SNUPPS

Standardized Nuclear Unit
Power Plant System

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Executive Director

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SUBJ: AEB Review

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket Nos.: STN 50-482, STN 50-483, and STN 50-486

Dear Mr. Denton:

In discussions with Dr. Gordon Edison, NRC Project Manager for the SNUPPS applications, it was learned that the Accident Evaluation Branch required additional information in order to complete their review of the SNUPPS FSAR. The enclosure to this letter provides the requested information and will be included in the next revision to the SNUPPS FSAR.

Very truly yours,

NAPetrick

Nicholas A. Petrick

RLS/dck/3a27

Enclosure

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2.3 METEOROLOGY

2.3.4 SHORT-TERM (ACCIDENT) DIFFUSION ESTIMATES

2.3.4.1 Objective

The objective of this section is to provide an envelope of the short-term atmospheric dispersion factors (χ/Qs) for the two sites for the postulated accident analyses presented in Chapter 15.0.

2.3.4.2 Calculations

2.3.4.2.1 Site Boundary and LPZ

The short-term atmospheric dispersion factors (χ/Qs) are based on onsite meteorological data for the two sites. The diffusion equations and assumptions used in the calculations were those outlined in draft NRC Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Assessment at Nuclear Power Plants." Table 2.3-1 lists the limiting χ/Qs for the Wolf Creek and Callaway sites. The detailed procedures used in the calculations are given in Section 2.3.4.2 of each Site Addendum.

2.3.4.2.2 Control Room Intake

The basic model employed for the distribution of relative concentrations (χ/Qs) within a building wake at the SNUPPS control room intakes following an accident is given by Reference 1 to be:

$$\chi/Q = \frac{K_c}{AV} \tag{1}$$

Where A = reference cross-sectional building area, m^2

V = reference wind speed, m/sec

K_c = nondimensional concentration coefficient

K_c is a function of nondimensional space coordinates x/L, y/L, and z/L, building configuration, wind direction, and source configuration. The K_c field for a given building configuration, source configuration, and wind direction is considered to be invariant. Accordingly, K_c values determined by wind tunnel tests with a model structure are expected to be the same as those that would be obtained with a geometrically similar building in the full-scale atmosphere in the same wind direction, with a similar leak. The SNUPPS contiguous building arrangement is shown in Figure 2.3-1. The K_c data used in the

analysis for low level release are presented in Figure 2.3-2 and were derived from two sets of tests. One used rectangular prisms (Ref. 2), the other used a model of the EBR-II complex (Ref. 1). Both tests were described and portions of the data presented in Reference 3. The K_c data for the unit vent release from the top of the containment were extracted from Figure 10 of Reference 1 and are presented in Table 2.3-2. The value of A used in conjunction with K_c in Figure 2.3.2 and Table 2.3-2 is the SNUPPS equivalent of the EBR-II area, $A = 1.12\ D^2 = 2280\ m^2$ with the diameter of the reactor D = 45.1 m.

The value of V used in conjunction with Figure 2.3-2 is the mean velocity of the approach flow at an elevation corresponding to the anemometer elevation of the EBR-II model tests. Reference 3 reports this elevation to be 62 feet or 0.77D above the top of the dome. The SNUPPS equivalent height becomes 63.4 + 0.77 x 45.1 = 98.1m above ground. The V values were obtained by extrapolating wind speeds at anemometer elevations equivalent to 98.1 meters by the power law.

$$V = u_1\ (98.1/z_1)^n \qquad (2)$$

Where

u_1 = mean speed at elevation z_1, m/sec

z_1 = anemometer elevation at a given site, m

n = atmospheric stability exponent

Values of n were arbitrarily assumed for the various stability classes as follows:

Pasquill Stability Class	A	B	C	D	E	F	G
n	0.20	0.25	0.29	0.33	0.40	0.50	0.60

A cumulative frequency distribution was constructed for the χ/Q values calculated by equations 1 and 2 above, using 3 years combined onsite meteorological data. The corresponding highest 5 percent, 10 percent, 20 percent, and 40 percent χ/Q values for each site are given in Table 2.3-3.

