
DATABASE FOR PROBABILISTIC RISK ASSESSMENT OF LIGHT WATER NUCLEAR POWER PLANTS

Maintenance Data

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GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPMSD

Sheet 1 of 3

Maintenance Duration: Pumps — 72-Hour Technical Specifications

Discrete Probability Distribution:

| Bin | Mean Maintenance Duration | Probability | Cumulative Probability |
|-----|---------------------------|-------------|------------------------|
| 1 | 8.6119E-01 | 2.3840E-02 | 2.3840E-02 |
| 2 | 1.2247E+00 | 3.2342E-02 | 5.6182E-02 |
| 3 | 1.7321E+00 | 4.0407E-02 | 9.6589E-02 |
| 4 | 2.4495E+00 | 9.1117E-02 | 1.8771E-01 |
| 5 | 3.4641E+00 | 9.1531E-02 | 2.7924E-01 |
| 6 | 4.4721E+00 | 8.4503E-02 | 3.6374E-01 |
| 7 | 5.4772E+00 | 7.5101E-02 | 4.3884E-01 |
| 8 | 6.9282E+00 | 1.2233E-01 | 5.6117E-01 |
| 9 | 8.9443E+00 | 9.1366E-02 | 6.5253E-01 |
| 10 | 1.0954E+01 | 6.8432E-02 | 7.2097E-01 |
| 11 | 1.3416E+01 | 7.3063E-02 | 7.9403E-01 |
| 12 | 1.7321E+01 | 7.4332E-02 | 8.6836E-01 |
| 13 | 2.2361E+01 | 4.2477E-02 | 9.1084E-01 |
| 14 | 2.7386E+01 | 2.6009E-02 | 9.3685E-01 |
| 15 | 3.4641E+01 | 2.8187E-02 | 9.6503E-01 |
| 16 | 4.4721E+01 | 1.3696E-02 | 9.7873E-01 |
| 17 | 6.7082E+01 | 1.6360E-02 | 9.9509E-01 |
| 18 | 1.0817E+02 | 3.1592E-03 | 9.9825E-01 |
| 19 | 1.6125E+02 | 1.2827E-03 | 9.9953E-01 |
| 20 | 2.1634E+02 | 4.6754E-04 | 1.0000E+00 |

| Mean | Variance | 5th Percentile | 50th Percentile | 95th Percentile |
|------------|------------|----------------|-----------------|-----------------|
| 1.1140E+01 | 2.0630E+02 | 1.1553E+00 | 6.2027E+00 | 3.0771E+01 |

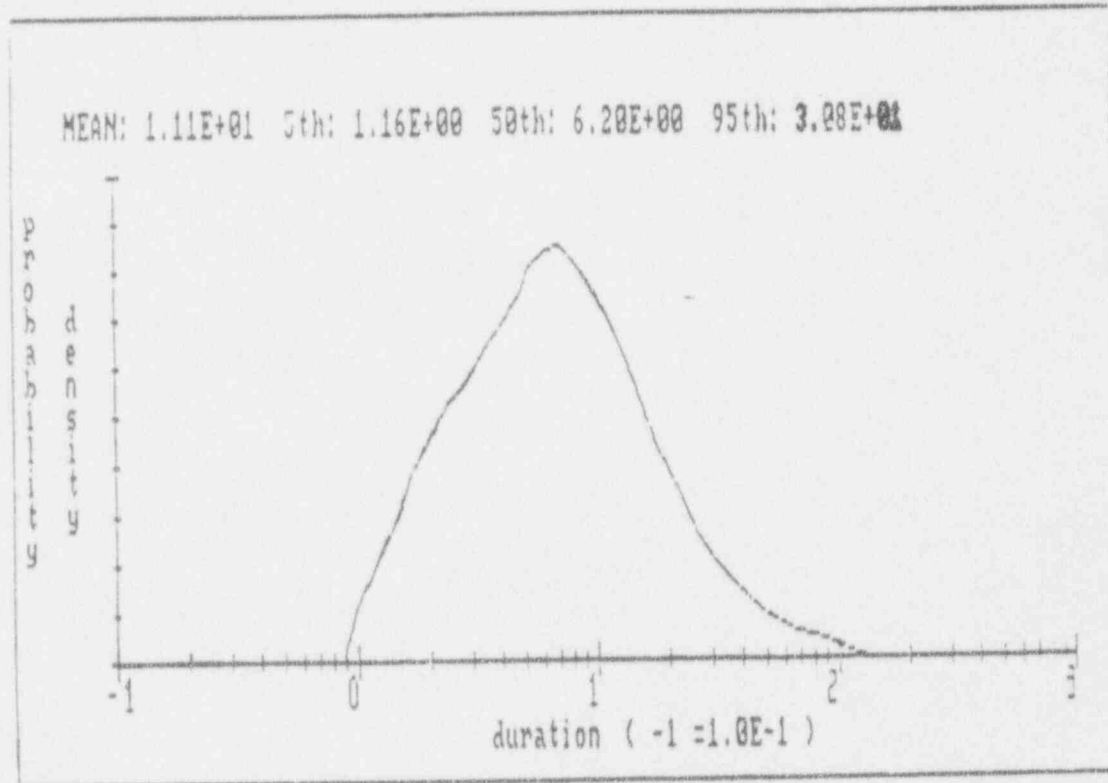
Type: DPD

Reference: PGE.1123 > DATA.PHASE3 > MAINT.REV1 (Diablo)

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPMSD

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GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPMSD

Sheet 3 of 8

Description: This distribution was developed using the following data:

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|---------------------|--------------|---------------|---|-------|-----------|--------|--------------|
| TMI-2 | RB Spray Pump | 72 | 11 | 29.5 1.7 8.5 6.2 6.0 4.0 10.0 5.5 3.0 58.0 6.5 | 12.63 | 16.03 | 11.79 | 1.34 |
| TMI-2 | Decay Heat CCW Pump | 72 | 14 | 3.8 0.33 3.5 2.0 1.0 1.0 0.8 0.25 0.25 3.0 1.5 1.3 1.7 1.0 | 1.53 | 1.12 | 1.50 | 1.38 |
| TMI-2 | EFW Pump | 72 | 17 | 1.5 2.5 2.75 0.67 1.25 3.3 3.5 2.2 2.5 4.0 4.25 1.0 1.5 3.5 1.5 1.3 2.3 | 2.32 | 1.06 | 2.31 | 1.20 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPMSD

Sheet 4 of 8

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|-----------------|--------------|---------------|------------------|-------|-----------|--------|--------------|
| BEZ | AFW Pump | 72 | 27 | 2 | 5.56 | 6.43 | 5.42 | 1.44 |
| | | | | 1 | | | | |
| | | | | 1 | | | | |
| | | | | 0 | | | | |
| | | | | 5 | | | | |
| | | | | 29 | | | | |
| | | | | 3 | | | | |
| | | | | 23 | | | | |
| | | | | 8 | | | | |
| | | | | 7 | | | | |
| | | | | 2 | | | | |
| | | | | 3 | | | | |
| | | | | 1 | | | | |
| | | | | 1 | | | | |
| | | | | 1 | | | | |
| | | | | 2 | | | | |
| | | | | 2 | | | | |
| | | | | 1 | | | | |
| | | | | 4 | | | | |
| | | | | 5 | | | | |
| | | | | 1 | | | | |
| | | | | 7 | | | | |
| | | | | 7 | | | | |
| | | | | 9 | | | | |
| | | | | 9 | | | | |
| | | | | 5 | | | | |
| | | | | 3 | | | | |
| OCON | HPI Pump A or B | 72 | 1 | 24 | 24.00 | 0.00 | 24.00 | 2.00* |
| TMI-2 | DHR Pump | 72 | 30 | 2.0 | 8.20 | 8.22 | 8.06 | 1.35 |
| | | | | 4.5 | | | | |
| | | | | 2.0 | | | | |
| | | | | 3.25 | | | | |
| | | | | 2.5 | | | | |
| | | | | 12.0 | | | | |
| | | | | 3.2 | | | | |
| | | | | 2.0 | | | | |
| | | | | 4.16 | | | | |
| | | | | 1.5 | | | | |
| | | | | 7.0 | | | | |
| | | | | 5.0 | | | | |
| | | | | 3.0 | | | | |
| | | | | 2.0 | | | | |
| | | | | 0.3 | | | | |
| | | | | 7.0 | | | | |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPMSD

Sheet 5 of 8

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|-----------------------------|--------------|---------------|---|-------|-----------|--------|--------------|
| TMI-2 | DHR Pump (continued) | | | 6.2 19.15 6.45 43.50 9.45 19.45 8.40 10.50 7.30 12.15 9.20 12.50 15.0 5.3 | | | | |
| TMI-2 | Reactor Building RW Pump | 72 | 73 | 5.0 1.5 1.0 2.0 0.25 3.5 2.0 7.5 4.5 5.2 3.0 5.0 0.7 1.2 2.5 8.0 0.5 4.3 4.25 3.0 10.0 7.0 36.25 39.17 3.58 5.30 3.0 6.0 11.35 8.20 3.15 24.0 9.0 | 11.32 | 9.52 | 11.27 | 1.18 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZNIPMSD

Sheet 6 of 8

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|---|--------------|---------------|------------------|-------|-----------|--------|--------------|
| TMI-2 | Reactor Building RW Pump (continued) | | | 6 15 | | | | |
| | | | | 6 40 | | | | |
| | | | | 30 0 | | | | |
| | | | | 60 0 | | | | |
| | | | | 12 30 | | | | |
| | | | | 15 0 | | | | |
| | | | | 7 3 | | | | |
| | | | | 13 0 | | | | |
| | | | | 16 0 | | | | |
| | | | | 17 20 | | | | |
| | | | | 15 40 | | | | |
| | | | | 14 0 | | | | |
| | | | | 5 3 | | | | |
| | | | | 9 15 | | | | |
| | | | | 6 0 | | | | |
| | | | | 10 0 | | | | |
| | | | | 11 0 | | | | |
| | | | | 14 15 | | | | |
| | | | | 13 0 | | | | |
| | | | | 15 3 | | | | |
| | | | | 15 4 | | | | |
| | | | | 13 0 | | | | |
| | | | | 17 45 | | | | |
| | | | | 16 45 | | | | |
| | | | | 15 20 | | | | |
| | | | | 11 30 | | | | |
| | | | | 20 15 | | | | |
| 16 15 | | | | | | | | |
| 20 25 | | | | | | | | |
| 15 3 | | | | | | | | |
| 15 15 | | | | | | | | |
| 14 0 | | | | | | | | |
| 16 0 | | | | | | | | |
| 14 3 | | | | | | | | |
| 14 3 | | | | | | | | |
| 14 3 | | | | | | | | |
| 14 5 | | | | | | | | |
| 11 45 | | | | | | | | |
| 15 0 | | | | | | | | |
| 8 15 | | | | | | | | |
| TMI-2 | DHRW Pump | 72 | 78 | 5 0 | 12 32 | 10 20 | 12 27 | 1 17 |
| | | | | 1 0 | | | | |
| | | | | 27 75 | | | | |
| | | | | 25 50 | | | | |

GENERIC DATA FOR MAINTENANCE DURATIONS

Sheet 7 of 8

ZMPMSD

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor | |
|-------|--------------------------|--------------|---------------|------------------|------|-----------|--------|--------------|--|
| TMI-2 | DHRW Pump (continued) | | | 2.3 | | | | | |
| | | | | 7.6 | | | | | |
| | | | | 8.0 | | | | | |
| | | | | 8.0 | | | | | |
| | | | | 8.0 | | | | | |
| | | | | 3.5 | | | | | |
| | | | | 1.2 | | | | | |
| | | | | 7.45 | | | | | |
| | | | | 4.8 | | | | | |
| | | | | 4.75 | | | | | |
| | | | | 0.5 | | | | | |
| | | | | 35.5 | | | | | |
| | | | | 3.25 | | | | | |
| | | | | 2.0 | | | | | |
| | | | | 24.0 | | | | | |
| | | | | 3.0 | | | | | |
| | | | | 4.75 | | | | | |
| | | | | 6.0 | | | | | |
| | | | | 36.25 | | | | | |
| | | | | 38.20 | | | | | |
| | | | | 2.5 | | | | | |
| | | | | 10.3 | | | | | |
| | | | | 3.3 | | | | | |
| | | | | 4.0 | | | | | |
| | | | | 3.0 | | | | | |
| | | | | 3.2 | | | | | |
| | | | | 10.3 | | | | | |
| | | | | 17.4 | | | | | |
| | | | | 5.45 | | | | | |
| | | | | 1.25 | | | | | |
| | | | | 55.0 | | | | | |
| | | | | 2.45 | | | | | |
| | | | | 7.20 | | | | | |
| | | 14.0 | | | | | | | |
| | | 14.0 | | | | | | | |
| | | 14.0 | | | | | | | |
| | | 5.3 | | | | | | | |
| | | 5.3 | | | | | | | |
| | | 17.2 | | | | | | | |
| | | 14.35 | | | | | | | |
| | | 17.3 | | | | | | | |
| | | 6.0 | | | | | | | |
| | | 12.0 | | | | | | | |
| | | 11.0 | | | | | | | |
| | | 14.15 | | | | | | | |
| | | 7.3 | | | | | | | |
| | | 13.0 | | | | | | | |
| | | 15.3 | | | | | | | |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPMSD

Sheet 2 of 3

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev | Median | Range Factor |
|--|-----------------------------|--------------|---------------|--|-------|----------|--------|--------------|
| TMI-2 | DHRW Pump (continued) | | | 15.4 13.0 17.45 16.45 15.2 11.30 20.15 16.15 20.25 15.30 15.30 15.15 14.0 16.0 14.3 14.3 14.3 14.5 11.45 15.0 8.15 4.0 5.0 7.3 3.5 10.0 | | | | |
| BEZ | Charging Pump (Two Pumps)** | 72 | 5 | 3 1 3 3 1 | 2.20 | 0.98 | 2.18 | 1.25 |
| OCON | Turbine-Driven EFW Pump | 72 | 9 | 77 48 8 8 24 47 2 24 6 | 27.11 | 23.91 | 26.01 | 1.61 |
| TMI-2 | EFW Pump | 72 | 7 | 10.5 10.5 2.25 4.75 3.0 4.30 5.4 | 5.81 | 3.12 | 5.70 | 1.09 |
| *Range factor judgmentally estimated **Each double maintenance outage treated as two events | | | | | | | | |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPLSD

Sheet 1 of 4

Maintenance Duration: Pumps — 168-Hour Technical Specifications

Discrete Probability Distribution:

| Bin | Mean Maintenance Duration | Probability | Cumulative Probability |
|-----|---------------------------|-------------|------------------------|
| 1 | 1.7687E + 00 | 1.6045E-02 | 1.6045E-02 |
| 2 | 2.6458E + 00 | 3.6537E-02 | 5.2582E-02 |
| 3 | 4.1833E + 00 | 4.8339E-02 | 1.0092E-01 |
| 4 | 6.1237E + 00 | 9.0037E-02 | 1.9096E-01 |
| 5 | 8.6603E + 00 | 8.9113E-02 | 2.8007E-01 |
| 6 | 1.1180E + 01 | 8.1864E-02 | 3.6193E-01 |
| 7 | 1.3693E + 01 | 7.2748E-02 | 4.3468E-01 |
| 8 | 1.7321E + 01 | 1.1898E-01 | 5.5366E-01 |
| 9 | 2.2361E + 01 | 8.9615E-02 | 6.4328E-01 |
| 10 | 2.7386E + 01 | 6.7749E-02 | 7.1102E-01 |
| 11 | 3.4641E + 01 | 9.1991E-02 | 8.0302E-01 |
| 12 | 4.8990E + 01 | 9.3575E-02 | 8.9659E-01 |
| 13 | 7.3485E + 01 | 5.5133E-02 | 9.5172E-01 |
| 14 | 1.0817E + 02 | 2.6318E-02 | 9.7804E-01 |
| 15 | 1.4866E + 02 | 1.0279E-02 | 9.8832E-01 |
| 16 | 2.0616E + 02 | 7.3410E-03 | 9.9566E-01 |
| 17 | 2.7388E + 02 | 1.7124E-03 | 9.9737E-01 |
| 18 | 3.2404E + 02 | 9.3734E-04 | 9.9831E-01 |
| 19 | 3.7417E + 02 | 5.5134E-04 | 9.9886E-01 |
| 20 | 4.5910E + 02 | 1.1379E-03 | 1.0000E + 00 |

| Mean | Variance | 5th Percentile | 50th Percentile | 95th Percentile |
|--------------|--------------|----------------|-----------------|-----------------|
| 2.8694E + 01 | 1.3667E + 03 | 2.5838E + 00 | 1.5684E + 01 | 7.2719E + 01 |

