

OCONEE TECHNICAL SPECIFICATIONS
TO CONTROL WASTE WATER PONDS' RADIOACTIVITY

3.9.9

- (a) The total quantity of radioactivity in the waste water/chemical treatment ponds (CTP) shall be limited to the quantities specified by the following expression:

$$\sum A_i Q_i \leq 30 \text{ and,}$$

$$\sum B_i Q_i \leq 9$$

where: Q_i = total quantity of radionuclide i in the CTP in Ci

A_i = conversion factor relating quantity of radionuclide i and the critical organ dose commitment in mrem/Ci.

See Table 3.9.9-1.

B_i = conversion factor relating quantity of radionuclide i and the total body dose commitment in mrem/Ci. See

Table 3.9.9-1.

- (b) Discharge of resins from the secondary water clean-up system (SWCU) to the CTP shall not be allowed if noble-gases have been detected in the secondary system during their use.
- (c) Samples of the resin from the SWCU shall be analyzed by gamma spectra analysis following each batch of backwash. A proportional composite sample of the resins and resin backwash water shall be analyzed quarterly for P-32, Fe-55, Sr-89 and Sr-90. Discharge of the resins from

the SWCU to the CTP shall not be allowed if the radioactivity of the previous batch of resin backwash exceeded 0.01% of the limits of Specification 3.9.9.a., i.e.,

$$\Sigma A_i Q_i \geq .003 \text{ or}$$

$$\Sigma B_i Q_i \geq .0009$$

3.9.10 A cumulative inventory (decay corrected) or the total radioactivity by individual nuclides discharged to the CTP shall be maintained and updated at least monthly. Radioactivity input into the CTP shall be accounted for by: (1) turbine building sump monitoring (Specification 3.9.11) and (2) separate samples of resin and resin backwash water from the secondary water clean-up system following each batch of backwash to the CTP (Specification 3.9.9(c)). A representative sample of the CTP water and basin bottoms shall be collected semi-annually and analyzed for P-32, Fe-55, Sr-89, Sr-90 and gamma isotopic. The cumulative inventory, quantities discharged, and results of the sample analysis shall be reported in the semi-annual effluent report. A composite sample of the discharge from the oil collection basin shall be analyzed weekly by gamma spectra analysis and quarterly for P-32, Fe-55, Sr-89 and Sr-90. The results in terms of the total quantity of the individual radionuclides released to the environment shall be included in the semi-annual effluent report.

3.9.11 The turbine building sump shall be continuously monitored for radioactivity to a sensitivity of 1×10^{-6} $\mu\text{Ci/ml}$ water. The monitor shall be set to alarm in the control room at a concentration of greater than 5×10^{-6} $\mu\text{Ci/ml}$. The monitor shall be calibrated at least once per 18 months and a functional test daily. With the monitor inoperable and the turbine building sump operating a

continuous discharge mode, representative grab samples will be taken every 4 hours and analyzed for gross beta, gamma. With the monitors inoperable and the turbine building sump operating in a batch discharge mode, a representative grab sample of the sump shall be analyzed for gross beta, gamma before discharge.

ASSUMPTIONS IN CALCULATING DOSE TO AN INDIVIDUAL
FROM RADIOACTIVITY RELEASES FROM THE CTP
AT OCONEE

The dominant dose pathway for liquid effluents at Oconee is from fish ingestion by an adult individual. This pathway is estimated to account for 98% of the total body or critical organ dose of an individual. The fish ingestion pathway alone is considered for determining limiting radioactivity inventory in the CTP. The dose to the total body or organ j of an adult individual by the fish pathway, D_j , in mrem is calculated by:

$$D_j = 1100 \frac{U}{F} \sum_i Q_i B_i D_{ij} \exp(-\lambda_i t)$$

where U = usage factor for fish consumption, 21 kg/yr;

F = Flow rate of diluted effluent at water usage location, 1,100 ft³/sec

1100 = Factor to convert (Ci/yr)/(ft³/sec) to pCi/liter

Q_i = Release of nuclide i in time period T , in Ci

B_i = Bioaccumulation factors for freshwater fish in pCi/kg per pCi/liter

D_{ij} = Ingestion dose factors for adults in mrem/pCi

λ_i = Decay constant of nuclide i , in hrs⁻¹

t = Delay time between harvest and consumption of fish, 24 hrs.

TABLE 3.9.9-1

FACTORS FOR EXPRESSIONS LIMITING QUANTITY OF RADIONUCLIDES IN CTP

<u>Radionuclide</u>	<u>A_i</u>	<u>B_i</u>
H-3	2.0 E-5	2.0 E-5
P-32	3.8 E+2	1.49E+1
Cr-51	2.7 E-3	1.09E-5
Mn-54	1.2 E-1	7.32E-3
Fe-55	5.8 E-3	9.30E-4
Fe-59	7.1 E-2	8.21E-3
Co-58	1.6 E-2	1.75E-3
Co-60	4.2 E-2	4.96E-3
Zn-65	6.5 E-1	2.92E-1
Rb-86	8.5 E-1	3.98E-1
Sr-89	1.9 E-1	4.99E-3
Sr-90	4.8 E+0	1.17E+0
Y-91	4.0 E-2	1.96E-6
Zr-95	2.1 E-3	4.53E-7
Zr-97	2.7 E-3	4.04E-9
Nb-95	1.3 E+1	1.17E-3
Mo-99	2.1 E-3	1.70E-4
Ru-103	4.5 E-3	1.67E-5
Ru-106	3.7 E-2	7.31E-5
Ag-110m	6.3 E-2	9.23E-5
Te-125m	9.2 E-2	2.99E-3
Te-127m	2.3 E-1	6.93E-3
Te-129m	4.9 E-1	1.50E-2
Te-131m	4.2 E+0	3.38E-3
Te-132	5.2 E-1	1.03E-2
I-131	5.6 E-1	9.88E-4
I-133	5.1 E-2	1.07E-4
Cs-134	6.22E+0	5.08E+0
Cs-136	1.02E+0	7.38E-1
Cs-137	4.58E+0	3.00E+0

TABLE 3.9.9-1 (Cont'd)

<u>Radionuclide</u>	<u>A_i</u>	<u>B_i</u>
Ba-140	3.3 E-3	1.06E-4
La-140	3.2 E-2	1.15E-7
Ce-141	4.9 E-4	1.48E-8
Ce-143	5.8 E-4	1.73E-9
Ce-144	3.5 E-3	5.50E-7
P-139	3.8 E-3	1.01E-8