Enclosure 1

# OFFSITE DOSE CALCULATION MANUAL
REVISION 15

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This revision adds a section to address the Reactor Coolant Leak Detection and E.F.A.S. monitor 7807. It also contains one editorial change and one ecuation correction, as well as correcting serveral typos from a previous revision.

Section 2.1.3(a) has been added to address the use of 7807 as an E.S.F.A.S. monitor and Reactor Coolant System Leak Detector. This section will remain in the ODCM until a Technical Specification change removes it.

An editorial re-expression of Formula 1-4 on page 1-4 has been adopted to conform to the format of Formulas 1-2 and 1-9. Formula 2-5 on page 2-5 has been corrected to remove a division by 2. This factor, which is an equal allocation between Unit 2/3 has already been accounted for in Formulas 2-4 and 2-4(a). Table 1-1 on page 1-15 has had Co-60 calibration factor change for monitor 7813 as a result of routine calibration. Table 2-1 on page 2-11 has had calibration factor changes to 2-7818B, 3-7818B, 3-7865 mid- and high-range as a result of routine calibration.

Several typos in the previous revision were identified on pages 1-5, 1-7a, 1-12b, 1-14 and corrected in this revision.

The changes in this revision to the ODCM do not reduce the accuracy or reliability of the dose calculations or setpoint determinations.

This revision was presented and accepted by the Onsite Review Committee on August 14, 1984.

Step 2) The effective MPC ($MPC_{eff}$) for each batch tank (or sump) is determined using:

$$MPC_{eff} = \frac{1}{\sum_i \frac{C_{\gamma i}/C}{(MPC_{\gamma i})} + \frac{C_s/C}{(MPC_s)} + \frac{C_t/C}{(MPC_t)} + \frac{C_a/C}{(MPC_a)} + \frac{C_{Fe}/C}{(MPC_{Fe})}} \qquad (1\text{-}4)$$

R

$MPC_{\gamma i}$, $MPC_s$, $MPC_t$, $MPC_{Fe}$, $MPC_\alpha$ = the limiting concentrations of the appropriate radionuclide from 10CFR20, Appendix B, Table II, Column 2.

Step 3) The radioactivity monitor setpoint $C_m$ (μCi/ml), may now be specified based on the values of $C$, $\sum_i C_{\gamma i}$, $F$, $MPC_{eff}$ and $R$ to provide compliance with the limits of 10CFR20, Appendix B, Table II, Column 2. The monitor setpoint (cpm) is taken from the applicable calibration constants given in Table 1-1 to correspond to the calculated monitor limit $C_m$ (μCi/ml).

<u>2/3 RT - 7813</u> (Radwaste discharge line monitor)

The value for $C_m$ (the concentration limit at the detector) is determined by using:

$$C_m \leq \frac{RW\ F\ C_{eff}}{\frac{R_1 C_1}{MPC_{eff1}} + \frac{R_{2\ 2}}{MPC_{eff2}} + \ldots + \frac{R_n C_n}{MPC_{effn}}} \qquad (1\text{-}5)$$

$C_{eff}$ = Effective gamma isotopic concentration at the monitor for the tank combination to be released (equal to $\sum_i C_{\gamma i}$ for single tank releases).

$$= \frac{R_1 (\sum_i C_{\gamma i})_1 + R_2 (\sum_i C_{\gamma i})_2 + \ldots + R_n (\sum_i C_{\gamma i})_n}{R_1 + R_2 + \ldots + R_n} \quad (1\text{-}6)$$

$(\sum_i C_{\gamma i})_1$, $(\sum_i C_{\gamma i})_2$, etc. = The total gamma isotopic concentration of first tank, second tank, etc., in µCi/ml. R

$R_1$, $R_2$, etc. = The effluent flow rate from first tank, second tank, etc. Values of R for each tank are as follows:

Radwaste Primary tanks R = 140 gpm/pump (x no. of pumps to be run)

Radwaste Secondary tanks R = 140 gpm/pump (x no. of pumps to be run)

Primary Plant Makeup Tanks R = 160 gpm/pump (x no. of pumps to be run)

Condensate Monitor Tanks R = 100 gpm/pump (x no. of pumps to be run)

Note that since the values of R are much smaller than F, the term F+R in the equation (1-1) can be replaced by F.