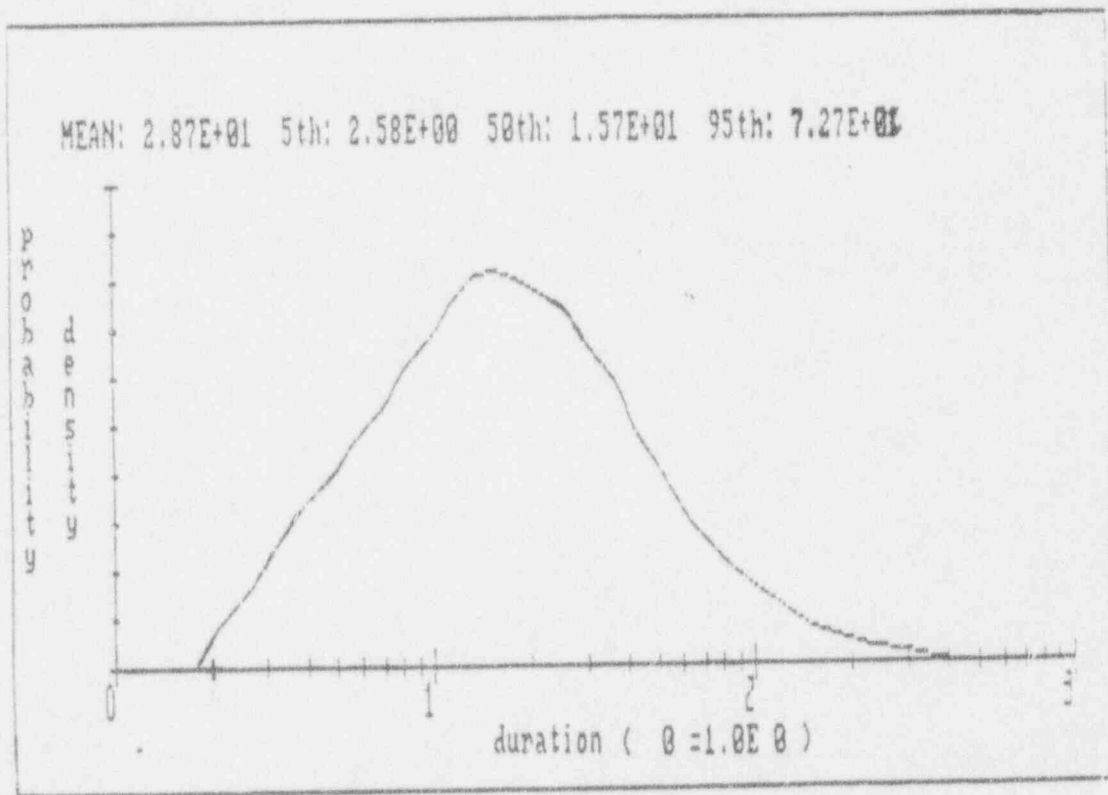
Type: DPD

Reference: PGE.1123 > DATA.PHASE3 > MAINT.REV1 (Diablo)

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPLSD

Sheet 2 of 4



GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPLSD

Sheet 3 of 4

Description: This distribution was developed using the following data:

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|-------------------------|--------------|---------------|---|------------------|-----------|--------|--------------|
| Zion | CS PUMPS | 168 | 7 | 8 8 4 11 34 19 5 | 12.71 | 9.32 | 12.20 | 1.50 |
| OCON | RB Spray Pump A or B | 168 | 4 | 34 5 14 5 | 14.50 | 11.84 | 13.42 | 1.31 |
| Zion | CS Pumps | 168 | 4 | 24 24 8 17 | 18.25 | 8.57 | 17.96 | 1.34 |
| Zion | Centrifugal Chrg. Pumps | 168 | 17 | 48 8 48 96 8 8 8 48 8 8 72 8 78 61 15 56 11 | 34.65 | 29.35 | 33.94 | 1.40 |
| TMI-2 | Fuel Oil Transfer | 168 | 2 | 1.25 3.25 | 2.25 | 1.00 | 2.15 | 1.66 |
| Zion | SI Pumps | 168 | 1 | 24 | 24.00 | 0.00 | 24.00 | 2.00 |
| Zion | RHR Pumps | 168 | 6 | 72 79 96 72 48 97 | 77.33 | 16.61 | 77.04 | 1.15 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPLSD

Sheet 4 of 4

| Plant | Component | Tech. Specs | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|-----------|-------------|---------------|--|-------|-----------|--------|--------------|
| Zion | SW Pumps | 168 | 24 | 8 24 24 8 8 8 8 24 8 8 24 8 8 8 3 19 96 9 8 30 8 8 12 11 | 15.79 | 18.23 | 15.37 | 1.47 |

DATA EVALUATION:

PCC AND SERVICE WATER DATA VARIABLE

ZMPJOR ZMPSWD

(ZMPCCD = variable name used
for PCC, same distribution
as ZMPSWD)

References

- (1) Engineering Evaluation 92-09, Rev 2., dated 12-11-92
- (2) Engineering Evaluation 92-42, dated 12-11-92

Purpose

The purpose of this evaluation is to provide documentation for the data variable used in the referenced North Atlantic Engineering Evaluations.

Discussion

PLG-0500 is used as the data source for the SSPSS-199³ and subsequent updates. PLG-0500 contains maintenance duration data for a variety of components based upon Allowed Outage Times (AOTs).

Data variable, ZMPNSD is the maintenance duration term for pumps with no LCO (i.e. unlimited AOT). This variable represents data from a variety of plants and systems within those plants. Table 4 is a listing from PLG-0500 for data variable, ZMPNSD. As can be seen from Table 4, the large number of systems represented in Table 6 provide a spectrum of maintenance duration's.

A new maintenance variable (~~ZMPJOR~~^{ZMPSWD}) has been created to more accurately portray the expected maintenance duration of the PCC/SW pumps at Seabrook. This term was created by counting only the CC/SW durations listed in PLG variable, ZMPNSD. The data module of Riskman 2.05 was used to convert the highlighted durations from Table 4 into the variable ~~ZMPJOR~~^{ZMPSWD}. This variable was saved to the Seabrook system analysis control model (SB906SY99) and used in subsequent quantification of the proposed PCC and SW Tech Spec changes.

~~Tables 1 through 5 contain the database reports for the maintenance durations for the following AOTs (short, 72 hrs, 168 hrs, SB PCC/SW, and no LCO). Figures 1 through 5 contain the plotted distributions for the aforementioned variables.~~

SUMMARY

Data variable, ~~ZMPJOR~~^{ZMPSWD} was created to more accurately reflect the expected maintenance duration for the Seabrook PCC and SW pumps. This data variable was used in the system analysis quantifications in support of the proposed PCC and SW Tech Spec changes.

DISCRETE PROBABILITY DISTRIBUTION DATABASE REPORT

DIST: ~~MPER~~ ^{ZMEND} Maintenance Duration for PCC/SW Pumps; Nc LCO

MAIN CHARACTERISTICS OF THE DISTRIBUTION

| | |
|-----------------|------------|
| MEAN | 9.7370E+01 |
| VARIANCE | 5.7709E+02 |
| 5TH PERCENTILE | 6.2342E+01 |
| 50TH PERCENTILE | 9.3973E+01 |
| 95TH PERCENTILE | 1.4016E+02 |

DISCRETE PROBABILITY DISTRIBUTION

| VALUE | PROBABILITY | CUMULATIVE |
|------------|-------------|------------|
| 4.6678E+01 | 5.0000E-03 | 5.0000E-03 |
| 5.2035E+01 | 5.0000E-03 | 1.0000E-02 |
| 5.8195E+01 | 3.0000E-02 | 4.0000E-02 |
| 6.1975E+01 | 5.0000E-03 | 4.5000E-02 |
| 6.6015E+01 | 5.5000E-02 | 1.0000E-01 |
| 7.3215E+01 | 1.0000E-01 | 2.0000E-01 |
| 8.0083E+01 | 1.0000E-01 | 3.0000E-01 |
| 8.5986E+01 | 1.0000E-01 | 4.0000E-01 |
| 9.1075E+01 | 8.0000E-02 | 4.8000E-01 |
| 9.3634E+01 | 1.0000E-02 | 4.9000E-01 |
| 9.5672E+01 | 6.0000E-02 | 5.5000E-01 |
| 9.8982E+01 | 5.0000E-02 | 6.0000E-01 |
| 1.0389E+02 | 1.0000E-01 | 7.0000E-01 |
| 1.1156E+02 | 1.0000E-01 | 8.0000E-01 |
| 1.2208E+02 | 1.0000E-01 | 9.0000E-01 |
| 1.3344E+02 | 4.0000E-02 | 9.4000E-01 |
| 1.3895E+02 | 5.0000E-03 | 9.4500E-01 |
| 1.4987E+02 | 4.5000E-02 | 9.9000E-01 |
| 1.7164E+02 | 5.0000E-03 | 9.9500E-01 |
| 1.9227E+02 | 5.0000E-03 | 1.0000E+00 |

DISCRETE PROBABILITY DISTRIBUTION DATABASE REPORT

DIST: ZMPNSD MAINT. DURN. - PUMPS - NO TECH SPECS

MAIN CHARACTERISTICS OF THE DISTRIBUTION

| | |
|-----------------|------------|
| MEAN | 2.6633E+02 |
| VARIANCE | 6.8967E+05 |
| 5TH PERCENTILE | 2.1834E+00 |
| 50TH PERCENTILE | 4.6093E+01 |
| 95TH PERCENTILE | 7.2561E+02 |

DISCRETE PROBABILITY DISTRIBUTION

| VALUE | PROBABILITY | CUMULATIVE |
|------------|-------------|------------|
| 8.3929E-01 | 5.0000E-03 | 5.0000E-03 |
| 8.3929E-01 | 5.0000E-03 | 1.0000E-02 |
| 1.6364E+00 | 1.0000E-02 | 2.0000E-02 |
| 1.7321E+00 | 1.0000E-02 | 3.0000E-02 |
| 2.1834E+00 | 2.0000E-02 | 5.0000E-02 |
| 5.1165E+00 | 5.0000E-02 | 1.0000E-01 |
| 9.3131E+00 | 1.0000E-01 | 2.0000E-01 |
| 1.8022E+01 | 1.0000E-01 | 3.0000E-01 |
| 2.9794E+01 | 1.0000E-01 | 4.0000E-01 |
| 4.6093E+01 | 1.0000E-01 | 5.0000E-01 |
| 7.4715E+01 | 1.0000E-01 | 6.0000E-01 |
| 1.1108E+02 | 1.0000E-01 | 7.0000E-01 |
| 1.8659E+02 | 1.0000E-01 | 8.0000E-01 |
| 3.7517E+02 | 1.0000E-01 | 9.0000E-01 |
| 7.2561E+02 | 5.0000E-02 | 9.5000E-01 |
| 1.3176E+03 | 2.0000E-02 | 9.7000E-01 |
| 2.1213E+03 | 1.0000E-02 | 9.8000E-01 |
| 2.6445E+03 | 1.0000E-02 | 9.9000E-01 |
| 4.4874E+03 | 5.0000E-03 | 9.9500E-01 |
| 9.6358E+03 | 5.0000E-03 | 1.0000E+00 |

TABLE ³/₈

(taken from PLG-0500, variable ZMPNSD)

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 3 of 17

DATA INCLUDED IN NEW DISTRIBUTION ZMPNSD IS CIRCLED.

Description: This distribution was developed using the following data:

| Plant | Component | Tech. Specs | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|------------|--------------------|-------------|---------------|--|--------|-----------|--------|--------------|
| TMI-2 | Chilled Water Pump | N | 4 | 2.3 2.0 4.7 1.25 | 2.56 | 1.59 | 2.48 | 1.50 |
| IP2 | AFW Pump | N | 2 | 86 21 | 53.50 | 32.50 | 49.16 | 1.97 |
| IP3 | AFW Pumps | N | 8 | 2 5 68 3120 51 3 15 6 | 408.75 | 1025.02 | 305.85 | 3.50 |
| <u>IP3</u> | <u>SW Pumps</u> | N | 44 | 24 24 24 2 2 2 1 2 2 9 321 48 17 6 10 864 8 47 15 9 180 17 52 174 246 29 4 10 79 7 9 4 4 | 57.18 | 141.49 | 53.58 | 1.81 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 4 of 17

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|----------------------|--------------|---------------|---|--------|-----------|--------|--------------|
| IP3 | SW Pumps (continued) | N | 44 | 12 3 7 183 5 5 6 6 6 6 25 | | | | |
| IP3 | AFW Pumps | N | 5 | 65 8 2479 9 4 | 513.00 | 983.26 | 389.49 | 3.39 |
| IP2 | AFW Pumps | N | 6 | 9 24 4 92 6 92 | 37.83 | 38.83 | 34.89 | 1.94 |
| TMI-2 | NSCCW Pump | N | 23 | 0.6 0.6 0.6 10.0 187 0.67 0.4 0.5 28.8 6.5 3.2 1.0 0.5 3.2 5.2 1.0 1.2 3.0 4.3 10.0 1.15 16.10 3.35 | 12.56 | 37.74 | 10.64 | 2.58 |
| IP3 | CC Pumps | N | 2 | 291 3 | 147.00 | 144.00 | 120.84 | 2.80 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 5 of 17

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|-------------------------|--------------|---------------|--|--------|-----------|--------|--------------|
| IP2 | CC Pump #22, 23 | N | 3 | 872 339 8 | 406.33 | 355.93 | 362.60 | 2.19 |
| TMI-2 | ICCW Pump | N | 5 | 3.5 2.0 2.0 22.25 6.50 | 7.24 | 7.68 | 6.55 | 2.10 |
| BEZ | SCCW Pump | N | 7 | 57 1 52 150 177 1 3 | 63.00 | 67.62 | 58.38 | 1.90 |
| Zion | Component Cooling Pumps | N | 45 | 8 48 96 24 120 8 2 2 2 2 2 2 8 768 336 72 24 8 24 24 4 4 24 8 8 7 24 24 6 6 2 2 | 204.98 | 860.98 | 174.27 | 2.55 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 6 of 17

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|-------------------------------------|--------------|---------------|---|-------|-----------|--------|--------------|
| Zion | Component Cooling Pumps (continued) | | | 1 2 64 26 24 192 5 1354 5712 51 5 66 15 10 | | | | |
| TMI-2 | Condensate Booster Pump | N | 36 | 20.5 34.0 2.2 1.5 2.15 78.0 5.0 4.0 3.75 1.0 3.1 1.5 2.0 3.6 1.6 2.6 0.6 10.0 1.6 4.6 55 13.5 2.0 8.5 2.25 1.30 1.0 0.4 1.50 3.45 3.20 184.0 4.10 | 16.38 | 35.34 | 15.42 | 1.77 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 9 of 17

