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

MAR 11 1986

Docket No. 50-461

APPLICANT: Illinois Power Company

FACILITY: Clinton Power Station

SUBJECT: SUMMARY OF MEETING TO RESOLVE TEST VS ANALYSIS CONCERN FOR ACTIVE VALVE QUALIFICATION IDENTIFIED DURING SQRT AND PVORT AUDITS AT CLINTON POWER STATION

A meeting was held January 28 and 29, 1986 at the Sargent and Lundy offices in Chicago, Illinois between Illinois Power Company (IP), Sargent and Lundy (S&L), the NRC staff, and the staff's consultants from the Brookhaven National Laboratory (BNL). A list of primary meeting attendees is contained in Enclosure 1.

The purpose of the meeting was to resolve the test vs analysis issue for qualification of active valves identified during the SQRT and PVORT audits. A description of IP's analytical approach to resolve this issue was presented by R. Tjernlund of S&L and is contained in Enclosure 2. Discussions between IP, S&L, the staff, and BNL followed and then the documentation provided by IP to verify the acceptability of its approach was reviewed by the staff and its consultants to determine if the information provided adequately addressed the staff's concerns.

Upon the completion of the review the staff and BNL provided IP with preliminary conclusions regarding its assessment of the information provided to resolve the issue of test vs analysis to satisfy both the SQRT and PVORT concerns. These preliminary conclusions are stated below.

For operability issue related to SQRT:

- IP has used an analytical approach
- IP has used data from 32 test data packages for verification
- The analysis conservatively predicts the test data in all cases
- Comparison between the test results and system analysis results show a large degree of conservatism (Enclosure 2, Table B2)
- IP has grouped all the active valves into 21 groups and identified the test valve data that are directly applicable to each valve group (Pages 4 and 5, Enclosure 2)
- The staff and BNL have reviewed the valve groups and determined that the test data are adequate to demonstrate operability for all but Groups 1 and 15 (for Crosby valves only). For these two groups, additional test data or a probabilistic analysis approach could be used to demonstrate operability.
- The staff and BNL will review further the acceptability of IP's analytical approach for the resolution of the operability issue for the remaining two valve groups.

In addition, the staff provided IP with the current status of the SQRT issues identified during the August SQRT audit and the following additional open issues resulting from the current review that either require or may require IP action.

1. Review test report #MR52600-570-1-1 needed for the similarity demonstration of valve #V526-6310-4C (Ref. Group #2) and present the findings to the staff.

2. For all active valves, the similarity analysis should be corrected, as needed, and included in the qualification package.

3. Adequate test data were not provided to demonstrate operability of the following valves:

   a) Anchor Darling Gate and Globe, Group 1
   b) 8" Crosby Relief, Group 15

   IP will be advised whether additional test data are required for the above valves.

For the operability issue related to PVORT:

The purpose of this review was to give S&L the opportunity to provide the staff the justification for qualification of valve components in lieu of providing verification by test to demonstrate operability. S&L has categorized all the Clinton valves into 21 groups. For purposes of this documentation review five groups were audited. The documentation provided reflected a clearer understanding by the applicant and S&L of qualification requirements. However, test data to verify each components analysis does not exist within the S&L files. The basis for S&L's approach was to show valve qualification by tests that were performed on similar components in other groups. The staff believes that S&L has provided all the documentation that they have in their possession. Final resolution of the Clinton PVORT will be determined by the staff after discussion with upper management and the staff's consultant. In addition, the staff provided IP with the current status of PVORT issues identified during the August and November audits.

The staff agreed to try to provide IP with a position with regard to acceptability of IP's approach to active valve qualification for the two remaining valve groups (Groups 1 and 15) reviewed under the SQRT program and with regard to the acceptability of the approach for the PVORT program by Friday, January 31, 1986 but no later than February 4, 1986.

Since the meeting the staff has identified the additional actions required of IP to achieve final resolution of both these issues. Enclosures 3 and 4 contains these actions which have also been informally provided to and discussed with IP on January 20, 1986. IP has stated they understand the staff's position on these issues and will comply with the actions identified in Enclosures 3 and 4. These positions will be sent to IP once they are officially received from the technical review branch.

Byron L. Siegel

Byron L. Siegel, Project Manager
BWR Project Directorate No. 4
Division of BWR Licensing

Enclosure:
As stated

cc: See next page

Mr. Frank A. Spangenberg
Illinois Power Company

Clinton Power Station
Unit 1

cc:
Mark Jason
Assistant Attorney General
Public Utilities Division
Office of the Attorney General
State of Illinois Center
100 West Randolph Street - 12th Floor
Chicago, Illinois 60601

Mr. D. P. Hall
Vice President
Clinton Power Station
P. O. Box 678
Clinton, Illinois. 61727

Mr. D. C. Shelton
Manager-Nuclear Station Engineering Dpt.
Clinton Power Station
P. O. Box 678
Clinton, Illinois 61727

Sheldon Zabel, Esquire
Schiff, Hardin & Waite
7200 Sears Tower
233 Wacker Drive
Chicago, Illinois 60606

Resident Inspector
U. S. Nuclear Regulatory Commission
RR 3, Box 229 A
Clinton, Illinois 61727

Mr. R. C. Heider
Project Manager
Sargent & Lundy Engineers
55 East Monroe Street
Chicago, Illinois 60603

Mr. L. Larson
Project Manager
General Electric Company
175 Curtner Avenue, N/C 395
San Jose, California 95125

Regional Administrator, Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Jean Foy, Esquire
511 W. Nevada
Urbana, Illinois 61801

