



## GE Energy

Jason. S. Post  
Manager, Engineering Quality & Safety  
Evaluations

3901 Castle Hayne Rd.,  
Wilmington, NC 28401  
USA

T 910 675-6608  
F 910 362 6608  
Jason.post@ge.com

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Document Control Desk  
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**Subject:** Part 21 Evaluation Completion: Non-conforming ASCO Diaphragm Discs

**Reference:** ASCO Notification to NRC, "Potential Non-conformance of Diaphragm Disc Used in Certain ASCO Scram Pilot Valves and Rebuild Kits," February 16, 2005

### Summary

This letter provides information concerning GE Energy - Nuclear (GE) evaluation of the potential non-conforming diaphragm discs supplied by ASCO for scram solenoid pilot valves (SSPVs) and rebuild kits that were sold to GE and the SSPVs supplied to Hope Creek (Reference 1). As committed in the Reference notification, ASCO performed accelerated life tests to qualify the valves for continued service and provided the results to GE. The testing has shown no appreciable degradation in response times and the design response time criterion was met. Therefore, this condition does not represent a reportable condition, and it is recommended that the Hope Creek SSPV diaphragms do not need to be changed out until completion of the current 18 month fuel cycle.

### Discussion

As part of an ASCO development test program, a thermogravimetric analysis (TGA) was performed on a diaphragm disc that had been significantly age conditioned. The measured TGA weight loss of 1.4% exceeded the ASCO acceptance limit of 0.2%. ASCO's receiving records indicated that the diaphragm discs came from a May 2004 lot. Other diaphragm discs from the same lot had been supplied to GE. No evidence was found that the TGA testing was performed on this May 2004 lot. Subsequently,

IEI 9

TGA testing was performed on "as-received" discs and the weight loss results ranged from 0.5% to 0.7%, which exceeded the 0.2% acceptance limit.

The discs from the May 2004 lot were traced to 14 SSPVs, Part No. HV268000-001, and 31 rebuild kits, Part No. 316929, which were sold to GE. The order numbers were identified and it was determined that the 14 SSPVs had been delivered to Hope Creek. PSEG indicated that 10 of the affected SSPVs had been installed. The 31 rebuild kits were intended for another GE customer, but were still in-stock and had not been shipped. No other kits or SSPVs with suspect diaphragm discs from the May 2004 lot were provided to any other GE customer.

The 0.2% weight loss acceptance limit was determined several years ago by GE and ASCO during intensive testing of various Viton compounds being evaluated for the diaphragm disc material. It was found that a 0.2% weight loss value at 350°C in the TGA weight loss curve was very conservative for the specific Viton compound being investigated. The diaphragm disc molded from this Viton compound yielded response times within the specification for the valve. It is noted that the 0.2% weight loss value corresponds to the amount of low molecular weight constituents in the specific Viton compound that are not tied-up in the molecular structure during the curing process. These uncured low molecular weight constituents allow for the diaphragm to stick to the valve seat and may cause its delayed response. The 0.2% value was deemed very conservative, and no variance was allowed. As a result, the 0.5 to 0.7% weight loss measured for the diaphragm discs of the May 2004 lot have required GE and ASCO to perform additional testing.

The diaphragm discs exhibiting excessive TGA weight losses represent higher volatiles in the elastomeric material that could potentially cause delayed scram times due to the "sticky" characteristic of the elastomer. During normal operation, the diaphragm disc is pressed closed against the exhaust seat and prevents the air from discharging through the exhaust port. Upon a scram initiation, the SSPV solenoids de-energize and block the air supply source and air depressurizes through the pilot. The resulting pressure differential across the diaphragm lifts the diaphragm open and discharges the air from the scram valve operators through the SSPV exhaust port. A diaphragm disc that sticks to the exhaust port seat would cause a delay in opening of the scram valves, and consequently cause a delay in scram performance.

ASCO performed response time testing using SSPVs with diaphragm discs from the May 2004 lot. For the purpose of establishing operating margin, the valves were age conditioned for 94.4 hours at 220°F, and 561.6 hours at 230°F, for a total of 656 hours (27.3 days), which conservatively represents more than 10 years of operation. Following the aging, all measured response times satisfied the manufacturing design requirement of 41 msec. The testing determined that even though the discs from the May 2004 lot did not meet the TGA weight loss acceptance criterion, they did not result in a failure to meet the SSPV response time requirement.

In addition, review of the Hope Creek scram data for the 10 control rods where the identified SSPVs are installed showed no significant changes in scram times. Scram times for the identified valves all met the Technical Specification scram time requirements.

Based on the response time testing and the observed plant scram data, it is expected that the identified SSPVs will continue to operate normally at Hope Creek throughout the current 18 month fuel cycle. Although the SSPVs are expected to operate normally beyond 1 fuel cycle, it is recommended that the valves or the diaphragms be replaced at the next refueling outage to avoid any potential problems or additional surveillance testing.

If you have any questions, please call me at (910) 675-6608.

Sincerely,



Jason S. Post, Manager  
Engineering Quality & Safety Evaluations

cc: S. D. Alexander (NRC-NRR/DISP/PSIB) Mail Stop 6 F2  
M. B. Fields (NRC-NRR/DLPM/LPD4) Mail Stop 7 E1  
C. V. Hodge (NRC-NRR/DIPM/IROB) Mail Stop 12 H2  
L. Guthreau ASCO, 50 Hanover Rd, Florham Park, NJ 07932  
E. Gibo (GE)  
M. E. Harding (GE)  
J. F. Harrison (GE)  
J. F. Klapproth (GE)  
A. Lingenfelter (GE)  
L. M. Quintana (GE)  
K. K. Sedney (GE)  
G. B. Stramback (GE)  
G. A. Watford (GE)  
Peter R. LaSala (PSEG)  
Judith Lloyd (PSEG)  
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