John R. McKernan, Jr
Governor

Rollin Ives
Commissioner

STATE OF MAINE
DEPARTMENT OF HUMAN SERVICES
AUGUSTA, MAINE 04333

November 4, 1991

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Maine Yankee Atomic Power Company - Proposed Change No. 158 - Radiological Effluent Technical Specifications (RETS)

Gentlemen:

In accordance with 10 CFR 50.91(b) the State of Maine has reviewed the proposed Technical Specification change modifying the RETS by:

a. incorporating the programmatic controls that satisfy the requirements of 10CFR 20.106, 40CFR 190, 10CFR 50.36a and Appendix I to the 10 CFR 50 into the administrative controls section of the revised Tech Specs and

b. relocating the procedural details of the current RETS into the Offsite Dose Calculation Manual (ODCM).

The State has no objections to the proposed change as it will be in agreement with the NRC's Generic Letter 89-01. Although only editorial in nature, numerous discrepancies were noted within Maine Yankee's ODCM submittal, which raises questions as to it's quality. For simplicity and expediency, the differences are identified in Attachment I. Moreover, a second attachment is provided indicating comments that would have been incorporated, had the most current revision of the ODCM been employed at the time of Maine Yankee's submittal.

Respectfully yours,

Patrick J. Dostie

Patrick J. Dostie
State Nuclear Safety Inspector
Office of Nuclear Safety
Division of Health Engineering

Attachments
cc:
Clough Toppan, State of Maine
Uldis Vanags, State of Maine
Steve Nichols, Maine Yankee

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ATTACHMENT 1

TECHNICAL SPECIFICATIONS

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Line in the margin
Change should
be indicated to
show that the title
has changed for
section 5.8 of the
Tech Specs

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2.3.4 Radioactive Gaseous Effluent Instrumentation

1. The radioactive gaseous process and effluent monitoring instrumentation channels shown in Table 2.2 shall be operable with their alarm/trip setpoints set to ensure that the limits in Section 2.2.3.1 are not exceeded during release of radioactive material via this pathway.

   The alarm/trip setpoints of these channels shall be determined in accordance with the methodology in this ODCM.

Remedial Action: With a radioactive gaseous process effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure that the limits in Section 2.2.3.1 are met, without delay take action to:

a. Suspend the release of radioactive gaseous effluents monitored by the affected channel,

b. Or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

Remedial Action: With less than the minimum number of radioactive effluent monitoring instrumentation channels operable, take action shown in Table ~~2.3-2.~~ Exert reasonable efforts to:

Correction → 2.2
as table 2.3-2 does not exist

a. Return the instrument(s) to operable status within 30 days; and

b. If unsuccessful, explain in the next Semiannual Radioactive Effluent Release Report the reason for the delay in correcting the inoperability.

Basis: The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments are to ensure that the alarm/trip will occur prior to exceeding the limits of 10CFR, Part 20.

The operability and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10CFR, Part 50.

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2.2.4, and 2.2.5. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

Correction 2.3

4. With milk samples no longer available from one or more of the sample locations required by Table 4.8-1, identify the new location(s) if available, for obtaining replacement samples and add to the Radiological Environmental Monitoring Program within 30 days. The specific location(s) from which samples were no longer available may then be deleted from the Monitoring Program. Identify the cause of the samples no longer being available and identify the new location(s) for obtaining available replacement samples in the next Annual Radiological Environmental Monitoring Report.

Basis: The radiological environmental monitoring required by this specification provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of individuals resulting from the station operation. This monitoring program thereby supplements the Radiological Effluent Monitoring Program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurement and modeling of the environmental exposure pathways. Program changes may be initiated based on operational experience.

A two-zone sample collection network has been established for environmental surveillance. Samples are collected in Zone I at locations in the vicinity of the plant where concentrations of plant effluents may be detectable.

These samples are compared to samples which have been collected simultaneously at locations in Zone II where the concentration of plant effluents is expected to be negligible. The Zone II samples provide a running background which will make it possible to distinguish significant radioactivity introduced into the environment by the operation of the plant from that introduced by weapons testing or other sources.

The detection capabilities required by Table 2.4 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular

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TABLE 2.3
Radiological Environmental Surveillance Program(1)(2)(3)

Exposure Pathway and/or Sample	Number of Sample Locations	Sampling and Collection Frequency	Type and Frequency of Analysis(4)
Airborne			
a. Radioiodine and Particulates	5	Continuous operation of sampler with sample collection as required by dust loading but at least once per week.	Radioiodine canister. Analyze at least once per week for I-131. Particulate sampler. Analyze for gross beta radioactivity at least 24 hours following filter change. Perform gamma isotopic analysis on composite (by location) sample at least once per quarter.
Direct Radiation	38	Quarterly.	Gamma dose quarterly.
Waterborne			
a. Surface (Estuary)	2	Composite* sample collected over a period of one month.	Gamma isotopic analysis of each monthly sample. Tritium analysis of composite sample at least once per quarter.
b. Ground**	2	At least once per quarter.	Gamma isotopic and tritium analysis of each sample.
c. Sediment from Shoreline	2	At least once per six months.	Gamma isotopic analysis of each sample.

