DMB 016

JUL 13 1984

Docket No. 50-302

DISTRIBUTION
Docket File
NRC PDR
L PDR
ORB#4 Rdg
DEisenhut
OELD
EJordan
JNGrace
EBlackwood
HOrnstein
ACRS-10
HSilver
RIngram
Gray File

Mr. Walter S. Wilgus
Vice President, Nuclear Operations
Florida Power Corporation
ATTN: Manager, Nuclear Licensing
& Fuel Management
P. O. Box 14042, M.A.C. H-2
St. Petersburg, Florida 33733

Dear Mr. Wilgus:

SUBJECT: CRYSTAL RIVER UNIT 3 - NRC COMMENTS ON THE OFFSITE DOSE CALCULATION MANUAL

Amendment No. 69 to the Crystal River Unit 3 operating license was issued on June 27, 1984 to implement the revised radioactive effluent Technical Specifications (RETS). In conjunction with our review of the RETS, we reviewed the proposed Crystal River Unit 3 Offsite Dose Calculation Manual (ODCM) and noted a number of areas in the manual that require revision or clarification. This letter forwards our comments on the ODCM. Florida Power Corporation should resolve the attached comments and revise the ODCM accordingly. In addition, we request that a section be added to the ODCM to provide for total dose calculation, including direct radiation, as required by RETS Section 4.11.3.

Sincerely,

"ORIGINAL SIGNED BY:"

George W. Rivenbark, Acting Chief
Operating Reactors Branch #4
Division of Licensing

Enclosure:
As Stated

cc w/enclosure:
See next page

ORB#4:DL
HSilver;cf
7/13/84

ORB#4:DL
GRivenbark
7/13/84

8407250028 840713
PDR ADOCK 05000302
P PDR

Crystal River Unit No. 3
Florida Power Corporation

50-302

cc w/enclosure(s):

Mr. Wilbur Langely, Chairman
Board of County Commissioners
Citrus County
Inverness, Florida 36250

Regional Radiation Representative
EPA Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Mr. R. W. Neiser, Senior
Vice President and General
Counsel
Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

Administrator
Department of Environmental Regulation
Power Plant Siting Section
State of Florida
2600 Blair Stone Road
Tallahassee, Florida 32301

Attorney General
Department of Legal Affairs
The Capitol
Tallahassee, Florida 32304

Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission, Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Mr. Robert B. Borsum
Babcock & Wilcox
Nuclear Power Generation Division
Suite 220, 7910 Woodmont Avenue
Bethesda, Maryland 20814

Mr. Tom Stetka, Resident Inspector
U.S. Nuclear Regulatory Commission
Route #3, Box 717
Crystal River, Florida 32629

Nuclear Plant Manager
Florida Power Corporation
P. O. Box 219
Crystal River, Florida 32629

Bureau of Intergovernmental Relations
660 Apalachee Parkway
Tallahassee, Florida 32304

Ulray Clark, Administrator
Radiological Health Services
Department of Health and
Rehabilitative Services
1323 Winewood Blvd.
Tallahassee, Florida 32301

ENCLOSURE

NRC COMMENTS ON THE PROPOSED CRYSTAL RIVER UNIT 3 OFFSITE DOSE CALCULATION MANUAL (ODCM)

