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SUBJECT: Forwards revised Section 3.6A of FSAR re analysis for HPCI & RCIC pump rooms. Info will be incorporated into next FSAR amend.

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Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
FSAR SECTION 3.6A
ER 100508 FILE 841-1
PLA-1866 Docket No. 50-388

Dear Mr. Schwencer:

In order to support obtaining an operating license for Susquehanna SES Unit 2, enclosed is revised Section 3.6A of the Susquehanna SES FSAR. This section provides the revised analysis for the Unit 2 HPCI and RCIC pump rooms. It also corrects some typographical errors. This revision will be incorporated in the next amendment to the FSAR.

Very truly yours.

N. W. Curtis
Vice President-Engineering & Construction-Nuclear

Enclosure

cc: R. L. Perch NRC

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APPENDIX 3.6A

PIPE BREAK OUTSIDE CONTAINMENT
SUMMARY OF ANALYSIS AND RESULTS

PART I - ANALYSIS FOR SPACES OTHER THAN MAIN STEAM TUNNEL

In addition to the analysis provided in Table 3.6-3, compartments containing high energy lines were analyzed to determine the peak pressures that might result from breaks in these lines. The analysis was done mainly to verify structural integrity. Duration of the blowdown was not a factor in the analysis since adequate vent area was provided, and pressure peaked quickly then declined to a lower steady state value. The structures are adequate to withstand the peak pressures indicated by the analysis.

The valves which would be used to terminate the blowdown are indicated. In general, however, it is unnecessary to qualify equipment for the pipe break environment because the safeguards systems are separated into compartments which are vented directly to the atmosphere and high energy breaks affect only a single space. The plant can be safely shutdown using equipment not affected by the high energy line break.

The following information for each compartment was utilized with the analytical techniques described in Appendix 6B of the FSAR to determine the pressures and temperatures resulting from high energy line breaks outside containment.

ANALYSIS FOR HPCI PENETRATION ROOM (UNIT 1)

Pipe Break Data

Location: HPCI Penetration Room
Line Identification/Size: DBB-114/10"

Isolation Valve Designation and Location: HV E41-1F003 located in the HPCI Penetration Room

Blowdown Data:

t(sec)	m(lbm/sec)	h(BTU/lbm)
0.0	1892	1192.2
0.1	1892	1192.2
0.1	1353	1192.2
0.2	1353	1192.2
0.2	738	1192.2
0.882	738	1192.2
0.882	407	1192.2
51.0	0	1192.2

Compartment Volume: 87,680 cu ft

Vent Area: 67.0 sq ft

Vent Coefficient: .574
L/A = 0.0022 Ft^{-1}

Results: Peak Pressure: 2.12 psig
Peak Temperature: 288.4 F

ANALYSIS FOR HPCI PUMP ROOM (UNIT 1)

Pipe Break Data

Location: HPCI Pump Room
Line Identification/Size: DBB-114/10"

Isolation Valve Designation and Location: HV E41-1F003 located in the HPCI Penetration Room

Blowdown Data:

t(sec)	m(lbm/sec)	h(BTU/lbm)
0.0	1892	1192.2
.088	1892	1192.2
.088	1402	1192.2
.164	1402	1192.2
.164	946	1192.2
.218	946	1192.2
.218	283	1192.2
50.0	0	1192.2

Compartment Volume: 27,883 cu ft

Vent Area: 60 sq ft

Vent Coefficient: .575
L/A = 0.0172Ft^{-1}

Results: Peak Pressure: 4.11 psig
Peak Temperature: 298.6 F

ANALYSIS FOR RCIC PUMP ROOM (UNIT 1)

Pipe Break Data

Location: RCIC Pump Room
Line Identification/Size: DBB-109/4"

Isolation Valve Designation and Location: HV-E51-1F008 Located in the HPCI Penetration Room

Blowdown Data:

t (sec)	m (Lbm/sec)	h (BTU/Ibm)
0.0	286.6	1192.2
0.024	286.6	1192.2
0.024	218.5	1192.2
0.042	218.5	1192.2
0.042	143.3	1192.2
0.278	143.3	1192.2
0.278	29	1192.2
7.6	29	1192.2
28.0	0	1192.2

Compartment Volume: 18,129 cu ft

Vent Area: 46.0 sq ft

Vent Coefficient: .575
L/A = 0.0426 Ft^{-1}

Results: Peak Pressure: 0.52 psig
Peak Temperature: 238.3 F

ANALYSIS FOR RHR ROOM A (UNIT-1)

Pipe Break Data

Location: RHR Room A
Line Identification/Size: DBB-115/10"

Isolation Valve Designation and Location: HV E41-1F003 located in the HPCI Penetration Room

Blowdown Data:

t (sec)	m (lbm/sec)	h (BTU/lbm)
0.0	1892	1192.2
.092	1892	1192.2
.092	1336	1192.2
.151	1336	1192.2
.151	738	1192.2
.261	738	1192.2
.261	348	1192.2
1.7	348	1192.2
52.0	0	1192.2

Compartment Volume: 48,554 cu ft

Vent Area: 85 sq ft

Vent Coefficient: .575
L/A = 0.0098 Ft-1

Results: Peak Pressure: 2.16 psig
Peak Temperature: 297.1 F

ANALYSIS FOR RHR ROOM B (UNIT 1)

Pipe Break Data

Location: RHR Room B
Line Identification/Size: DBB-115/8"

Isolation Valve Designation and Location: HV E41-1F003 located in the HPCI Penetration Room

Blowdown Data:

t (sec)	m (lbm/sec)	h (BTU/lbm)
0.0	1892	1192.2
0.023	1892	1192.2
0.023	946	1192.2
0.222	946	1192.2
0.222	255	1192.2
2.6	255	1192.2
53.0	0	1192.2