$B_2$ and $B_3$ are administrative values used to account for simultaneous releases from both SONGS 2 and SONGS 3. The fractions $B_2$ and $B_3$ will be assigned such that

$B_2 + B_3 < 1.0$ R

The 0.1 is an administrative value used to account for the potential activity from other releases. This assures that the total concentration from all release points to the plant discharge will not result in a release of concentrations exceeding the limits of 10CFR20, Appendix B, Table II, Column 2 from the site.

Note: If $C_{59-2}$, $C_{53-2}$, $C_{59-3}$, or $C_{53-3} \leq \Sigma_i \; C \gamma_i$ then no release is possible. To increase $C_{59-2}$, $C_{53-2}$, $C_{59-3}$ or $C_{53-3}$, increase dilution flow F (by running more circulating water pumps), and/or decrease the effluent flow rate R (by throttling the flow as measured on 2FIC-4055, 2FIC-4056, 3FIC-4055, 3FIC-4056 or 2/3FI-7643, as appropriate) and recalculate $C_{59-2}$, $C_{53-2}$ $C_{59-3}$ or $C_{53-3}$ using the new values of F, R and equation (1-11). |R

If there is no release associated with this monitor, the monitor setpoint should be established as close to background as practical to prevent spurious alarms and yet assure and alarm should an inadvertant release occur.

$T_2$ and $T_3$ are administrative values used to account for simultaneous releases from both SONGS 2 and SONGS 3. The fractions $T_2$ and $T_3$ will be assigned such that $T_2 + T_3 \leq 1.0$. R

The 0.1 is an administrative value to account for the potential activity from other releases. This assures that the total concentration from all release points to the plant discharge will not result in a release of concentrations exceeding the limits of 10CFR20, Appendix B, Table II, Column 2 from the site.

NOTE: If $C_2$ or $C_3 < \sum_i C_{\gamma i}$ then no release is possible. To increase $C_2$ or $C_3$, increase the dilution flow F (by running more circulating water pumps) and recalculate $C_2$ or $C_3$ using the new value of F and equation (1-12).

If there is no release associated with this monitor, the monitor setpoint should be established as close to background as practical to prevent spurious alarms and yet assure an alarm should an inadvertant release occur.

Table 1-1[a]

Liquid Effluent Radiation Monitor
Calibration Constants

| Monitor | Co-60* | Ba-133* | Cs-137* |
|---|---|---|---|
| 2RT-6753 | | 1.86 E-8 | 1.96 E-8 |
| 2RT-6759 | | 1.79 E-8 | 1.91 E-8 |
| 3RT-6753 | | 1.72 E-8 | 1.92 E-8 |
| 3RT-6759 | | 1.74 E-8 | 1.90 E-8 |
| 2/3RT-7813 | 1.79 E-9 | 3.58 E-9 | 5.60 E-9 |
| 2RT-7817 | 2.10 E-9 | 3.19 E-9 | 4.93 E-9 |
| 2RT-7821 | 2.08 E-9 | 3.17 E-9 | 4.61 E-9 |
| 3RT-7817 | 2.24 E-9 | 2.99 E-9 | 4.63 E-9 |
| 3RT-7821 | 2.15 E-9 | 3.30 E-9 | 4.72 E-9 |

|R

*μCi/cc/cpm

(a) This table provides typical (± 20%) calibration constants for the liquid effluent radiation monitors.

2.0 GASEOUS EFFLUENTS (Continued)

2.1.2.1 (Continued)

The calibration constant used is based on Kr-85m or on Xe-133, whichever yields a lower detection efficiency. R

The alarm setpoint will not be set greater than the maximum permissible alarm setting determined above.

If there is no release associated with this monitor, the monitor setpoint should be established as close as practical to background to prevent spurious alarms yet assure an alarm should an inadvertent release occur.