JUNE 1984

CRYSTAL RIVER ODCM REVIEW

Comment	Crystal River ODCM
1. <u>Sections 1.3-1</u> It is not clear why there are two defintions for "$^*Q_i$ in Section 1.3-1. Was the second definition meant to be written as "$^*Q_i$ = (Nuclide Concentration in the Effluent Stream) x (Flow)"? What is the significance of the "*"?	$^*\ Q_i$ = Effluent Stream Flow Rate Nuclide Concentration Flow Rates 1) Reactor Building Purge Exhause Duct = 50,000 cfm = 2.4 x 10^7 cc/sec 2) Auxiliary Building and Fuel Handling Area Exhaust Duct = 156,000 cfm = 7.4 x 10^7 cc/sec 3) Waste Gas Decay Tank Release Line = 50 cfm max = 2.4 x 10^4 cc/sec In order for a gaseous release to be within the limits of specification 1.1-1, the following equations must be satisfied: Eq. 4 $\text{Dose Rate}_\gamma \div 500 \leq 1$ Eq. 5 $\text{Dose Rate}_\beta \div 3000 \leq 1$ Eq. 6 $\text{Dose Rate}_{I,T,P} \div 1500 \leq 1$ where: 500 = The allowable total body dose rate due to noble gas gamma emissions in mrem/yr. 3000 = The allowable skin dose rate due to noble gas beta emissions in mrem/yr. 1500 = The allowable organ dose rate in mrem/yr.

Comment

2. Sections 1.3-1 and 1.3-2

The titles for Section 1.3-1 and 1.3-2 should be changed as these sections are not setpoint calculations, but are the pre-release calculations to ascertain 10 CFR Part 20 compliance.

3. Section 1.3-2

The Licensee should state that the activity of all components in the expression were obtained from the most recent analysis. Specifically, C_t, C_α, C_s, and C_{Fe} are obtained on a monthly or quarterly basis.

Crystal River ODCM

SETPOINT CALCULATION 1.3-2
LIQUID RADWASTE RELEASE

I. INTRODUCTION

Prior to initiating a release of liquid radwaste, it must be determined that the concentration of radionuclides to be released and the flow rates at which they are released will not lead to a release concentration greater than the limits of specification 1.1-2 at the point of discharge.

II. INFORMATION REQUIRED

Results of appropriate Nuclide Analysis from Section 1.2

III. CALCULATION

$$\text{Discharge Concentration} = \left[\frac{\left(\frac{\Sigma_i C_{\gamma i}}{MPC_{\gamma i}} + \frac{C_I}{MPC_I} + \frac{C_G}{MPC_G} + \frac{C_\alpha}{MPC_\alpha} + \frac{C_T}{MPC_T} + \frac{C_s}{MPC_s} + \frac{C_{Fe}}{MPC_{Fe}} \right) R}{(F + R)} \right]$$

where:

$\Sigma_i C_{\gamma i}$ = Sum of the concentrations of isotope i, in the gamma spectrum

C_I = Iodine 131 concentration

C_G = Dissolved or entrained noble gas concentration

C_T = Tritium Concentration

C_α = Gross alpha emitters concentration

C_s = Sr-89, 90 concentration

C_{Fe} = Fe-55 concentration

from most recent analysis

R = Effluent Stream Flow Rate (600gpm-RM-L7; 100gpm-RM-L2)

F = Dilution Stream Flow Rate (10,000gpm; Ref: FSAR Sec. 11.2.1.1)

MPC = 10CFR20 Appendix B, Table II, Column 2 Maximum Permissible Concentration by isotope.

If the Calculated Discharge Concentration is less than or equal to 1, the discharge may be initiated. If the calculated discharge concentration is greater than 1, action must be taken to reduce the effluent concentration or effluent stream flow rate prior to initiating discharge.

Comment

4. Section 1.4-5

The term $\frac{C}{MPC}$ should be written as $\sum_{i} \frac{Ci}{MPC_i}$

where i i. .he ith nuclide

Crystal River ODCM

Setpoint Adjustment 1.4-5
Plant Discharge Line Monitor (RM-L2)
(Batch Type Releases)

INTRODUCTION

Following completion of the analyses required by Section 1.2-4 and determination of release rates and concentration limits in accordance with Section 1.3-2, the monitor setpoint requires adjustment to ensure that alarm and pathway isolation occur if the nuclide concentration or release rate exceeds the limits determined.