Richard B. Hubbard
Vice President
Technical Associates
1723 Hamilton Avenue - Suite K
San Jose, California 95125

Enclosure 1

Principal Attendee's to January 28 and 29, 1986 Meeting to Resolve Test VS Analysis Concern for Qualification of Active Valves at Clinton Power Station

Name	Company
D. W. Wilson	Illinois Power
R. C. Heider	S&L
M. J. Shewski	S&L
I. T. Kisisel	S&L
R. M. Tjernlund	S&L
P. D. Raheja	S&L
P. Raysircar	IP
H. M. Sroka	S&L
K. Bandyopadhyay	BNL
B. Siegel	NRC
J. Lombardo	NRC
B. Miller	BNL
M. E. D'Haem	IPC
D. C. Shelton	IP
C. T. Gentile	IP
R. Kokesh	S&L

NRC CONCERNS

OPERABILITY OF ACTIVE VALVE ASSEMBLIES

DEPENDENT UPON DISPLACEMENT OF EXTENDED PARTS

NRC SATISFIED

WITH CLINTON APPROACH FOR DEMONSTRATING

*VALVE STRUCTURAL INTEGRITY

*OPERATOR SEISMIC CAPABILITY

APPROACH

1) OPERABILITY DEMONSTRATED BY

   TESTING ALONE, OR
   COMBINATION OF TEST AND ANALYSIS

2) WHEN ANALYSIS USED:

   -EACH VALVE ANALYZED
   -REPRESENTATIVE SAMPLES OF SIMILAR VALVE ASSEMBLIES TESTED

3) PURPOSE OF TESTING:

   *DEMONSTRATE OPERABILITY OF TESTED ASSEMBLIES
   *SUBSTANTIATE ANALYTICAL METHODS

4) ONCE SUBSTANTIATED

   *SAME ANALYTICAL MODEL/METHODS CAN BE USED TO QUALIFY SIMILAR VALVES

5) ANALYSIS PERFORMED BY VALVE MFG OR BY HIS SUBCONTRACTOR
   S&L REVIEWS

CLINTON ACTIVE VALVES CATAGORIZED INTO 21 GROUPS ACCORDING TO:

*VALVE TYPE

*VALVE MANUFACTURER

*ACTUATOR TYPE

*ACTUATOR MANUFACTURER

CATEGORIES OF CLINTON ACTIVE VALVES

Group	Valve Mfg.	Valve Type	Actuator Type	Actuator Mfg	Size Range	Population	Test Valve
1	Anchor Darling	Gate/Globe	Mo	Limitorque	1" - 24"	152	16"-150# Mo Gate
2	Valcor	Gate/Globe	So	Valcor	½" - 2½	57	½"-So Globe 1"-600# Gate 1"-2500# So Globe 2"-275# So Globe
3	Rockwell	Globe	Mo	Limitorque	1"- 1 1/2"	5	1½"-1500#Mo Globe
4	Sporlan	Globe	So Thermal Expan.	Sporlan	5/8"-7/8"	21	7/8" So Globe
5	Alco	Globe	So	Alco	5/8"	2	5/8" So Globe
6	Yarway	Globe	Mo	Limitorque	1"-2"	22	1½"-3600#So Globe
7	Fisher	Globe	Ao	Fisher	3/4"-8"	56	1"-600# Ao Globe 1"-1500# Ao Globe 1½"-600# Ao Globe 3"-600# Ao Globe 4"-600# Ao Globe
8	Atwood & Morrill	Globe	Ao	Sheffer	24"	16	24"-1500# Globe
9	Jamesbury	Bfly, Ball	Ho	ITT	1½"-4"	5	NH-90 Series Actuator
10	Clow	Bfly	Ao	Bettis	12"	4	12"-150# Ao Bfly
11	Posi-Seal	Bfly	Mo Ao	Limitorque Matrix	2"- 36"	58	HBC/SMB Actuator 8"-150# AO Bfly 12"-150# Ao Bfly 24"-150# AO Bfly
12	XOMOX	Plug	Ao	X-ACT	2"	2	2"-150# AO Plug
13	XOMOX	Plug	Mo	Limitorque	2"-3"	3	HBC/SMB Actuator

CATEGORIES OF CLINTON ACTIVE VALVES

Group	Valve Mfg.	Valve Type	Actuator Type	Actuator Mfg.	Size Range	Population	Tested Valves
14	Dikkers	Relief	Ao	Dikkers	8"	16	8 x 10 Safety Relief
15	Target Rock Dresser Crosby	Relief	None	N/A	½"-8"	70	1"-1500# Relief 2"-1500# Relief 4"-1500# Relief
16	Anderson Greenwood	Vacuum Relief	None	N/A	10"	32	10" Vaccum Breaker
17	Hammel Dahl	Globe	Ao	Hammel Dahl	1"-2"	2	1"-1500# Ao Globe 2"-1500# Ao Globe
18	Conax	explosive	explosive	Conax	1½"	2	1½"-1400# Explosive
19	Robert Shaw ASCO GE	HCU Valves Globe (126,127) Globe (139) Check (114) (115) (137) (138)	Ao So None	Robert Shaw ASCO N/A	3/4"-1" 3/4"-1"	290 145 580	Tested with HCU's
20	Anchor Darling Dragon GPE	Check	None(a)	N/A	½"-30"	128	
21	Gimpel	Globe	Mo	Limitorque	3"	1	Tested with RClC Turbine

Note: a) 8 of the check valves are testable possessing Ao Actuators

SAMPLE VALVE ASSEMBLIES FROM EACH GROUP TESTED

EXCEPTIONS:

1) CHECK VALVES NOT SEISMICALLY TESTED

SEISMIC LOADS INCONSEQUENTIAL COMPARED TO IMPACT LOADS ASSOCIATED WITH RAPID CLOSING/OPENING

2) TESTING FOR 2 GROUPS OF 90° TURN VALVES, TESTED EXTENDED PARTS ONLY, NOT BODY

TESTING OF EXTENDED PARTS SUFFICIENT TO DEMONSTRATE OPERABILITY

3) 1 GROUP OF AO PLUG VALVES NOT TESTED FOR CLINTON

WERE TESTED FOR ANOTHER STATION WITH OPERABILITY DEMONSTRATED

TABLE B1
OPERABILITY VERIFICATION OF VALVE ASSEMBLIES
COMPARISON OF ACTUAL & TEST ACCELERATIONS

Group Number	Valve Description	Accelerations for which Analysis Demonstrated Operability			Test Accelerations For Which Operability is Demonstrated			NOTES
		H1	H2	V	H1	H2	V	
1	4"-Gate 300#-MO (Powell)	4.5	4.5	3.0	9.4	9.1	6.2	(1,8)
1	16"-Gate 150#-MO (Anchor/Darling)	4.5	4.5	3.0	12.3	11.9	5.6	(1,8)
2	1/2"-Globe-S.O. (Valcor)	4.5	4.5	3.0	15.0	15.0	8.0	(1,8)
2	1"-Gate 600#-S.O. (Valcor)	4.5	4.5	3.0	4.5	4.5	4.5	(1,8)
2	1"-Globe 2500#-S.O. (Valcor)	4.5	4.5	3.0	4.5	4.5	4.5	(1,8)
2	2"-Globe 275#-S.O. (Valcor)	4.5	4.5	3.0	4.5	4.5	4.5	(1,8)
3	1½"-Globe-1500#-M.O. (Rockwell)	4.5	4.5	3.0	4.5	4.5	3.0	(4,8)
4	7/8" Globe Valve (Sporlan)	4.5	4.5	3.0	6.3	6.3	4.5	(1, 8)
5	5/8" Globe Valve (Alco)	4.5	4.5	3.0	6.3	6.3	4.5	(1, 8)
6	1½"-Globe 3600#-M.O. (Yarway)	4.5	4.5	3.0	6.0	5.0	--	(4,8)
7	1"-Globe 600#-A.O. (Fisher)	4.5	4.5	3.0	9.4	9.4	--	(3,8)
7	1½"-Globe 600#-A.O. (Fisher)	4.5	4.5	3.0	9.7	9.6	--	(3,8)
7	3"-Globe 600#-A.O. (Fisher)	4.5	4.5	3.0	10.5	10.5	--	(3,8)
7	4"-Globe 600#-A.O. (Fisher)	4.5	4.5	3.0	9.2	9.2	--	(3,8)
7	1"-Globe 1500#-A.O. (Fisher)	4.5	4.5	3.0	9.4	9.4	--	(3,8)
8	24"-Globe Valve (Atwood & Morrill)	6.5	7.3	9.0	10.0	10.0	15.0	(1,7,8)

TABLE B1

OPERABILITY VERIFICATION OF VALVE ASSEMBLIES

COMPARISON OF ACTUAL & TEST ACCELERATIONS

Group Number	Valve Description	Accelerations for which Analysis Demonstrated Operability			Test Accelerations For Which Operability is Demonstrated			NOTES
		H1	H2	V	H1	H2	V	
10	12"-Butterfly 150#-A.O. (Clow)	4.5	4.5	3.0	11.0	11.0	11.0	(1,8)
11	12"-Butterfly 150#-A.O. (Posi-Seal)	3.0	3.0	3.0	4.0	4.0	4.0	(1,8)
11	12"-Butterfly 150#-A.O. (Posi-Seal)	3.0	3.0	3.0	4.5	4.5	4.5	(1,8)
11	24"-Butterfly 150#-A.O. (Posi-Seal)	3.0	3.0	3.0	4.5	4.5	4.5	(1,8)
11	8"-Butterfly 150#-A.O. (Posi-Seal)	3.0	3.0	3.0	4.5	4.5	4.5	(1,8)
14	8"x10" Safety Relief Valve (Dickers)	5.8	5.8	3.6	6.4	6.4	6.0	(1,9)
15	1"-Pressure Relief -1500#-Spring (Dresser)	4.5	4.5	3.0	--	--	6.0	(6,8)
15	2"-Pressure Relief -1500#-Spring (Dresser)	4.5	4.5	3.0	--	--	6.0	(6,8)
15	4"-Pressure Relief -1500#-Spring (Dresser)	4.5	4.5	3.0	--	--	6.0	(6,8)
15	3/4" Pressure Relief Valve (Crosby	4.5	4.5	3.0	5.0	5.0	5.0	(2,8)
16	10"-Vacuum Breaker (Anderson Greenwood)	21.5	18.2	21.8	--	--	--	(5)
17	1"-Globe Valve (Hamhal Dahl)	4.5	4.5	3.0	6.5	6.5	6.0	(1,8)
17	2"-Globe Valve (Hamhal Dahl)	4.5	4.5	3.0	6.5	6.5	6.0	(1,8)
18	1 1/2"-Conax Explosive (Conax)	4.5	4.5	3.0	6.8	6.8	6.8	(2,9)