2.1.2.2 2RT 7870-1 and 3RT 7870-1 (Wide Range Gas Monitor)

The maximum Release Rate (μCi/sec) is determined by converting the concentration at the detector, $C_{det}$ to an equivalent release rate in μCi/sec.

$$A_{max} = (C_{det}, \mu Ci/cc)\ (\text{flow rate, cc/sec}) \qquad (2\text{-}5)$$ R

where $A_{max}$ = the maximum permissible release rate

$C_{det}$ = the smaller value of $C_{det}$, as obtained from equations (2-4) and (2-4a)

flow rate = flow rate of the condenser air ejector, cc/sec

= 4.719 E+5 cc/sec (conservatively assumed as design flow rate) flow rate = the containment purge flow rate in cfm

= 40,000 cfm full purge

= 2,000 cfm mini purge

other parameters are as specified in 2.1.1.1. above.

The smaller of the values of maximum permissible $C_{det}$ from equations (2-6) or (2-6a) and for equations (2-7) or (2-7a) is to be used in determining the maximum permissible monitor alarm setpoint (cpm).

The maximum permissible alarm setting (cfm) is determined by using the calibration constant for the Containment Airborne Monitor given in Table 2-1. The maximum permissible alarm setpoint is the cpm value corresponding to the concentration, $C_{det}$. The calibration constant is based on Kr-85m or on Xe-133 whichever yields a lower detection efficiency.

The alarm setpoint will not be set greater than the maximum permissible alarm setting determined above.

If there is no release associated with this monitor, the monitor setpoint should be established as close as practical to background to prevent spurious alarms yet assure an alarm should an inadvertent release occur.

2.1.3 Reactor Coolant System Leak Detection and E.S.F.A.S. Monitor

2RI-7807B, 2RI-7807C, 3RI-7807B, 3RI-7807C

For the purpose of implementation of Specification 3.4.5.1 and 3.3.2, the alarm setpoint levels for the noble gas and particulate monitors shall be based on values to assist in recognizing a sudden increase in RCS leakage into containment, or an inadvertent criticality during refueling. These setpoints should be established as close as practical to background to prevent spurious alarms and yet assure an alarm should a sudden leak occur.

N

Note: This section is applicable only until Tech. Spec. Table 3.3-4, item 12, Containment Purge Isolation (C.P.I.S.) reference to the O.D.C.M. for setpoint determination has been removed.

2.1.4 Waste Gas Header - 2/3 RT-7814, 2/3 RT-7808

For the purpose of Specification 3.11.2.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and meteorological dispersion factor. Since the waste gas header discharges to the plant vent stack, either 2/3 RT-7814 or 2/3 RT-7808 may be used to monitor waste gas header releases.

2/3 RT-7808

When plant vent stack monitor, 2/3 RT-7808, is being used to monitor waste gas header releases, the setpoint determined by equation (2-1) or (2-2), whichever is lesser, will provide automatic termination of release from the waste gas header.

Determine the maximum permissible waste gas header effluent flow rate corresponding to the vent stack monitor setpoint in accordance with the following:

$$f < \frac{(0.9)\ C_{det} F}{\sum_i C_{\gamma i}} \qquad (2\text{-}8)$$

Where:

f = waste gas header effluent flow rate (cfm)

F = plant vent stack flow rate (cfm) used in equation (2-1) or (2-2)

$\sum_i C_{\gamma i}$ = total gamma activity (µCi/cc)of the waste gas holdup tank to be released, as determined from the pre-release sample analysis.

The 0.9 is an administrative value to account for the potential activity from other releases in the same release pathway.

2/3 RT-7814

The concentration at the detector corresponding to a body dose rate of 500 mrem/yr at the exclusion area boundary is determined by using:

$$C_{det} = \frac{(0.9)(0.45)(2120 \frac{cfm}{m^3/sec})\ (500\ mrem/yr)\ (10^{-6} Ci/uCi)}{(\text{Flow Rate}, cfm)\ (X/Q,\ sec/m^3)\ [\Sigma_i (K_i,\ \frac{mrem/yr}{uCi/m^3})(\frac{C_i}{C_{tot}})]} \quad (2\text{-}9)$$