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|----------------------|--------------|---------------|---|--------|-----------|--------|--------------|
| BEZ | Sec. Aux. Cing. Pump | N | 17 | 1 8 5 77 4 7 74 176 97 7 7 8 8 5 8 5 6 | 29.59 | 46.93 | 27.62 | 1.84 |
| IP2 | SW Pumps | N | 38 | 210 2256 14 5 4 4 16 73 5 2010 6 8 27 27 77 3 480 442 248 2 9 2 59 72 29 20 1064 6 14 | 253.18 | 538.68 | 239.33 | 1.74 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 10 of 17

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|--------|----------------------|--------------|---------------|--|-------|-----------|--------|--------------|
| IP2 | SW Pumps (continued) | | | 21 24 1296 980 50 3 4 48 3 | | | | |
| T-11-2 | NSRW Pump | N | 94 | 392.5 462.75 312 389 220 386.3 127.30 138.50 105.0 4.0 7.0 6.0 0.5 22.5 22.5 7.5 4.0 5.0 9.0 8.0 2.5 4.0 8.7 1.5 3.4 1.5 3.5 2.0 8.50 3.5 27.45 1.30 5.0 17.40 64.50 2.15 3.0 16.15 | 38.27 | 89.04 | 37.21 | 1.48 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 11 of 17

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor | |
|-------|--------------------------|--------------|---------------|------------------|------|-----------|--------|--------------|--|
| TMI-2 | NSRW Pump (continued) | | | 12.15 | | | | | |
| | | | | 5.45 | | | | | |
| | | | | 8.0 | | | | | |
| | | | | | | 13.0 | | | |
| | | | | | | 33.2 | | | |
| | | | | | | 60.0 | | | |
| | | | | | | 12.3 | | | |
| | | | | | | 15.0 | | | |
| | | | | | | 7.3 | | | |
| | | | | | | 13.0 | | | |
| | | | | | | 16.0 | | | |
| | | | | | | 17.2 | | | |
| | | | | | | 15.4 | | | |
| | | | | | | 14.0 | | | |
| | | | | | | 5.3 | | | |
| | | | | | | 7.2 | | | |
| | | | | | | 14.0 | | | |
| | | | | | | 17.2 | | | |
| | | | | | | 14.35 | | | |
| | | | | | | 17.3 | | | |
| | | | | | | 6.0 | | | |
| | | | | | | 9.2 | | | |
| | | | | | | 7.50 | | | |
| | | | | | | 9.4 | | | |
| | | | | | | 11.0 | | | |
| | | | | | | 14.15 | | | |
| | | | | | | 13.0 | | | |
| | | | | | | 15.3 | | | |
| | | | | | | 15.4 | | | |
| | | | | | | 13.0 | | | |
| | | | | | | 17.45 | | | |
| | | | | | | 16.45 | | | |
| | | | | | | 10.0 | | | |
| | | | | 6.45 | | | | | |
| | | | | 15.2 | | | | | |
| | | | | 11.3 | | | | | |
| | | | | 20.15 | | | | | |
| | | | | 16.15 | | | | | |
| | | | | 20.25 | | | | | |
| | | | | 1.15 | | | | | |
| | | | | 15.30 | | | | | |
| | | | | 15.3 | | | | | |
| | | | | 15.15 | | | | | |
| | | | | 14.0 | | | | | |
| | | | | 16.0 | | | | | |
| | | | | 14.3 | | | | | |
| | | | | 14.3 | | | | | |
| | | | | 14.3 | | | | | |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 12 of 17

| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|-------|--------------------------|--------------|---------------|---|-------|-----------|--------|--------------|
| TMI-2 | NSRW Pump (continued) | | | 14.5 11.45 15.0 8.15 3.4 23.0 5.1 24.0 | | | | |
| BEZ | PAC Booster Pump | N | 17 | 1 27 392 169 199 14 65 301 145 25 11 30 7 10 7 307 26 | 29.59 | 46.93 | 98.01 | 1.60 |
| BEZ | Charging Pump | N | 182 | 66 915 9 15 9 5 3 40 113 17 2 7 3 2 53 16 7 2 29 19 1 | 63.87 | 314.56 | 60.00 | 1.79 |

GENERIC DATA FOR MAINTENANCE DURATIONS

ZMPNSD

Sheet 17 of 17

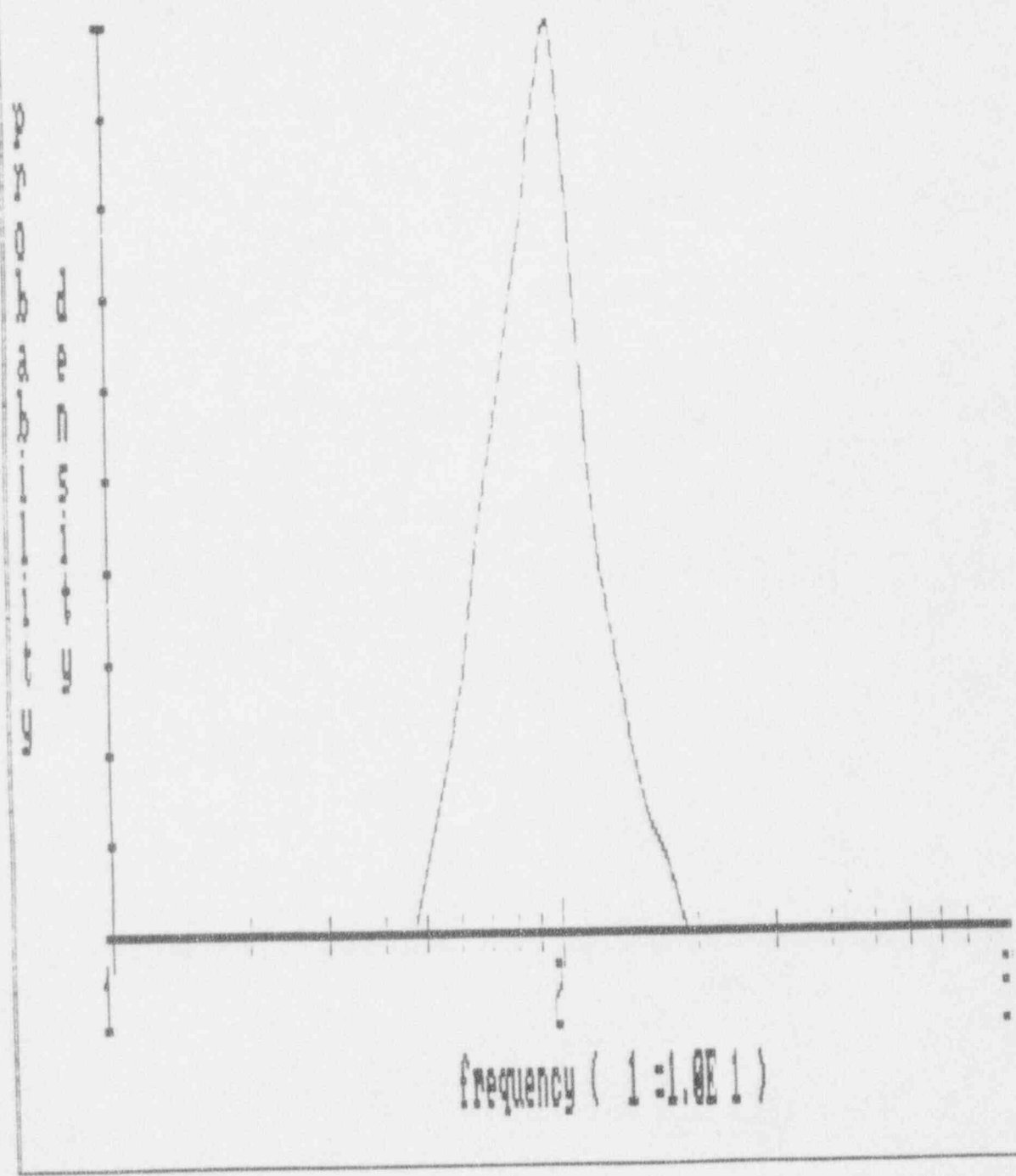
| Plant | Component | Tech. Specs. | No. of Events | Duration (hours) | Mean | Std. Dev. | Median | Range Factor |
|---|--------------------------------------|--------------|---------------|---|--------|-----------|--------|--------------|
| Zion | Turbine-Driven AFW Pumps (continued) | | | 162 49 208 120 31 45 685 36 4 178 10 24 96 24 | | | | |
| BEZ | PCCW Pump | N | 6 | 35 31 1 2 1 3 | 12.17 | 14.76 | 10.90 | 2.16 |
| IP2 | SI Pumps | N | 3 | 172 19 2 | 64.33 | 76.45 | 53.05 | 2.78 |
| IP3 | SI Pumps | N | 1 | 66 | 66.00 | 0.00 | 66.00 | 2.00* |
| BEZ | Prim. Aux. Cng. Pump | N | 46 | 71 237 69 2 139 2 6 29 1 7 3 2 9 6 10 43 28 27 6 7 29 | 102.12 | 123.22 | 32.96 | 1.74 |
| *Standard deviation judgmentally estimated. | | | | | | | | |

288 EVENT

MEAN = 97.37 HRS

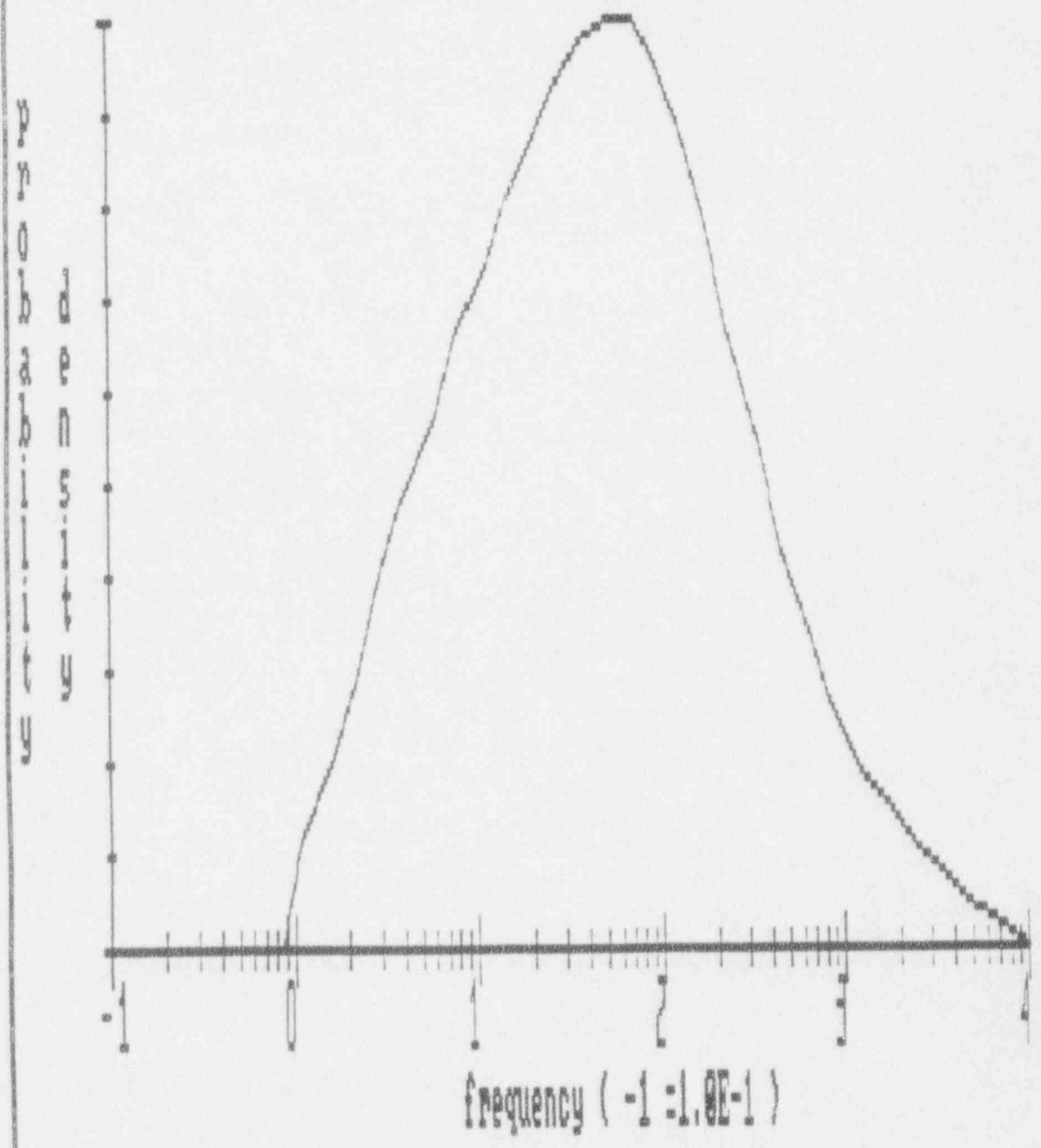
VARIANCE = 573.28

11-23-1996 / ZMPSWD RISKMAN PLOT-DENSITY FUNCTION 15:32:44
TITLE: ZMPSWD Maintenance Duration for Seabrook PCC/SW Pumps
MEAN: 9.74E+01 5th: 6.21E+01 50th: 9.39E+01 95th: 1.40E+02



11-23-92

11-23-1992 RISKMAN PLOT-DENSITY FUNCTION 15:32:11
TITLE: ZMPSD MAINT. DURN. - PUMPS - NO TECH SPECS
MEAN: 2.66E+02 5th: 2.18E+00 50th: 4.61E+01 95th: 7.26E+02



PE Value of SW1 = 3.9143E-07 Date : 08 DEC 1993 16:03

10:52:36 14 DEC 1993

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| No... | Cutsets..... | Value..... | % Importance | % Cumulative Alignment... | |
|-------|---|------------|--------------|---------------------------|--------|
| 1 | [FN.SWFN40A.FS,FM. SWFN40B.FS] * OPTA | 2.394E-07 | 61.1599 | 61.1599 | NORMAL |
| 2 | MO.SWV44.CL * OPTA | 1.572E-08 | 4.0160 | 65.1759 | NORMAL |
| 3 | [FN.SWFN40A.FR,FM. SWFN40B.FR] * OPTA | 1.338E-08 | 3.4182 | 68.5941 | NORMAL |
| 4 | [FN.SWFN40A.FS,FM. SWFN40B.FS] * [MO.SWV4.FO,MO.SWV 5.FO] | 9.725E-09 | 2.4845 | 71.0786 | NORMAL |
| 5 | [FN.SWFN40A.FS,FM. SWFN40B.FS] * [PP.SWP110A.FS,PP. SWP110B.FS] | 4.927E-09 | 1.2587 | 72.3373 | NORMAL |
| 6 | [FN.SWFN40A.FS,FM. SWFN40B.FS] * OPTA | 4.814E-09 | 1.2298 | 73.5672 | AMNT1 |
| 7 | [FN.SWFN40A.FS,FM. SWFN40B.FS] * OPTA | 4.814E-09 | 1.2298 | 74.7970 | BMNT1 |
| 8 | [FN.SWFN40A.FS,FM. SWFN40B.FS] * [FN.2SWFN51B.FS,FM .SWFN51A.FS] | 2.855E-09 | .7294 | 75.5264 | NORMAL |
| 9 | [FN.SWFN40A.FS,FM. SWFN40B.FS] * [FN.SWFN51A.FS,FM. SWFN51B.FS] | 2.855E-09 | .7294 | 76.2557 | NORMAL |
| 10 | [FN.SWFN40A.FS,FM. SWFN40B.FS] * [MO.SWV23.FC,MO.SW V34.FC] | 2.787E-09 | .7120 | 76.9677 | NORMAL |

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 9.7170E-03 | 9.8940E-01 | 9.6140E-03 | 9.6130E-01 |
| AMNT2 | 3.7810E-02 | 3.3490E-03 | 1.2660E-04 | 1.2660E-02 |
| BMNT2 | 3.5070E-02 | 3.3490E-03 | 1.1750E-04 | 1.1740E-02 |
| BMNT3 | 3.5620E-02 | 2.6000E-03 | 9.2610E-05 | 9.2600E-03 |
| AMNT3 | 3.8530E-02 | 1.3000E-03 | 5.0090E-05 | 5.0090E-03 |