TABLE B1

OPERABILITY VERIFICATION OF VALVE ASSEMBLIES

COMPARISON OF ACTUAL & TEST ACCELERATIONS

Group Number	Valve Description	Accelerations for which Analysis Demonstrated Operability			Test Accelerations For Which Operability is Demonstrated			NOTES
		H1	H2	V	H1	H2	V	
19	3/4"-Check Valve (General Electric)	-	-	-	9.0	9.0	24.0	(1,10)
19	3/4"-Globe Valve (Robert Shaw)	-	-	-	9.0	9.0	24.0	(1,10)
19	1/2"-Globe Valve (Robert Shaw)	-	-	-	9.0	9.0	24.0	(1,10)
19	1"-Check Valve (General Electric)	-	-	-	9.0	9.0	24.0	(1,10)
19	1"-Globe Valve (General Electric)	-	-	-	9.0	9.0	24.0	(1,10)
21	4"-Globe Valve (Terry Turbine)	-	-	-	4.0	4.0	5.0	(1,10)

TABLE B2

OPERABILITY VERIFICATION OF VALVE ASSEMBLIES

COMPARISON OF ACTUAL & TEST ACCELERATIONS

Group Number	Valve Description	Actual Accelerations Per Piping Analysis			Test Accelerations For Which Operability is Demonstrated			NOTES
		H1	H2	V	H1	H2	V	
1	4"-Gate 300#-MO (Powell)	1.9	2.8	1.3	9.4	9.1	6.2	(1,8)
1	16"-Gate 150#-MO (Anchor/Darling)	2.0	1.7	2.2	12.3	11.9	5.6	(1,8)
2	1/2"-Globe-S.O. (Valcor)	1.33	1.33	1.2	15.0	15.0	8.0	(1,8)
2	1"-Globe 600#-S.O. (Valcor)	0.4	0.4	0.4	4.5	4.5	4.5	(1,8)
2	1"-Globe 2500#-S.O. (Valcor)	0.3	0.3	0.9	4.5	4.5	4.5	(1,8)
2	2"-Globe 275#-S.O. (Valcor)	0.2	0.2	0.3	4.5	4.5	4.5	(1,8)
3	1½"-Globe-1500#-M.O. (Rockwell)	2.2	1.3	1.0	4.5	4.5	3.0	(4,8)
4	7/8" Globe Valve (Sporlan)	.3	.3	.9	6.3	6.3	4.5	(1, 8)
5	5/8" Globe Valve (Alco)	.3	.3	.9	6.3	6.3	4.5	(1, 8)
6	1½"-Globe 3600#-M.O. (Yarway)	1.1	2.0	1.4	6.0	5.0	--	(4,8)
7	1"-Globe 600#-A.O. (Fisher)	0.3	0.3	1.0	9.4	9.4	--	(3,8)
7	1½"-Globe 600#-A.O. (Fisher)	0.8	0.6	1.0	9.7	9.6	--	(3,8)
7	3"-Globe 600#-A.O. (Fisher)	1.1	1.1	1.1	10.5	10.5	--	(3,8)
7	4"-Globe 600#-A.O. (Fisher)	0.4	0.3	1.2	9.2	9.2	--	(3,8)
7	1"-Globe 1500#-A.O. (Fisher)	0.4	0.0	0.0	9.4	9.4	--	(3,8)
8	24"-Globe Valve (Atwood & Morrill)	6.5	7.3	9.0	10.0	10.0	15.0	(1,7,8)

TABLE B2

OPERABILITY VERIFICATION OF VALVE ASSEMBLIES

COMPARISON OF ACTUAL & TEST ACCELERATIONS

Group Number	Valve Description	Actual Accelerations Per Piping Analysis			Test Accelerations For Which Operability is Demonstrated			NOTES
		H1	H2	V	H1	H2	V	
10	12"-Butterfly 150#-A.O. (Clow)	0.8	0.9	1.3	11.0	11.0	11.0	(1,8)
11	12"-Butterfly 150#-A.O. (Posi-Seal)	2.2	0.2	0.2	4.0	4.0	4.0	(1,8)
11	12"-Butterfly 150#-A.O. (Posi-Seal)	0.7	0.7	0.9	4.5	4.5	4.5	(1,8)
11	24"-Butterfly 150#-A.O. (Posi-Seal)	1.0	0.9	1.1	4.5	4.5	4.5	(1,8)
11	8"-Butterfly 150#-A.O. (Posi-Seal)	1.8	0.7	0.2	4.5	4.5	4.5	(1,8)
14	8"x10" Safety Relief Valve (Dickers)	2.8	2.8	1.6	6.4	6.4	6.0	(1,9)
15	1"-Pressure Relief -1500#-Spring (Dresser)	0.3	0.3	0.9	--	--	6.0	(6,8)
15	2"-Pressure Relief -1500#-Spring (Dresser)	1.2	1.0	1.3	--	--	6.0	(6,8)
15	4"-Pressure Relief -1500#-Spring (Dresser)	1.0	1.9	2.0	--	--	6.0	(6,8)
15	3/4" Pressure Relief Valve (Crossby)	0.2	0.2	0.9	5.0	5.0	5.9	(2,8)
16	10"-Vacuum Breaker (Anderson Greenwood)	10.4	15.9	14.5	--	--	--	(5)
17	1"-Globe Valve (Hamhal Dahl)	2.3	2.3	1.2	6.5	6.5	6.0	(1,8)
17	2"-Globe Valve (Hamhal Dahl)	2.3	2.3	1.2	6.5	6.5	6.0	(1,8)
18	1 1/2"-Conax Explosive (Conax)	1.1	1.7	0.7	6.8	6.8	6.8	(2,9)