2.3.5 REFERENCES

1. Halitsky, J., Golden, J., Halpern, P., (1963): "Wind Tunnel Tests of Gas Diffusion From a Leak in the Shell of a Nuclear Power Reactor and from a Nearby Stack," N. Y. University Department of Met. & Ocean, GSL Rep. 63-2 under USWB Contract Cwb-10321

2. Halitsky, J. (1963): "Gas Diffusion Near Buildings," ASHRAE Trans. 69: pp. 464-484

AAB

3. Slade, D. H., ed. (1968): "Meteorology and Atomic Energy," U. S. AEC Division of Technical Information TID-24190

TABLE 2.3-1

LIMITING ATMOSPHERIC DISPERSION FACTOR, χ/Q (sec/m^3)

Site Boundary	Callaway	Wolf Creek
0-2 hr.	2.0E-4	1.5E-4
Low Population Zone		
0-8 hr.	2.6E-5	1.9E-5
8-24 hr.	1.7E-5	1.3E-5
24-96 hr.	7.2E-6	5.3E-6
96-720 hr.	2.0E-6	1.5E-6

TABLE 2.3-2

VARIATION OF INTAKE K_c WITH WIND DIRECTION
UNIT VENT RELEASE

Wind Direction	Wolf Creek	Callaway
N	0	1.5
NNE	0	0.5
NE	0	0
ENE	0.5	0
E	1.5	0
ESE	2.5	0
SE	1.5	0
SSE	0.5	0
S	0	0
SSW	0	0
SW	0	0
WSW	0	0
W	0	0
WNW	0	0.5
NW	0	1.5
NNW	0	2.5

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TABLE 2.3-3

RELATIVE CONCENTRATION (X/Q) AT CONTROL BUILDING AIR INTAKE

From Low Level Release

Percentage	SITE Wolf Creek	Callaway
5	5.33	7.18
10	3.62	5.28
20	0.66	1.66
40	0	0

For Unit Vent Release

Percentage	Wolf Creek	Callaway
5	1.14	1.33
10	0.68	0.90
20	0.17	0.41
40	0	0

*Units for χ/Qs are 10^{-4} m/sec^3

MATHEMATICAL MODELS USED IN THE ANALYSIS - Mathematical models used in the analysis are described in the following sections:

a. The mathematical models used to analyze the activity released during the course of the accident are described in Section 15A.2.

b. The atmospheric dispersion factors used in the analysis were calculated, based on the onsite meteorological measurements program described in Section 2.3 of each Site Addendum, and are provided in Table 15A-2.

c. The thyroid inhalation total-body immersion doses to a receptor exposed at the exclusion area boundary and the outer boundary of the low population zone were analyzed, using the models described in Sections 15A.2.4 and 15A.2.5, respectively.

d. Buildup of activity in the control room and the integrated doses to the control room personnel are analyzed, based on models described in Section 15A.3.

IDENTIFICATION OF LEAKAGE PATHWAYS AND RESULTANT LEAKAGE ACTIVITY - For evaluating the radiological consequences of a postulated LOCA, the resultant activity released to the containment atmosphere is assumed to leak directly to the environment.

No credit is taken for ground deposition or radioactive decay during transit to the exclusion area boundary or LPZ outer boundary.