11:24:34 16 DEC 1993

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Split Fraction SW1 - SWS (BOTH TRAINS) - no LOSP, no SI signal, with OP action

PE Mean = 4.1763E-07 Date : 16 DEC 1993 11:19
MC/LH Mean = 3.2190E-07 Date : 06 DEC 1993 09:30

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 4.0650E-07 | 9.8940E-01 | 4.0220E-07 | 9.6280E-01 |
| AMNT2 | 1.5270E-06 | 3.3490E-03 | 5.1140E-09 | 1.2240E-02 |
| BMNT2 | 1.4120E-06 | 3.3490E-03 | 4.7280E-09 | 1.1320E-02 |
| BMNT3 | 1.4180E-06 | 2.6000E-03 | 3.6880E-09 | 8.8290E-03 |
| AMNT3 | 1.5340E-06 | 1.3000E-03 | 1.9940E-09 | 4.7740E-03 |

Split Fraction SW2 - SWS (BOTH TRAINS) - no LOSP, no SI signal, without OP action

PE Mean = 4.2532E-05 Date : 16 DEC 1993 11:19
MC/LH Mean = 3.4429E-05 Date : 06 DEC 1993 09:30

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 4.2530E-05 | 9.8940E-01 | 4.2080E-05 | 9.8940E-01 |
| BMNT2 | 4.2530E-05 | 3.3490E-03 | 1.4240E-07 | 3.3490E-03 |
| AMNT2 | 4.2530E-05 | 3.3490E-03 | 1.4240E-07 | 3.3490E-03 |
| BMNT3 | 4.2530E-05 | 2.6000E-03 | 1.1060E-07 | 2.6000E-03 |
| AMNT3 | 4.2530E-05 | 1.3000E-03 | 5.5290E-08 | 1.3000E-03 |

Split Fraction SW3 - SWS (BOTH TRAINS) - LOSP, no SI signal, without OP actions

PE Mean = 7.6388E-04 Date : 16 DEC 1993 11:19
MC/LH Mean = 8.9372E-04 Date : 06 DEC 1993 09:30

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 7.6380E-04 | 9.8940E-01 | 7.5570E-04 | 9.8940E-01 |
| BMNT2 | 7.6380E-04 | 3.3490E-03 | 2.5580E-06 | 3.3490E-03 |
| AMNT2 | 7.6380E-04 | 3.3490E-03 | 2.5580E-06 | 3.3490E-03 |
| BMNT3 | 7.6380E-04 | 2.6000E-03 | 1.9860E-06 | 2.6000E-03 |
| AMNT3 | 7.6380E-04 | 1.3000E-03 | 9.9300E-07 | 1.3000E-03 |

Split Fraction SW4 - SWS (BOTH TRAINS) - SI signal, no LOSP, with OP action

PE Mean = 3.1713E-04 Date : 16 DEC 1993 11:19
MC/LH Mean = 2.7100E-04 Date : 06 DEC 1993 09:30

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.1710E-04 | 9.8940E-01 | 3.1370E-04 | 9.8930E-01 |
| BMNT2 | 3.2000E-04 | 3.3490E-03 | 1.0720E-06 | 3.3790E-03 |
| AMNT2 | 3.2010E-04 | 3.3490E-03 | 1.0720E-06 | 3.3810E-03 |
| BMNT3 | 3.2000E-04 | 2.6000E-03 | 8.3210E-07 | 2.6240E-03 |
| AMNT3 | 3.2010E-04 | 1.3000E-03 | 4.1620E-07 | 1.3120E-03 |

Split Fraction SW5 - SWS (BOTH TRAINS) - SI signal, no LOSP, without OP action

PE Mean = 3.6310E-04 Date : 16 DEC 1993 11:19
MC/LH Mean = 3.3382E-04 Date : 06 DEC 1993 09:30

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.6310E-04 | 9.8940E-01 | 3.5920E-04 | 9.8940E-01 |
| BMNT2 | 3.6310E-04 | 3.3490E-03 | 1.2160E-06 | 3.3490E-03 |
| AMNT2 | 3.6310E-04 | 3.3490E-03 | 1.2160E-06 | 3.3490E-03 |
| BMNT3 | 3.6310E-04 | 2.6000E-03 | 9.4400E-07 | 2.6000E-03 |
| AMNT3 | 3.6310E-04 | 1.3000E-03 | 4.7200E-07 | 1.3000E-03 |

Split Fraction SW6 - SWS (BOTH TRAINS) - CT only

PE Mean = 1.0002E-02 Date : 16 DEC 1993 11:19
MC/LH Mean = 7.4000E-03 Date : 06 DEC 1993 09:30

13:29:26 16 DEC 1993
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~~MC/LH Mean = 3.3362E-04 Date: 06 DEC 1993 09:30~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.5830E-04 | 8.2070E-01 | 2.9400E-04 | 8.1980E-01 |
| BMNT1 | 3.6070E-04 | 6.5190E-02 | 2.3510E-05 | 6.5550E-02 |
| AMNT1 | 3.6070E-04 | 6.5190E-02 | 2.3510E-05 | 6.5550E-02 |
| PLMNTA | 3.6070E-04 | 1.9180E-02 | 6.9170E-06 | 1.9280E-02 |
| PLMNTB | 3.6070E-04 | 1.9180E-02 | 6.9170E-06 | 1.9280E-02 |
| BMNT2 | 3.5830E-04 | 3.3490E-03 | 1.2000E-06 | 3.3450E-03 |
| AMNT2 | 3.5830E-04 | 3.3490E-03 | 1.2000E-06 | 3.3450E-03 |
| BMNT3 | 3.5830E-04 | 2.6000E-03 | 9.3160E-07 | 2.5970E-03 |
| AMNT3 | 3.5830E-04 | 1.3000E-03 | 4.6580E-07 | 1.2990E-03 |

Split Fraction SW6 - SWS (BOTH TRAINS) - CT only

PE Mean = 1.0001E-02 Date: 16 DEC 1993 10:16
~~MC/LH Mean = 7.7000E-03 Date: 06 DEC 1993 09:30~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 9.7170E-03 | 8.2070E-01 | 7.9750E-03 | 7.9740E-01 |
| BMNT1 | 9.7170E-03 | 6.5190E-02 | 6.3340E-04 | 6.3340E-02 |
| AMNT1 | 9.7170E-03 | 6.5190E-02 | 6.3340E-04 | 6.3340E-02 |
| PLMNTB | 9.7170E-03 | 1.9180E-02 | 1.8640E-04 | 1.8630E-02 |
| PLMNTA | 9.7170E-03 | 1.9180E-02 | 1.8640E-04 | 1.8630E-02 |
| BMNT2 | 3.5070E-02 | 3.3490E-03 | 1.1750E-04 | 1.1740E-02 |
| AMNT2 | 3.7810E-02 | 3.3490E-03 | 1.2660E-04 | 1.2660E-02 |
| BMNT3 | 3.5620E-02 | 2.6000E-03 | 9.2610E-05 | 9.2600E-03 |
| AMNT3 | 3.8530E-02 | 1.3000E-03 | 5.0090E-05 | 5.0090E-03 |

13:29:23 16 DEC 1993

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Split Fraction SW1 - SWS (BOTH TRAINS) - no LOSP, no SI signal, with OP action

PE Mean = 3.9724E-07 Date: 16 DEC 1993 10:16
~~MC/LN Mean = 3.2190E-07 Date: 06 DEC 1993 09:30~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.8420E-07 | 8.2070E-01 | 3.1530E-07 | 7.9360E-01 |
| AMNT1 | 3.9530E-07 | 6.5190E-02 | 2.5770E-08 | 6.4860E-02 |
| BMNT1 | 3.9530E-07 | 6.5190E-02 | 2.5770E-08 | 6.4860E-02 |
| PLMNTB | 3.9530E-07 | 1.9180E-02 | 7.5820E-09 | 1.9080E-02 |
| PLMNTA | 3.9530E-07 | 1.9180E-02 | 7.5820E-09 | 1.9080E-02 |
| AMNT2 | 1.5050E-06 | 3.3490E-03 | 5.0390E-09 | 1.2680E-02 |
| BMNT2 | 1.3900E-06 | 3.3490E-03 | 4.6540E-09 | 1.1710E-02 |
| BMNT3 | 1.3960E-06 | 2.6000E-03 | 3.6300E-09 | 9.1370E-03 |
| AMNT3 | 1.5120E-06 | 1.3000E-03 | 1.9650E-09 | 4.9460E-03 |

Split Fraction SW2 - SWS (BOTH TRAINS) - no LOSP, no SI signal, without OP action

PE Mean = 3.9772E-05 Date: 16 DEC 1993 10:16
~~MC/LN Mean = 3.4419E-05 Date: 06 DEC 1993 09:30~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.9520E-05 | 8.2070E-01 | 3.2430E-05 | 8.1540E-01 |
| BMNT1 | 4.1030E-05 | 6.5190E-02 | 2.6740E-06 | 6.7230E-02 |
| AMNT1 | 4.1030E-05 | 6.5190E-02 | 2.6740E-06 | 6.7230E-02 |
| PLMNTB | 4.1030E-05 | 1.9180E-02 | 7.8680E-07 | 1.9780E-02 |
| PLMNTA | 4.1030E-05 | 1.9180E-02 | 7.8680E-07 | 1.9780E-02 |
| AMNT2 | 3.9520E-05 | 3.3490E-03 | 1.3230E-07 | 3.3270E-03 |
| BMNT2 | 3.9520E-05 | 3.3490E-03 | 1.3230E-07 | 3.3270E-03 |
| BMNT3 | 3.9520E-05 | 2.6000E-03 | 1.0280E-07 | 2.5830E-03 |
| AMNT3 | 3.9520E-05 | 1.3000E-03 | 5.1380E-08 | 1.2920E-03 |

Split Fraction SW3 - SWS (BOTH TRAINS) - LOSP, no SI signal, without OP actions

PE Mean = 7.6390E-04 Date: 16 DEC 1993 10:16
~~MC/LN Mean = 8.0376E-04 Date: 06 DEC 1993 09:30~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 7.6380E-04 | 8.2070E-01 | 6.2690E-04 | 8.2070E-01 |
| BMNT1 | 7.6380E-04 | 6.5190E-02 | 4.9790E-05 | 6.5180E-02 |
| AMNT1 | 7.6380E-04 | 6.5190E-02 | 4.9790E-05 | 6.5180E-02 |
| PLMNTB | 7.6380E-04 | 1.9180E-02 | 1.4650E-05 | 1.9180E-02 |
| PLMNTA | 7.6380E-04 | 1.9180E-02 | 1.4650E-05 | 1.9180E-02 |
| AMNT2 | 7.6380E-04 | 3.3490E-03 | 2.5580E-06 | 3.3490E-03 |
| BMNT2 | 7.6380E-04 | 3.3490E-03 | 2.5580E-06 | 3.3490E-03 |
| BMNT3 | 7.6380E-04 | 2.6000E-03 | 1.9860E-06 | 2.6000E-03 |
| AMNT3 | 7.6380E-04 | 1.3000E-03 | 9.9300E-07 | 1.3000E-03 |

Split Fraction SW4 - SWS (BOTH TRAINS) - SI signal, no LOSP, with OP action

PE Mean = 3.1706E-04 Date: 16 DEC 1993 10:16
~~MC/LN Mean = 2.7180E-04 Date: 06 DEC 1993 09:30~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.1700E-04 | 8.2070E-01 | 2.6020E-04 | 8.2060E-01 |
| BMNT1 | 3.1700E-04 | 6.5190E-02 | 2.0670E-05 | 6.5190E-02 |
| AMNT1 | 3.1700E-04 | 6.5190E-02 | 2.0670E-05 | 6.5190E-02 |
| PLMNTA | 3.1700E-04 | 1.9180E-02 | 6.0800E-06 | 1.9180E-02 |
| PLMNTB | 3.1700E-04 | 1.9180E-02 | 6.0800E-06 | 1.9180E-02 |
| AMNT2 | 3.1920E-04 | 3.3490E-03 | 1.0690E-06 | 3.3720E-03 |
| BMNT2 | 3.1910E-04 | 3.3490E-03 | 1.0680E-06 | 3.3700E-03 |
| BMNT3 | 3.1910E-04 | 2.6000E-03 | 8.2960E-07 | 2.6170E-03 |
| AMNT3 | 3.1920E-04 | 1.3000E-03 | 4.1500E-07 | 1.3090E-03 |

Split Fraction SW5 - SWS (BOTH TRAINS) - SI signal, no LOSP, without OP action

PE Mean = 3.5873E-04 Date: 16 DEC 1993 10:16

10:50:29 17 DEC 1993

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| | | | | |
|-------|------------|------------|------------|------------|
| BMNT2 | 3.5830E-04 | 1.3000E-03 | 4.6580E-07 | 1.3000E-03 |
| AMNT3 | 3.5830E-04 | 1.3000E-03 | 4.6580E-07 | 1.3000E-03 |
| AMNT2 | 3.5830E-04 | 1.3000E-03 | 4.6580E-07 | 1.3000E-03 |

Split Fraction SW6 - SWS (BOTH TRAINS) - CT only

PE Mean = 9.8921E-03 Date : 16 DEC 1993 10:53
~~MC/LM Mean = 7.488E-03 Date : 23 JUN 1993 22:24~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 9.7170E-03 | 9.5510E-01 | 9.2810E-03 | 9.3830E-01 |
| BMNT1 | 9.7170E-03 | 1.9200E-02 | 1.8660E-04 | 1.8860E-02 |
| AMNT1 | 9.7170E-03 | 1.9200E-02 | 1.8660E-04 | 1.8860E-02 |
| BMNT3 | 3.5620E-02 | 2.6000E-03 | 9.2610E-05 | 9.3620E-03 |
| AMNT3 | 3.8530E-02 | 1.3000E-03 | 5.0090E-05 | 5.0640E-03 |
| BMNT2 | 3.5070E-02 | 1.3000E-03 | 4.5600E-05 | 4.6100E-03 |
| AMNT2 | 3.7810E-02 | 1.3000E-03 | 4.9150E-05 | 4.9680E-03 |

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Split Fraction SW1 - SWS (BOTH TRAINS) - no LOSP, no SI signal, with OP action

PE Mean = 3.9143E-07 Date: 16 DEC 1993 10:53
~~MC/LM Mean = 3.3117E-07 Date: 23 JUN 1993 22:21~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.8420E-07 | 9.5510E-01 | 3.6690E-07 | 9.3730E-01 |
| AMNT1 | 3.9530E-07 | 1.9200E-02 | 7.5910E-09 | 1.9390E-02 |
| BMNT1 | 3.9530E-07 | 1.9200E-02 | 7.5910E-09 | 1.9390E-02 |
| BMNT3 | 1.3960E-06 | 2.6000E-03 | 3.6300E-09 | 9.2720E-03 |
| AMNT2 | 1.5050E-06 | 1.3000E-03 | 1.9560E-09 | 4.9970E-03 |
| BMNT2 | 1.3900E-06 | 1.3000E-03 | 1.8070E-09 | 4.6150E-03 |
| AMNT3 | 1.5120E-06 | 1.3000E-03 | 1.9650E-09 | 5.0190E-03 |

Split Fraction SW2 - SWS (BOTH TRAINS) - no LOSP, no SI signal, without OP action