Compartment Volume: 60,000 cu ft

Vent Area: 85 sq ft

Vent Coefficient: .575
L/A = 0.0076 Ft^{-1}

Results: Peak Pressure: 1.33 psig
Peak Temperature: 287.4 F

ANALYSIS FOR REACTOR WATER CLEANUP SYSTEM (RWCS) PENETRATION ROOM

Pipe Break Data

Location: RWCS Penetration Room
Line Identification/Size: DBC-101/6"

Isolation Valve Designation and Location: HV G33-1F004 in RWCS Penetration Room

Blowdown Data:

t(sec)	m(lbm/sec)	h(BTU/lbm)
0.0	3630	513
0.063	3630	513
0.063	2450	513
.11	2450	513
.11	1085	513
.843	1085	513
.843	450	513
30.0	0	513

Compartment Volumes:

Arch. Room No.	Volume (Cu. Ft.)
I-501	5552
I-502	2540
I-503	2540
I-504	4933
I-505	4850

Flow Path	Area (Ft^2)	Flow Coefficient	L/A (Ft^1)
I-501 to ATM	45	0.575	0.0426
I-501 to I-503	64	0.711	0.0327
I-503 to I-504	64	0.682	0.0580
I-504 to I-505	150	0.709	0.0169
I-503 to I-502	53	0.745	0.0854

Results:

Arch. Room No.	Peak Pressure (PSIG)	Peak Temp. (°F)
I-501	2.14	211.7
I-502	2.07	113.9
I-503	2.14	154.4
I-504	2.27	113.3
I-505	2.31	132.3

Note: The RWCS penetration room I-501, communicates with the two RWCS Pump Rooms, I-502 and I-503 (vol. 2,540 cu ft each), the Regenerative Heat Exchanger Room, I-504 (vol. 4,933 cu ft), and the Non-regenerative Heat Exchanger Room, I-505, (vol. 4,850 cu ft). A break in the RWCS penetration room results in a more severe environment than a break in any other room; therefore, only results for this break are presented.

Analysis for Compartment Pressurization in Unit 2 is identical to Unit 1, with the exception of breaks in the HPCI and RCIC Rooms. These analyses are presented below.

ANALYSIS FOR RCIC PUMP ROOM (UNIT 2)

Pipe Break Data

Location: RCIC Pump Room
Line Identification/Size: DBB-209/4"

Isolation Valve Designation and Location: HV-E51-2F008 located in HPCI Penetration Room

Blowdown Data:

t(sec)	m(lbm/sec)	h(BTU/lbm)
0	286	1192.2
.024	286	1192.2
.0241	215	1192.2
.045	215	1192.2
.0451	143	1192.2
.278	143	1192.2
.2781	29.2	1192.2
7.6	29.2	1192.2
27.6	0	1192.2

Compartment Volumes:

RCIC	18129 Cu. Ft.
HPCI	27880 Cu. Ft.

Tunnel 2650 Cu. Ft.

Flow Path	Area (Ft^2)	Flow Coefficient	L/A (Ft^1)
RCIC to Tunnel	25	0.76	0.381
Tunnel to HPCI	72	0.83	0.399
Tunnel to ATM	45	0.92	0.319

Results:

Room	Peak Pressure (PSIG)	Peak Temp. (°F)
RCIC	0.69	217.85
HPCI	0.533	105.69
Tunnel	0.531	203.25

Notes:

A break in the RCIC pump room results in a change in environment to the HPCI pump room via connection of the tunnel to both rooms. Therefore, peak pressures are shown for all three compartments.

ANALYSIS FOR HPCI PUMP ROOM (UNIT 2)

Pipe Break Data

Location: HPCI Pump Room
Line Identification/Size: DBB-214/10"

Isolation Valve Designation and Location: HV-E41-2F003 located in the HPCI Penetration Room

Blowdown Data:

t (sec)	m (lbm/sec)	h (BTU/lbm)
0	1892	1192.2
.07	1892	1192.2
.0701	1412	1192.2
.127	1412	1192.2
.12701	946	1192.2
.223	946	1192.2
.22301	284	1192.2
50.0	0	1192.2

Compartment Volumes:

HPCI	27880 Cu. Ft.
RCIC	18129 Cu. Ft.
Tunnel	2650 Cu. Ft.

Flow Path	Area (FT^2)	Flow Coefficient	L/A (Ft^1)
HPCI to Tunnel	72	0.83	0.399
Tunnel to RCIC	25	0.78	0.381
Tunnel to ATM	45	0.92	0.319

Results:

Room	Peak Pressure (PSIG)	Peak Temp. (°F)
HPCI	3.83	299.35
RCIC	1.98	123.27
Tunnel	2.52	299.11

Notes:

A break in the HPCI pump room results in a change in environment to the RCIC pump room via connection of the tunnel to both rooms. Therefore, peak pressures are shown for all three compartments.

PART II - ANALYSIS OF MAIN STEAM LINE BREAKS IN THE MAIN STEAM LINE TUNNEL

Subcompartment differential pressure analysis were performed for the main steamline tunnel. Two break locations were chosen to render the design of each portion of the tunnel (viz. - Reactor and Turbine Building sides) conservative. They are:

Case A. MSLB in the Reactor Building.
(24" DBB-103 at El. 719'-8", 1st elbow)

Case B. MSLB in the Turbine Building.
(24" DBB-103 at El. 719'-8", 2nd elbow)

The pressure and temperature response of these areas to the postulated pipe breaks are predicted using the analytical model described in Appendix 6B with the changes described below. The Appendix 6B model ignores "momentum effects" within a subcompartment. For most cases considered, this is justified as the momentum effects are insignificant relative to the absolute pressure peaks. However, momentum effects are important to