TABLE B2

OPERABILITY VERIFICATION OF VALVE ASSEMBLIES

COMPARISON OF ACTUAL & TEST ACCELERATIONS

Group Number	Valve Description	Actual Accelerations Per Piping Analysis			Test Accelerations For Which Operability is Demonstrated			NOTES
		H1	H2	V	H1	H2	V	
19	3/4"-Check Valve (General Electric)	0.8	0.8	3.8	9.0	9.0	24.0	(1,10)
19	3/4"-Globe Valve (Robert Shaw)	0.8	0.8	3.8	9.0	9.0	24.0	(1,10)
19	1/2"-Globe Valve (Robert Shaw)	0.8	0.8	3.8	9.0	9.0	24.0	(1,10)
19	1"-Check Valve (General Electric)	0.8	0.8	3.8	9.0	9.0	24.0	(1,10)
19	1"-Globe Valve (General Electric)	0.8	0.8	3.8	9.0	9.0	24.0	(1,10)
21	4"-Globe Valve (Terry Turbine)	0.5	0.5	0.7	4.0	4.0	5.0	(1,10)

TABLE B

OPERABILITY VERIFICATION OF VALVE ASSEMBLIES

COMPARISON OF ANALYSIS & TEST RESULTS

NOTES:

1) Valve Dynamically Tested: Biaxial or triaxial random motion test.

2) Valve Dynamically Tested: Uniaxial sine dwell or sine beat test.

3) Valve Static-Pull Tested: Using resultant loads applied uniaxially in the most critical direction.

4) Valve Static-Pull Tested: Using loads applied biaxilly.

5) Valve Impact Tested: Using maximum postulated closing/ opening disc velocities.

6) Valve Dynamically Tested: Uniaxial random motion test with the load applied in the most severe direction.

7) Valve has been analyzed to the exact piping accelerations.

8) Valve was cycled (open-closed) during testing.

9) Special function valve. Operability verified after the test. Electrical continuity monitored during the test.

10) Valve was tested as part of an assembly to show operability as part of the entire system. System was operational before, during, and after the seismic test.

ENCLOSURE 3

STAFF POSITION FOR ACCEPTANCE OF THE CLINTON STATION'S PUMP AND VALVE OPERABILITY PROGRAM

Two PVORT audits were performed at the Clinton station and one documentation review was performed at the S&L headquarters in Chicago. Several outstanding concerns remain to be resolved. Qualification by analysis alone vs. analysis with test verification of the analysis has become the most significant issue. The purpose of the S&L HQ review was to give S&L the opportunity to demonstrate adequacy of their approach for qualification of valve components, in lieu of providing verification by test to demonstrate operability. S&L had catagorized all of the Clinton valves into 21 groups, from which the staff and its consultant selected 5 groups for audit. The documentation provided during that third audit reflected a clearer understanding by the applicant and S&L of the information needed to establish operability qualification. S&L's approach was to show valve qualification by test(s), performed for the most part on components in other groups, and similarity.

To supplement the information provided by the applicant to date, and based upon the experience gained from the three audits, the applicant should be required to (1) review all qualification documentation including test data to assure that all fluid dynamic concerns regarding operability qualification have been addressed, e.g. flow interruption capability, fatigue, cyclic, vibration, water hammer, thermal loads, corrosion, aging, and stress analysis, and (2) document the bases used to verify the adequacy of analysis including conservatisms in the analyses, and if similarity to another valve is used, the bases upon which the similarity has been established. Upon completion of this effort the applicant shall provide a statement confirming that the operability qualification of all valves within the scope of the program is complete, and that all documentation relied upon to demonstrate the qualification of each valve is in an auditable format*. The attachment provides guidance regarding qualification documentation.

For any valve assembly failure, i.e. inability to properly function, identified during preoperational testing conducted as of the end of February 1986 that is determined to be design, system, or fluid induced, the applicant shall, (1) perform an evaluation of the failure to determine the root cause, (2) reevaluate the qualification documentation to determine why the potential for this failure was not addressed previously, (3) verify that the qualification documentation still supports a conclusion that operability qualification is established, and (4) determine if the failure is an isolated case or has generic implications. The applicant shall document the results of this effort in an auditable format and submit it to the NRC staff for review.

Completion of the above, as well as satisfactory responses to the open items from the three audits, should provide the staff with sufficient confidence to conclude that the Clinton Pump and Valve Operability Program is acceptable.

ATTACHMENT: Documentation-Excerpt from NUREG/CR-3914 Pump & Valve Qualification Review Guide

* Auditable format-The documentation is organized in a readily understandable and traceable manner that permits independent auditing of that documentation and the conclusions drawn from it.

5. DOCUMENTATION

The qualification documentation should verify that each component is qualified for its application and meets its specified performance requirements. The basis of qualification should be explained to show the relation ship of all facets of proof needed to support adequacy of the complete equipment. Data used to demonstrate the qualification of the equipment should be pertinent to the application and organized in an auditable form. This section was taken from NUREG-0588 and IEEE 323 and modified to relate to pump and valve qualification.

5.1 FILES

The applicant/licensee should maintain a qualification file that contains the following information, depending on the qualification method used.

5.1.1 Type Test Data

The type test data should contain the following:

- Equipment performance specification.
- Identification of the specific feature(s) to be demonstrated by the test.
- Test plan.
- Report of test results:
  - objectives,
  - equipment tested,
  - description of test facility (test setup) and instrumentation used, including calibration and records reference,
  - test procedures,
  - test data and accuracy (results),
  - acceptance criteria,
  - summary, conclusions, and recommendations,
  - supporting data,
  - statement of similarity,
  - approval signature and date.