* Composite sample shall be collected by collecting an aliquot at intervals not exceeding two hours. ~~Control~~ station s samples may be grab samples rather than composite.

** Groundwater samples shall be taken when this source is tapped for drinking or irrigation purposes in area where hydraulic gradient or recharge properties are suitable for contamination.

Typo

Asterisks missing

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TABLE 2.3 (Continued)
Radiological Environmental Surveillance Program(1)(2)(3)

Exposure Pathway and/or Sample	Number of Sample Locations	Sampling and Collection Frequency	Type and Frequency of Analysis(4)
Ingestion			
a. Milk*	3	At least once per month.	Gamma isotopic and I-131 analysis of each sample.
b. Fish and Invertebrates	2	One sample in season, or semiannually if not seasonal, of each of at least two commercially or recreationally important species.	Gamma isotopic analysis on edible portions.
c. Food Products, consisting of at least three types of broad ~~lead~~ leaf vegetation. Performed only if milk sampling is not done. typo	3	Monthly when available.	Gamma isotopic and I-131.

(1) Specific sample locations for all media are specified in the Off-Site Dose Calculation Manual and reported in the Annual Radiological Environmental Operating Report.
(2) See Table 2.4 for maximum values for the lower limits of detection.
(3) Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, to seasonal unavailability or to malfunction of sampling equipment. If the latter occurs, every effort shall be made to complete corrective action prior to the end of the next sampling period.
(4) Gamma isotopic analysis means the identification and quantification of gamma-emmitting radionuclides that may be attributable to effluents from the plant.

*Food products (4.c) may be substituted for milk samples.

.4R

footnote #s are missing

should be (c) only to refer to the above

Letters missing for column title and isotopic letters. I assume this was inadvertent and probably a copying error.

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TABLE 2.4

Detection Capabilities for Environmental Sample Analysis(a)(b)(d)
Lower Limits of Detection

alysis(e)	Water (pCi/l)	Airborne Particulate or Gas (pCi/m^3)	Fish and Invertebrates (pCi/kg/wet)	Milk pCi/l	Sediment (pCi/kg/dry)	Food Products (pCi/kg/wet)
Gross Beta	4	.01				
3	2000*					
-54	15		130			
-59	30		260			
-58, Co-60	15		130			
-65	30		260			
-Nb-95	15[c]					
131	1**	.07		1		60
-134	15	.05	130	15	150	60
-137	18	.06	150	18	180	80
-La-140	15[c,f]			15[c,f]		

* If no drinking water pathway exists, a value of 3,000 pCi/l may be used.
** If no drinking water exists, a value of 15 pCi/l may be used.

asterisks missing

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TABLE 2.4 (Continued)

Table Notation

a. The LLD is the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability and that only a 5% probability exists of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66 * S_b}{E * V * 2.2 * Y * Exp(-\lambda * \Delta t)}$$

Correct # is 2.22

where:

LLD is the "a priori" lower limit of detection as defined above (as picocuries per unit mass or volume).

4.66 is a constant derived from the K_{alpha} and K_{beta} values for the 95% confidence level.

S_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute).

E is the counting efficiency (as counts per disintegration).

V is the sample size (in units of mass or volume).

2.22 is the number of disintegration per minute per picocuries.

Y is the fractional radiochemical yield (when applicable).

λ is the radioactive decay constant for the particular radionuclide.

Δt is the elapsed time between sample collection and analysis.

Correct # is 2.5 as Section 2.7 does not exist.

Typical values of E, V, Y, and Δt can be used in the calculation.

This equation results in an LLD in terms of picocuries. For the purposes of Section 2.7, where the required LLD is set forth in microcuries, the terms 2.22 in the denominator should be replaced by 2.22E6, which is the number of disintegrations per minute per microcurie.

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TABLE 2.4 (Continued)

Table Notation

In calculating the LLD for a radionuclide determined by gamma-ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples (e.g., Potassium-40 in milk samples).

The analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally, background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unavailable. In such cases, the contributing factors will be identified and described in the Annual Radiological Environmental Operating Report.

b. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. This does not preclude the calculation of an a posteriori LLD for a particular measurement based upon the actual parameters for the sample in question and appropriate decay correction parameters, such as decay while sampling and during analysis.

c. Parent only.

typo word should be uncertainty

d. If the measured concentration minus the three standard deviation uncertainties is found to exceed the specified LLD, the sample does not have to be analyzed to meet the specified LLD.

e. This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the listed nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Specification 5.9.1.5.

f. The Ba-140 LLD and concentration can be determined by the analysis of its short-lived daughter product, La-140, subsequent to an eight-day period following collection. The calculation shall be predicated on the normal ingrowth equations for a parent-daughter situation and the assumption that any unsupported La-140 in the sample would have decayed to an insignificant amount (at least 3.6% of its original value). The ingrowth equations will assume that the supported La-140 activity at the time of collection is zero.