METHODOLOGY

Evaporator Condensate Storage Tank or Laundry and Shower Sump Tank contents are circulated through radiation monitor RM-L2 and returned to the auxiliary building sump to obtain the actual count rate at RM-L2 for the concentration contained in the tank for release. The observed count rate is adjusted for release flow, background and statistical counting variations, particular to this release flow path. The resulting value is used as the alarm/trip setpoint and RM-L2 is adjusted to this value prior to initiating the release.

CALCULATION

$$\text{Monitor Setpoint (CPM)} = \left[\frac{\text{Net CPM x Admin. Factor}}{\text{C/MPC}}\right]\left[\frac{F_R + F_D}{F_R}\right] + \text{Bkg} + 3.3\sqrt{\text{Bkg}}$$

where:

Net CPM =	The observed monitor count rate, in counts per minute.
Admin. Factor =	Administration Factor to account for error in setpoint determination. Admin. Factor = 0.5.
C/MPC =	The ratio of the actual concentration of the tank contents to be released to the Maximum Permissible Concentration (MPC) as listed in 10 CFR 20, Table II, Column 2 for unrestricted areas.
F_R =	The release flow rate of waste to be discharged in gallons per minute.
F_D =	The dilution flow from the Nuclear Services Sea Water system in gallons per minute.
BKG =	The background count rate at RM-L2 in counts per minute (cpm).
$3.3\sqrt{\text{BKg}}$ =	A statistical spread on the background count rate which represents a 99.95% confidence level on monitor counting. This factor is included to prevent inadvertent high/trip alarms due to random counts on the monitor. Only the positive (+) side of the spread is applied.

CRYSTAL RIVER ODCM REVIEW

Comment

5. Section 2.2-1 and Section 2.2-2

Should the second equation for D_p be written as

$$D_p = \frac{(D_{L-2})\ k_2 + (D_{L-1})\ k_1 + (D_L)\ k}{3}$$

As written "k" has the same value for all three terms.

Crystal River ODCM

DOSE PROJECTION METHODOLOGY 2.2-1
GASEOUS RADWASTE

I. INTRODUCTION

Crystal River Unit 3 operating practices require use of the waste gas system (Waste Gas Decay Tanks). The normal release paths for gaseous effluents are via ventilation exhaust treatment systems (HEPA and Charcoal Filters). The operability of the ventilation exhaust treatment systems is controlled by the Crystal River Unit 3 Technical Specifications.

As long as these practices and specifications are maintained, the radwaste reduction requirements of Crystal River Unit 3 Technical Specification 3.7.13.3 are met, and there is no need to project doses prior to the release of gaseous radwaste.

II. CALCULATIONS

Dose projection calculations will be necessary if either system is not available for use. The dose projection will be made using whichever formula below yields the higher projected dose.

1) $D_p = (D_L)\ k$

2) $D_p = \dfrac{(D_{L-2})\ k + (D_{L-1})\ k + (D_L)\ k}{3}$

where:

D_p = Projected Dose.

D_L = Dose, calculated in accordance with section 4.3-1 of this manual for the most recently completed (reference) month.

k = A constant to account for the use of the waste gas system during the reference month.

  k = 4 if the waste gas system was used.

  k = 1 if the system was not used.

Assumptions:

1) Xe-133 and I-131 are major dose contributors.
2) I-131 is removed by charcoal filters
3) Nominal holdup time is ten days (two Xe-133 half-lives).

References:
1) T.S. 3.6.4.2, 3.7.8.1
2) FSAR 3.3.1, 5.3.2

CRYSTAL RiVER ODCM REVIEW

Comment

6. **Calculation of Dose Factors in the Ground Plane Pathway**

The t should be for 15 years and not for one year.

The units for DFG_i should be μC_i, not C_i.

