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AUTH.NAME AUTHOR AFFILIATION
VAN BRUNT,E.E. Arizona Public Service Co.
RECIP.NAME RECIPIENT AFFILIATION
B NOVAK,T.M. Assistant Director for Licensing

SUBJECT: Forwards results of tests demonstrating operability of purge & vent valves, resolving SER Item II E.4.2. Valves need not be sealed closed & verified closed as stated in NRC 811102 ltr.

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[illegible] Assistant Director for Licensing

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	[illegible] 07	1	1	[illegible] 16	1	1
	[illegible] 12	1	1	[illegible] 19	1	1
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	[illegible] 04	1	1	[illegible]	3	2
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	[illegible] 03	1	1	[illegible]	1	1

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ARIZONA NUCLEAR POWER PROJECT
Post Office Box 2166[illegible]hoenix, Arizona 85036

November 16, 1982
ANPP 22288-WFQ/JYM

Mr. T. M. Novak
Assistant Director for Licensing
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Palo Verde Nuclear Generating Station
(PVNGS) Units 1, 2 and 3
Docket Nos. STN-50-528/529/530
File: 82-056-026; G.1.01.10

Reference: (1) NUREG-0857, "Safety Evaluation Report" related to the Operation of Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2 and 3 dated November, 1981.
(2) NRC letter to E. E. Van Brunt, Jr. from Frank J. Miraglia dated September 23, 1981, Subject: Request for Additional Information - Palo Verde Nuclear Generating Station
(3) APS letter to Robert L. Tedesco from E. E. Van Brunt dated November 2, 1981, Subject: PVNGS

Dear Mr. Novak:

Section II E.4.2 of the referenced (1) SER discussed the evaluation of the operability of the PVNGS purge valves. APS agreed to submit documentation for review to show that the containment power access isolation valves satisfy the operability criteria set forth in Branch Technical Position CSB No. 6-4.

Guidelines for Demonstration of Operability of Purge and Vent Valves were forwarded in reference (2). The enclosure provides the results of testing to satisfy those guidelines.

Demonstration of the various aspects of operability of purge and vent valves were adequately covered by analysis and bench testing. In situ testing was not deemed necessary for demonstrating valve operability. Also, considerations which assured valve design adequacy were included.

B001

PVNGS purge valves satisfy the operability criteria therefore it is not necessary that the valves be sealed closed and verified closed as stated in reference (3).

We believe this information adequately responds to the request made by confirmatory item No. 7 of the subject SER.

If you have any questions concerning this matter, please contact me.

Very truly yours,

E. E. Van Brunt

E. E. Van Brunt, Jr.
APS Vice President,
Nuclear Projects
ANPP Project Director

EEVBJr/JYM/dh
Attachment

cc: A. C. Gehr
L. Bernabei
P. Hourihan
E. Licitra

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPS)

I, A. Carter Rogers, represent that I am Nuclear Engineering Manager of Arizona Public Service Company, that the foregoing document has been signed by me for Edwin E. Van Brunt, Jr., Vice President Nuclear Projects, on behalf of Arizona Public Service Company with full authority so to do, that I have read such document and know its contents, and that to the best of my knowledge and behalf, the statements made therein are true.

A. Carter Rogers
A. Carter Rogers

Sworn to before me this 17th day of November, 1982

David L. Graham
Notary Public

My Commission expires:

My Commission Expires May 19, 1986

My Commission Expires May 19, 1993

GUIDELINES FOR DEMONSTRATION OF OPERABILITY OF PURGE AND VENT VALVES

OPERABILITY

In order to establish operability it must be shown that the valve actuator's torque capability has sufficient margin to overcome or resist the torques and/or forces (i.e., fluid dynamic, bearing, seating, friction) that resist closure when stroking from the initial open position to full seated (bubble tight) in the time limit specified. This should be predicted on the pressure(s) established in the containment following a design basis LOCA. Considerations which should be addressed in assuring valve design adequacy include:

1. Valve closure rate versus time - i.e., constant rate or other.
2. Flow direction through valve; P across valve.
3. Single valve closure (inside containment or outside containment valve) or simultaneous closure. Establish worst case.
4. Containment back pressure effect on closing torque margins of air-operated valve which vent pilot air inside containment.
5. Adequacy of accumulator (when used) sizing and initial charge for valve closure requirements.
6. For valve operators using torque limiting devices - are the settings of the devices compatible with the torques required to operate the valve during the design basis condition.
7. The effect of the piping system (turns, branches) upstream and downstream of all valve installations.
8. The effect of butterfly valve disc and shaft orientation to the fluid mixture egressing from the containment.