5.1.2 Operating Experience Data

The operating experience data should contain the following:

- Equipment performance specification.
- Interface or boundary conditions of the equipment.
- Specifications of equipment for which operating experience is available.
- Identification of the specific features to be demonstrated by operating experience.

- Comparison of past application and specifications with the new equipment specifications for each feature identified above.

- Summary and source of operating experience applicable to equipment qualification.

- The basis on which the data have been determined to be suitable and the equipment qualified.

- Approval signature and date.

5.1.3 Analysis

The analysis data should contain the following:

- Equipment performance specification.

- Interface or boundary conditions of the equipment.

- Specific features, postulated failure modes, or the failure effects to be analyzed.

- Assumptions, empirically derived values, and mathematical models used, together with appropriate justification for their use.

- Description of analytical methods or computer programs used.

- Summary of analytically established performance characteristics and their acceptability.

- Approval signature and date.

5.1.4 Extrapolation

Where test data or operating experience data have been extrapolated, the basis and justification for the extrapolation should be included.

THE SQRT REVIEW STATUS OF THE CLINTON SEISMIC QUALIFICATION PROGRAM

The following presents a summary of the status of the SQRT (seismic qualification review team) review of the applicant's program for the seismic qualification of safety-related equipment, in general, and of active valves in particular. It addresses the applicant's generic valve qualification program, their position and SQRT's concerns.

Active Valve Qualfication Program

a) The active valves for Clinton were procured by using a specification which allowed the vendor to use "analysis only" along with other choices to seismically qualify an active valve, including its operability. Most vendors opted to use an "analysis only" approach to qualify the active valves. IP/S&L reviewed and approved the qualification documents on this basis.

b) During the audit in August, 1985, the SQRT expressed concerns regarding the approach of qualifying active valves by "analysis only". Subsequently, IP/S&L collected test data for some valves (not necessarily Clinton valves) to demonstrate validity of their analysis models and techniques. Thus, IP/S&L attempted to justify the analysis approach generically.

c) In response to the SQRT's request to correlate the existing test data with the applicable valves, IP/S&L divided the entire active valve population into twenty-one (21) groups, during the SQRT's second audit conducted at S&L office in Chicago, Ill., on Janaury 28 & 29, 1986, and provided reference to test data available, if any, for each group.

IP/S&L's Position

IP/S&L maintains that "analysis only" is a valid method. They argue that once the analysis technique is validated by test results of a valve, other valves, which could be of different types (e.g., gate vs. globe) and sizes and/or from different manufacturers, can be qualified by analysis only, without a need for further test results.

SQRT Comment on IP/S&L's Position

The SQRT believes that the key element in this review is similarity with the tested valves. Due to inherent complexities and nonlinear characteristics of valve assemblies, and the limitation of analytical models, the analysis technique may not be adequate to assess valve operability, which primarily depends on the deflection of the extended part of the valve. This is especially true due to the fact that the allowable and the actual deflections are of the order of 10^{-2} inch or less. Moreover, it is the valve deflection rather than stresses that should be considered as the parameter for comparison of the analysis results with the test results so far as operability is concerned. Instead valves groups, should be identified and similarity should be established by considering valve types, design, size, manufacturer, actuator types, etc.

SQRT Review

Since the SQRT did not agree with the qualification methodology adopted by IP/S&L to demonstrate operability of active valves, it was decided that the SQRT would study the valve groups with IP/S&L engineers to verify that similarity exists between the tested valves and other valves in the group, or whether judgement can be used (e.g., short extended part, low as-built g-values, etc.) to accept the qualification. On this basis, SQRT studied various valve groups and reviewed some documents. IP/S&L engineers provided valve design drawings, available test results and some non-auditable similarity analyses.

Open Issues

As a result of the study, it was found that a majority of the valves can be shown to be similar to the tested valves. Therefore, the SQRT study proved to be successful at least in reducing the number of valves in question.

The following comments are offered by the SQRT regarding demonstration of operability of active valves, in addition to the other related comments for valves provided in the Clinton SSER No. 5.

1. Test report MR52600-570-1-1 was required for demonstration of similarity of valve No. V526-6310-4C (Ref. Group No. 2). This report was not available during the most recent audit, nor was it reviewed by IP/S&L. IP/S&L should review this document and present the findings to the SQRT for acceptance.

2) As stated above, there were documents presented during the most recent audit which are required for demonstration of valve similarity. All such similarity analyses should be corrected as needed and included in the qualification package in an auditable format. Note that the similarity analysis should address all individual valves, rather than just the generic valve group, to ensure that all valves in that group have been examined.

3. Adequate test data were not available to demonstrate operability of the following valves:

a) Anchor Darling Gate and Globe Valves, Group No. 1, valves sizes 1" -24", various actuator sizes, population 152 (i.e., about 29% of all active valves other than check valves and valves bought with HCU's).

b) 8" Crosby Relief Valves, Group No. 15.

IP should divide these valves into multiple groups based upon similarity, procedure the test report (or perform a valve operability test, if required) of a representative valve from each group, perform simiarity analyses for the remaining valves and submit the qualfication package to the SQRT for review and approval.