The concentration at the detector corresponding to a 3000 mrem/yr skin dose rate of 3000 mrem/yr at the exclusion area boundary is determined by using:

$$C_{det} = \frac{(0.9)(0.45)(2120 \frac{cfm}{m^3/sec})(3000\ mrem/yr)\ (10^{-6} Ci/uCi)}{(\text{Flow Rate}, cfm)\ (X/Q,\ sec/m^3)\ [\Sigma_i (L_i + 1.1 M_i,\ \frac{mrem/yr}{uCi/m^3})\ (\frac{C_i}{C_{tot}})]} \quad (2\text{-}9a)$$

## Table 2-1[a]

### Gaseous Effluent Radiation Monitor Calibration Constants

| Monitor | Kr-85* | Xe-133* | |
|---|---|---|---|
| 2RT-7804-1C | 3.07 E-8 | 3.86 E-8 | |
| 3RT-7804-1C | 2.71 E-8 | 4.71 E-8 | |
| 2/3RT-7808C | 2.76 E-8 | 3.72 E-8 | |
| 2/3RT-7814A | 3.14 E-8 | 2.82 E-8 | |
| 2/3RT-7814B | 5.02 E-5 | 3.27 E-5 | |
| 2RT-7818A | 2.40 E-8 | 5.30 E-8 | |
| 2RT-7818B | 4.67 E-5 | 1.87 E-5 | R |
| 3RT-7818A | 3.41 E-8 | 5.52 E-8 | |
| 3RT-7818B | 6.49 E-5 | 2.54 E-5 | R |
| 2RT-7865-1 (low) | 1.41 E-8 | 3.02 E-8 | |
| 2RT-7865-1 (mid) | | 5.33 E-5 | |
| 2RT-7865-1 (high) | | 2.68 E-2 | |
| 3RT-7865-1 (low) | 1.41 E-8 | 3.02 E-8 | |
| 3RT-7865-1 (mid) | | 7.76 E-5 | R |
| 3RT-7865-1 (high) | | 1.90 E-1 | |
| 2RT-7870-1 (low) | 1.41 E-8 | 3.02 E-8 | |
| 2RT-7870-1 (mid) | | 6.55 E-5 | |
| 2RT-7870-1 (high) | | 1.78 E-2 | |
| 3RT-7870-1 (low) | 1.41 E-8 | 3.02 E-8 | |
| 3RT-7870-1 (mid) | | 1.08 E-4 | |
| 3RT-7870-1 (high) | | 2.17 E-2 | |

*μCi/cc/cpm

(a) This table provides typical (± 20%) calibration constantly for the gaseous effluent radiation monitors.

# DESCRIPTION OF CHALLENGE TO SAFETY VALVES (UNIT 2)

On August 26, 1984, at 1700 with Unit 2 at 100% power, the feeder breaker supplying power to the backup AC lube oil pump, 2P121 for Main Feedwater Pump Turbine 2K005, spuriously tripped. At 1718, MFWPT 2K005 tripped, forcing operators to rapidly reduce load to approximately 45% power. A condenser low vacuum alarm was received, and at 1725, the turbine generator tripped. The Steam Bypass Control System (SBCS) actuated to control steam generator secondary side pressure, but was operating erratically due to low condenser vacuum. Because the SBCS was not properly controlling secondary side pressure, operators fully opened both atmospheric dump valves (2HV-8419 and 2HV-8421); but, secondary side pressure increased to 1135 psia. There are nine safety valves per steam line, and the first one is set to open at 1100 psia, with succeeding valves opening one per additional 7 psia.

Because there is no instrumentation on the secondary side safety valves, no proof of the valves' operability exists. Shift personnel examined the valves approximately 10 hours after the event, and found two of the valves (2HV-8403 and 2HV8414) were cold to the touch, while others were still hot. This fact does not warrant concern that the valves failed to operate properly for several reasons:

1. The valves were not examined until approximately 10 hours after the incident. This allowed ample time for the valves to cool after an actuation. The reason other valves felt hot can be attributed to varying leakage rates through the valves.

2. Several days after the incident, personnel again examined the valves and found the two subject valves cold and others still hot. This provides further evidence that leakage rates differ through the valves.

There is no compelling evidence that any of the secondary side safety valves failed to operate; therefore, this incident is not reportable as a violation of Technical Specification 3.7.1.1. However, since secondary side pressure reached 1135 psia, the safety valves were challenged.