15.6.5.4.1.2 Radioactive Releases Due to Leakage from ECCS and Containment Spray Recirculation Lines

Subsequent to the injection phase of ESF system operation, the water in the containment recirculation sumps is recirculated by the residual heat removal, centrifugal charging and safety injection pumps, and the containment spray pumps. Due to the operation of the ECCS and the containment spray system, most of the radioiodine released from the core would be contained in the containment sump. It is conservatively assumed that a leakage rate of 2 gpm from the ECCS and containment spray recirculation lines exists for the duration of the LOCA. This leakage would occur inside the containment as well as inside the auxiliary building. For this analysis, all the leakage is assumed to occur inside the auxiliary building. Only trace quantities of radioiodine are expected to be airborne within the auxiliary building due to the temperature and pH level of the recirculated water. However, 10 percent of the radioiodine in the leaked water is assumed to become airborne and exhausted from the unit vent to the environment through safety grade filters.

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Radiological Consequences of ECCS/CS Recirculation Line Leakage - The assumptions used to calculate the amount of radioiodine released to the environment are given in Table 15.6-6. The dose models are presented in Section 15.A. The offsite doses at the site boundary and LPZ and the doses to control room personnel from this pathway are given in Table 15.6-8.

15.6.5.4.2 Identification of Uncertainties and Conservatisms in the Analysis

The uncertainties and conservatisms in the assumptions used to evaluate the radiological consequences of a LOCA result principally from assumptions made involving the amount of the gaseous fission products available for release to the environment and the meteorology present at the site during the course of the accident. The most significant of these assumptions are:

a. The ECCS is designed to prevent fuel cladding damage that would allow the release of the fission products contained in the fuel to the reactor coolant. Severe degradation of the ECCS (i.e., to the unlikely extent of simultaneous failure of redundant components) would be necessary in order for the release of fission products to occur of the magnitude assumed in the analysis.

b. The release of fission products to the containment is assumed to occur instantaneously.

c. It is assumed that 50 percent of the iodines released to the containment atmosphere is adsorbed onto the internal surfaces of the containment or adheres to internal components; however, it is estimated that the removal of airborne iodines by various physical

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TABLE 15.6-6 (Sheet 2)

3. Sprayed volume, percent	85
4. Unsprayed volume, percent	15
5. Sprayed-unsprayed mixing rate, CFM	85,000
6. Containment volume, ft^3	2.5E+6

d. Activity released to containment

Isotope	Curies
I-131	2.24E+7
I-132	3.40E+7
I-133	5.00E+7
I-134	5.85E+7
I-135	4.55E+7
Xe-131m	9.25E+5
Xe-133m	4.93E+6
Xe-133	2.00E+8
Xe-135m	5.55E+7
Xe-135	1.91E+8
Xe-137	1.82E+8
Xe-138	1.70E+8
Kr-83m	1.48E+7
Kr-85m	4.62E+7
Kr-85	1.46E+6
Kr-87	8.32E+7
Kr-88	1.14E+8
Kr-89	1.42E+8

e. ECCS/recirculation leakage

1. Leak rate (0.47 hours-30 day), gpm	2.0
2. Iodine inventory in sump @ 0.47 hour, curies	
I-131	4.46E+7
I-132	5.90E+7
I-133	9.87E+7
I-134	8.08E+7
I-135	8.67E+7
3. Sump volume, gal.	460,000
4. Fraction iodine airborne	0.1
5. ESF filter efficiency, %	90.0

IV. Control room parameters — Tables 15A-1 and 15A-2

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TABLE 15.6-8

RADIOLOGICAL CONSEQUENCES OF A LOSS-OF-COOLANT-ACCIDENT

	Doses (rem)	
	Callaway	Wolf Creek
I. Exclusion Area Boundary (0-2 hr)		
a. Containment leakage (0-2 hr)		
Thyroid	87	65
Whole body	2.9	2.2
b. ECCS recirc. leakage (0.47 hr-2 hr)		
Thyroid	27	20
Whole body	0.081	0.061
II. Low Population Zone Outer Boundary (0-30 day)		
a. Containment leakage (0-30 day)		
Thyroid	55	41
Whole body	1.0	0.75
b. ECCS recirc. leakage (0.47 hr-30 day)		
Thyroid	59	44
Whole body	0.059	0.044
III. Control Room (0-30 day)		
a. Containment leakage (0-30 day)		
Thyroid	16	11
Whole body	0.43	0.31
Beta-skin	7.8	5.5
b. ECCS recirc. leakage (0.47 hr-30 day)		
Thyroid	3.1	2.1
Whole body	8.4E-4	6.4E-5
Beta-skin	7.5E-4	5.7E-4