Other Equipment Specific Open Items

SQRT comments to IP responses on other SQRT open issues were provide to IP during the most recent audit. A brief discussion was held on different SQRT items, especially on BOP-4, 6900 Volt switchgear. IP claimed that the SQRT form had described the safety functions, and all modifications had been implemented prior to the SQRT audit. IP submitted a version of the SQRT form in support of their statement. SQRT found this version of the form to be complete departure from what IP had identified earlier in the SQRT form submitted during the SQRT audit of August 1985 (see attachment 1). A similar inconsistency in IP's statement regarding a valve qualification status was observed during the active valve discussions (see attachment 2). Here, an actuator was identified as installed and qualified while its support was still not in place. Based on the reviews conducted thus far, it is the SQRT's opinion that the applicant's seismic qualification program is not supported by adequate documentation, and that the applicant continues to address only selected SQRT items. Therefore, an auditable filing system, consisting of all pertinent documentation, should be established by the applicant.

The above SQRT concerns on active valve qualification as well as on other equipment specific open items, must be satisfactorily resolved by the applicant before the staff can conclude that the Clinton seismic qualification program is acceptable.

ATTACHMENT 1

This SQRT form was handed over to the SQRT during the audit in Aug. 85

NRC ITEM BOP 4 (SER)
PAGE 1 of 3

SEISMIC AND DYNAMIC QUALIFICATION SUMMARY OF EQUIPMENT

° TO BE COMPLETED TO STAND ON ITS OWN (DO NOT REFER TO ANY DOCUMENT)
° ALL QUESTIONS ARE TO BE ANSWERED (IF NOT APPLICABLE; MARK "N/A")

I. PLANT NAME: Clinton Power Station

1. UTILITY: Illinois Power Co.
2. LOCATION: Clinton, IL
3. TYPE: BWR
4. CAPACITY (MWe NET): 985
5. CONTAINMENT TYPE: MK. III
6. COOLING SOURCE: Lake
7. NRC DOCKET NO.: 50-461
8. CP DOCKET DATE: 10/30/73
9. NSSS VENDOR: G.E.Co.
10. A/E: Sargent & Lundy

II. COMPONENT NAME: 6900V Switchgear (1AP05E)

1. SCOPE: ☐ NSSS ☒ BOP
2. VENDOR: Westinghouse
3. VENDOR MODEL NO.: 6900V
4. MANUFACTURER: Westinghouse
5. MANUFACTURER MODEL NO.: 6900V
6. PURCHASE SPEC. NO. ~~K~~-2968
7. TOTAL NO. IN SAFETY SYSTEMS: 1
8. LOCATION (CHOOSE THE WORST ONE WITH RESPECT TO SEISMIC)
   A. BUILDING: Auxiliary
   B. ELEVATION AND AREA: 762'
   C. ENVIRONMENT: ☐ HARSH ☒ MILD
9. FIELD MOUNTING:
   A. ☒ FLOOR ☐ WALL ☐ PIPE ☐ PANEL
      ☐ OTHER (DESCRIBE)
   B. ☒ BOLTED; DESCRIPTION: 6/Cubicle ½"Ø SAE GR-5 (NO., SIZE, GRADE, ETC.)
      ☐ WELDED; DESCRIPTION: (SIZE, LENGTH, ELECTRODE TYPE, ETC.)
      ☐ OTHER; DESCRIPTION:
   C. MOUNTING RESTRICTION FROM THE MANUFACTURER, IF ANY: (HORIZONTAL VERTICAL, ETC.) NONE
10. FUNCTIONAL DESCRIPTION OF THE EQUIPMENT:
   A. SYSTEM IN WHICH LOCATED: Auxiliary Power (AP) (FOR ITEM 8 IN II, ABOVE)
   B. TYPE: ☒ ACTIVE ☐ PASSIVE

1. Safety function (p. 2)
2. Modifications (p. 3)

(cont'd)

C. EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☐ BOTH ☒ NEITHER

D. INTENDED SAFETY FUNCTION: NONE

E. DIRECT CONSEQUENCES OF ITS FAILURE (BRIEF DESCRIPTION OF THE EFFECT ON THE SYSTEM): _____

F. REDUNDANCIES, IF ANY: _____

III. EQUIPMENT QUALIFICATION METHOD:

☒ TEST ☐ ANALYSIS

☐ COMBINATION OF TEST & ANALYSIS ☐ OTHER (DESCRIBE) _____

IV LOADS AND LOAD COMBINATIONS:

1. LOADS:

A. ☒ SEISMIC B. ☒ HYDRODYNAMIC

C. ☐ FLOW INDUCED VIB. D. ☐ NORMAL OPERATION VIB.

E. ☐ OTHER DYNAMIC LOADS: (SPECIFY) _____

2. COMBINATION TECHNIQUE: ABS (SRSS Required)

3. REQUIRED ACCELERATION IN EACH DIRECTION: See Attached RRS Curves (Attachment B)

A. ☐ ZPA ☐ OTHER; SPECIFY: _____

B. OBE: S/S _____; F/B: _____; V: _____

SSE: S/S _____; F/B: _____; V: _____

V QUALIFICATION BY TEST (COMPLETE THIS SECTION FOR EACH REPORT INCLUDING PARTIAL TEST):

1. TEST REPORT: (COMPANY) Westinghouse

A. TITLE: Dynamic Qualification of Clinton Plant 7.5kV Switchgear Assemblies for Illinois Power Company

NO.: WCAP-10328 ; REVISION: 0 ; DATE: October 1983

B. REVIEWED BY: Sargent & Lundy (Qualification Report SQ-CL366)

2. QUALIFICATION REPORT: (COMPANY) Westinghouse

A. TITLE: Dynamic Qualification of Clinton Plant 7.5kV Switchgear Assemblies for Illinois Power Company

NO.: WCAP-10328 ; REVISION; 0 ; DATE: October 1983

B. REVIEWED BY: Sargent & Lundy (Qualification Report SQ-CL366)

(a) During several of the test runs, contact bounce was detected on the type SSC-T relays and the ITTH and SSC-T elements on the type COM-5 relays, during the relay non-operating modes. IPC and Sargent & Lundy Engineers evaluated the problem and determined that the contact bounce of the relays and the premature actuation of the DVP breaker were not safety related malfunctions and thus were considered acceptable for Clinton applications.