Crystal River ODCM

Calculation of Dose Factors in the Ground Plane Pathway (R_i^G [D/Q])

$$R_i^G(D/Q) = K' K'' (SF)\, DFG_i \quad (1 - e^{-\lambda_i t}) / \lambda_i)$$

units = m2 · mrem/yr per uCi/sec

where:

Reference Table, R.G. 1.109

K' = A constant unit of conversion, 10^6 pCi/μCi.

K" = A constant unit of conversion, 8760 hr/yr

SF = The shielding factor, (dimension bas, 0.7) E-13

λ_i = The decay constant for the ith radionuclide, sec^{-1}

t = The exposure period, 3.15×10^7 sec (1 year) 15 years

DFG_i = The ground plane dose conversion factor for the ith radionuclide (mrem/hr per μCi/m^2) E-6

Reference: The equation deriving $R_i^G(D/Q)$ was taken from NUREG 0133, Section 5.3.1.2.

CRYSTAL RIVER ODCM REVIEW

Comment	Crystal River ODCM
7. The total dose calculation including direct radiation was not addressed.	

CRYSTAL RIVER ODCM REVIEW

Comment

3. The following sample locations were omitted:

	Sample Location Omitted
Table 5.1-2	C27
Table 5.1-1	C14H, C09, C43
Figure 5.1	C14H, C43

Note: C09 is identified in Figure 5.1

Crystal River ODCM

TABLE 5.1-2

RING TLDs
(INNER RING)

LOCATION	DIRECTION	DISTANCE (Ft.)
C60	N	4400
C61	NNE	4400
C62	NE	5300
C63	ENE	4400
C64	E	4400
C65	ESE	1740
C66	SE	1600
C67	SSE	1430
C68	S	1500
C69	SSW	1780
C41	SW	2100
C70	WSW	4400
C71	WNW	3600
C72	NW	3600
C73	NNW	2000

CRYSTAL RIVER ODCM REVIEW

Comment

d. The following sample locations were omitted:

	Sample Location Omitted
Table 5.1-2	C27
Table 5.1-1	C14H, C09, C43
Figure 5.1	C14H, C48

Note: C09 is identified in Figure 5.1

Crystal River ODCM

Table 5.1-1

Environmental Radiological Monitoring Stations Locations

STATION	LOCATION	DIRECTION FROM PLANT	DISTANCE FROM PLANT (mi)
C04	State Park Old Dam on River near road intersection	ENE	6.3
C07	Crystal River Public Water Plant	ESE	7.5
C10	Indian Waters Public Water Supply	ESE	5.9
C13	Mouth of Intake Canal	WSW	3.4
C14H	Head of Discharge Canal	NW	0.1
C14G	Discharge Canal at Gulf of Mexico	W	2.8
C18	Yankeetown City Well	N	5.2
C19	NW Corner State Roads 488 & 495	ENE	8.3
C29	Discharge Area	N	2.0
C30	Intake Area	WSW	3.6
C40	Near N.E. Site Boundary near excavated pond & pump station	E	3.5
C41	Onsite meteorological tower	SSW	0.4
C46	North Pump Station	N	0.4
C47	University of Florida, Gainesville	NNE	32
C49	To be determined from annual milk cow census		