PE Mean = 3.9582E-05 Date: 16 DEC 1993 10:53
~~MC/LM Mean = 3.3755E-05 Date: 23 JUN 1993 22:21~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.9520E-05 | 9.5510E-01 | 3.7750E-05 | 9.5370E-01 |
| BMNT1 | 4.1030E-05 | 1.9200E-02 | 7.8770E-07 | 1.9900E-02 |
| AMNT1 | 4.1030E-05 | 1.9200E-02 | 7.8770E-07 | 1.9900E-02 |
| BMNT3 | 3.9520E-05 | 2.6000E-03 | 1.0280E-07 | 2.5960E-03 |
| AMNT3 | 3.9520E-05 | 1.3000E-03 | 5.1380E-08 | 1.2980E-03 |
| AMNT2 | 3.9520E-05 | 1.3000E-03 | 5.1380E-08 | 1.2980E-03 |
| BMNT2 | 3.9520E-05 | 1.3000E-03 | 5.1380E-08 | 1.2980E-03 |

Split Fraction SW3 - SWS (BOTH TRAINS) - LOSP, no SI signal, without OP actions

PE Mean = 7.6390E-04 Date: 16 DEC 1993 10:53
~~MC/LM Mean = 7.2257E-04 Date: 23 JUN 1993 22:21~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 7.6380E-04 | 9.5510E-01 | 7.2950E-04 | 9.5510E-01 |
| BMNT1 | 7.6380E-04 | 1.9200E-02 | 1.4670E-05 | 1.9200E-02 |
| AMNT1 | 7.6380E-04 | 1.9200E-02 | 1.4670E-05 | 1.9200E-02 |
| BMNT3 | 7.6380E-04 | 2.6000E-03 | 1.9860E-06 | 2.6000E-03 |
| AMNT2 | 7.6380E-04 | 1.3000E-03 | 9.9300E-07 | 1.3000E-03 |
| AMNT3 | 7.6380E-04 | 1.3000E-03 | 9.9300E-07 | 1.3000E-03 |
| BMNT2 | 7.6380E-04 | 1.3000E-03 | 9.9300E-07 | 1.3000E-03 |

Split Fraction SW4 - SWS (BOTH TRAINS) - SI signal, no LOSP, with OP action

PE Mean = 3.1705E-04 Date: 16 DEC 1993 10:53
~~MC/LM Mean = 3.1571E-04 Date: 23 JUN 1993 22:21~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.1700E-04 | 9.5510E-01 | 3.0280E-04 | 9.5510E-01 |
| BMNT1 | 3.1700E-04 | 1.9200E-02 | 6.0870E-06 | 1.9200E-02 |
| AMNT1 | 3.1700E-04 | 1.9200E-02 | 6.0870E-06 | 1.9200E-02 |
| BMNT3 | 3.1910E-04 | 2.6000E-03 | 8.2960E-07 | 2.6170E-03 |
| AMNT2 | 3.1920E-04 | 1.3000E-03 | 4.1500E-07 | 1.3090E-03 |
| AMNT3 | 3.1920E-04 | 1.3000E-03 | 4.1500E-07 | 1.3090E-03 |
| BMNT2 | 3.1910E-04 | 1.3000E-03 | 4.1480E-07 | 1.3080E-03 |

Split Fraction SW5 - SWS (BOTH TRAINS) - SI signal, no LOSP, without OP action

PE Mean = 3.5843E-04 Date: 16 DEC 1993 10:53
~~MC/LM Mean = 3.7430E-04 Date: 23 JUN 1993 22:21~~

| Alignment | Total Prob. | Frequency | Total | Importance |
|-----------|-------------|------------|------------|------------|
| NORMAL | 3.5830E-04 | 9.5510E-01 | 3.4220E-04 | 9.5490E-01 |
| BMNT1 | 3.6070E-04 | 1.9200E-02 | 6.9250E-06 | 1.9320E-02 |
| AMNT1 | 3.6070E-04 | 1.9200E-02 | 6.9250E-06 | 1.9320E-02 |
| BMNT3 | 3.5830E-04 | 2.6000E-03 | 9.3160E-07 | 2.5990E-03 |

AMNT2 Alignment - MAINTENANCE ON TRAIN A CT PUMP
Fraction of Time in the Alignment is:
ZMPMSF*ZMPLSD = 3.3490E-03
Basic Event Impacts for AMNT2 Alignment

| Basic Event | State |
|---------------|-------|
| PP.SWP110A.FS | F |

BMNT2 Alignment - MAINTENANCE ON TRAIN B CT PUMP
Fraction of Time in the Alignment is:
ZMPMSF*ZMPLSD = 3.3490E-03
Basic Event Impacts for BMNT2 Alignment

| Basic Event | State |
|---------------|-------|
| PP.SWP110B.FS | F |

AMNT3 Alignment - MAINTENANCE ON TRAIN A CT FAN
Fraction of Time in the Alignment is:
ZMPMSF*ZMPMSD = 1.3000E-03
Basic Event Impacts for AMNT3 Alignment

| Basic Event | State |
|---------------|-------|
| FN.SWFM51A.FR | F |

BMNT3 Alignment - MAINTENANCE ON TRAIN B CT FAN
Fraction of Time in the Alignment is:
2*ZMPMSF*ZMPMSD = 2.6000E-03
Basic Event Impacts for BMNT3 Alignment

| Basic Event | State |
|---------------|-------|
| FN.SWFM51B.FR | F |

NORMAL Alignment - NORMAL ALIGNMENT

Fraction of Time in the Alignment is:
1-AMNT2-BMNT2-AMNT3-BMNT3 = 9.8940E-01

-

AMNT1 Alignment - MAINTENANCE ON TRAIN A SW PUMP

Fraction of Time in the Alignment is:

$$2 * ZMPSWF * ZMPSWD = 6.5190E-02$$

Basic Event Impacts for AMNT1 Alignment

| Basic Event | State |
|--------------|-------|
| PP.SWP41C.FS | F |

BMNT1 Alignment - MAINTENANCE ON TRAIN B SERVICE WATER PUMP

Fraction of Time in the Alignment is:

$$2 * ZMPSWF * ZMPSWD = 6.5190E-02$$

Basic Event Impacts for BMNT1 Alignment

| Basic Event | State |
|--------------|-------|
| PP.SWP41D.FS | F |

AMNT2 Alignment - MAINTENANCE ON TRAIN A CT PUMP

Fraction of Time in the Alignment is:

$$ZMPSF * ZMPLSD = 3.3490E-03$$

Basic Event Impacts for AMNT2 Alignment

| Basic Event | State |
|---------------|-------|
| PP.SWP110A.FS | F |

BMNT2 Alignment - MAINTENANCE ON TRAIN B CT PUMP

Fraction of Time in the Alignment is:

$$ZMPSF * ZMPLSD = 3.3490E-03$$

Basic Event Impacts for BMNT2 Alignment

| Basic Event | State |
|---------------|-------|
| PP.SWP110B.FS | F |

AMNT3 Alignment - MAINTENANCE ON TRAIN A CT FAN

Fraction of Time in the Alignment is:

$$ZMPSF * ZMPSD = 1.3000E-03$$

Basic Event Impacts for AMNT3 Alignment

| Basic Event | State |
|---------------|-------|
| FN.SWFN51A.FR | F |

BMNT3 Alignment - MAINTENANCE ON TRAIN B CT FAN

Fraction of Time in the Alignment is:

$$2 * ZMPSF * ZMPSD = 2.6000E-03$$

Basic Event Impacts for BMNT3 Alignment

| Basic Event | State |
|---------------|-------|
| FN.SWFN51B.FR | F |

AMNT1 Alignment - MAINTENANCE ON TRAIN A SW PUMP
 Fraction of Time in the Alignment is:
 $2 * ZMPLSD * ZMPSWF = 1.9200E-02$
 Basic Event Impacts for AMNT1 Alignment

| Basic Event | State |
|--------------|-------|
| PP.SWP41C.FS | F |

BMNT1 Alignment - MAINTENANCE ON TRAIN B SW PUMP
 Fraction of Time in the Alignment is:
 $2 * ZMPLSD * ZMPSWF = 1.9200E-02$
 Basic Event Impacts for BMNT1 Alignment

| Basic Event | State |
|--------------|-------|
| PP.SWP41D.FS | F |

AMNT2 Alignment - MAINTENANCE ON TRAIN A CT PUMP
 Fraction of Time in the Alignment is:
 $ZMPMSF * ZMPMSD = 1.3000E-03$
 Basic Event Impacts for AMNT2 Alignment

| Basic Event | State |
|---------------|-------|
| PP.SWP110A.FS | F |

BMNT2 Alignment - MAINTENANCE ON TRAIN B CT PUMP
 Fraction of Time in the Alignment is:
 $ZMPMSF * ZMPMSD = 1.3000E-03$
 Basic Event Impacts for BMNT2 Alignment

| Basic Event | State |
|---------------|-------|
| PP.SWP110B.FS | F |

AMNT3 Alignment - MAINTENANCE ON TRAIN A CT FAN
 Fraction of Time in the Alignment is:
 $ZMPMSF * ZMPMSD = 1.3000E-03$
 Basic Event Impacts for AMNT3 Alignment

| Basic Event | State |
|---------------|-------|
| FN.SWFN51A.FR | F |

BMNT3 Alignment - MAINTENANCE ON TRAIN B CT FAN
 Fraction of Time in the Alignment is:
 $2 * ZMPMSF * ZMPMSD = 2.6000E-03$
 Basic Event Impacts for BMNT3 Alignment

| Basic Event | State |
|---------------|-------|
| FN.SWFN51B.FR | F |

NORMAL Alignment - NORMAL ALIGNMENT

Fraction of Time in the Alignment is:
 $1 - AMNT1 - BMNT1 - AMNT2 - BMNT2 - AMNT3 - BMNT3 = 9.5510E-01$

Attachment C - SW System Results

This section contains the details of the SW system quantification for maintenance. Results are presented for the Baseline case, the New TS case, and the Sensitivity case, in the following tables:

| | |
|--|--|
| <p>Table C.1 Maintenance Alignment Definitions - BASECASE Table C.2 Maintenance Alignment Definitions - NEW TS CASE Table C.3 Maintenance Alignment Definitions - SENSITIVITY CASE</p> | <p>These tables present the equation for maintenance term in terms of data variables. They also show the impact of the maintenance alignment, i.e. what basic event is failed as a result of the maintenance.</p> |
| <p>Table C.4 Maintenance Alignment Contributions to System Unavailability - BASECASE Table C.5 Maintenance Alignment Contributions to System Unavailability - NEW TS CASE Table C.6 Maintenance Alignment Contributions to System Unavailability - SENSITIVITY</p> | <p>These tables present the maintenance contribution to system unavailability for the 6 boundary conditions discussed in the evaluation. This shows the conditional failure, the frequency of being in the alignment, the total unavailability contribution, and the importance of that alignment.</p> |
| <p>Table C.7 Cause Table for SW1 (Normal Alignment) - BASECASE Table C.8 Cause Table for SW1 (Normal Alignment) - NEW TS CASE Table C.9 Cause Table for SW1 (Normal Alignment) - SENSITIVITY CASE</p> | <p>These tables present the dominant cut sets for SW1, normal configuration with the CT. The cut set basic events are defined in Attachment A. Note that the cutsets in [brackets] are common cause terms.</p> |

PE Value of SW1 = 4.1763E-07 Date : 16 DEC 1993 11:19
 MC/LH Value of SW1 = 3.2190E-07 Date : 06 DEC 1993 09:30

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| No... | Cutssets..... | Value..... | % Importance | % Cumulative | Alignment... |
|-------|--|------------|--------------|--------------|--------------|
| 1 | [FN.SWFN40A.FS,FN.SWFN40B.FS] * OPTA | 2.480E-07 | 59.3827 | 59.3827 | NORMAL |
| 2 | MO.SWV44.CL * OPTA | 1.629E-08 | 3.9006 | 63.2833 | NORMAL |
| 3 | [FN.SWFN40A.FR,FN.SWFN40B.FR] * OPTA | 1.386E-08 | 3.3187 | 66.6020 | NORMAL |
| 4 | [PP.SWP41A.FR,PP.SWP41B.FR,PP.SWP41D.FR] * OPTA | 1.109E-08 | 2.6555 | 69.2575 | NORMAL |
| 5 | [PP.SWP41A.FR,PP.SWP41B.FR,PP.SWP41C.FR] * OPTA | 1.109E-08 | 2.6555 | 71.9129 | NORMAL |
| 6 | [FN.SWFN40A.FS,FN.SWFN40B.FS] * [MO.SWV4.FO,MO.SWV5.FO] | 1.007E-08 | 2.4112 | 74.3242 | NORMAL |
| 7 | [FN.SWFN40A.FS,FN.SWFN40B.FS] * [PP.SWP110A.FS,PP.SWP110B.FS] | 5.104E-09 | 1.2221 | 75.5463 | NORMAL |
| 8 | [FN.SWFN40A.FS,FN.SWFN40B.FS] * [FN.SWFN51A.FS,FN.SWFN51B.FS] | 2.957E-09 | .7080 | 76.2543 | NORMAL |
| 9 | [FN.SWFN40A.FS,FN.SWFN40B.FS] * [FN.SWFN51B.FS,FN.SWFN51A.FS] | 2.957E-09 | .7080 | 76.9624 | NORMAL |
| 10 | [FN.SWFN40A.FS,FN.SWFN40B.FS] * [MO.SWV20.FO,MO.SWV27.FO] | 2.887E-09 | .6913 | 77.6537 | NORMAL |

| No... | Cutsets..... | Value..... | % Importance | % Cumulative | Alignment... |
|-------|---|------------|--------------|--------------|--------------|
| 1 | [FN.SWPN40A.FS, FN. SWFN40B.FS] * OPTA | 2.154E-07 | 54.2703 | 54.2703 | NORMAL |
| 2 | [FN.SWPN40A.FS, FN. SWFN40C.FS] * OPTA | 1.634E-08 | 4.1169 | 58.3872 | AMNT1 |
| 3 | [FN.SWPN40A.FS, FN. SWFN40B.FS] * OPTA | 1.634E-08 | 4.1169 | 62.5041 | BMNT1 |
| 4 | MO.SWV44.CL * OPTA | 1.414E-08 | 3.5626 | 66.0667 | NORMAL |
| 5 | [FN.SWPN40A.FR, FN. SWFN40B.FR] * OPTA | 1.204E-08 | 3.0335 | 69.1002 | NORMAL |
| 6 | [FN.SWPN40A.FS, FN. SWFN40B.FS] * [MO.SWV4.FO, MO.SWV S.FO] | 8.747E-09 | 2.2038 | 71.3040 | NORMAL |
| 7 | [FN.SWPN40A.FS, FN. SWFN40B.FS] * [PP.SWP110A.FS, PP. SWP110B.FS] | 4.432E-09 | 1.1166 | 72.4206 | NORMAL |
| 8 | [FN.SWPN40A.FS, FN. SWFN40B.FS] * [FN.2SWFN51B.FS, FN. SWFN51A.FS] | 2.568E-09 | .6470 | 73.0676 | NORMAL |
| 9 | [FN.SWPN40A.FS, FN. SWFN40B.FS] * [FN.SWFN51A.FS, FN. SWFN51B.FS] | 2.568E-09 | .6470 | 73.7147 | NORMAL |
| 10 | [FN.SWPN40A.FS, FN. SWFN40B.FS] * [MO.SWV25.FC, MO.SW V54.FC] | 2.507E-09 | .6316 | 74.3463 | NORMAL |

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Split Fraction WB1 - SWS TRAIN B - no LOSP, no SI signal, with OP action - single train
 PE Mean = 7.0045E-05 Date: 16 DEC 1993 11:19
 Basic Event Impacts for Split Fraction: WB1

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| CC.SWS.7 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WB2 - SWS TRAIN B - no LOSP, no SI signal, with OP action - given train A failed
 PE Mean = 6.5410E-03 Date: 16 DEC 1993 11:19
 Conditional Split Fraction: SW1/WA1

Split Fraction WB3 - SWS TRAIN B - no LOSP, no SI signal, with OP action, given train A success
 PE Mean = 6.9620E-05 Date: 16 DEC 1993 11:19
 Conditional Split Fraction: (WB1-SW1)/(1-WA1)