(b) In order to continue testing, a modification was made to the bifurcation CT's. The phase A rear CT which had borken loose was replaced with a new identical CT. All six of the CT's were then strapped to the CT support bracket by heavy duty flat cable ties (two per each CT). The unit was then rotated 90° clockwise and mounted to the table.

(c) The modifications made during the test (see Item (b) above) need not be implemented in the field since the failure of the non-1E CT's is not a safety related failure. Thus, the mounting modifications are only suggested by the vendor, are not required and have not been implemented.

ATTACHMENT 2

ILLINOIS POWER COMPANY
CLINTON POWER STATION,
DOCKET NUMBER 50-461

7/21/85

SEISMIC QUAL/INST STATUS BY SYSTEM/EQUIPMENT NUMBER

SYSTEM	EQUIPMENT NUMBER	MANUFACTURER/MODEL NUMBER	INSTALLED	QUALIFIED
SX	1SX023A(V)	Fshr/Cnt Vlv 657NS/ES	Yes	Yes
SX	1SX023B(L)	Namco/EA180	Yes	Yes
SX	1SX023B(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX023B(OS)	Conax/N-11135-03	No	Yes
SX	1SX023B(V)	Fshr/Cnt Vlv 657NS/ES	Yes	Yes
SX	1SX025A	GrvCrp/Vlv Act	Yes	Yes
SX	1SX025A(V)	Jmsbry/2" CU Vlv	Yes	Yes
SX	1SX025B	GrvCrp/Vlv Act	Yes	No
SX	1SX025B(V)	Jmsbry/2" Ball Vlv	Yes	Yes
SX	1SX025C	GrvCrp/Vlv Act	Yes	No
SX	1SX025C(V)	Jmsbry/BWS 2236 Vlv	Yes	Yes
SX	1SX027A(L)	Namco/EA180	Yes	Yes
SX	1SX027A(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX027A(OS)	Conax/N-11135-03	No	Yes
SX	1SX027A(V)	Fshr/Cnt Vlv 657NS/ES	Yes	Yes
SX	1SX027B(L)	Namco/EA180	Yes	Yes
SX	1SX027B(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX027B(V)	Fshr/Cnt Vlv 657NS/ES	Yes	Yes
SX	1SX027C(L)	Namco/EA180	Yes	Yes
SX	1SX027C(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX027C(OS)	Conax/N-11135-01	No	Yes
SX	1SX027C(V)	Fshr/Cnt Vlv 657NS/ES	Yes	Yes
SX	1SX029A(L)	Namco/EA180	Yes	Yes
SX	1SX029A(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX029A(OS)	Conax/N-11135-03	No	Yes
SX	1SX029A(V)	Fshr/Cnt Vlv	Yes	Yes
SX	1SX029B(L)	Namco/EA180	Yes	Yes
SX	1SX029B(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX029B(OS)	Conax/N-11135-03	No	Yes
SX	1SX029B(V)	Fshr/Cnt Vlv	Yes	Yes
SX	1SX029C(L)	Namco/EA180	Yes	Yes
SX	1SX029C(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX029C(OS)	Conax/N-11135-01	No	Yes
SX	1SX029C(V)	Fshr/Cnt Vlv 657NS/ES	Yes	Yes
SX	1SX02MA	PathBell/6" Exp Joint	Yes	No
SX	1SX02MB	PathBell/6" Exp Joint	Yes	No
SX	1SX02MC	PathBell/6" Exp Joint	Yes	No
SX	1SX032	A/D/2.50GLOBE VLV	Yes	No
SX	1SX033(L)	Namco/EA180	Yes	Yes
SX	1SX033(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX033(OS)	Conax/N-11135-01	No	Yes
SX	1SX033(V)	Fshr/Cnt Vlv 657NS/ES	Yes	Yes
SX	1SX037(L)	Namco/EA180	Yes	Yes
SX	1SX037(O)	Asco/Vlv 2068323U	No	Yes
SX	1SX037(OS)	Conax/N-11135-03	No	Yes
SX	1SX037(V)	Fshr/Cnt Vlv	Yes	Yes
SX	1SX03MA	PathBell/6" Exp Joint	Yes	Yes
SX	1SX03MB	PathBell/6" Exp Joint	Yes	Yes
SX	1SX041A(L)	Namco/EA180	Yes	Yes

Since the meeting the staff has identified the additional actions required of IP to achieve final resolution of both these issues. Enclosures 3 and 4 contains these actions which have also been informally provided to and discussed with IP on January 20, 1986. IP has stated they understand the staff's position on these issues and will comply with the actions identified in Enclosures 3 and 4. These positions will be sent to IP once they are officially received from the technical review branch.

Original Signed by

Byron L. Siegel, Project Manager
BWR Project Directorate No. 4
Division of BWR Licensing

Enclosure:
As stated

cc: See next page

DISTRIBUTION
Docket File
NRC PDR
Local PDR
PD#4 Reading
WButler
BSiegel
Goddard, OELD
EJordan
BGrimes
ACRS (10)
MTG Participants

*Previously concurred:

PD#4/PM	PD#4/D
*BSiegel:lb	*WButler
03/11/86	03/11/86