Response:

1. Valves close at constant rate in five (5) seconds or less.
2. There are four valves - two valves for inlet power access purge and two valves for outlet power access purge. On a DBA the flow is reversed through the inlet pair and is in normal direction through the outlet pair. The differential pressure across the valves is 43 psi (based on the first pressure peak for a double ended discharge leg slot break at about 15 seconds even though valve is closed in 8.35 seconds, refer to FSAR Figure 6.2.1-3).
3. Valves are simultaneous closure. The worst case was determined to be a single valve closure of the inside containment valve that has a reverse flow during a DBA, with the outside containment valve fixed at the fully-open position. The calculation of the required closing torque for these worst cases valves was determined in an analysis program to be 1,636 inch-pounds.
4. Not applicable since valves are motor operated.
5. Not applicable since valves are motor operated.
6. The torque limiting device will be removed from the valve operator. The valve operator torque rating is 15,600 inch-pounds.
7. The effect of the piping system configuration was considered in the analysis conducted by the vendor. The results are provided in Torque Table 1.
8. The results are provided in Torque Table 1.

DEMONSTRATION

Demonstration of the various aspects of operability of purge and vent valves may be by analysis, bench testing, in situ testing or a combination of these means.

Purge and vent valve structural elements (valve/actuator assembly) must be evaluated to have sufficient stress margins to withstand loads imposed while valve closes during a design basis accident. Torsional shear, shear, bending, tension and compression loads/stresses should be considered. Seismic loading should be addressed.

Once valve closure and structural integrity are assured by analysis, testing or a suitable combination, a determination of the sealing integrity after closure and long term exposure to the containment environment should be evaluated. Emphasis should be directed at the effect of radiation and of the containment spray chemical solutions on seal material. Other aspects such as the effect on sealing from outside ambient temperatures and debris should be considered.

Response:

Demonstration of these valves is done by analysis and bench testing. A seismic analysis has been made and stress margins have been tabulated; i.e., calculated stress versus allowable stress. In all cases the calculated stress was lower than the allowable stress. The above calculations have been made with normal flow conditions. An analysis was conducted under simulated DBA conditions and results are given in Torque Table 1.

The seat or sealing material is an EPT rubber seat material. This material is documented to withstand a radiation level of 1×10^8 at a temperature of $350^{\circ}F$. The seat material is not affected by the containment spray chemical solution.

BENCH TESTING

The following considerations apply when testing is chosen as a means for demonstrating valve operability:

A. Bench testing can be used to demonstrate suitability of the in-service valve by reason of its traceability in design to a test valve. The following factors should be considered when qualifying valves through bench testing.

   1. Whether a valve was qualified by testing of an identical valve assembly or by extrapolation of data from a similarly designed valve.

   2. Whether measures were taken to assure that piping upstream and downstream and valve orientation are simulated.

3. Whether the following load and environmental factors were considered:

   a. Simulation of LOCA
   b. Seismic loading
   c. Temperature soak
   d. Radiation exposure
   e. Chemical exposure
   f. Debris

B. Bench testing of installed valves to demonstrate the suitability of the specific valve to perform its required function during the postulated design basis accident is acceptable.

   1. The factors listed in items A.2 and A.3 should be considered when taking this approach.

Response:

A.1 These valves were qualified by extrapolation of data from a similarly designed valve.

A.2 The effects of piping upstream and downstream and the effect of valve orientation were determined in the analysis conducted by vendor with the DBA flow conditions and are provided in Torque Table 1.

A.3 The bench testing program did consider items 3a, 3b, and 3c. Radiation and chemical exposure have been discussed previously in this response under "DEMONSTRATION."

Debris problems are eliminated by grill covers on all the inlet and outlet duct openings which are inside the containment.

B. Bench testing of installed valves was not used for qualifying these valves.

IN SITU TESTING

In situ testing of purge and vent valves may be performed to confirm the suitability of the valve under actual conditions. When performing such tests, the conditions (loading, environment) to which the valve(s) will be subjected during the test should simulate the design basis accident.

NOTE: Post test valve examination should be performed to establish structural integrity of the key valve/actuator components.

Response

In situ testing was not used for qualifying these valves.

