CP&L
Carolina Power & Light Company

January 27, 1982


File: BC/A-4

Office of Nuclear Reactor Regulation
ATTN: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
United States Nuclear Regulatory Commission
Washington, D.C. 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
IMPLEMENTATION OF ODYN CODE

Dear Mr. Vassallo:

SUMMARY

Mr. D. G. Eisenhut's November 4, 1980 letter stated that all operating BWRs with General Electric (GE) reload licensing analyses must have the limiting transients recalculated with the ODYN transient code by January 1982, even if a reload submittal has not been made. In a June 30, 1981 letter, Carolina Power & Light Company (CP&L) advised the NRC that, based on the scheduled refueling date of April 1982, an ODYN reanalysis for Brunswick-1 would be applicable to only the last three months of the current operating cycle and would represent redundant analyses since the unit had already been licensed with the REDY code. Accordingly, CP&L requested that Brunswick-1 be permitted to complete Cycle 3 using the existing REDY code analysis for which GE had presented evidence demonstrating that the REDY code is, under specified conditions (ODYN Option B), more conservative than the ODYN code. Based on operating performances of Brunswick-1 and Brunswick-2 to date, the refuelings of Unit 1 and Unit 2 are now scheduled to begin September 1982 and June 1982, respectively.

DISCUSSION

Mr. T. A. Ippolito's December 22, 1981 letter and Mr. D. G. Eisenhut's December 29, 1981 letter stated that if scram time test data is bounded by the ODYN Option B scram time distribution, the use of ODYN Option B calculations would be conservative in the area of concern; therefore, a delay in implementing the ODYN code analyses until the next operating cycle would be considered reasonable and acceptable. CP&L has obtained the ODYN Option B criteria from GE and has completed calculations of the mean scram times for both Brunswick-1 and Brunswick-2. This information demonstrates that the data from Brunswick-1, Cycle 3 and Brunswick-2, Cycle 4 (the current cycles) are in compliance with the GE criteria for the use of ODYN Option B.



Box 1551 • Raleigh, N. C. 27602

A001
S1/1

The scram time test data for Brunswick-1, Cycle 3 and Brunswick-2, Cycle 4 are attached. The Brunswick-1 mean scram time was calculated using three scram periodic tests that have been run in Cycle 3. A total of 167 control rods were tested, resulting in a mean scram time for Unit 1 of 0.811 seconds. Since this time is less than the Option B scram time limit specification of 0.922 seconds, the Option B criteria are satisfactorily met. The Brunswick-2 mean scram time was calculated using five scram periodic tests that have been run in Cycle 4. A total of 177 control rods were tested, resulting in a mean scram time for Brunswick-2 of 0.838 seconds. Since this time is less than the Option B scram time limit specification of 0.919 seconds, the Option B criteria are satisfactorily met. A copy of these calculations is attached.

CONCLUSION

Since this data is satisfactory, CP&L plans to complete the current operating cycles of Brunswick-1 and Brunswick-2 without performing reanalyses using the ODYN code. Subsequent reload analyses for each unit will be performed using the ODYN code. If you should require any additional information, please contact my staff.

Yours very truly,

S. R. Zimmerman
Manager
Licensing & Permits

WRM/lr (7798)

Enclosures

cc: Mr. J. P. O'Reilly (R-II)

ODYN OPTION B SCRAM TIME SURVEILLANCE REQUIREMENTS

## Following BOC Test

- Notch "x" = Notch which corresponds most closely to 20% insertion of rods = 36.

- The mean scram time, $\tau_{ave}$, for the scram data generated to date in the cycle is determined by:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} = \text{N/A} \text{ sec}$$

where: n = number of surveillance tests performed to date in the cycle. (Including BOC)
= 1

$\tau_i$ = average scram time to notch x for surveillance test i.

$N_i$ = number of rods tested in surveillance test i.

therefore; $\sum_{i=1}^{n} N_i$ = 137

$\sum_{i=1}^{n} N_i \tau_i$ = (137 · 0.815) = 111.622

$$\therefore \tau_{ave} = \frac{111.622}{137} = 0.815 \text{ sec}$$

- The Option B scram time limit specification, $\tau_B$, is determined as follows:

$$\tau_B = \mu + 1.65\left(\frac{N_1}{\sum_{i=1}^{n} N_i}\right)^{1/2} \cdot \sigma$$

where: $\mu$ = mean value for statistical scram time distribution to notch x. (Table 1)
= 0.834 sec

$\sigma$ = standard deviation of above distribution (Table 1)
= 0.059 sec

$N_1$ = number of rods test at BOC (All active rods).
= 137

$$\therefore \tau_B = 0.834 + 1.65\left(\frac{137}{137}\right)^{1/2} \cdot 0.059 = 0.931 \text{ sec}$$

- Test the following for trueness:

$$\tau_{ave} \leq \tau_B \rightarrow \underline{0.815} \leq \underline{0.931} \quad \underline{\text{YES}}$$

If yes, the MCPR for each pressurization event is determined from Option B MCPR's.

If no, the MCPR for each pressurization event is determined from the following linear interpolation:

$$MCPR_{adjusted} = MCPR_{Option\ B} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B} \cdot \left( MCPR_{Option\ B} - MCPP_{Option\ A} \right)$$

where: $\tau_A$ = present tech spec scram time requirements to notch x. (Table 1 or Tech Spec)

= _____ sec

- (From the cycle specific reload license supplement)

| | 7X7 | 8X8 | 8X8R | P8X8R | |
|---|---|---|---|---|---|
| (1) Non-pressurization events | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | |
| (2) TT/LR wo BP | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | † |
| (3) FWCF | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | † |

† use only if $\tau_{ave} > \tau_B$

- The Operating Limit MCPR is the maximum of all three event MCPR's.