CRYSTAL RIVER ODCM REVIEW

Comment

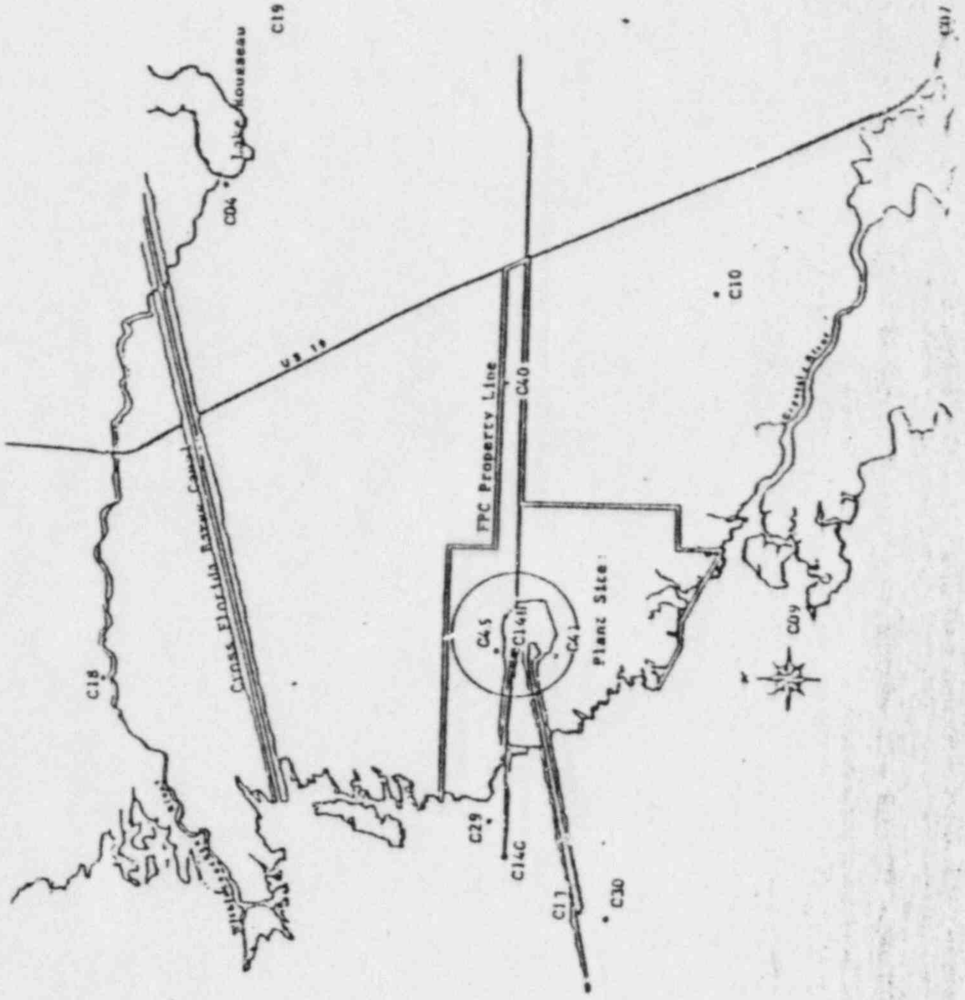
8. The following sample locations were omitted:

	Sample Location Omitted
Table 5.1-2	C27
Table 5.1-1	C14M, C09, C48
Figure 5.1	C14M, C48

Note: C09 is identified in Figure 5.1

Crystal River ODCM

FIGURE 5.1



Environmental Monitoring
Sample Station Locations

CRYSTAL RIVER ODCM REVIEW

Comment

9. <u>Section 4.3-3</u>

The Licensee should consider use of a near field average dilution factor in the expression for the liquid dose calculation.

Crystal River ODCM

DOSE CALCULATION 4.3-3
(LIQUID EFFLUENTS)

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to UNRESTRICTED AREAS is calculated as follows:

$$D_\tau = \sum_i \left[A_{i\tau} \sum_{l=1}^{m} \Delta t_l \; C_{il} \right]$$

where:

D_τ = The cumulative dose commitment to the total body or any organ, τ, from the liquid effluents for the total time period $\sum_{l=1}^{m} \Delta t_l$, in mrem.

Δt_l = The length of the lth time period over which C_{il} is averaged for all liquid releases, in hours.

C_{il} = The average concentration of radionuclide, i, in undiluted liquid effluent during time period Δt_l from any liquid release, in μCi/ml.

$A_{i\tau}$ = The site related ingestion dose commitment factor to the total body or any organ τ for each identified principal gamma and beta emitter as shown in Table 4.4-17 of this manual, in mrem-ml per hour μCi.

