subject bolts at Susquehanna have been investigated. The location and function of each bolt from the subject lot was determined and a failure mode and effects analysis conducted. In all cases no substantial safety hazards were identified, therefore reporting under 10CFR21 is not required. Bolt replacements will be made, as appropriate.

PP&L has been in contact with Cardinale officials regarding the cracked bolts. The current Cardinale company is a restructured limited partnership operating under new ownership and management. The original Cardinale corporation that manufactured the subject bolts had been bankrupt for 8 years. As a result of the reorganization, Cardinale officials have been unable to locate the procurement and quality records associated with the sale of the subject bolts to PP&L in 1985.

If you have any questions, please call Mr. J.B. Wesner at (610) 774-7911.

Very truly yours,



R. G. Byram

cc: ~~NRC-Document-Control-Desk-(original)~~
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