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| ∴ OLMCPR : | | | | |

BSEP-1
BOC

TABLE 1

ODYN Option B Scram Time Conformance Requirements

| Rod Inserted to Notch: | | Scram Times From De-Energization of Scram Pilot Valve Solenoid (Sec.) Option B Mean $\mu$ | Standard Deviation $\sigma$ | 1967 A/B* Tech Spec Curve $\tau_A$ |
|---|---|---|---|---|
| 39 | Pickup | 0.671 | 0.050 | 0.838 |
| | Dropout | 0.688 | 0.052 | 0.862 |
| 38 | Pickup | 0.723 | 0.054 | 0.911 |
| | Dropout | 0.741 | 0.055 | 0.937 |
| 37 | Pickup | 0.778 | 0.056 | 0.988 |
| | Dropout | 0.797 | 0.057 | 1.013 |
| 36 | Pickup | 0.834 | 0.059 | 1.064 |
| | Dropout | 0.852 | 0.060 | 1.089 |

*Note: 67A = 67B in these notch positions

ODYN OPTION B SCRAM TIME SURVEILLANCE REQUIREMENTS

Following 11/5/80 Test

- Notch "x" = Notch which corresponds most closely to 20% insertion of rods = 36.

- The mean scram time, $\tau_{ave}$, for the scram data generated to date in the cycle is determined by:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} = 0.815 \text{ sec}$$

where: n = number of surveillance tests performed to date in the cycle. (Including BOC)
= 2

$\tau_i$ = average scram time to notch x for surveillance test i.

$N_i$ = number of rods tested in surveillance test i.

therefore; $\sum_{i=1}^{n} N_i$ = 137 + 16 = 153

$\sum_{i=1}^{n} N_i \tau_i$ = (137 · 0.815) + (16 · 0.789) ≃ 124.279

$$\therefore \tau_{ave} = \frac{124.279}{153} = 0.812 \text{ sec}$$

- The Option B scram time limit specification, $\tau_B$, is determined as follows:

$$\tau_B = \mu + 1.65\left(\frac{N_1}{\sum_{i=1}^{n} N_i}\right)^{1/2} \cdot \sigma$$

where: $\mu$ = mean value for statistical scram time distribution to notch x. (Table 1)
= 0.834 sec

$\sigma$ = standard deviation of above distribution (Table 1)
= 0.059 sec

$N_1$ = number of rods test at BOC (All active rods).
= 137

$$\therefore \tau_B = 0.834 + 1.65\left(\frac{137}{153}\right)^{1/2} \cdot 0.059 = 0.926 \text{ sec}$$

- Test the following for trueness:

$$\tau_{ave} \leq \tau_B \rightarrow \underline{0.812} \leq \underline{0.926} \quad \underline{\text{YES}}$$

If yes, the MCPR for each pressurization event is determined from Option B MCPR's.

If no, the MCPR for each pressurization event is determined from the following linear interpolation:

$$MCPR_{adjusted} = MCPR_{Option\ B} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B} \cdot \left( MCPR_{Option\ B} - MCPP_{Option\ A} \right)$$

where: $\tau_A$ = present tech spec scram time requirements to notch x. (Table 1 or Tech Spec)

= _____ sec

- (From the cycle specific reload license supplement)

| | 7X7 | 8X8 | 8X8R | P8X8R | |
|---|---|---|---|---|---|
| (1) Non-pressurization events | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | |
| (2) TT/LR wo BP | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | † |
| (3) FWCF | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | † |

† use only if $\tau_{ave} > \tau_B$

- The Operating Limit MCPR is the maximum of all three event MCPR's.

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| ∴ OLMCPR : | | | | |

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| | Dropout | 0.741 | 0.055 | 0.937 |
| 37 | Pickup | 0.778 | 0.056 | 0.988 |
| | Dropout | 0.797 | 0.057 | 1.013 |
| 36 | Pickup | 0.834 | 0.059 | 1.064 |
| | Dropout | 0.852 | 0.060 | 1.089 |

*Note: 67A = 67B in these notch positions

ODYN OPTION B SCRAM TIME SURVEILLANCE REQUIREMENTS

BSEP-1

Following 3/20/81 Test

- Notch "x" = Notch which corresponds most closely to 20% insertion of rods = 36.

- The mean scram time, $\tau_{ave}$, for the scram data generated to date in the cycle is determined by:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} = 0.812 \text{ sec}$$

where: n = number of surveillance tests performed to date in the cycle. (Including BOC)
= 3

$\tau_i$ = average scram time to notch x for surveillance test i.

$N_i$ = number of rods tested in surveillance test i.

therefore; $\sum_{i=1}^{n} N_i = 137 + 16 + 14 = 167$

$\sum_{i=1}^{n} N_i \tau_i = (137 \cdot 0.815) + (16 \cdot 0.789) + (14 \cdot 0.795) \simeq 135.409$

$$\therefore \tau_{ave} = \frac{135.409}{167} = 0.811 \text{ sec}$$

- The Option B scram time limit specification, $\tau_B$, is determined as follows:

$$\tau_B = \mu + 1.65\left(\frac{N_1}{\sum_{i=1}^{n} N_i}\right)^{1/2} \cdot \sigma$$

where: $\mu$ = mean value for statistical scram time distribution to notch x. (Table 1)
= 0.834 sec

$\sigma$ = standard deviation of above distribution (Table 1)
= 0.059 sec

$N_1$ = number of rods test at BOC (All active rods).
= 137

$$\therefore \tau_B = 0.834 + 1.65\left(\frac{137}{167}\right)^{1/2} \cdot 0.059 = 0.922 \text{ sec}$$

BSEP-1
3-20-81

- Test the following for trueness:

$$\tau_{ave} \leq \tau_B \rightarrow \underline{0.811} \leq \underline{0.922} \quad \underline{\underline{YES}}$$

If yes, the MCPR for each pressurization event is determined from Option B MCPR's.