References:

1) NUREG 0133, Section 4.3

CRYSTAL RIVER ODCM REVIEW

Comment	Crystal River ODCM
Calculation of Inhalation Pathway Dose Factor (P_i) The P_i should be R_i in both the title and the expression.	Typo R_i CALCULATION OF INHALATION PATHWAY DOSE FACTOR (P_i) R_i P_i = K' (BR) DFA_i = mrem/year per $\mu Ci/m^3$ (from section 5.2.1.1 of NUREG 0133) where: K' = A constant unit of conversion - 10^6 pCi/μCi BR = The Breathing Rate of the represented age group: (from Table E-5 of Regulatory Guide 1.109). 1400 m^3/yr - infant 3700 m^3/yr - child 8000 m^3/yr - teen 8000 m^3/yr - adult DFA_i = The maximum organ inhalation dose factor for the represented age group for the ith radionuclide, in mrem/pCi. The values of DFA_i are listed in Regulatory Guide 1.109 as follows: DFA_i (infant) - Table E-10 DFA_i (child) - Table E-9 DFA_i (teen) - Table E-8 DFA_i (adult) - Table E-7

CRYSTAL RIVER ODCM REVIEW

Comment

Calculation of Ingestion Dose Factor Grass-Cow-Meat Pathway

The term $e^{-\lambda_i t_h}$ should be $e^{-\lambda_i t_f}$

Crystal River ODCM

Calculation of Ingestion Dose Factor
Grass-Cow-Meat Pathway (R_i^M [D/Q])

$$R_i^M[D/Q] = K'\left[\frac{Q_F(U_{ap})}{\lambda_i + \lambda_w}\right] F_f \, (r) \, (DFL_i)_a \left[\frac{f_p f_s}{Y_p} + \frac{(1 - f_p f_s)\, e^{-\lambda_i t_h}}{Y_s}\right] e^{-\lambda_i t_h}$$

Typo t_f

where: Units = $m^2 \cdot$ mrem/yr per uci/sec

			Reference Table, R.G. 1.109
K'	=	A constant of unit conversion, 10^6 pCi/µCi.	
Q_F	=	The cow's consumption rate, 50 kg/day (wet weight)	E-3
U_{ap}	=	The receptor's meat consumption rate for age (a), in kg/yr Infant - 0 Child - 41 Teen - 65 Adult - 110	E-3
Y_p	=	The agricultural productivity by unit area of pasture feed grass 0.7 kg/m^2	E-15
Y_s	=	The agricultural productivity of unit area of stored feed 2.0 kg/m^2	E-15
F_f	=	The stable element transfer coefficients, in days/kg.	E-1
r	=	Fraction of deposited activity retained on cow's feed grass 1.0 radioiodine 0.2 particulates	E-15 E-15
t_f	=	Transport time from pasture to receptor, in sec. 1.73x10^6 sec (20 days)	E-15
t_h	=	Transport time from crop field to receptor, in sec. 7.78x10^6 sec. (90 days)	E-15)
$(DFL_i)_a$	=	The maximum organ ingestion dose factor for the ith radionuclide for the receptor in age group (a), in mrem/pCi	E-11 to E-14
λ_i	=	The decay constant for the ith radionuclide, in sec $^{-1}$	
λ_w	=	The decay constant for removal of activity on leaf and plant surfaces by weathering, 5.73 x 10^{-7} sec $^{-1}$ (corresponding to a 14 day half-life).	
f_p	=	Fraction of the year that the cow is on pasture (dimensionless) = 1*	
f_s	=	Fraction of the cow feed that is pasture grass while the cow is on pasture (dimensionless) = 1*.	

*Milk cattle are considered to be fed from two potential sources, pasture grass and stored feeds. Following the development in Regulatory Guide 1.109, the values of f_p and f_s will be considered unity, in lieu of site specific information provided in the annual land census report by the licensee.