Split Fraction WB4 - SWS TRAIN B - no LOSP, no SI signal, without OP actions, single train
 PE Mean = 1.4764E-03 Date: 16 DEC 1993 11:19
 Basic Event Impacts for Split Fraction: WB4

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| CC.SWS.7 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WB5 - SWS TRAIN B - no LOSP, no SI signal, without OP action, given train A failure
 PE Mean = 2.8810E-02 Date: 16 DEC 1993 11:19
 Conditional Split Fraction: SW2/WA2

Split Fraction WB6 - SWS TRAIN B - no LOSP, no SI signal, without OP actions, given train A success
 PE Mean = 1.4360E-03 Date: 16 DEC 1993 11:19
 Conditional Split Fraction: (WB4-SW2)/(1-WA2)

Split Fraction WB7 - SWS TRAIN B - LOSP, no SI signal, without OP action, single train
 PE Mean = 1.1868E-02 Date: 16 DEC 1993 11:19
 Basic Event Impacts for Split Fraction: WB7

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | F | OFFSITE POWER AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| CC.SWS.7 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WB8 - SWS TRAIN B - LOCA, no SI signal, without OP action, given train A failed
 PE Mean = 6.4360E-02 Date: 16 DEC 1993 11:19
 Conditional Split Fraction: SW3/WA3

Split Fraction WB9 - SWS TRAIN B - LOCA, no SI signal, without OP action, given train A success
 PE Mean = 1.1240E-02 Date: 16 DEC 1993 11:19
 Conditional Split Fraction: (WB7-SW3)/(1-WA3)

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Split Fraction WB10 - SWS TRAIN B - no LOSP, SI signal, with OP action, single train

PE Mean = 4.3592E-03 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WB10

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| CC.SWS.7 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WB11 - SWS TRAIN B - no LOSP, SI signal, with OP action, given train B failed

PE Mean = 7.2850E-02 Date: 16 DEC 1993 11:19

Conditional Split Fraction: SW4/WA4

Split Fraction WB12 - SWS TRAIN B - no LOSP, SI signal, with OP action, given train A success

PE Mean = 4.0600E-03 Date: 16 DEC 1993 11:19

Conditional Split Fraction: (WB10-SW4)/(1-WA4)

Split Fraction WB13 - SWS TRAIN B - SI Signal, no LOSP, without OP actions

PE Mean = 5.7718E-03 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WB13

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| CC.SWS.7 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WB14 - SWS TRAIN B - SI Signal, No LOSP, without OP action

PE Mean = 6.2910E-02 Date: 16 DEC 1993 11:19

Conditional Split Fraction: SW5/WA5

Split Fraction WB15 - SWS TRAIN B - SI Signal, no LOSP, without OP actions

PE Mean = 5.4400E-03 Date: 16 DEC 1993 11:19

Conditional Split Fraction: (WB13-SW5) / (1-WA5)

Split Fraction WB16 - SWS TRAIN B - CT only, single train

PE Mean = 4.5203E-02 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WB16

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| MO.SWV44.CL | F | UNIT 1 INTAKE TUNNEL NOV SW-V44 TRANSFERS CLOSED |
| CC.SWS.7 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WB17 - SWS TRAIN B - CT only, given train A failed

PE Mean = 2.4410E-01 Date: 16 DEC 1993 11:19

Conditional Split Fraction: SW6/WA6

Split Fraction WB18 - SWS TRAIN B - CT only, given train A success

PE Mean = 3.6710E-02 Date: 16 DEC 1993 11:19

Conditional Split Fraction: (WB16-SW6)/(1-WA6)

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Split Fraction WA1 - SWS TRAIN A - no LOSP, no SI signal, with OP action

PE Mean = 6.3853E-05 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WA1

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| CC.SWS.6 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WA2 - SWS TRAIN A - no LOSP, no SI signal, without OP actions

PE Mean = 1.4764E-03 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WA2

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| CC.SWS.6 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WA3 - SWS TRAIN A - LOSP, no SI signal, without OP action

PE Mean = 1.1868E-02 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WA3

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | F | OFFSITE POWER AVAILABLE |
| CC.SWS.6 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WA4 - SWS TRAIN A - SI signal, no LOSP, with OP actions

PE Mean = 4.3528E-03 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WA4

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| CC.SWS.6 | F | Common Cause: Group PPS, 1/4 |

Split Fraction WA5 - SWS TRAIN A - SI signal, no LOSP, without OP action

PE Mean = 5.7716E-03 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WA5

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| CC.SWS.6 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WA6 - SWS TRAIN A - CT only

PE Mean = 4.0966E-02 Date: 16 DEC 1993 11:19

Basic Event Impacts for Split Fraction: WA6

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| NO.SVV44.CL | F | UNIT 1 INTAKE TUNNEL NOV SW-V44 TRANSFERS CLOSED |
| CC.SWS.6 | F | Common Cause: Group PPB, 1/4 |

Split Fraction WAA - SWS TRAIN A - SINGLE TRAIN
PE Mean = 6.5410E-03 Date : 16 DEC 1993 11:19
Equation: SW1/WA1

Split Fraction WAF - SWS TRAIN A - Guaranteed Failure
PE Mean = 1.0000E+00 Date : 16 DEC 1993 11:19
Constant Value: 1

Split Fraction WB1 - SWS TRAIN B - no LOSEP, no SI signal, with OP action - single train
 PE Mean = 6.1668E-05 Date : 16 DEC 1993 10:16
 Basic Event Impacts for Split Fraction : WB1

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WB2 - SWS TRAIN B - no LOSEP, no SI signal, with OP action - given train A failed
 PE Mean = 7.0530E-03 Date : 16 DEC 1993 10:16
 Conditional Split Fraction: SW1/WA1

Split Fraction WB3 - SWS TRAIN B - no LOSEP, no SI signal, with OP action, given train A success
 PE Mean = 6.1280E-05 Date : 16 DEC 1993 10:16
 Conditional Split Fraction: (WB1-SW1)/(1-WA1)

Split Fraction WB4 - SWS TRAIN B - no LOSEP, no SI signal, without OP actions, single train
 PE Mean = 1.2726E-03 Date : 16 DEC 1993 10:16
 Basic Event Impacts for Split Fraction : WB4

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |

Split Fraction WB5 - SWS TRAIN B - no LOSEP, no SI signal, without OP actions, given train A failure
 PE Mean = 3.1260E-02 Date : 16 DEC 1993 10:16
 Conditional Split Fraction: SW2/WA2

Split Fraction WB6 - SWS TRAIN B - no LOSEP, no SI signal, without OP actions, given train A success
 PE Mean = 1.2340E-03 Date : 16 DEC 1993 10:16
 Conditional Split Fraction: (WB4-SW2)/(1-WA2)

Split Fraction WB7 - SWS TRAIN B - LOSEP, no SI signal, without OP action, single train
 PE Mean = 1.1868E-02 Date : 16 DEC 1993 10:16
 Basic Event Impacts for Split Fraction : WB7

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | F | OFFSITE POWER AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |

Split Fraction WB8 - SWS TRAIN B - LOCA, no SI signal, without OP action, given train A failed
 PE Mean = 6.4360E-02 Date : 16 DEC 1993 10:16
 Conditional Split Fraction: SW3/WA3

Split Fraction WB9 - SWS TRAIN B - LOCA, no SI signal, without OP action, given train A success
 PE Mean = 1.1240E-02 Date : 16 DEC 1993 10:16
 Conditional Split Fraction: (WB7-SW3)/(1-WA3)

Split Fraction WB10 - SWS TRAIN B - no LOSEP, SI signal, with OP action, single train
 PE Mean = 4.3516E-03 Date : 16 DEC 1993 10:16
 Basic Event Impacts for Split Fraction : WB10

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WB11 - SWS TRAIN B - no LOSP, SI signal, with OP action, given train B failed
 PE Mean = 7.2940E-02 Date: 16 DEC 1993 10:16
 Conditional Split Fraction: SW4/WA4

Split Fraction WB12 - SWS TRAIN B - no LOSP, SI signal, with OP action, given train A success
 PE Mean = 4.0520E-03 Date: 16 DEC 1993 10:16
 Conditional Split Fraction: (WB10-SW4)/(1-WA4)

Split Fraction WB13 - SWS TRAIN B - SI Signal, no LOSP, without OP actions
 PE Mean = 5.5679E-03 Date: 16 DEC 1993 10:16
 Basic Event Impacts for Split Fraction: WB13

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |

Split Fraction WB14 - SWS TRAIN B - SI Signal, No LOSP, without OP action
 PE Mean = 6.4420E-02 Date: 16 DEC 1993 10:16
 Conditional Split Fraction: SW5/WA5

Split Fraction WB15 - SWS TRAIN B - SI Signal, no LOSP, without OP actions
 PE Mean = 5.2380E-03 Date: 16 DEC 1993 10:16
 Conditional Split Fraction: (WB13-SW5) / (1-WA5)

Split Fraction WB16 - SWS TRAIN B - CT only, single train
 PE Mean = 4.5203E-02 Date: 16 DEC 1993 10:16
 Basic Event Impacts for Split Fraction: WB16

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| MO.SWV44.CL | F | UNIT 1 INTAKE TUNNEL MOV SW-V44 TRANSFERS CLOSED |

Split Fraction WB17 - SWS TRAIN B - CT only, given train A failed
 PE Mean = 2.4410E-01 Date: 16 DEC 1993 10:16
 Conditional Split Fraction: SW6/WA6

Split Fraction WB18 - SWS TRAIN B - CT only, given train A success
 PE Mean = 3.6710E-02 Date: 16 DEC 1993 10:16
 Conditional Split Fraction: (WB16-SW6)/(1-WA6)

15:29:01 16 DEC 1993
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Split Fraction WB11 - SWS TRAIN B - no LOSP, SI signal, with OP action, given train B failed
 PE Mean = 7.2990E-02 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: SW4/WA4

Split Fraction WB12 - SWS TRAIN B - no LOSP, SI signal, with OP action, given train A success
 PE Mean = 4.0490E-03 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: (WB10-SW4)/(1-WA4)

Split Fraction WB13 - SWS TRAIN B - SI Signal, no LOSP, without OP actions
 PE Mean = 5.5528E-03 Date : 16 DEC 1993 10:53
 Basic Event Impacts for Split Fraction : WB13

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| OP1A | F | OPERATOR INITIATES COOLING TOWER OPERATION |

Split Fraction WB14 - SWS TRAIN B - SI Signal, No LOSP, without OP action
 PE Mean = 6.4540E-02 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: SW5/WA5

Split Fraction WB15 - SWS TRAIN B - SI Signal, no LOSP, without OP actions
 PE Mean = 5.2240E-03 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: (WB13-SW5) / (1-WA5)

Split Fraction WB16 - SWS TRAIN B - CT only, single train
 PE Mean = 4.3233E-02 Date : 16 DEC 1993 10:53
 Basic Event Impacts for Split Fraction : WB16

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| MO.SWV44.CL | F | UNIT 1 INTAKE TUNNEL ROV SW-V44 TRANSFERS CLOSED |

Split Fraction WB17 - SWS TRAIN B - CT only, given train A failed
 PE Mean = 2.5370E-01 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: SW6/WA6

Split Fraction WB18 - SWS TRAIN B - CT only, given train A success
 PE Mean = 3.4700E-02 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: (WB16-SW6)/(1-WA6)

13:31:47 16 DEC 1993

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Split Fraction WA1 - SWS TRAIN A - no LOSP, no SI signal, with OP action
PE Mean = 5.6327E-05 Date : 16 DEC 1993 10:16
Basic Event Impacts for Split Fraction : WA1

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WA2 - SWS TRAIN A - no LOSP, no SI signal, without OP actions
PE Mean = 1.2724E-03 Date : 16 DEC 1993 10:16
Basic Event Impacts for Split Fraction : WA2

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WA3 - SWS TRAIN A - LOSP, no SI signal, without OP action
PE Mean = 1.1867E-02 Date : 16 DEC 1993 10:16
Basic Event Impacts for Split Fraction : WA3

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | F | OFFSITE POWER AVAILABLE |

Split Fraction WA4 - SWS TRAIN A - SI signal, no LOSP, with OP actions
PE Mean = 4.3460E-03 Date : 16 DEC 1993 10:16
Basic Event Impacts for Split Fraction : WA4

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WA5 - SWS TRAIN A - SI signal, no LOSP, without OP action
PE Mean = 5.5676E-03 Date : 16 DEC 1993 10:16
Basic Event Impacts for Split Fraction : WA5

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WA6 - SWS TRAIN A - CT only
PE Mean = 4.0964E-02 Date : 16 DEC 1993 10:16
Basic Event Impacts for Split Fraction : WA6

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| MO.SWV44.CL | F | UNIT 1 INTAKE TUNNEL MOV SW-V44 TRANSFERS CLOSED |

Split Fraction WAA - SWS TRAIN A - SINGLE TRAIN
PE Mean = 7.0530E-03 Date : 16 DEC 1993 10:16
Equation: SW1/WA1

Split Fraction WAF - SWS TRAIN A - Guaranteed Failure
PE Mean = 1.0000E+00 Date : 16 DEC 1993 10:16
Constant Value: 1

15:28:59 16 DEC 1993

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Split Fraction WA1 - SWS TRAIN A - no LO SP, no SI signal, with OP action
PE Mean = 5.3369E-05 Date : 16 DEC 1993 10:53
Basic Event Impacts for Split Fraction : WA1

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WA2 - SWS TRAIN A - no LO SP, no SI signal, without OP actions
PE Mean = 1.2580E-03 Date : 16 DEC 1993 10:53
Basic Event Impacts for Split Fraction : WA2

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WA3 - SWS TRAIN A - LO SP, no SI signal, without OP action
PE Mean = 1.1869E-02 Date : 16 DEC 1993 10:53
Basic Event Impacts for Split Fraction : WA3

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | F | OFFSITE POWER AVAILABLE |

Split Fraction WA4 - SWS TRAIN A - SI signal, no LO SP, with OP actions
PE Mean = 4.3436E-03 Date : 16 DEC 1993 10:53
Basic Event Impacts for Split Fraction : WA4

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WA5 - SWS TRAIN A - SI signal, no LO SP, without OP action
PE Mean = 5.5536E-03 Date : 16 DEC 1993 10:53
Basic Event Impacts for Split Fraction : WA5

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WA6 - SWS TRAIN A - CT only
PE Mean = 3.8993E-02 Date : 16 DEC 1993 10:53
Basic Event Impacts for Split Fraction : WA6

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | S | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | F | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| MO.SVV44.CL | F | UNIT 1 INTAKE TUNNEL MOV SW-V44 TRANSFERS CLOSED |

Split Fraction WAA - SWS TRAIN A - SINGLE TRAIN
PE Mean = 7.3340E-03 Date : 16 DEC 1993 10:53
Equation: SW1/WA1

Split Fraction WAF - SWS TRAIN A - Guaranteed Failure
PE Mean = 1.0000E+00 Date : 16 DEC 1993 10:53
WC/LH Mean = 1.0000E+00 Date : 23 JUN 1993 22:21
Constant Value: 1

Split Fraction WB1 - SWS TRAIN B - no LOSP, no SI signal, with OP action - single train
 PE Mean = 5.8690E-05 Date : 16 DEC 1993 10:53
 Basic Event Impacts for Split Fraction : WB1

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

Split Fraction WB2 - SWS TRAIN B - no LOSP, no SI signal, with OP action - given train A failed
 PE Mean = 7.3340E-03 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: SW1/WA1

Split Fraction WB3 - SWS TRAIN B - no LOSP, no SI signal, with OP action, given train A success
 PE Mean = 5.8300E-05 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: (WB1-SW1)/(1-WA1)

Split Fraction WB4 - SWS TRAIN B - no LOSP, no SI signal, without OP actions, single train
 PE Mean = 1.2579E-03 Date : 16 DEC 1993 10:53
 Basic Event Impacts for Split Fraction : WB4