If no, the MCPR for each pressurization event is determined from the following linear interpolation:

$$MCPR_{adjusted} = MCPR_{Option\ B} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B} \cdot \left( MCPR_{Option\ B} - MCPR_{Option\ A} \right)$$

where: $\tau_A$ = present tech spec scram time requirements to notch x. (Table 1 or Tech Spec)

= _____ sec

- (From the cycle specific reload license supplement)

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| (1) Non-pressurization events | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = |
| (2) TT/LR wo BP | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = † |
| (3) FWCF | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = † |

† use only if $\tau_{ave} > \tau_B$

- The Operating Limit MCPR is the maximum of all three event MCPR's.

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| ∴ OLMCPR : | | | | |

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| | Dropout | 0.741 | 0.055 | 0.937 |
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| | Dropout | 0.797 | 0.057 | 1.013 |
| 36 | Pickup | 0.834 | 0.059 | 1.064 |
| | Dropout | 0.852 | 0.060 | 1.089 |

*Note: 67A = 67B in these notch positions

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1

SCRAM TIME TESTING
BEGINNING OF CYCLE (BOC) 3

| ROD NUMBER | 20% INSERTION TIME (SEC.) | ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|---|---|
| 02-19 | 0.800 | 18-43 | 0.800 |
| 02-23 | 0.900 | 18-47 | 0.850 |
| 02-27 | 0.783 | 18-51 | 0.750 |
| 02-31 | 0.850 | 22-03 | 0.750 |
| 02-35 | 0.733 | 22-07 | 0.750 |
| 06-11 | 0.800 | 22-11 | 0.817 |
| 06-15 | 0.783 | 22-15 | 0.817 |
| 06-19 | 1.367 | 22-19 | 0.817 |
| 06-23 | 0.767 | 22-23 | 0.817 |
| 06-27 | 0.817 | 22-27 | 0.800 |
| 06-31 | 0.800 | 22-31 | 0.917 |
| 06-35 | 0.750 | 22-35 | 0.867 |
| 06-39 | 0.850 | 22-39 | 0.850 |
| 06-43 | 0.733 | 22-43 | 0.767 |
| 10-07 | 0.767 | 22-47 | 0.800 |
| 10-11 | 0.767 | 22-51 | 0.800 |
| 10-15 | 0.817 | 26-03 | 0.783 |
| 10-19 | 0.817 | 26-07 | 0.783 |
| 10-23 | 0.867 | 26-11 | 0.817 |
| 10-27 | 0.783 | 26-15 | 0.650 |
| 10-31 | 0.767 | 26-19 | 0.950 |
| 10-35 | 0.817 | 26-23 | 0.767 |
| 10-39 | 0.800 | 26-27 | 0.817 |
| 10-43 | 0.833 | 26-31 | 0.867 |
| 10-47 | 0.767 | 26-35 | 0.817 |
| 14-07 | 0.850 | 26-39 | 0.833 |
| 14-23 | 0.850 | 26-43 | 0.833 |
| 14-27 | 0.783 | 26-47 | 0.833 |
| 14-31 | 0.867 | 26-51 | 0.783 |
| 14-35 | 0.850 | 30-07 | 0.817 |
| 14-39 | 0.783 | 30-11 | 0.800 |
| 14-43 | 0.850 | 30-15 | 0.817 |
| 14-47 | 0.800 | 30-19 | 0.867 |
| 18-03 | 0.750 | 30-23 | 0.850 |
| 18-07 | 0.800 | 30-27 | 0.900 |
| 18-11 | 0.767 | 30-31 | 0.883 |
| 18-15 | 0.867 | 30-35 | 0.883 |
| 18-19 | 0.800 | 30-39 | 0.850 |
| 18-23 | 0.783 | 30-43 | 0.767 |
| 18-27 | 0.833 | 30-47 | 0.733 |
| 18-31 | 0.850 | 30-51 | 0.800 |
| 18-35 | 0.800 | 34-03 | 0.750 |
| 18-39 | 0.833 | 34-07 | 0.817 |

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1 (CONT'D)

SCRAM TIME TESTING
BEGINNING OF CYCLE (BOC) 3

| ROD NUMBER | 20% INSERTION TIME (SEC.) | ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|---|---|
| 34-11 | 0.767 | 50-27 | 0.817 |
| 34-15 | 0.900 | 50-31 | 0.783 |
| 34-19 | 0.850 | 50-35 | 0.733 |
| 34-23 | 0.850 | 38-15 | 0.850 |
| 34-27 | 0.867 | 30-03 | 0.867 |
| 34-31 | 0.850 | 14-11 | 0.850 |
| 34-35 | 0.833 | 14-15 | 0.833 |
| 34-39 | 0.817 | 14-19 | 0.800 |
| 34-43 | 0.800 | | |
| 34-47 | 0.833 | | |
| 34-51 | 0.750 | | |
| 38-07 | 0.767 | | |
| 38-11 | 0.783 | | |
| 38-19 | 0.767 | | |
| 38-23 | 0.850 | | |
| 38-27 | 0.850 | | |
| 38-31 | 0.800 | | |
| 38-35 | 0.833 | | |
| 38-39 | 0.867 | | |
| 38-43 | 0.767 | | |
| 38-47 | 0.817 | | |
| 42-07 | 0.817 | | |
| 42-11 | 0.800 | | |
| 42-15 | 0.783 | | |
| 42-19 | 0.867 | | |
| 42-23 | 0.850 | | |
| 42-27 | 0.817 | | |
| 42-31 | 0.817 | | |
| 42-35 | 0.783 | | |
| 42-39 | 0.850 | | |
| 42-43 | 0.767 | | |
| 42-47 | 0.800 | | |
| 46-11 | 0.783 | | |
| 46-15 | 0.833 | | |
| 46-19 | 0.767 | | |
| 46-23 | 0.800 | | |
| 46-27 | 0.783 | | |
| 46-31 | 0.850 | | |
| 46-35 | 0.767 | | |
| 46-39 | 0.800 | | |
| 46-43 | 0.833 | | |
| 50-19 | 0.700 | | |
| 50-23 | 0.767 | | |