Note: The above equation does not apply to the concentration of tritium in meat. A separate equation is provided in NUREG 0133, section 5.3.1.4 to determine Tritium value.

Reference: The equation deriving R_i^M (D/Q) was taken from NUREG 0133, Section 5.3.1.3.

CRYSTAL RIVER ODCM REVIEW

Comment

<u>Calculation of Ingestion Dose Factor Vegetation Pathway</u>

The term $\frac{1}{(i + w)}$ should be $\frac{1}{(\lambda_i + \lambda_w)}$

The defintion for t_L should state it is for <u>leafy</u> vegetation instead of <u>stored vegetation</u>.

The defintion for Y_v should use a capital letter Y.

Crystal River ODCM

Calculation of Ingestion Dose Factor
Vegetation Pathway (R_i^v $[D/Q]$)

$$R_i^v[D/Q] = K' \frac{(r)}{Y_v (\lambda_i + \lambda_w)} (DFL_i)_a \left[U_a^L f_L e^{-\lambda_i t_L} + U_a^S f_g e^{-\lambda_i t_h} \right]$$

where: Units = m^2 · mrem/yr per uci/sec

		<u>Reference Table, R.G. 1.109</u>
K' =	A constant of unit conversion, 106 pCi/µCi.	
U_a^L =	The consumption rate of fresh leafy vegetation by the receptor in age group (a), in kg/yr. Infant - 0 Child - 26 Teen - 42 Adult - 64	E-5
U_a^S =	The consumption rate of stored vegetation by the receptor in age group (a), in kg/yr Infant - 0 Child - 520 Teen - 630 Adult - 520	E-5
$(DFL_i)a$ =	The maximum organ ingesting dose factor for the ith radionuclide for the receptor in age group (a), in mrem/pCi.	E-11 to E-14
f_L =	The fraction of the annual intake of fresh leafy vegetation grown locally. (default 1.0)	
f_g =	The fraction of the annual intake of stored vegetation grown locally. (default 0.76)	
t_L =	The average time between harvest of stored leafy vegetation and its consumption, 8.6 x 10^4, seconds, (1 day)	Typo
t_h =	The average time between harvest of stored vegetation and its consumption, 5.18 x 10^6 seconds, (60 days)	E-15
y_v =	The vegetation areal density, 2.0 kg/m^2	E-15
r =	Fraction of deposited activity retained on the vegetation 1.0 radioiodine 0.2 particulates	E-15
λ_i =	The decay constant for the ith radionuclide, in sec $^{-1}$	
λ_w =	The decay constant for removal of activity on leaf and plant surfaces by weathering, 5.73 x 10^{-7} sec $^{-1}$ (corresponding to a 14 day half-life).	

Note: The above equation does not apply to the concentrations of tritium in vegetation. A separate equation is provided in NUREG 0133, section 5.3.1.3 to determine tritium values.

Reference: The equation deriving R_i^v (D/Q) was taken from NUREG 0133, Section 5.3.1.5.

CRYSTAL RIVER ODCM REVIEW

Comment

Section 4.3-1

The units for Q_i should be $_\mu C_i$ not Ci.

Crystal River ODCM

DOSE CALCULATION 4.3-1
(NOBLE GAS)

The dose to an individual at or beyond the SITE BOUNDARY due to noble gases released in gaseous effluents is calculated as follows:

$$D_\gamma = 3.17 \times 10^{-8} \sum_i \left[M_i (\overline{X/Q}) Q_i \right] \quad \text{gamma radiation}$$

$$D_\beta = 3.17 \times 10^{-8} \sum_i \left[N_i (\overline{X/Q}) Q_i \right] \quad \text{beta radiation}$$

where:

D_γ = The dose to an individual at or beyond the SITE BOUNDARY due to gamma emissions from noble gases in gaseous effluents in mrad/time period.

D_β = The dose to an individual at or beyond the SITE BOUNDARY due to beta emissions from noble gases in gaseous effluents in mrad/time period.