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APPENDIX 15A

ACCIDENT ANALYSIS RADIOLOGICAL CONSEQUENCES EVALUATION MODELS AND PARAMETERS

15A.1 GENERAL ACCIDENT PARAMETERS

This section contains the parameters used in analyzing the radiological consequences of postulated accidents. Table 15A-1 contains the general parameters used in all the accident analyses. For parameters specific only to particular accidents, refer to that accident parameter section. The site specific, ground-level release, short-term dispersion factors (for accidents, ground-level releases are assumed) are based on Regulatory Guide 1.145 (Ref. 1) methodology and represent the worst of the 5 percent overall site meteorology and the 0.5 percent worst-sector meteorology and these are given in Table 15A-2 (see Section 2.3.4 and each site addendum for additional details on meteorology). The core and gap inventories are given in Table 15A-3. The thyroid (via inhalation pathway), beta skin, and total-body (via submersion pathway) dose factors based on References 2 and 3 are given in Table 15A-4.

15A.2 OFFSITE RADIOLOGICAL CONSEQUENCES CALCULATIONAL MODELS

This section presents the models and equations used for calculating the integrated activity released to the environment, the accident flow paths, and the equations for dose calculations. Two major release models are considered: (1) a single holdup system with no internal cleanup and (2) a holdup system wherein a two-region spray model is used for internal cleanup.

15A.2.1 ACCIDENT RELEASE PATHWAYS

The release pathways for the major accidents are given in Figure 15A-1. The accidents and their pathways are as follows:

LOCA: Immediately following a postulated loss-of-coolant accident (LOCA), the release of radioactivity from the containment is to the environment with the containment spray and ESF systems in full operation. The release in this case is calculated using equation (12) which takes into account a two-region spray model within the containment. The release of radioactivity to the environment due to assumed ESF system leakages in the auxiliary building will be via ESF filters and is calculated using equation (5).

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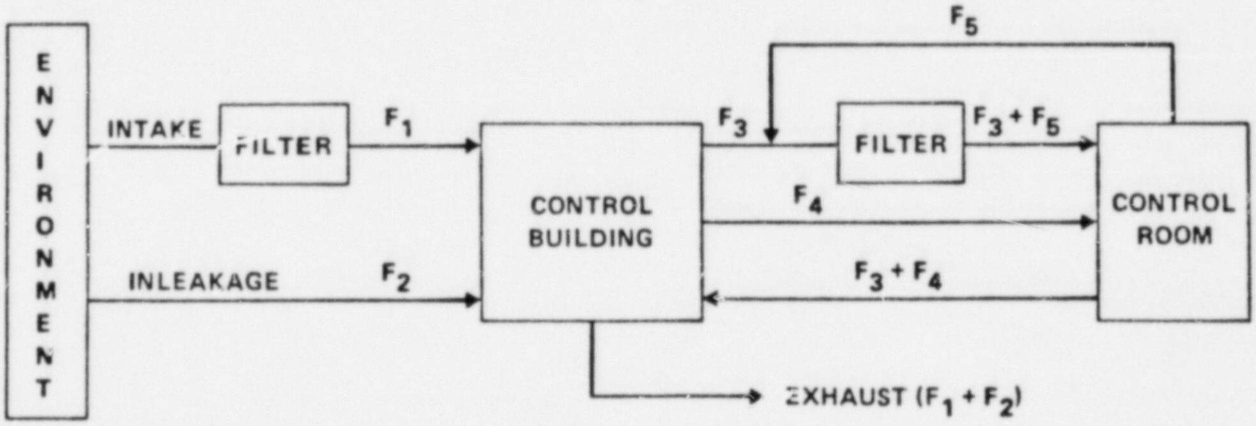
15A.3 CONTROL ROOM RADIOLOGICAL CONSEQUENCES CALCULATIONAL MODELS

Only radiation doses to a control room operator due to postulated LOCA are presented in this chapter since a study of the radiological consequences in the control room due to various postulated accidents indicate that the LOCA is the limiting case.