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1

SCRAM TIME TESTING
NOVEMBER 5, 1980

| ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|
| 26-39 | 0.717 |
| 10-15 | 0.850 |
| 26-15 | 0.817 |
| 02-35 | 0.717 |
| 10-39 | 0.817 |
| 22-27 | 0.817 |
| 14-27 | 0.833 |
| 26-39 | 0.750 |
| 02-19 | 0.767 |
| 42-39 | 0.850 |
| 42-15 | 0.800 |
| 34-51 | 0.733 |
| 50-35 | 0.717 |
| 38-27 | 0.833 |
| 50-19 | 0.700 |
| 30-27 | 0.900 |

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 1

SCRAM TIME TESTING
MARCH 20, 1981

| ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|
| 26-51 | 0.767 |
| 10-43 | 0.767 |
| 18-43 | 0.800 |
| 34-43 | 0.800 |
| 02-27 | 0.783 |
| 10-27 | 0.800 |
| 42-27 | 0.850 |
| 50-27 | 0.800 |
| 10-11 | 0.783 |
| 18-11 | 0.783 |
| 34-11 | 0.800 |
| 42-11 | 0.800 |
| 26-03 | 0.783 |
| 26-35 | 0.817 |

ODYN OPTION B SCRAM TIME SURVEILLANCE REQUIREMENTS

BSEP-2

Following BOC Test

- Notch "x" = Notch which corresponds most closely to 20% insertion of rods = 36.

- The mean scram time, $\tau_{ave}$, for the scram data generated to date in the cycle is determined by:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} = \text{N/A} \text{ sec}$$

where: n = number of surveillance tests performed to date in the cycle. (Including BOC)

= 1

$\tau_i$ = average scram time to notch x for surveillance test i.

$N_i$ = number of rods tested in surveillance test i.

therefore; $\sum_{i=1}^{n} N_i$ = 136

$\sum_{i=1}^{n} N_i \tau_i$ = (136 · 0.846) ≃ 115.015

$$\therefore \quad \tau_{ave} = \frac{115.015}{136} = 0.846 \text{ sec}$$

- The Option B scram time limit specification, $\tau_B$, is determined as follows:

$$\tau_B = \mu + 1.65\left(\frac{N_1}{\sum_{i=1}^{n} N_i}\right)^{1/2} \cdot \sigma$$

where: $\mu$ = mean value for statistical scram time distribution to notch x. (Table 1)

= 0.834 sec

$\sigma$ = standard deviation of above distribution (Table 1)

= 0.059 sec

$N_1$ = number of rods test at BOC (All active rods).

= 136

$$\therefore \quad \tau_B = 0.834 + 1.65\left(\frac{136}{136}\right)^{1/2} \cdot 0.059 = 0.931 \text{ sec}$$

- Test the following for trueness:

$$\tau_{ave} \leq \tau_B \rightarrow \underline{0.846} \leq \underline{0.931} \quad \text{YES}$$

If yes, the MCPR for each pressurization event is determined from Option B MCPR's.

If no, the MCPR for each pressurization event is determined from the following linear interpolation:

$$MCPR_{adjusted} = MCPR_{Option\ B} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B} \cdot \left( MCPR_{Option\ B} - MCPP_{Option\ A} \right)$$

where: $\tau_A$ = present tech spec scram time requirements to notch x. (Table 1 or Tech Spec)

= _____ sec

- (From the cycle specific reload license supplement)

| | 7X7 | 8X8 | 8X8R | P8X8R | |
|---|---|---|---|---|---|
| (1) Non-pressurization events | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | |
| (2) TT/LR wo BP | $MCPR_A$= | $MCPR_A$= | $MCPR_A$= | $MCPR_A$= | † |
| | $MCPR_B$= | $MCPR_B$= | $MCPR_B$= | $MCPR_B$= | |
| | $MCPR_{adj}$= | $MCPR_{adj}$= | $MCPR_{adj}$= | $MCPR_{adj}$= | † |
| (3) FWCF | $MCPR_A$= | $MCPR_A$= | $MCPR_A$= | $MCPR_A$= | † |
| | $MCPR_B$= | $MCPR_B$= | $MCPR_B$= | $MCPR_B$= | |
| | $MCPR_{adj}$= | $MCPR_{adj}$= | $MCPR_{adj}$= | $MCPR_{adj}$= | † |

† use only if $\tau_{ave} > \tau_B$

- The Operating Limit MCPR is the maximum of all three event MCPR's.

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| ∴ OLMCPR : | | | | |

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| 38 | Pickup | 0.723 | 0.054 | 0.911 |
| | Dropout | 0.741 | 0.055 | 0.937 |
| 37 | Pickup | 0.778 | 0.056 | 0.988 |
| | Dropout | 0.797 | 0.057 | 1.013 |
| 36 | Pickup | 0.834 | 0.059 | 1.064 |
| | Dropout | 0.852 | 0.060 | 1.089 |

*Note: 67A = 67B in these notch positions

ODYN OPTION B SCRAM TIME SURVEILLANCE REQUIREMENTS

BSEP-2

Following 2/8/81 Test

- Notch "x" = Notch which corresponds most closely to 20% insertion of rods = 36.

