Domestic Members

AmerenUE
Callaway
American Electric Power Co.
D.C. Cook 1 & 2
Carolina Power & Light Co.
H.B. Robinson 2
Shearon Harris
Consolidated Edison Company of NY, Inc.
Indian Point 2
Duke Power Company
Catawba 1 & 2
McGuire 1 & 2
Entergy Nuclear Operations Inc.
Indian Point 3
Exelon
Braidwood 1 & 2
Byron 1 & 2
First Energy Nuclear Operating Co.
Beaver Valley 1 & 2
Florida Power & Light Co.
Turkey Point 3 & 4
Northeast Utilities
Seabrook
Millstone 3
Nuclear Management Co.
Point Beach 1 & 2
Prairie Island 1 & 2
Kewaunee
Pacific Gas & Electric Co.
Diablo Canyon 1 & 2
PSEG - Nuclear
Salem 1 & 2
Rochester Gas & Electric Co.
R.E. Ginna
South Carolina Electric & Gas Co.
V.C. Summer
STP Nuclear Operating Co.
South Texas Project 1 & 2
Southern Nuclear Operating Co.
J.M. Farley 1 & 2
A.W. Vogtle 1 & 2
Tennessee Valley Authority
Sequoyah 1 & 2
Watts Bar 1
TXU Electric
Commanche Peak 1 & 2
Virginia Electric & Power Co. (Dominion)
North Anna 1 & 2
Surry 1 & 2
Wolf Creek Nuclear Operating Corp.
Wolf Creek

International Members

Electrabel
Doel 1, 2, 4
Tihange 1, 3
Kansai Electric Power Co.
Mihama 1
Takahama 1
Ohi 1 & 2
Korea Electric Power Co.
Kori 1 - 4
Yonggwang 1 & 2
Nuclear Electric plc
Sizewell B
Nuklearna Elektrarna Krsko
Krsko
Spanish Utilities
Asco 1 & 2
Vandellos 2
Almaraz 1 & 2
Vattenfall AB
Ringhals 2 - 4
Taiwan Power Co.
Maanshan 1 & 2

OG-01-016

Project Number 694

February 20, 2001

Document Control Desk
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. T.L. King, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Subject: Westinghouse Owners Group
Westinghouse Owners Group Review and Comment on Draft Report "NUREG-1715, Vol. Y, Component Performance Study – Motor Operated Valves, 1987-1998" (MUHP-4019)

Reference: Letter from T.L King, NRC, to A.P. Drake, WOG Project Manager, Westinghouse, dated December 15, 2000

The Westinghouse Owners Group (WOG) would like to thank you for this opportunity to review and comment on the draft report, "Component Performance Study – Motor Operated Valves, 1987-1998". The WOG believes peer review by the industry will help to strengthen these type activities and allows both the NRC and industry to benefit from the final documents. The attachment to this letter provides the WOG comments. Please include these comments in your review process prior to issuing the final report.

If you have any questions regarding these comments, please contact Mr. Ike Ezekoye, Westinghouse, at (412) 374-6643, or myself (423) 751-8201.

Very truly yours

Robert H. Bryan
Chairman
Westinghouse Owners Group

cc: T.L. King, USNRC (1L, 1A)
Westinghouse Owners Group Primary Representatives (1L, 1A)
Systems and Equipment Engineering Subcommittee (1L, 1A)
Steering Committee (1L, 1A)
A.P. Drake, WOG Project Manager (1L, 1A)

DC48

01og016.doc

NUREG 1715, Vol. Y
MOTOR-OPERATED VALVES

Comment 1:

This report examines motor-operated valve reliability over the time period 1987-1998. Unfortunately, the report fails to recognize and discuss that the methods and efforts applied at nuclear power plants to maintain, test and evaluate MOVs went through major innovations and improvements over the period of study. These changes were driven by plants' responses to NRC IEB 85-03, GL 89-10, GL 95-07 and GL 96-05. As a result of these improvements, statements of *average* probability of failure or standby failure rate (for the period of study) are not meaningful.

It is necessary to recognize that the methods and efforts applied to nuclear power plant MOV engineering, testing and maintenance over the 1987-1998 have changed just as radically. For example,

- Over the intervening years, diagnostic testing of MOVs has evolved from being a sporadic activity for a few plants to being a reliable scientific approach routinely employed today in every US nuclear power plant with safety-related MOVs for identification of MOV problems and quantification of margin for successful operation. As a result, reliability is rigorously monitored. Hence, the data shows more failures than exist today.

- The increased reliance on diagnostic testing over the intervening years of the study also affected maintenance practices. MOV maintenance practices have improved considerably due to the need to formalize and proceduralize testing approaches, document and interpret the test results to ensure valve operability. The evolution of developing the technical bases of maintenance activities and their impacts on valve performance has, therefore, greatly enhanced the reliability of MOVs.

