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CURTIS,N.W. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Licensing Branch 2

SUBJECT: Requests confirmation of util understanding of NRC actions arising from 820520 meeting of Mark II owners & NRC re vacuum actuation load due to pool swell.Handouts encl.

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JUN 04 1982

Docket Nos. 50-387
50-388

A. Schwencer, Chief
Licensing Branch No. 2
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION
VACUUM BREAKER (VB) ACTUATION DUE
TO POOL SWELL
ER 100450 FILE 171-M-149, 172-07
PLA- 1119

Dear Mr. Schwencer:

On May 20, 1982, the Mark II Owners and PP&L met with the NRC to discuss the VB actuation load due to pool swell.

During our plant unique presentation, we informed you of the following:

- Based on the conservative 5.5 PSID uplift differential pressure during pool swell, our VB's are not ASME qualified to the VB actuation impact load.

- PP&L participates in the AGCO VB Test Program and will retrofit the Phase 3A redesign to qualify the VB to the pool swell actuation load developed from the subject program. The VB fix consists of a linkage change to reduce the disc impact velocities, and change out of the highly stressed valve intervals.

- The complete VB fix will not be available until after the date at which the VB must be "operable" per the Technical Specifications (Mode 3: greater than 200°F reactor temperature).

- As a result, we presented the basis for justifying plant operation beyond Mode 3 with the existing VB's as:

  - Implement linkage change prior to Mode 3.
  - Successful completion of VB impact test which subjects the VB to the impact velocities predicted for pool swell with the linkage change (Phase IV tests). The VB tested will be identical to the partially modified VB which will exist in SSES beyond Mode 3. If the VB passes a post test acceptance criteria (i.e. maintains leak tightness and operability), we believe the VB is functionally qualified to the pool swell actuation load. We expect results from the Phase IV test in June 1982.

B001

- Most of the highly stressed components were changed out as a result of our SQRT evaluation (new shaft, shaft keys, arm turnbuckle and column).

- Implement remaining VB changes for full ASME qualification at first refueling.

- The pool swell event is caused by a major break size LOCA (i.e: guillotine rupture of a RCL or MSL), which is an extremely improbable event during the interim time period required to implement the total VB fix.

- The VB impact velocities determined for pool swell are based on the conservative uplift differential pressure of 5.5 PSID. PP&L has initiated an analytical effort to justify both a lower uplift differential pressure and lower VB impact velocities. Results will be available in June 1982.

We understand that you provided the following comments on our approach:

- o You will allow plant operation beyond Mode 3 with the existing VB's, if PP&L successfully completes the above actions.

- o PP&L will meet with the NRC to discuss the results of the Phase IV VB impact tests in early July 1982.

The attached contains the hand-outs for the subject meeting.

Very truly yours,

N. W. Curtis
Vice President - Engineering & Construction

Copy to:
Farouk Eltawalia NRC

PAF:mcr

Response Required: No

PP&L VACCUM BREAKER QUALIFICATION

INTRODUCTION

PRIMARY CONTAINMENT VACUUM BREAKERS MUST BE QUALIFIED TO ALL POSTULATED LOADS:

- O DYNAMIC LOADS (SEISMIC, CHUGGING, AND CO)
- O PRESSURE AND DEADWEIGHT
- O VB CYCLING DUE TO CHUGGING
- O RECENTLY IDENTIFIED VB ACTUATION DUE TO POOL SWELL

AT THIS TIME, VB IS ASME QUALIFIED TO ALL LOADS EXCEPT VB ACTUATION DUE TO POOL SWELL BASED ON A CONSERVATIVE UPLIFT DIFFERENTIAL PRESSURE OF 5.5 PSID

- O NUS COMPLETED SQRT EVALUATION WHICH INDICATES VB CAN ACCEPT DYNAMIC, PRESSURE AND DEADWEIGHT LOADS
- O CAPPING VB DOWNCOMERS ELIMINATES VB CYCLING DUE TO CHUGGING

AS A RESULT, AGCO DEVELOPED VB FIX TO QUALIFY VB TO POOL SWELL LOAD:

- O LINKAGE CHANGE TO REDUCE DISC IMPACT VELOCITIES FOR SAME FORCING FUNCTION DUE TO POOL SWELL
- O CHANGE OUT OF HIGHLY STRESSED VALVE INTERNALS