15A.3.1 INTEGRATED ACTIVITY IN CONTROL ROOM

Radioactivity is brought into the control room via the control room filtration system which draws in air from the control building. Radioactivity is brought into the control building through safety grade filters via the control room pressurization fan which draws in outside air. Additional radioactivity is brought into the control building via an assumed inleakage rate. The activity concentrations at the control building for each time interval are found by multiplying the activity release to the environment by the appropriate χ/Q for that time interval. The flow path model is shown below.



Once activity is brought into the control building, mixing within the control building is afforded by the control room pressurization fan. Only one-half of the control building volume is considered as the mixing volume. The control room filtration system fan takes air from the control building and the control room (recirculation) and discharges to the control room through the control room filtration safety grade filters.

The CRVIS starts both trains of the control room pressurization system and the control room filtration system. For the determination of doses to control room personnel, the worst single failure has been ascertained to be the failure of the filtration fan in one of the two filtration system trains. Operator action is required to isolate the system train with the failed filtration fan. Prior to isolation, a potential pathway exists allowing air from the control building to enter the

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control room, bypassing the control room filtration filters. After isolation, one control room pressurization fan and one control room filtration fan operate for the duration of the accident.

Owning to this single failure of the control room filtration fan, the assumed failure of one of the two containment spray (CS) trains, and one of the two containment cooling system (CtCS) trains, inherent in the LOCA analysis parameters, given in Table 15.6-6, should not be applied in this analysis. With both trains of CS and C_tCS operating, more volumetric coverage of the containment spray and more mixing between the new sprayed and unsprayed regions would be expected, thereby giving much greater iodine removal within the containment atmosphere, prior to leakage to the outside environment. However, the doses to control room personnel have been based on the LOCA analysis parameters given in Table 15.6-1.

The activity in the control building and control room is calculated by solving the following coupled set of first order differential equations.

$$\frac{dA_{CB}(t)}{dt} = [(1-7)\ F_1 + F_2]\ \chi/Q\ [R(+)] + \lambda_{4\ell}\ A_{CR}(t) - \lambda_3\ A_{CB}(+)$$

$$\frac{dA_{CR}(t)}{dt} = [(1-7)\ \lambda_{.3f} + \lambda_{3u}]\ A_{CB}(t) - \lambda_4\ A_{CR}(t)$$

where $A_{CB}(t)$ = activity in control building at time t, curies

$A_{CR}(t)$ = activity in control room at time t, curies

= filter efficiency, fraction

F_1 = filtered intake rate, $meter^3/sec$

F_2 = unfiltered intake (inleakage), $meter^3/sec$

χ/Q = atmospheric dispersion factor, $sec/meter^3$

$R(t)$ = activity release rate in Ci/sec as given in Equation 3 of Section 15A.2.2 or Equations 11 and 11a of Section 15A.2.3

λ_3 = total removal rate from the control building, sec^{-1}

= $\lambda_d + \lambda_{3\ell} + \lambda_{3f} + \lambda_{3u}$ where

λ_d = isotopic decay constant, sec^{-1}

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$\lambda_{3\ell}$ = outleakage to atmosphere from the control building ($=(F_1 + F_2)/V_{CB}$ with V_{CB} being control building mixing volume in meter^3), sec^{-1}

λ_{3f} = filtered flow from control building into control room ($=F_3/V_{CB}$, F_3 in meter^3/sec), sec^{-1}