- The mean scram time, $\tau_{ave}$, for the scram data generated to date in the cycle is determined by:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} = 0.846 \text{ sec}$$

where: n = number of surveillance tests performed to date in the cycle. (Including BOC)
= 2

$\tau_i$ = average scram time to notch x for surveillance test i.

$N_i$ = number of rods tested in surveillance test i.

therefore; $\sum_{i=1}^{n} N_i = 136 + 14 = 150$

$\sum_{i=1}^{n} N_i \tau_i = (136 \cdot 0.846) + (14 \cdot 0.807) \simeq 126.316$

$$\therefore \tau_{ave} = \frac{126.316}{150} = 0.842 \text{ sec}$$

- The Option B scram time limit specification, $\tau_B$, is determined as follows:

$$\tau_B = \mu + 1.65 \left( \frac{N_1}{\sum_{i=1}^{n} N_i} \right)^{1/2} \cdot \sigma$$

where: $\mu$ = mean value for statistical scram time distribution to notch x. (Table 1)
= 0.834 sec

$\sigma$ = standard deviation of above distribution (Table 1)
= 0.059 sec

$N_1$ = number of rods test at BOC (All active rods).
= 136

$$\therefore \tau_B = 0.834 + 1.65 \left( \frac{136}{150} \right)^{1/2} \cdot 0.059 = 0.927 \text{ sec}$$

- Test the following for trueness:

$$\tau_{ave} \leq \tau_B \rightarrow \underline{0.842} \leq \underline{0.927} \quad \underline{\underline{YES}}$$

If yes, the MCPR for each pressurization event is determined from Option B MCPR's.

If no, the MCPR for each pressurization event is determined from the following linear interpolation:

$$MCPR_{adjusted} = MCPR_{Option\ B} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B} \cdot \left( MCPR_{Option\ B} - MCPR_{Option\ A} \right)$$

where: $\tau_A$ = present tech spec scram time requirements to notch x. (Table 1 or Tech Spec)

= _____ sec

- (From the cycle specific reload license supplement)

| | 7X7 | 8X8 | 8X8R | P8X8R | |
|---|---|---|---|---|---|
| (1) Non-pressurization events | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | |
| (2) TT/LR wo BP | $MCPR_A$= | $MCPR_A$= | $MCPR_A$= | $MCPR_A$= | † |
| | $MCPR_B$= | $MCPR_B$= | $MCPR_B$= | $MCPR_B$= | |
| | $MCPR_{adj}$= | $MCPR_{adj}$= | $MCPR_{adj}$= | $MCPR_{adj}$= | † |
| (3) FWCF | $MCPR_A$= | $MCPR_A$= | $MCPR_A$= | $MCPR_A$= | † |
| | $MCPR_B$= | $MCPR_B$= | $MCPR_B$= | $MCPR_B$= | |
| | $MCPR_{adj}$= | $MCPR_{adj}$= | $MCPR_{adj}$= | $MCPR_{adj}$= | † |

† use only if $\tau_{ave} > \tau_B$

- The Operating Limit MCPR is the maximum of all three event MCPR's.

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| ∴ OLMCPR : | | | | |

TABLE 1

ODYN Option B Scram Time Conformance Requirements

| Rod Inserted to Notch: | | Scram Times From De-Energization of Scram Pilot Valve Solenoid (Sec.) Option B Mean $\mu$ | Standard Deviation $\sigma$ | 1967 A/B* Tech Spec Curve $\tau_A$ |
|---|---|---|---|---|
| 39 | Pickup | 0.671 | 0.050 | 0.838 |
| | Dropout | 0.688 | 0.052 | 0.862 |
| 38 | Pickup | 0.723 | 0.054 | 0.911 |
| | Dropout | 0.741 | 0.055 | 0.937 |
| 37 | Pickup | 0.778 | 0.056 | 0.988 |
| | Dropout | 0.797 | 0.057 | 1.013 |
| 36 | Pickup | 0.834 | 0.059 | 1.064 |
| | Dropout | 0.852 | 0.060 | 1.089 |

*Note: 67A = 67B in these notch positions

ODYN OPTION B SCRAM TIME SURVEILLANCE REQUIREMENTS

BSEP-2

Following 7/28/81 Test

- Notch "x" = Notch which corresponds most closely to 20% insertion of rods = 36.

- The mean scram time, $\tau_{ave}$, for the scram data generated to date in the cycle is determined by:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} = 0.842 \text{ sec}$$

where: n = number of surveillance tests performed to date in the cycle. (Including BOC)

= 3

$\tau_i$ = average scram time to notch x for surveillance test i.

$N_i$ = number of rods tested in surveillance test i.

therefore; $\sum_{i=1}^{n} N_i = 136 + 14 + 14 = 164$

$\sum_{i=1}^{n} N_i \tau_i = (136 \cdot 0.846) + (14 \cdot 0.807) + (14 \cdot 0.819) \simeq 137.782$

$$\therefore \tau_{ave} = \frac{137.782}{164} = 0.840 \text{ sec}$$

- The Option B scram time limit specification, $\tau_B$, is determined as follows:

$$\tau_B = \mu + 1.65 \left( \frac{N_1}{\sum_{i=1}^{n} N_i} \right)^{1/2} \cdot \sigma$$

where: $\mu$ = mean value for statistical scram time distribution to notch x. (Table 1)

= 0.834 sec

$\sigma$ = standard deviation of above distribution (Table 1)

= 0.059 sec

$N_1$ = number of rods test at BOC (All active rods).