HOWEVER, COMPLETE VB FIX WILL NOT BE AVAILABLE UNTIL AFTER THE DATE AT WHICH VB MUST BE "OPERABLE" PER THE TECHNICAL SPECIFICATIONS (MODE 3: GREATER THAN 200°F REACTOR TEMP)

PP&L VACUUM BREAKER QUALIFICATION

INTRODUCTION(CONT)

THUS, FOR VB IMPACT VELOCITIES PREDICTED FOR 5.5 PSID UPLIFT PRESSURE, MUST JUSTIFY INTERIM PLANT OPERATION BEYOND MODE 3 WITH EXISTING VB's BASED ON:

- IMPLEMENTING LINKAGE CHANGE PRIOR TO MODE 3
- SUCCESSFUL COMPLETION OF VB IMPACT TEST WHICH SUBJECTS VB TO DISC IMPACT VELOCITIES PREDICTED FOR PRESENT VB WITH LINKAGE CHANGE (8 RAD/SEC FOR CLOSING AND 10 RAD/SEC FOR OPENING)
- THE IMPACT VELOCITIES ARE DETERMINED FROM AN UNREALISTIC AND CONSERVATIVE UPLIFT PRESSURE DIFFERENTIAL TIME HISTORY
- IMPLEMENT REMAINING VB CHANGES AT FIRST REFUELING OUTAGE

PP&L V.B. QUALIFICATION
SQRT PROGRAM

- o VB's ARE SUBJECTED TO THE FOLLOWING LOADS
  - CONTAINMENT INERTIAL LOADS DUE TO SSE
  - CONTAINMENT INERTIAL LOADS DUE TO CO AND CHUGGING
  - CONTAINMENT INERTIAL LOADS CAUSED BY ACTUATION OF ADS VALVES
  - DIRECT SUBMERGED STRUCTURE DRAG LOADS ON THE VB DOWNCOMERS CAUSED BY ADS, CO AND CHUGGING
  - CHUGGING LATERAL TIP LOAD AT EXIT OF DOWNCOMERS
  - TRADITIONAL DEAD WEIGHT AND PRESSURE LOADS
- o PERFORMED EVALUATION OF VB'S TO THE ABOVE LOADS
- o RESULTS INDICATED THE VB's COULD BE EASILY MODIFIED TO ACCOMODATE ABOVE LOADS
  - COLUMN
  - SHAFT
  - SHAFT KEYS
  - ARM TURNBUCKLE
- o SSES VB's HAVE BEEN MODIFIED ACCORDINGLY

PP&L V.B. QUALIFICATION

CHUGGING CYCLING LOADS

- IN ADDITION, VB CYCLING DUE TO CHUGGING CAUSES ADDITIONAL LOADING
- CREARE IS USING OUR GKM II-M CHUGGING DATA TO PREDICT VB OPENING AND CLOSING IMPACT VELOCITIES
- PRELIMINARY RESULTS INDICATED THESE LOADS TO BE SIGNIFICANT
- THESE LOADS MUST BE COMBINED WITH LOADS FROM SORT
- QUALIFICATION OF VALVE DID NOT LOOK PROMISING, THEREFORE, PP&L DECIDED TO CAP VB DOWNCOMERS TO ELIMINATE VB CYCLING DUE TO CHUGGING
- CAPPING AS A FIX TO THE CHUGGING CYCLING LOADS PRESENTED AT NOVEMBER 18, 1981 NRC/MARK II MEETING
- SSES CAPPING IS COMPLETE

PP&L V.B. QUALIFICATION

POOL SWELL ACTUATION LOADS

- BASED ON CONSERVATIVE 5.5 PSID UPLIFT PRESSURE, VB NOT ASME QUALIFIED TO VB IMPACT VELOCITIES PREDICATED FOR POOL SWELL
- AGCo DEVELOPED VB FIX FOR POOL SWELL ACTUATION LOADS.
- FIX CONSISTS OF TWO PHASES
  - THE FIRST PHASE REPLACES 4-BAR LINKAGE WITH A SINGLE LINK TO PROVIDE RESTORING TORQUE CHARACTERISTIC THAT REDUCES IMPACT VELOCITIES.
  - HOWEVER, BASED ON PREVIOUS IMPACT TESTING, REDUCED IMPACT VELOCITIES STILL CAUSE OVERSTRESS CONDITIONS IN SOME VB COMPONENTS
  - BECAUSE OF THIS, THE SECOND PHASE REPLACES CRITICAL COMPONENTS
    - REPLACE THE FOLLOWING COMPONENTS WITH BASICALLY THE SAME DESIGN, BUT STONGER MATERIAL
      - SHAFT
      - KEYS
      - TURNBUCKLE
      - ARM ASSEMBLY
    - FOR SSES, ABOVE CHANGES EXCEPT ARM ASSEMBLY ALREADY IMPLEMENTED FROM SQRT EVALUATION.
    - NEW DISC ASSEMBLY TO ACCOMODATE CLOSING IMPACT LOADS
    - NEW SHAFT BEARING CAPS