λ_{3u} = unfiltered flow from control building into control room ($=F_3/V_{CB}$, F_3 in meter^3/sec), sec^{-1}

λ_4 = total removal rate from the control room, sec^{-1}

= $\lambda_d + \lambda_r + \lambda_{4\ell}$ where

λ_r = recirculation removal rate ($=7F_5/V_{CR}$ with F_5 being recirculation flow rate through filter with efficiency 7 in meter^3/sec and V_{CR} being control room volume in meter^3), sec^{-1}

$\lambda_{4\ell}$ = leakage to control building from the control room ($=(F_3 + F_4)/V_{CR}$), sec^{-1}

Upon solving this coupled set of differential equations, the integrated activity in the control room (IA_{CR}) is determined by the expression

$$IA_{CR}(t) = \int_0^t A_{CR}(t)\,dt$$

This $IA_{CR(t)}$ is used to calculate the doses to the operator in the control room. This activity is multiplied by an occupancy factor which accounts for the time fraction the operator is in the control room.

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15A.3.2 CONTROL ROOM THYROID DOSE CALCULATIONAL MODEL

Control room thyroid doses via inhalation pathway are calculated using the following equation:

$$D_{TH-CR} = \frac{BR}{V_{CR}} \sum_i DCF_{Thi} \sum_j (IA_{CRij}) \times O_j$$

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where

D_{Th-CR} = control room thyroid dose in rem

and

BR = breathing rate assumed to be always 3.47×10^{-4} meter^3/second

V_{CR} = volume of the control room in cubic meters

DCF_{Thi} = thyroid dose conversion factor for adult via inhalation in rem/Ci for isotope i

IA_{CRij} = integrated activity in control room in Ci-sec for isotope i during time interval j

O_j = control room occupancy fraction during time interval j

15A.3.3 CONTROL ROOM BETA-SKIN DOSE CALCULATIONAL MODEL

The beta-skin doses to a control room operator are calculated using the following equation:

$$D_{\beta-CR} = \frac{1}{V_{CR}} \sum_i DCF_{\beta i} \sum_j (IA_{CRij}) \times O_j$$

where $D_{\beta-CR}$ and $DCF_{\beta i}$ are the beta-skin doses in the control room in rem and the beta-skin dose conversion factor for isotope i in rem-meter^3/Ci-sec, respectively. The other symbols are explained in Section 15A.3.4.

15A.3.4 CONTROL ROOM TOTAL-BODY DOSE CALCULATION

Due to the finite structure of the control room, the total-body gamma doses to a control room operator will be substantially less than what they would be due to immersion in an infinite cloud of gamma emitters. The finite cloud gamma doses are calculated using Murphy's method (Ref. 4) which models the control room as a hemisphere. The following equation is used:

$$D_{TB-CR} = \frac{1}{V_{CR}(GF)} \sum_i DCF_{\gamma i} \sum_j (IA_{CRij}) \times O_j$$

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where

GF = dose reduction due to control room geometry factor

$GF = 1173/(V_1)^{0.338}$

V_1 = volume of the control room in cubic feet

D_{TB-CR} = total-body dose in the control room in rem,

and other quantities have been defined in subsections 15A.2.5 and 15A.3.4.

15A.3.4.1 Model for Radiological Consequences Due to Radioactive Cloud External to the Control Room

This dose is calculated based on the semi-infinite cloud model which is modified using the protection factors described in Section 7.5.4 of Reference 5 to account for the control room walls.

15A.4 REFERENCES

1. USNRC Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," August 1979.

2. USNRC Regulatory Guide 1.109, Rev. 1, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50 Appendix I," October 1977.

3a. Kocher, D.C., "Nuclear Decay Data for Radionuclides Occurring in Routine Releases from Nuclear Fuel Cycle Facilities," ORNL/NUREG/TM-102, August 1977.

3b. Berger, M.J., "Beta-Ray Dose in Tissue-Equivalent Material Immersed in a Radioactive Cloud," Health Physics, Vol. 26, pp. 1-12, January 1974.