= 136

$$\therefore \tau_B = 0.834 + 1.65 \left( \frac{136}{164} \right)^{1/2} \cdot 0.059 = 0.923 \text{ sec}$$

- Test the following for trueness:

$$\tau_{ave} \leq \tau_B \rightarrow \underline{0.840} \leq \underline{0.923} \quad \underline{\text{YES}}$$

If yes, the MCPR for each pressurization event is determined from Option B MCPR's.

If no, the MCPR for each pressurization event is determined from the following linear interpolation:

$$MCPR_{adjusted} = MCPR_{Option\ B} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B} \cdot \left( MCPR_{Option\ B} - MCPR_{Option\ A} \right)$$

where: $\tau_A$ = present tech spec scram time requirements to notch x. (Table 1 or Tech Spec)

= _____ sec

- (From the cycle specific reload license supplement)

| | 7X7 | 8X8 | 8X8R | P8X8R | |
|---|---|---|---|---|---|
| (1) Non-pressurization events | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | |
| (2) TT/LR w/o BP | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | † |
| (3) FWCF | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | † |

† use only if $\tau_{ave} > \tau_B$

- The Operating Limit MCPR is the maximum of all three event MCPR's.

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| ∴ OLMCPR : | | | | |

TABLE 1

ODYN Option B Scram Time Conformance Requirements

| Rod Inserted to Notch: | | Scram Times From De-Energization of Scram Pilot Valve Solenoid (Sec.) Option B Mean $\mu$ | Standard Deviation $\sigma$ | 1967 A/B* Tech Spec Curve $\tau_A$ |
|---|---|---|---|---|
| 39 | Pickup | 0.671 | 0.050 | 0.838 |
| | Dropout | 0.688 | 0.052 | 0.862 |
| 38 | Pickup | 0.723 | 0.054 | 0.911 |
| | Dropout | 0.741 | 0.055 | 0.937 |
| 37 | Pickup | 0.778 | 0.056 | 0.988 |
| | Dropout | 0.797 | 0.057 | 1.013 |
| 36 | Pickup | 0.834 | 0.059 | 1.064 |
| | Dropout | 0.852 | 0.060 | 1.089 |

*Note: 67A = 67B in these notch positions

ODYN OPTION B SCRAM TIME SURVEILLANCE REQUIREMENTS

Following 10/30/81 Test

- Notch "x" = Notch which corresponds most closely to 20% insertion of rods = 36.

- The mean scram time, $\tau_{ave}$, for the scram data generated to date in the cycle is determined by:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} = 0.840 \text{ sec}$$

where: n = number of surveillance tests performed to date in the cycle. (Including BOC)

= 4

$\tau_i$ = average scram time to notch x for surveillance test i.

$N_i$ = number of rods tested in surveillance test i.

therefore; $\sum_{i=1}^{n} N_i = 136 + 14 + 14 + 1 = 165$

$\sum_{i=1}^{n} N_i \tau_i = (136 \cdot 0.846) + (14 \cdot 0.807) + (14 \cdot 0.819) + (1 \cdot 0.867)$

$\simeq 138.649$

$\therefore \tau_{ave} = \frac{138.649}{165} = 0.840$ sec

- The Option B scram time limit specification, $\tau_B$, is determined as follows:

$$\tau_B = \mu + 1.65 \left( \frac{N_1}{\sum_{i=1}^{n} N_i} \right)^{1/2} \cdot \sigma$$

where: $\mu$ = mean value for statistical scram time distribution to notch x. (Table 1)

= 0.834 sec

$\sigma$ = standard deviation of above distribution (Table 1)

= 0.059 sec

$N_1$ = number of rods test at BOC (All active rods).

= 136

$$\therefore \tau_B = 0.834 + 1.65 \left( \frac{136}{165} \right)^{1/2} \cdot 0.059 = 0.922 \text{ sec}$$

- Test the following for trueness:

$$\tau_{ave} \leq \tau_B \rightarrow 0.840 \leq 0.922 \quad \text{YES}$$

If yes, the MCPR for each pressurization event is determined from Option B MCPR's.

If no, the MCPR for each pressurization event is determined from the following linear interpolation:

$$MCPR_{adjusted} = MCPR_{Option\ B} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B} \cdot \left( MCPR_{Option\ B} - MCPP_{Option\ A} \right)$$

where: $\tau_A$ = present tech spec scram time requirements to notch x. (Table 1 or Tech Spec)

= _____ sec

- (From the cycle specific reload license supplement)

| | 7X7 | 8X8 | 8X8R | P8X8R | |
|---|---|---|---|---|---|
| (1) Non-pressurization events | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | |
| (2) TT/LR wo BP | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | † |
| (3) FWCF | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | † |

† use only if $\tau_{ave} > \tau_B$

- The Operating Limit MCPR is the maximum of all three event MCPR's.

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| ∴ OLMCPR : | | | | |

TABLE 1

ODYN Option B Scram Time Conformance Requirements

| Rod Inserted to Notch: | | Scram Times From De-Energization of Scram Pilot Valve Solenoid (Sec.) Option B Mean $\mu$ | Standard Deviation $\sigma$ | 1967 A/B* Tech Spec Curve $\tau_A$ |
|---|---|---|---|---|
| 39 | Pickup | 0.671 | 0.050 | 0.838 |
| | Dropout | 0.688 | 0.052 | 0.862 |
| 38 | Pickup | 0.723 | 0.054 | 0.911 |
| | Dropout | 0.741 | 0.055 | 0.937 |
| 37 | Pickup | 0.778 | 0.056 | 0.988 |
| | Dropout | 0.797 | 0.057 | 1.013 |
| 36 | Pickup | 0.834 | 0.059 | 1.064 |
| | Dropout | 0.852 | 0.060 | 1.089 |

*Note: 67A = 67B in these notch positions

ODYN OPTION B SCRAM TIME SURVEILLANCE REQUIREMENTS

Following 12/21/81 Test

- Notch "x" = Notch which corresponds most closely to 20% insertion of rods = 36.