- The engineering basis for MOVs (including quantification of design basis requirements and margin) was virtually nonexistent prior to the period of study and has now been thoroughly developed and documented at each plant. During the course of this engineering work, numerous modifications to MOVs (to improve margin and reliability) were identified and implemented. Further, the results of this engineering work provide the basis for setting up and evaluating MOVs during testing. In other words, this activity was not simply a "paper exercise," but instead had a real and favorable impact on genuine equipment reliability.

We conservatively judge that US nuclear power plants collectively spent $1 billion to $2 billion during the period of study specifically to address and improve MOV reliability. That investment likely exceeds the expenditure rate on MOVs during the time preceding the study by one or possibly two orders of magnitude. We judge that this extent of effort and the radical changes in how MOVs are evaluated, maintained and tested has had a positive impact on the reliability of MOVs. We would like the report to discuss these activities to the extent that they have contributed to MOV reliability improvement. However, it appears that the draft report refers to this important backdrop affecting MOV reliability in only a causal, dismissive manner (p. 37). *"The cause of the downward trend in systems failures could be the result of increased licensees' attention to these RI (Risk Important) system MOVs in response to the Maintenance Rule, various Information Notices, and GL 89-10 activities."*

We note from the draft report that for all systems with statistically significant data, the reliability trend over the period 1987-1995 is favorable. Specifically, the improvement in mean reliability is a factor of 5 or greater (and in some cases an order of magnitude). Considering that most plants were still developing their MOV design basis verifications and performing their baseline testing in 1995, we expect that further improvements have occurred since that time.

We recommend that the draft report be changed in two fundamental ways.

1. The report should be revised to include a discussion of how the methods and efforts applied to MOVs at US nuclear power plants have changed dramatically from 1987 to 1998 (the period of study). Numerous references are available throughout the industry describing these changes and the associated history. A presentation, discussion and understanding of these changes needs to precede any meaningful discussion of MOV reliability for this period.

2. Once the improvements in MOV care-taking are recognized, the report should focus on the changes in MOV reliability over the time period of interest. If comparisons are to be made to the generic reliability values used in NUREG/CR-4550 or to the values used in IPEs, these comparisons should be made separately for "beginning of period" (before the dramatic changes) and "end of period" (after the dramatic changes). In this way, information related to the present state of MOV reliability can be more meaningfully conveyed. In this light, it appears that the conclusions:

   - *"...the MOV probability of failure on demand estimates were consistent with the generic values from NUREG/CR-4550..."* (p.ix)

     and

   - *"...PWR and BWR IPE mean values were generally consistent with the rseults* (sic) *of this study..."* (p. x)

are no longer good conclusions. Instead, it appears that the NUREG/CR-4550 values and the IPE values are generally under the data (nonconservative) in the "beginning of period" and generally exceed the data (conservative) at the "end of period."

Comment 2:

The values for lower bound probability of failure on demand in Table ES-A and Table A are not consistent with the values shown on Figures ES-1, ES-2, 3 and 4. With the exception of BWR HPCS, the values on the graphs are consistently higher than shown on the tables. For BWR HPCS, the values on the graph are lower than the value shown on the table.

For upper bound probability of failure on demand, the values on Table ES-A and Table A for BWR HPCI and HPCS are not consistent with the values on Figures ES-2 and 4. For BWR HPCI, the values on the figure are less than the value on the table. For BWR HPCS, the values on the figure are greater than the value on the table.

Proposed Resolution to Comment 2

The values described in the comment should be verified and, as necessary, corrected. If a large discrepancy remains between the tables and graphs, an explanation should be provided in the report.

Comment 3

The data for the 16 plants are very difficult to read in Figure 8.

Proposed Resolution to Comment 3

This is likely a typographical or copying error, which should be corrected.

Comment 4: Omissions and Typos

1. Table of Contents (page v): 2.1 and 3.3 (Titles are inconsistent with text)
2 Tables (page vii): Table C should add (1987-1995)
3 MOV Yearly Trends Section 3.2; Figure 1-4 (Add to Table F-1)
4 Change "AOVs" to "MOVs" in the 1st paragraph of Mr. Thomas King's letter.
5 Table F-1: Correct the following:
   - Section 3.2 should be Section 3.4
   - Figures 3 - 14 should be Figures 5 - 16
   - Figures 15 should be Figure 17 and delete Appendix (item 6)
   - Change 16 & 17 to 18 & 19 (item 7)
   - Change Figures 18 - 22 to 20 - 24 (item 8)

Comment 5:

On page 25 last bullet, correct the U value of -3.021 to be less (<) than -1.645

Comment 6

Smudged and/or Overtyped Figures:

a. Figure 21
b. Figure 23
c. Figure 24

Comment 7

Provide reference for the calculation of Chi-square equation on page 7.

Comment 8

The symbol "L" is undefined in the equation for the statistic U

Comment 9

Recommended commonly used acronym (page xxi): MTBF