D-37523(D0174-6&7) TORQUE TABLE 1 4 / 6 / 82

JOB:BECHTEL/PALO VERDE
SAT.STEAM/AIR MIXTURE WITH 1.4 LBS STEAM PER 1-LBS AIR
SPEC.GR.= .738255 MOL.WT.= 21.3872 KAPA(ISENT.EXP.)= 1.19775 R= 72.1972
GAS CONSTANT-CALC.
SONIC SPEED(MOVING MIXTR.)= 1322.41 FEET/SEC AT 231 DEG.

ABSOL.MAX.TORQUE(FIRST SONIC)AT 72-68 DG.VLV.ANG.= 1636 IN-LBS @ 68 DEG.
MAX.TORQUE INCLUDES SIZE EFFECT(REYNOLDS NO.ETC)APPX. X 1.08615 FOR 7.5 IN
CH BASIC LINE I.D.
ALL PRESSURES USED:STATIC(TAP)PRESS.-ABSOLUTE;P2 INCL.RECOVERY PRESS.
(TORQUE)CALC'S VALIDITY:P1/P2>1.07;

VALVE TYPE: 8"-1200 CLASS 150
DISC SIZE: 7.2 INCHES OFFSET ASYMMETRIC DISC
SHAFT DIA.: 1.125 INCHES.
BEARING TYPE: BRONZE
SEATING FACTOR: 15
INLET PRESS.VAR.MAX.: 57.7 PSIA
OUTLET PRESSURE(P6): 17.15 PSIA (72 DEG. ACTUAL PRESS.ONLY(VAR.))
MAX.ANG.FLOW RATE: 12613.8 CFM; 21803.4 SCFM; 1198.59 LB/MIN
CRIT.SONIC FLOW-90DG: 863.881 LB/MIN AT 20.2108 INLET PSIA
VALVE INLET DENSITY: 9.50220E-02 LB/FT^3-MIN. .162356 LB/FT^3-MAX.
FULL OPEN DELTA P: 16.0668 PSI
SYSTEM CONDITIONS:
PIPE IN-PIPE-OUT -AND- AIR/STEAM MIXTURE SERVICE @ 231 DEG.F
MINIMUM 0.75 DIAM. PIPE DOWNSTREAM FROM CENT.LINE SHAFT.

P1 ABS. PRESSURE(ADJ.)FOLLOWS TIME/PRESS.TRANSIENT CURVE.

ANGLE APPRX.	P1 PSIA	P2 PSIA	DELP PSI	PRESS. RATIO	FLOW (SCFM)	FLOW (LB/MIN)	TD ----INCHES----	TB+TH	TIME(LOCA) TD-TB-TH	SEC.
90	33.77	15.95	17.82	.472 CR	21803	1198	599	44	554	3.35
85	37.33	14.99	22.33	.402 CR	25462	1399	881	62	819	3.78
80	40.11	15.02	25.09	.374 CR	26633	1464	932	66	866	4.21
75	42.53	15.02	27.51	.353 CR	26651	1465	1389	98	1290	4.60
72	43.82	14.99	28.84	.342 CR	25781	1417	1762	125	1636	4.82
70	44.62	14.98	29.64	.336 CR	24639	1354	1700	120	1580	4.96
65	46.37	14.92	31.45	.322 CR	22162	1218	1630	115	1514	5.27
60	47.76	14.87	32.89	.311 CR	19035	1046	1272	101	1170	5.52
55	48.76	14.82	33.95	.304 CR	16040	881	1102	120	982	5.70
50	49.38	14.78	34.59	.299 CR	13140	722	854	137	716	5.81
45	49.58	14.76	34.82	.298 CR	12875	707	831	152	679	5.85
40	49.73	14.74	34.99	.296	8799	483	537	165	371	5.89
35	50.18	14.72	35.46	.293	6896	379	326	179	147	6.00
30	50.90	14.71	36.19	.289	5126	281	184	194	-9	6.18
25	51.86	14.71	37.15	.284	3675	202	123	210	-86	6.43
20	53.00	14.70	38.29	.277	2324	127	95	228	-132	6.74
15	54.25	14.70	39.55	.271	1335	73	37	242	-205	7.10
10	55.54	14.70	40.84	.265	642	35	22	255	-232	7.49
5	56.77	14.70	42.07	.259	213	11	16	266	-249	7.92
0	57.70	14.70	43.00	.255	0	0	1089	246	843	8.35

--5 IN.MODEL EQUIV.VALUES------ACTUAL SIZE VALUES-----

SEATING + BEARING + HUB SEAL TORQUE (M/M)= 1089 IN-LBS @ 0 DEG.
MAX.DYN. - BEARING - HUB SEAL TORQUE (M/M) = 1636 IN-LBS @ 70 DEG.