- BASED ON SSES START-UP SCHEDULE NEW DISC NOT AVAILABLE UNTIL AFTER PLANT CONDITION WHICH REQUIRES VB'S OPERABLE PER THE TECHNICAL SPECIFICATIONS (MODE 3)
- HOWEVER, PP&L WILL COMMIT TO A COURSE OF ACTION WHICH WE ARE CONFIDENT WILL ASSURE A FUNCTIONAL VALVE

PP&L VACUUM BREAKER QUALIFICATION

JUSTIFICATION FOR INTERIM PLANT OPERATION

- PP&L COMMITS TO THE FOLLOWING TO JUSTIFY PLANT OPERATION BEYOND A MODE 3 WITH EXISTING VB
  - IMPLEMENTING SINGLE BAR LINKAGE PRIOR TO MODE 3
  - FUNCTIONALLY QUALIFY EXISTING VB BY SUBJECTING VB TO DISC IMPACT VELOCITIES PREDICATED FOR POOL SWELL, EXCEPT TEST RESULTS BY EARLY JUNE 1982.
  - COMPLETE REMAINING VB CHANGES AT FIRST REFUELING OUTAGE (NEW DISC, ARM ASSEMBLY & BEARING CAPS)

- WE BELIEVE ABOVE COMMITMENTS JUSTIFY INTERIM PLANT OPERATION WITH EXISTING VB's, SINCE
  - EXISTING VB ASME QUALIFIED TO ALL POSTULATED LOADING CONDITIONS, EXCEPT POOL SWELL ACTUATION
  - POOL SWELL ACTUATION CAUSED BY MAJOR BREAK SIZE LOCA (I.E GUILLOTINE RUPTURE OF RCL OR MSL), WHICH IS AN EXTREMELY IMPROBABLE EVENT DURING THE INTERIM TIME PERIOD REQUIRED TO IMPLEMENT THE TOTAL VB FIX
  - IMPLEMENTING SINGLE BAR LINKAGE REDUCES IMPACT VELOCITIES TO "TOLERABLE" LEVEL
  - MOST HIGHLY STRESSED COMPONENTS REPLACED AS A RESULT OF SQRT EVALUATION
  - REMAINING COMPONENTS FUNCTIONALLY QUALIFIED, WHEN VB PASSES IMPACT ACCEPTANCE CRITERIA
  - WETWELL/DRYWELL DIFFERENTIAL TIME HISTORY USED TO PREDICT IMPACT VELOCITIES DUE TO POOL SWELL BASED ON UNREALISTIC 5.5 PSID UPLIFT PRESSURE
    - GKM II-M DATA SHOWS 0 UPLIFT PRESSURE
    - 4T-CO DATA SHOWS NO UPLIFT PRESSURE
    - MAJORITY OF PROTOTYPICAL LOCA TEST DATA SHOWS NO UPLIFT PRESSURE

PP&L V.B. QUALIFICATION

CONCLUSION

- THEREFORE PP&L CONCLUDES THAT THE ABOVE PROGRAM RESULTS IN A VB WHICH IS ASME QUALIFIED FOR ALL POSTULATED LOADS EXCEPT THE POOL SWELL ACTUATION BASED ON A CONSERVATIVE 5.5 PSID UPLIFT PRESSURE FOR WHICH WE COMMIT

  - TO PERFORM HARDWARE MODIFICATIONS AND FUNCTIONAL TESTING TO ASSURE A SAFE AND FUNCTIONAL VB PRIOR TO MODE 3, AND

  - TO COMPLETE REMAINING HARDWARE CHANGES RESULTING IN AN ASME QUALIFIED VB AT FIRST REFUELING OUTAGE (NEW DISC AND BEARING CAP)

- IN ADDITION, PP&L IS PURSUING AN EFFORT TO TECHNICALLY JUSTIFY A MORE REALISTIC AND REDUCED UPLIFT DIFFERENTIAL PRESSURE FOR DETERMINING THE VB IMPACT VELOCITIES.