- The mean scram time, $\tau_{ave}$, for the scram data generated to date in the cycle is determined by:

$$\tau_{ave} = \frac{\sum_{i=1}^{n} N_i \tau_i}{\sum_{i=1}^{n} N_i} = 0.840 \text{ sec}$$

where: n = number of surveillance tests performed to date in the cycle. (Including BOC)
= 5

$\tau_i$ = average scram time to notch x for surveillance test i.

$N_i$ = number of rods tested in surveillance test i.

therefore; $\sum_{i=1}^{n} N_i = 136 + 14 + 14 + 1 + 12 = 177$

$\sum_{i=1}^{n} N_i \tau_i = (136 \cdot 0.846) + (14 \cdot 0.807) + (14 \cdot 0.819) + (1 \cdot 0.867) + (12 \cdot 0.867$

$\simeq 148.382$

$\therefore \tau_{ave} = \frac{148.382}{177} = 0.838$ sec

- The Option B scram time limit specification, $\tau_B$, is determined as follows:

$$\tau_B = \mu + 1.65\left(\frac{N_1}{\sum_{i=1}^{n} N_i}\right)^{1/2} \cdot \sigma$$

where: $\mu$ = mean value for statistical scram time distribution to notch x. (Table 1)
= 0.834 sec

$\sigma$ = standard deviation of above distribution (Table 1)
= 0.059 sec

$N_1$ = number of rods test at BOC (All active rods).
= 136

$$\therefore \tau_B = 0.834 + 1.65\left(\frac{136}{177}\right)^{1/2} \cdot 0.059 = 0.919 \text{ sec}$$

- Test the following for trueness:

$$\tau_{ave} \leq \tau_B \rightarrow \underline{0.838} \leq \underline{0.919} \quad \underline{\text{YES}}$$

If yes, the MCPR for each pressurization event is determined from Option B MCPR's.

If no, the MCPR for each pressurization event is determined from the following linear interpolation:

$$MCPR_{adjusted} = MCPR_{Option\ B} + \frac{\tau_{ave} - \tau_B}{\tau_A - \tau_B} \cdot \left( MCPR_{Option\ B} - MCPP_{Option\ A} \right)$$

where: $\tau_A$ = present tech spec scram time requirements to notch x. (Table 1 or Tech Spec)

= _____ sec

- (From the cycle specific reload license supplement)

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| (1) Non-pressurization events | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = | Maximum MCPR = |
| (2) TT/LR wo BP | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = † |
| (3) FWCF | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = | $MCPR_A$ = † |
| | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = | $MCPR_B$ = |
| | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = | $MCPR_{adj}$ = † |

† use only if $\tau_{ave} > \tau_B$

- The Operating Limit MCPR is the maximum of all three event MCPR's.

| | 7X7 | 8X8 | 8X8R | P8X8R |
|---|---|---|---|---|
| ∴ OLMCPR : | | | | |

TABLE 1

ODYN Option B Scram Time Conformance Requirements

| Rod Inserted to Notch: | | Scram Times From De-Energization of Scram Pilot Valve Solenoid (Sec.) Option B Mean $\mu$ | Standard Deviation $\sigma$ | 1967 A/B* Tech Spec Curve $\tau_A$ |
|---|---|---|---|---|
| 39 | Pickup | 0.671 | 0.050 | 0.838 |
| | Dropout | 0.688 | 0.052 | 0.862 |
| 38 | Pickup | 0.723 | 0.054 | 0.911 |
| | Dropout | 0.741 | 0.055 | 0.937 |
| 37 | Pickup | 0.778 | 0.056 | 0.988 |
| | Dropout | 0.797 | 0.057 | 1.013 |
| 36 | Pickup | 0.834 | 0.059 | 1.064 |
| | Dropout | 0.852 | 0.060 | 1.089 |