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |

Split Fraction WB5 - SWS TRAIN B - no LOSP, no SI signal, without OP action, given train A failure
 PE Mean = 3.1460E-02 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: SW2/WA2

Split Fraction WB6 - SWS TRAIN B - no LOSP, no SI signal, without OP actions, given train A success
 PE Mean = 1.2200E-03 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: (WB4-SW2)/(1-WA2)

Split Fraction WB7 - SWS TRAIN B - LOSP, no SI signal, without OP action, single train
 PE Mean = 1.1867E-02 Date : 16 DEC 1993 10:53
 Basic Event Impacts for Split Fraction : WB7

| Basic Event | State | Description |
|--------------|-------|--|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | S | SI SIGNAL PRESENT |
| XX.OSP.XX | F | OFFSITE POWER AVAILABLE |
| OPTA | F | OPERATOR INITIATES COOLING TOWER OPERATION |

Split Fraction WB8 - SWS TRAIN B - LOCA, no SI signal, without OP action, given train A failed
 PE Mean = 6.4360E-02 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: SW3/WA3

Split Fraction WB9 - SWS TRAIN B - LOCA, no SI signal, without OP action, given train A success
 PE Mean = 1.1240E-02 Date : 16 DEC 1993 10:53
 Conditional Split Fraction: (WB7-SW3)/(1-WA3)

Split Fraction WB10 - SWS TRAIN B - no LOSP, SI signal, with OP action, single train
 PE Mean = 4.3482E-03 Date : 16 DEC 1993 10:53
 Basic Event Impacts for Split Fraction : WB10

| Basic Event | State | Description |
|--------------|-------|-------------------------------------|
| XX.TRAINA.XX | F | TRAIN A SUPPORT SYSTEMS UNAVAILABLE |
| XX.TRAINB.XX | S | TRAIN B SUPPORT AVAILABLE |
| XX.SIGNAL.XX | F | SI SIGNAL PRESENT |
| XX.OSP.XX | S | OFFSITE POWER AVAILABLE |

| | | | | | | |
|----|---|---|----------|-----|-------|------|
| 15 | ALOPF (1.3E+0) | (RT1)(PL1)(AM1) (1.4E-4)(6.7E-1)(1.0E-2) | 7.24E-07 | .61 | 68.95 | MELT |
| | ATWS - LOSS OF MAIN FEEDWATER (PLMPW + TLMFW) | | | | | |
| | - | | | | | |
| | - | | | | | |
| | - | | | | | |
| 16 | PLMPW (1.1E+0) | (PA1)(PB2) (1.1E-4)(6.4E-3) | 7.19E-07 | .61 | 69.56 | MELT |
| | PARTIAL LOSS OF MAIN FEEDWATER | | | | | |
| | - PRIMARY COMPONENT COOLING - TRAIN A | | | | | |
| | - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 17 | SLOCA (1.0E-2) | (LS2)(L65)(RMLT1) (5.2E-3)(8.4E-2)(1.0E-1) | 7.10E-07 | .60 | 70.16 | MELT |
| | SMALL LOCA | | | | | |
| | - RHR INJECTION (WITH HX) - TRAIN A | | | | | |
| | - RHR INJECTION (WITH HX) - TRAIN B | | | | | |
| | - | | | | | |
| | - | | | | | |
| 18 | FSWPH (4.0E-4) | (WA6)(WB16) (4.1E-2)(4.5E-2) | 6.96E-07 | .59 | 70.75 | MELT |
| | FIRE IN SW PUMPHOUSE - LOSS OF BOTH OCEAN SW TRAINS | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN A | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 19 | TT (1.1E+0) | (PA1)(PB2) (1.1E-4)(6.4E-3) | 6.81E-07 | .58 | 71.33 | MELT |
| | TURBINE TRIP | | | | | |
| | - PRIMARY COMPONENT COOLING - TRAIN A | | | | | |
| | - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 20 | E7T (1.6E-5) | (QY7)(QD7) (9.6E-1)(5.2E-2) | 6.02E-07 | .51 | 71.83 | MELT |
| | SIGNIFICANT 0.7% TRANSIENT EVENT | | | | | |
| | - | | | | | |
| | - | | | | | |
| 21 | RT (1.4E+0) | (WA1)(WB2) (6.4E-5)(6.5E-3) | 5.30E-07 | .45 | 72.28 | MELT |
| | REACTOR TRIP | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN A | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN B | | | | | |

| | | | | | | |
|----|---|--|----------|-----|-------|------|
| 22 | ALMFP (1.3E+0) | (RT1)(PL1)(RT1)(PSB3) (1.4E-4)(0.7E-1)(2.0E-2)(3.2E-1) | 4.75E-07 | .40 | 72.68 | MELT |
| | ATMS - LOSS OF MAIN FEEDWATER (PLMFW + TLMFW) | | | | | |
| | - RCS PRESSURE RELIEF | | | | | |
| 23 | FLLP (6.9E-4) | (WA3)(WBB) (1.2E-2)(6.4E-2) | 4.46E-07 | .38 | 73.06 | MELT |
| | FLOOD IN TURBINE BUILDING - LOSS | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN A | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 24 | PLMFW (1.1E+0) | (WA1)(WB2) (6.4E-5)(6.5E-3) | 4.43E-07 | .37 | 73.44 | MELT |
| | PARTIAL LOSS OF MAIN FEEDWATER | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN A | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 25 | TT (1.1E+0) | (WA1)(WB2) (6.4E-5)(6.5E-3) | 4.20E-07 | .35 | 73.79 | MELT |
| | TURBINE TRIP | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN A | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN B | | | | | |

TABLE E.3

MODEL NUMBER SENS CASE

Total Frequency of Sequences in Group : CDF = 1.18E-04 per year
ALL INITIATING EVENTS

16:50:51 20 DEC 1993

| Rank No. | Initiating Event | Failed or Multi-State Split Fractions (Dependent "Guaranteed" Failures Excluded) | Frequency (per year) | Percent | Percent Cume | End State |
|----------|--|---|-------------------------|---------|-----------------|--------------|
| 1 | L1SMB (6.3E-2) | (WAA) (WB16) (6.5E-3)(4.5E-2) | 1.76E-05 | 14.87 | 14.87 | MELT |
| | LOSS OF TRAIN B SERVICE WATER - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 2 | L1CCB (2.8E-3) | (PAA) (6.4E-3) | 1.65E-05 | 13.94 | 28.81 | MELT |
| | LOSS OF TRAIN B PRIMARY COMPONENT COOLING - PRIMARY COMPONENT COOLING - TRAIN A | | | | | |
| 3 | L1CCA (2.8E-3) | (PB2) (6.4E-3) | 1.65E-05 | 13.94 | 42.76 | MELT |
| | LOSS OF TRAIN A PRIMARY COMPONENT COOLING - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 4 | L1SMA (6.3E-2) | (WA6) (WB2) (4.1E-2)(6.5E-3) | 1.59E-05 | 13.47 | 56.23 | MELT |
| | LOSS OF TRAIN A SERVICE WATER - ENG. EVAL. 92-09 - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 5 | LOSP (7.0E-2) | (WA3) (WB8) (ER9) (1.2E-2)(6.4E-2)(4.8E-2) | 2.18E-06 | 1.85 | 58.07 | MELT |
| | LOSS OF OFFSITE POWER - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 6 | L1SMA (6.3E-2) | (OG1) (WB8) (5.7E-4)(6.4E-2) | 1.97E-06 | 1.67 | 59.74 | MELT |
| | LOSS OF TRAIN A SERVICE WATER - ENG. EVAL. 92-09 - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 7 | FPCC3P (2.0E-4) | (PB10) (1.0E-2) | 1.93E-06 | 1.63 | 61.37 | MELT |
| | FIRE IN PAB - LOSS OF TRAIN A PCC AND RUNNING TRAIN B PUMP - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |

| | | | | | | |
|--|-------------------|---|----------|------|-------|------|
| 8 | PCRC (1.7E-5) | (ORS2) (1.0E-1) | 1.61E-06 | 1.36 | 62.73 | MELT |
| FIRE IN CONTROL ROOM - PCC LOSS | | | | | | |
| 9 | LOSP (7.0E-2) | (GA1) (GBA) (ER1) (4.1E-2)(5.4E-2)(1.1E-2) | 1.55E-06 | 1.31 | 64.04 | MELT |
| LOSS OF OFFSITE POWER - AC POWER - DIESEL GENERATOR A - AC POWER - DIESEL GENERATOR B | | | | | | |
| 10 | E7T (1.6E-5) | (Q7) (QK7) (9.6E-1)(1.1E-1) | 1.31E-06 | 1.11 | 65.15 | MELT |
| SEISMIC 0.76 TRANSIENT EVENT | | | | | | |
| 11 | FLP (6.9E-4) | (GA1) (GBA) (ER5) (4.1E-2)(5.4E-2)(7.1E-1) | 1.00E-06 | .85 | 65.99 | MELT |
| FLOOD IN TURBINE BUILDING - LOFP - AC POWER - DIESEL GENERATOR A - AC POWER - DIESEL GENERATOR B | | | | | | |
| 12 | BLOCA (1.8E-2) | (ER1) (6.0E-3) | 9.93E-07 | .84 | 66.83 | MELT |
| SMALL LOCA | | | | | | |
| 13 | FLSW (1.1E-6) | | 9.30E-07 | .79 | 67.62 | MELT |
| EXTERNAL FLOODING - LOSS OF ALL SERVICE WATER | | | | | | |
| 14 | RT (1.4E+0) | (PA1) (PB2) (1.1E-4)(6.4E-3) | 8.59E-07 | .73 | 68.34 | MELT |
| REACTOR TRIP - PRIMARY COMPONENT COOLING - TRAIN A - PRIMARY COMPONENT COOLING - TRAIN B | | | | | | |

| | | | | | | |
|----|---|---|----------|-----|-------|------|
| 15 | PLMFW (1.1E+0) | (PA1)(P02) (1.1E-4)(6.4E-3) | 7.19E-07 | .87 | 60.38 | MELT |
| | PARTIAL LOSS OF MAIN FEEDWATER - PRIMARY COMPONENT COOLING - TRAIN A - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 16 | SLOCA (1.0E-2) | (L52)(L65)(RMLT1) (5.2E-3)(8.4E-2)(1.0E-1) | 7.10E-07 | .86 | 61.24 | MELT |
| | SMALL LOCA - RHR INJECTION (WITH RK) - TRAIN A - RHR INJECTION (WITH RK) - TRAIN B - | | | | | |
| 17 | FSMPH (4.0E-4) | (WA6)(WB16) (4.1E-2)(4.5E-2) | 6.96E-07 | .84 | 62.08 | MELT |
| | FIRE IN SW PUMPHOUSE - LOSS OF BOTH OCEAN SW TRAINS - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 18 | TT (1.1E+0) | (PA1)(P02) (1.1E-4)(6.4E-3) | 6.81E-07 | .83 | 62.91 | MELT |
| | TURBINE TRIP - PRIMARY COMPONENT COOLING - TRAIN A - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 19 | E7T (1.6E-5) | (QY7)(Q07) (9.6E-1)(5.2E-2) | 6.02E-07 | .73 | 63.63 | MELT |
| | SEISMIC 0.7% TRANSIENT EVENT - | | | | | |
| 20 | RT (1.4E+0) | (WA1)(WB2) (5.6E-5)(7.1E-3) | 5.04E-07 | .61 | 64.25 | MELT |
| | REACTOR TRIP - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 21 | ALOMF (1.3E+0) | (R11)(PL1)(R11)(PS03) (1.4E-4)(6.7E-1)(2.0E-2)(3.2E-1) | 4.75E-07 | .53 | 64.82 | MELT |
| | ATWS - LOSS OF MAIN FEEDWATER (PLMFW + TLMFW) - - - - RCS PRESSURE RELIEF | | | | | |

| | | | | | | |
|----|---|---|----------|-----|-------|------|
| 22 | FLLP (6.9E-4) | (WA3)(LWB2) (1.2E-2)(6.4E-2) | 4.46E-07 | .54 | 65.36 | MELT |
| | FLOOD IN TURBINE BUILDING - LOSS | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN A | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 23 | PLMFU (1.1E+0) | (WA1)(LWB2) (5.6E-5)(7.1E-3) | 4.22E-07 | .51 | 65.87 | MELT |
| | PARTIAL LOSS OF MAIN FEEDWATER | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN A | | | | | |
| | - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 24 | ALDMP (1.3E+0) | (RT1)(PL1)(EPA) (1.4E-6)(6.7E-1)(5.5E-3) | 4.06E-07 | .49 | 66.36 | MELT |
| | ATWS - LOSS OF MAIN FEEDWATER (PLMFU + TLMFU) | | | | | |
| | - EMERGENCY FEEDWATER - TURBINE DRIVEN AND MOTOR DRIVEN PUMPS | | | | | |
| 25 | EST (1.9E-5) | (OY5)(OAS) (8.3E-1)(2.0E-2) | 4.00E-07 | .48 | 66.85 | MELT |

SEISMIC 0.5g TRANSIENT EVENT

TABLE E.2
MODEL Name: NEW SWTS

Total Frequency of Sequences in Group : CDF = 8.25E-05 per year
ALL INITIATORS - ALL END STATES

16:39:44 20 DEC 1993

| Rank No. | Initiating Event | Failed or Multi-State Split Fractions (Dependent "Guaranteed" Failures Excluded) | Frequency (per year) | Percent | Percent Cum. | End State |
|----------|---|---|-------------------------|---------|-----------------|--------------|
| 1 | L1CCB (2.8E-3) | (PAA) (6.4E-3) | 1.65E-05 | 20.00 | 20.00 | MELT |
| | LOSS OF TRAIN B PRIMARY COMPONENT COOLING - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 2 | L1CCA (2.8E-3) | (PB2) (6.4E-3) | 1.65E-05 | 20.00 | 40.00 | MELT |
| | LOSS OF TRAIN A PRIMARY COMPONENT COOLING - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 3 | LOSP (7.0E-2) | (WA3)(WB8)(ER9) (1.2E-2)(6.4E-2)(4.8E-2) | 2.18E-06 | 2.65 | 42.65 | MELT |
| | LOSS OF OFFSITE POWER - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 4 | FPCC3P (2.0E-4) | (PB10) (1.0E-2) | 1.93E-06 | 2.34 | 44.99 | MELT |
| | FIRE IN PAR - LOSS OF TRAIN A PCC AND RUNNING TRAIN B PUMP - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 5 | FCRCC (1.7E-5) | (DR52) (1.0E-1) | 1.61E-06 | 1.95 | 46.94 | MELT |
| | FIRE IN CONTROL ROOM - PCC LOSS | | | | | |
| 6 | L1SLB (5.3E-3) | (WAA)(WB16) (7.1E-3)(4.5E-2) | 1.57E-06 | 1.91 | 48.84 | MELT |
| | LOSS OF TRAIN B SERVICE WATER - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 7 | LOSP (7.0E-2) | (GA1)(GBA)(ER1) (4.1E-2)(5.4E-2)(1.1E-2) | 1.55E-06 | 1.88 | 50.72 | MELT |
| | LOSS OF OFFSITE POWER - AC POWER - DIESEL GENERATOR A - AC POWER - DIESEL GENERATOR B | | | | | |