4. Murphy, K.G. and Campe, K.M., "Nuclear Power Plant Control Room Ventilation System Design for Meeting General Criterion 19," Paper presented at the 13th AEC Air Cleaning Conference.

5. "Meteorology and Atomic Energy 1968," D. H. Slade (ed.), USAEC Report, TID 24190, 1968.

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TABLE 15A-1

PARAMETERS USED IN ACCIDENT ANALYSIS

I.	General	
	1. Core power level, Mwt	3565
	2. Full-power operation, days	1000
	3. Number of fuel assemblies in the core	193
	4. Maximum radial peaking factor	1.65
	5. Percentage of failed fuel	1.0
	6. Steam generator tube leak, lb/hr	500
II.	Sources	
	1. Core inventories, Ci	Table 15A-3
	2. Gap inventories, Ci	Table 15A-3
	3. Primary coolant specific activities, μCi/gm	Table 11.1-5
	4. Primary coolant activity, technical specification limit for iodines - I-131 dose equivalent, μCi/gm	1.0
	5. Secondary coolant activity technical specification limit for iodines - I-131 dose equivalent, μCi/gm	0.1
III.	Activity Release Parameters	
	1. Free volume of containment, ft^3	2.5×10^6
	2. Containment leak rate	
	i. 0-24 hours, % per day	0.2
	ii. after 24 hrs, % per day	0.1
IV.	Control Room Dose Analysis (for LOCA)	
	1. Control building	
	i. Mixing volume, cf	150,000
	ii. Filtered intake, cfm	
	Prior to operator action (0-30 minutes)	1000
	After operator action (30 minutes - 720 hours)	500
	iii. Unfiltered inleakage, cfm	300
	iv. Filter efficiency (all forms of iodine), %	90
	2. Control room	
	i. Volume, cf	100,000
	ii. Filtered flow from control building, cfm	400
	iii. Unfiltered flow from control building, cfm	
	Prior to operator action (0-30 minutes)	400
	After operator action (30 minutes - 720 hours)	0

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TABLE 15A-1 (Sheet 2)

iv.	Filtered recirculation, cfm	1600
v.	Filter efficiency (all forms of iodine), %	90

V. Miscellaneous

1.	Atmospheric dispersion factors, χ/Q sec/m^3	Table 15A-2
2.	Dose conversion factors	
	i. total body and beta skin, rem-meter^3/Ci-sec	Table 15A-4
	ii. thyroid, rem/Ci	Table 15A-4
3.	Breathing rates, meter^3/sec	
	i. control room at all times	3.47×10^{-4}
	ii. offsite	
	0-8 hrs	3.47×10^{-4}
	8-24 hrs	1.75×10^{-4}
	24-720 hrs	2.32×10^{-4}
4.	Control room occupancy fractions	
	0-24 hrs	1.0
	24-96 hrs	0.6
	96-720 hrs	0.4

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TABLE 15A-2

LIMITING SHORT-TERM ATMOSPHERIC DISPERSION FACTORS (χ/Qs) FOR ACCIDENT ANALYSIS FOR SNUPPS SITES (sec/meter^3)

Location Type/ Time Interval (hrs)	Callaway	Wolf Creek
Site boundary		
0-2	2.0E-4	1.5E-4
Low-population zone		
0-8	2.6E-5	1.9E-5
8-24	1.7E-5	1.3E-5
24-96	7.2E-6	5.3E-6
96-720	2.0E-6	1.5E-6
Control room (via containment leakage)		
0-8	7.18E-4	5.33E-4
8-24	5.28E-4	3.62E-4
24-96	1.66E-4	6.60E-5
96-720	0	0
Control room (via unit vent exhaust)		
0-8	1.3E-4	1.1E-4
8-24	9.0E-5	6.8E-5
24-96	4.1E-5	1.7E-5
96-720	0	0