3.17×10^{-8} = The number of years in one second.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/year per uCi/m^3.

N_i = The air dose factor due to beta emissions for each identified noble gas radionuclide, in mrad/year per uCi/m^3.

$(\overline{X/Q})$ = The highest calculated annual average relative concentration for areas at or beyond the UNRESTRICTED AREA Boundary, 2.5×10^{-6} sec/m^3.

Q_i = The average release of noble gas radionuclides in gaseous releases from all vents in μCi. Releases shall be cumulative over the time period of concern.

Typo

CRYSTAL RIVER ODCM REVIEW

Comment

Section 1.3-1

The word "For" is spelled as "Fbr" in the $\frac{X}{Q}$ definition. →

Crystal River ODCM

SETPOINT CALCULATION 1.3-1
GASEOUS RADWASTE RELEASE

I. INTRODUCTION

Prior to initiating a release of gaseous radwaste, it must be determined that the concentration of radionuclides to be released, and the flow rates at which they are released will not exceed the dose rate limitations of Specification 1.1-1.

II. INFORMATION REQUIRED

Results of appropriate Nuclide Analysis from Section 1.2

III. CALCULATIONS

A. Noble Gas Gamma Emissions

Eq. 1 $$\text{Dose Rate}_\gamma = \Sigma_i \left[K_i((\overline{X/Q})\ Q_i)\right] \quad \text{mrem/yr.}$$

B. Noble Gas Beta Emissions

Eq. 2 $$\text{Dose Rate}_\beta = \Sigma_i \left[(L_i + 1.1M_i)((\overline{X/Q})\ Q_i)\right] \quad \text{mrem/yr.}$$

C. Iodine 131, Tritium, Radioactive Particulates

Eq. 3 $$\text{Dose Rate I,T,P} = \Sigma_i\ P_i \left[(\overline{X/Q})\ Q_i\right] \quad \text{mrem/yr.}$$

where:

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide, in mrem/yr per μCi/m^3. (See Table 1.3-1).

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide, in mrem/yr per μCi/m^3. (See Table 1.3-1).

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/yr per μCi/m^3 (unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose). (See Table 1.3-1).

P_i = The dose parameter for radionuclides other than noble gases for the inhalation pathway, in mrem/yr per μCi/m^3. (See Table 1.3-2).

Q_i = The release rate of radionuclides, i, in gaseous effluent from individual release sources, in μCi/sec (per unit, unless otherwise specified).

(X/Q) = 2.5×10^{-6} sec/m^3. Fbr all vent releases. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary.

Typo

CRYSTAL RIVER ODCM REVIEW

Comment	Crystal River ODCM
Section 1.3-3 a. Shouldn't the value 3.26×10^8 cc be 1.36×10^7 cc? The 3.26×10^8 value is not used in the calculation. b. The "μ" is missing from most of the units, e.g., 2.08 μCi and 6.62×10^{-1} μCi.	In order to determine the total quantity of Iodine 131 collected on the filter, the values of C_v above are multiplied by the volume assumed to have passed through the filter, (3.26×10^8 cc). $Q_I = C_V \times f_f \times k$ where: Q_I = The total quantity of Iodine 131 collected on the filter in μCi. C_V = The concentration of Iodine 131 in the vent in μCi/cc. f_f = The assumed total volume of vent atmosphere that has passed through the filter, 1.36×10^7 cc (1 CFM for 8 hours). k = The Iodine removal efficiency of the filters: 90% Solving for Q_I for the Reactor Building vent yields: $Q_{I(RB)}$ = 2.08μCi 2.04 μCi Solving for Q_I for the Auxiliary Building and Fuel Handling Area vent yields: $Q_{I(AB)}$ = 6.62×10^{-1} μCi These values are translated to counts per minute for the Iodine monitoring channels through use of the appropriate calibration curves.