| | | | | | | |
|----|--|---|----------|------|-------|------|
| 8 | L1SMA (5.3E-3) | (MA6)(MB2) (4.1E-2)(7.1E-3) | 1.43E-06 | 1.73 | 52.45 | MELT |
| | LOSS OF TRAIN A SERVICE WATER - ENG. EVAL. 92-09 - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 9 | E7T (1.6E-5) | (QY7)(QKT) (9.6E-1)(1.1E-1) | 1.31E-06 | 1.59 | 54.04 | MELT |
| | SEISMIC 0.7G TRANSIENT EVENT - - | | | | | |
| 10 | PLP (6.9E-4) | (GA1)(GBA)(ER5) (4.1E-2)(5.4E-2)(7.1E-1) | 1.00E-06 | 1.21 | 55.25 | MELT |
| | FLOOD IN TURBINE BUILDING - LOSS - AC POWER - DIESEL GENERATOR A - AC POWER - DIESEL GENERATOR B - | | | | | |
| 11 | SLOCA (1.8E-2) | (EN1) (6.0E-5) | 9.93E-07 | 1.20 | 56.46 | MELT |
| | SMALL LOCA - | | | | | |
| 12 | FLSW (1.1E-6) | | 9.30E-07 | 1.13 | 57.58 | MELT |
| | EXTERNAL FLOODING - LOSS OF ALL SERVICE WATER | | | | | |
| 13 | RT (1.4E+0) | (PA1)(PB2) (1.1E-4)(6.4E-3) | 8.59E-07 | 1.04 | 58.63 | MELT |
| | REACTOR TRIP - PRIMARY COMPONENT COOLING - TRAIN A - PRIMARY COMPONENT COOLING - TRAIN B | | | | | |
| 14 | ALMP (1.3E+0) | (RT1)(PL1)(AM1) (1.4E-4)(6.7E-1)(1.0E-2) | 7.24E-07 | .88 | 59.50 | MELT |
| | ATWS - LOSS OF MAIN FEEDWATER (PLMPW + TLMFW) - - - | | | | | |

| | | | | | | |
|---|-------------------|---|----------|-----|-------|------|
| 15 | ELUCA (1.0E-2) | (L52)(L65)(RHLT1) (5.2E-3)(8.4E-2)(1.0E-1) | 7.10E-07 | .88 | 59.91 | MELT |
| SMALL LOCA | | | | | | |
| - RWR INJECTION (WITH RX) - TRAIN A | | | | | | |
| - RWR INJECTION (WITH RX) - TRAIN B | | | | | | |
| 16 | L1SWA (2.6E-3) | (WAG)(W62) (3.9E-2)(7.3E-3) | 7.07E-07 | .88 | 60.78 | MELT |
| LOSS OF TRAIN A SERVICE WATER | | | | | | |
| - SERVICE WATER SYSTEM - TRAIN A | | | | | | |
| - SERVICE WATER SYSTEM - TRAIN B | | | | | | |
| 17 | TI (1.1E+0) | (PA1)(PB2) (1.1E-4)(6.4E-3) | 6.81E-07 | .84 | 61.63 | MELT |
| TURBINE TRIP | | | | | | |
| - PRIMARY COMPONENT COOLING - TRAIN A | | | | | | |
| - PRIMARY COMPONENT COOLING - TRAIN B | | | | | | |
| 18 | FSWPH (4.0E-4) | (WAG)(W616) (3.9E-2)(4.3E-2) | 6.33E-07 | .79 | 62.41 | MELT |
| FIRE IN SW PUMPHOUSE - LOSS OF BOTH OCEAN SW TRAINS | | | | | | |
| - SERVICE WATER SYSTEM - TRAIN A | | | | | | |
| - SERVICE WATER SYSTEM - TRAIN B | | | | | | |
| 19 | E7T (1.6E-5) | (QY7)(QD7) (9.6E-1)(5.2E-2) | 6.02E-07 | .75 | 63.16 | MELT |
| SEISMIC 0.7% TRANSIENT EVENT | | | | | | |
| 20 | RT (1.4E+0) | (W41)(W62) (5.3E-5)(7.3E-3) | 4.96E-07 | .62 | 63.78 | MELT |
| REACTOR TRIP | | | | | | |
| - SERVICE WATER SYSTEM - TRAIN A | | | | | | |
| - SERVICE WATER SYSTEM - TRAIN B | | | | | | |
| 21 | ALOMP (1.3E+0) | (RT1)(PL1)(R11)(PS65) (1.4E-4)(6.7E-1)(2.0E-2)(3.2E-1) | 4.79E-07 | .59 | 64.37 | MELT |
| ATWS - LOSS OF MAIN FEEDWATER (PLNFW + TLNFW) | | | | | | |
| - | | | | | | |
| - | | | | | | |
| - RCS PRESSURE RELIEF | | | | | | |

| | | | | | | |
|----|--|---|----------|-----|-------|------|
| 22 | FLLP (6.9E-4) | (WA3)(WBB) (1.2E-2)(6.4E-2) | 4.46E-07 | .55 | 64.92 | MELT |
| | FLOOD IN TURBINE BUILDING - LOFP - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 23 | PLMPW (1.1E+0) | (WA1)(WB2) (5.3E-5)(7.3E-3) | 4.15E-07 | .52 | 65.43 | MELT |
| | PARTIAL LOSS OF MAIN FEEDWATER - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | |
| 24 | ALMP (1.3E+0) | (RT1)(PL1)(EPA) (1.4E-4)(6.7E-1)(5.5E-3) | 4.06E-07 | .50 | 65.94 | MELT |
| | ATWS - LOSS OF MAIN FEEDWATER (PLMPW + TLMPW) - EMERGENCY FEEDWATER - TURBINE DRIVEN AND MOTOR DRIVEN PUMPS | | | | | |
| 25 | EST (1.9E-5) | (QYS)(QKS) (8.3E-1)(2.8E-2) | 4.00E-07 | .50 | 66.43 | MELT |
| | SEISMIC 0.5G TRANSIENT EVENT | | | | | |

TABLE E.1
MODEL Name: BASELINE

Total Frequency of Sequences in Group : CDF = 8.06E-05 per year
ALL INITIATORS AND END STATES

16:25:43 20 DEC 1993

| Rank | Initiating No. | Event | Failed or Multi-State Split Fractions (Dependent "Guaranteed" Failures Excluded) | Frequency (per year) | Percent | Percent Cum | End State | |
|------|-------------------|---|---|-------------------------|----------|----------------|--------------|------|
| 1 | L1CCB (2.8E-3) | (PAA) (6.4E-3) | | 1.65E-05 | 20.46 | 20.46 | MELT | |
| | | LOSS OF TRAIN B PRIMARY COMPONENT COOLING - PRIMARY COMPONENT COOLING - TRAIN A | | | | | | |
| 2 | L1CCA (2.8E-3) | (PB2) (6.4E-3) | | 1.65E-05 | 20.46 | 40.93 | MELT | |
| | | LOSS OF TRAIN A PRIMARY COMPONENT COOLING - PRIMARY COMPONENT COOLING - TRAIN B | | | | | | |
| 3 | LOSP (7.0E-2) | (MA3) (1.2E-2) | (MB8) (6.4E-2) | (ER9) (4.8E-2) | 2.18E-06 | 2.71 | 43.64 | MELT |
| | | LOSS OF OFFSITE POWER - SERVICE WATER SYSTEM - TRAIN A - SERVICE WATER SYSTEM - TRAIN B | | | | | | |
| 4 | FPCCP (2.0E-4) | (PB10) (1.0E-2) | | 1.93E-06 | 2.39 | 46.03 | MELT | |
| | | FIRE IN PAB - LOSS OF TRAIN A PCC AND RUNNING TRAIN B PUMP - PRIMARY COMPONENT COOLING - TRAIN B | | | | | | |
| 5 | FCRCC (1.7E-5) | (ORS2) (1.0E-1) | | 1.61E-06 | 1.99 | 48.02 | MELT | |
| | | FIRE IN CONTROL ROOM - PCC LOSS | | | | | | |
| 6 | LOBP (7.0E-2) | (GA1) (4.1E-2) | (GBA) (5.4E-2) | (ER1) (1.1E-2) | 1.55E-06 | 1.92 | 49.95 | MELT |
| | | LOSS OF OFFSITE POWER - AC POWER - DIESEL GENERATOR A - AC POWER - DIESEL GENERATOR B | | | | | | |
| 7 | EPT (1.6E-5) | (QY7) (9.6E-1) | (QK7) (1.1E-1) | 1.31E-06 | 1.62 | 51.57 | MELT | |
| | | SEISMIC 0.7G TRANSIENT EVENT | | | | | | |

8 FLLP (GA1)(GBA)(EPS)
 (6.9E-6) (4.1E-2)(5.4E-2)(7.1E-1)
 1.00E-06 1.24 52.81 MELT

FLOOD IN TURBINE BUILDING - (OSP
 - AC POWER - DIESEL GENERATOR A
 - AC POWER - DIESEL GENERATOR B

9 SLOCA (EB1)
 (1.0E-2) (6.0E-5)
 9.93E-07 1.23 54.04 MELT

SMALL LOCA

10 FLSM (1.1E-6)
 9.30E-07 1.13 55.20 MELT

EXTERNAL FLOODING - LOSS OF ALL SERVICE WATER

11 RT (PA1)(PB2)
 (1.4E+0) (1.1E-4)(6.4E-3)
 8.59E-07 1.07 56.26 MELT

REACTOR TRIP
 - PRIMARY COMPONENT COOLING - TRAIN A
 - PRIMARY COMPONENT COOLING - TRAIN B

12 LLSM (WAA)(W616)
 (2.6E-3) (7.3E-3)(4.3E-2)
 7.84E-07 .97 57.24 MELT

LOSS OF TRAIN B SERVICE WATER
 - SERVICE WATER SYSTEM - TRAIN A
 - SERVICE WATER SYSTEM - TRAIN B

13 ALPH (RT1)(PL1)(AM1)
 (1.3E+0) (1.4E-6)(6.7E-1)(1.0E-2)
 7.24E-07 .90 58.13 MELT

ATWS - LOSS OF MAIN FEEDWATER (PLRFW + TLRFW)

14 PLRFW (PA1)(PB2)
 (1.1E+0) (1.1E-4)(6.4E-3)
 7.19E-07 .89 59.03 MELT

PARTIAL LOSS OF MAIN FEEDWATER
 - PRIMARY COMPONENT COOLING - TRAIN A
 - PRIMARY COMPONENT COOLING - TRAIN B

Attachment E - Plant Model Results

This section contains the ranked list of core damage sequences for the three cases: Table E.1 (Base Case), Table E.2 (New TS Case) and Table E.3 (Sensitivity Case). Each list contains the top 25 sequences, with the SW impacted sequences highlighted.

The highest ranked sequence involving SW failure is Sequence #3: loss of offsite power and failure of both trains of SW. This is assumed to result in unrecoverable failure of the diesel generators. As discussed in the evaluation, SW is quantified for the normally operating ocean SW pumps only. The standby SW and CT pumps would not auto start, and no credit is given for the operator manually starting the pumps due to limited time for DG cooling. Because of this, this sequence is not impacted by the New TS Case or the Sensitivity case.

The relationship between split fractions, used in the sequences, and system results, given in Attachment C, is explained in the following tables:

| | |
|-----------|--|
| Table E.4 | Split Fraction Report - BASELINE |
| Table E.5 | Split Fraction Report - NEW TS CASE |
| Table E.6 | Split Fraction Report - SENSITIVITY CASE |

TABLE D.3

MODEL Name: SENS CASE
Cause Table for Top Event L1SW and Split Fraction L1SW1

PE Value of L1SW1 = 6.3324E-02 Date : 20 DEC 1993 10:57
MC/LH Value of L1SW1 = 0.0000E+00 Date :

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| No... | Cutsets..... | Value..... | % importance | % Cumulative | Alignment... |
|-------|--------------|------------|--------------|--------------|--------------|
| 1 | PP.SWP41A.FR | 6.104E-02 | 96.3934 | 96.3934 | NORMAL |
| 2 | MO.SWV20.CL | 5.684E-04 | .8976 | 97.2910 | NORMAL |
| 3 | MO.SWV2.CL | 5.684E-04 | .8976 | 98.1886 | NORMAL |

MODEL Name: BASELINE
 Cause Table for Top Event L1SW and Split Fraction L1SW1

PE Value of L1SW1 = 2.6331E-03 Date : 20 DEC 1993 10:42
 MC/LH Value of L1SW1 = 0.0000E+00 Date :

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| No... | Cutsets..... | Value.... | % Importance | % Cumulative | Alignment... |
|-------|----------------------------------|-----------|--------------|--------------|--------------|
| 1 | PP.SWP41A.FR | 5.860E-04 | 22.2552 | 22.2552 | LSWMT |
| 2 | MO.SWV44.IE | 5.630E-04 | 21.3817 | 43.6368 | NORMAL |
| 3 | MO.SWV20.CL | 5.630E-04 | 21.3817 | 65.0185 | NORMAL |
| 4 | PP.SWP41A.FR * MO.SWV22.FC | 2.597E-04 | 9.8629 | 74.8814 | NORMAL |
| 5 | VL.SWV68.CL | 2.549E-04 | 9.6806 | 84.5620 | NORMAL |
| 6 | VL.SWV70.CL | 2.549E-04 | 9.6806 | 94.2427 | NORMAL |
| 7 | PP.SWP41A.FR * PP.SWP41C.FS | 9.718E-05 | 3.6907 | 97.9334 | NORMAL |
| 8 | PP.SWP41A.FR * PP.SWP41C.FRIE | 1.727E-05 | .6559 | 98.5893 | NORMAL |

TABLE D.2

MODEL Name: NEW SWTS
Cause Table for Top Event L1SW and Split fraction L1SW1

PE Value of L1SW1 = 5.2574E-03 Date : 20 DEC 1993 10:23
MC/LH Value of L1SW1 = 0.00L '+00 Date :

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| No... | Cutssets..... | Value..... | % Importance | % Cumulative | Alignment... |
|-------|----------------------------------|------------|--------------|--------------|--------------|
| 1 | PP.SWP41A.FR | 1.989E-03 | 37.8323 | 37.8323 | AMNT1 |
| 2 | PP.SWP41A.FR | 1.171E-03 | 22.2733 | 60.1056 | PLMNTA |
| 3 | MO.SWV44.IE | 5.390E-04 | 10.2522 | 70.3578 | NORMAL |
| 4 | MO.SWV20.CL | 5.390E-04 | 10.2522 | 80.6100 | NORMAL |
| 5 | PP.SWP41A.FR * MO.SWV22.FC | 2.486E-04 | 4.7286 | 85.3386 | NORMAL |
| 6 | VL.SWV70.CL | 2.440E-04 | 4.6411 | 89.9797 | NORMAL |
| 7 | VL.SWV68.CL | 2.440E-04 | 4.6411 | 94.6207 | NORMAL |
| 8 | PP.SWP41A.FR * PP.SWP41C.FS | 9.305E-05 | 1.7699 | 96.3906 | NORMAL |
| 9 | PP.SWP41A.FR * PP.SWP41C.FRIE | 5.612E-05 | 1.0674 | 97.4581 | NORMAL |
| 10 | MO.SWV20.CL | 1.853E-05 | .3525 | 97.8105 | AMNT1 |
| 11 | MO.SWV2.CL | 1.853E-05 | .3525 | 98.1630 | AMNT1 |
| 12 | MO.SWV44.IE | 1.853E-05 | .3525 | 98.5154 | AMNT1 |
| 13 | MO.SWV2.CL | 1.090E-05 | .2073 | 98.7228 | PLMNTA |
| 14 | MO.SWV44.IE | 1.090E-05 | .2073 | 98.9301 | PLMNTA |

Attachment D - Initiating Event Results - Loss of One Train SW

This section contains the dominant cutsets for the initiator loss of one train of SW, in Table D.1 (Base Case), Table D.2 (New TS Case) and Table D.3 (Sensitivity Case).

The Base Case shows that the highest frequency cutset is failure of the operating SW pump while the standby pump is in maintenance (LSWMNT). Cutsets 2, 3, 5, and 6 are normally open valves, common to the SW train, that are modeled to transfer closed. These are not impacted by changes to the maintenance model. Cutsets 4 and 7 are failure of the operating SW pump with failure of the standby pump to start or failure of the discharge MOV to open.

The New TS Case increases the duration of maintenance for the standby pump (AMNT1), which impacts the first cutset. The second cutset is failure of the operating SW pump while the standby pump is in planned maintenance.

The Sensitivity Case is dominated by the operating pump failing to continue to run for an operating year.