*Note: 67A = 67B in these notch positions

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2

SCRAM TIME TESTING
BEGINNING OF CYCLE (BOC) 4

| ROD NUMBER | 20% INSERTION TIME (SEC.) | ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|---|---|
| 02-19 | 0.817 | 18-31 | 0.867 |
| 02-23 | 0.783 | 18-35 | 0.900 |
| 02-27 | 0.817 | 18-39 | 0.867 |
| 02-31 | 0.783 | 18-43 | 0.883 |
| 02-35 | 0.883 | 18-47 | 0.967 |
| 06-11 | 0.817 | 18-51 | 0.800 |
| 06-15 | 0.800 | 22-03 | 0.833 |
| 06-19 | 0.767 | 22-07 | 0.850 |
| 06-23 | 0.800 | 22-11 | 0.850 |
| 06-27 | 0.817 | 22-15 | 0.867 |
| 06-31 | 0.850 | 22-19 | 0.867 |
| 06-35 | 0.867 | 22-23 | 0.833 |
| 06-39 | 0.850 | 22-27 | 0.900 |
| 06-43 | 0.783 | 22-31 | 0.967 |
| 10-07 | 0.800 | 22-35 | 0.850 |
| 10-11 | 0.883 | 22-39 | 0.917 |
| 10-15 | 0.850 | 22-43 | 0.850 |
| 10-19 | 0.933 | 22-47 | 0.817 |
| 10-23 | 0.900 | 22-51 | 0.883 |
| 10-27 | 0.850 | 26-03 | 0.800 |
| 10-31 | 0.883 | 26-07 | 0.833 |
| 10-35 | 0.817 | 26-11 | 0.833 |
| 10-39 | 0.850 | 26-15 | 0.650 |
| 10-43 | 0.833 | 26-19 | 0.950 |
| 10-47 | 0.767 | 26-23 | 0.817 |
| 14-07 | 0.900 | 26-27 | 0.800 |
| 14-11 | 0.867 | 26-31 | 0.817 |
| 14-15 | 0.800 | 26-35 | 0.817 |
| 14-19 | 0.867 | 26-39 | 0.883 |
| 14-23 | 0.833 | 26-43 | 0.917 |
| 14-27 | 0.900 | 26-47 | 0.850 |
| 14-31 | 0.883 | 26-51 | 0.783 |
| 14-35 | 0.850 | 30-03 | 0.767 |
| 14-39 | 0.933 | 30-07 | 0.850 |
| 14-43 | 0.817 | 30-11 | 0.800 |
| 14-47 | 0.883 | 30-15 | 0.850 |
| 18-03 | 0.800 | 30-19 | 0.833 |
| 18-07 | 0.783 | 30-23 | 0.833 |
| 18-11 | 0.933 | 30-27 | 0.900 |
| 18-15 | 0.900 | 30-31 | 0.850 |
| 18-19 | 0.983 | 30-35 | 0.833 |
| 18-23 | 0.900 | 30-39 | 0.817 |
| 18-27 | 0.850 | 30-43 | 0.867 |

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2 (CONT'D)

SCRAM TIME TESTING
BEGINNING OF CYCLE (BOC) 4

| ROD NUMBER | 20% INSERTION TIME (SEC.) | ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|---|---|
| 30-47 | 0.783 | 46-39 | 0.900 |
| 30-51 | 0.800 | 46-43 | 0.850 |
| 34-03 | 0.800 | 50-19 | 0.817 |
| 34-07 | 0.800 | 50-23 | 0.783 |
| 34-11 | 0.833 | 50-27 | 0.850 |
| 34-15 | 0 833 | 50-31 | 0.833 |
| 34-19 | 0.833 | 50-35 | 0.833 |
| 34-23 | 0.883 | | |
| 34-27 | 0.950 | | |
| 34-31 | 0.850 | | |
| 34-35 | 0.967 | | |
| 34-39 | 0.800 | | |
| 34-43 | 0.867 | | |
| 34-47 | 0.833 | | |
| 34-51 | 0.817 | | |
| 38-07 | 0.817 | | |
| 38-11 | 0.833 | | |
| 38-15 | 0.850 | | |
| 38-19 | 0.817 | | |
| 38-23 | 0.833 | | |
| 38-27 | Ins. Rod | | |
| 38-31 | 0.917 | | |
| 38-35 | 0.900 | | |
| 38-39 | 0.867 | | |
| 38-43 | 0.817 | | |
| 38-47 | 0.750 | | |
| 42-07 | 0.900 | | |
| 42-11 | 0.833 | | |
| 42-15 | 0.817 | | |
| 42-19 | 0.850 | | |
| 42-23 | 0.833 | | |
| 42-27 | 0.850 | | |
| 42-31 | 0.850 | | |
| 42-35 | 0.833 | | |
| 42-39 | 0.850 | | |
| 42-43 | 0.883 | | |
| 42-47 | 0.817 | | |
| 46-11 | 0.783 | | |
| 46-15 | 0.833 | | |
| 46-19 | 0.850 | | |
| 46-23 | 0.817 | | |
| 46-27 | 0.783 | | |
| 46-31 | 0.867 | | |
| 46-35 | 0.850 | | |

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2

SCRAM TIME TESTING
CYCLE 4 - TEST NO. 1
FEBRUARY 8, 1981

| ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|
| 50-27 | 0.817 |
| 42-07 | 0.833 |
| 34-07 | 0.767 |
| 42-47 | 0.800 |
| 42-39 | 0.850 |
| 42-15 | 0.783 |
| 34-47 | 0.817 |
| 10-07 | 0.783 |
| 02-27 | 0.800 |
| 10-47 | 0.783 |
| 10-15 | 0.817 |
| 18-07 | 0.817 |
| 18-47 | 0.817 |
| 10-39 | 0.817 |

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2

SCRAM TIME TESTING
CYCLE 4 - TEST NO. 2
JULY 28, 1981

| ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|
| 34-39 | 0.833 |
| 34-15 | 0.833 |
| 34-31 | 0.833 |
| 50-31 | 0.783 |
| 34-23 | 0.867 |
| 34-51 | 0.800 |
| 50-23 | 0.767 |
| 34-03 | 0.783 |
| 18-51 | 0.817 |
| 02-31 | 0.800 |
| 02-23 | 0.783 |
| 18-03 | 0.817 |
| 18-15 | 0.867 |
| 18-31 | 0.883 |

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2

SCRAM TIME TESTING
CYCLE 4 - TEST NO. 3
OCTOBER 30, 1981

| ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|
| 18-47 | 0.867 |

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2

SCRAM TIME TESTING
CYCLE 4 - TEST NO. 4
DECEMBER 21, 1981

| ROD NUMBER | 20% INSERTION TIME (SEC.) |
|---|---|
| 02-35 | 0.850 |
| 02-19 | 0.833 |
| 06-43 | 0.867 |
| 06-39 | 0.800 |
| 06-15 | 0.833 |
| 26-51 | 0.783 |
| 26-03 | 0.817 |
| 46-39 | 0.817 |
| 46-15 | 0.767 |
| 46-11 | 0.733 |
| 50-35 | 0.833 |
| 50-19 | 0.800 |