Implies a footnote but none listed; Is it trying to refer back to table 3-4 footnote "d"?

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TABLE 2.5

Reporting Levels for Radioactivity Concentrations in Environmental Samples

Analysis(d)	Water (pCi/l)	Airborne Particulate or Gas (pCi/m^3)	Fish and Invertebrates (pCi/kg/wet)	Milk (pCi/l)	Food Products (pCi/l)
H-3	20,000*				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400**				
I-131	2***	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200**			300	

* For drinking water samples, if no drinking water pathway exists, a value of 30,000 pCi/l may be used.

** Parent only.

*** If no drinking water exists, a value of 20 pCi/l may be used.

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TABLE 2.6

Radioactive Liquid Waste Sampling and Analysis Program

Correct footnote is the letter "e"

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (uCi/ml)[a]
A. Batch Waste Release Tanks[d]	PR Each Batch	PR Each Batch	Principal Gamma Emitters[f]	5×10^{-7}
			I-131	1×10^{-6}
	PR One Batch/M	M	Dissolved and Entrained Gases (Gamma Emitters)	1×10^{-5}
	PR Each Batch	M[b] Composite	H-3	1×10^{-5}
			Gross Alpha	1×10^{-7}
	PR Each Batch	Q Composite[b]	Sr-89, Sr-90 Fe-55[h]	5×10^{-8} 1×10^{-6}
B. Plant Continuous Releases[c]	D[c] Grab Sample*	W Composite[b]	Principal Gamma Emitters[f]	5×10^{-7}
* Turbine Building Sump	W[g] Grab Sample**		I-131	1×10^{-6}
** Steam Generator Blowdown Only	M Grab Sample	M	Dissolved and Entrained Gases	1×10^{-5}
	W[g] Grab Sample**	M Composite[b]	H-3 Gross Alpha	1×10^{-5} 1×10^{-7}
	W[g] Grab Sample**	Q Composite[b]	Sr-89, Sr-90	5×10^{-8}

Incorrect term
Should be Gaseous
Indicate the current Tech Specs
show the same word but this
is typo that should have been
corrected earlier.

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TABLE 2.7

Radioactive Gaseous Waste Sampling and Analysis Program

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (uCi/ml)[a]
A. Waste Gas Storage Tank	PR Each Tank Grab Sample	PR Each Tank	Principal Gamma Emitters[e]	1×10^{-4}
B. Containment Purge	PR Each Purge[b] Grab Sample	PR Each Purge[b]	Principal Gaseous Gamma Emitters[e]	1×10^{-4}
			H-3	1×10^{-6}
C. Plant Vent Stack	M[b] Grab	M[b]	Principal Gamma Emitters[e]	1×10^{-4}
	Continuous[d]	W[c] Charcoal Sample	I-131	1×10^{-12}
	Continuous[d]	W[c] Particulate Sample	Principal Gamma Emitters[e] (I-131, Others)	1×10^{-11}
	Continuous[d]	M Composite Particulate Sample	Gross Alpha	1×10^{-11}
	Continuous[d]	Q Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11}
	Continuous[d]	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	1×10^{-6}

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TABLE 3.1

Maine Yankee Dose Factors for Liquid Releases

Nuclide	Total Body Dose Factor mrem/Ci DFL_{it}	Critical Organ Dose Factor mrem/Ci DFL_{ico}
H-3	2.96E-07	2.96E-07
Na-24	2.46E-05	2.83E-05
Cr-51	1.54E-05	1.45E-03
Mn-54	4.27 ~~[illegible]~~E-03	2.55E-02
Mn-56	1.89E-06	4.09E-05
Fe-55	1.24E-02	7.53E-02
Fe-59	8.58E-02	6.54E-01
Co-58	2.22 ~~2.21~~E-03	1.35E-02
Co-60	4.79E-02	7.80E-02
Zn-65	2.68E-01	5.39 ~~5.38~~E-01
Sr-89	2.13E-04	7.45E-03
Sr-90	3.16E-02	1.29E-01
Zr-95	5.15 ~~5.03~~E-04	1.74 ~~1.73~~E-02
Mo-99	2.95E-05	2.63 ~~2.62~~E-04
Tc-99m	3.79E-05 ~~4.06E-07~~	6.22E-5 ~~1.98E-06~~
Sb-124	1.34E-03	9.36E-03
I-131	2.07E-04	9.86E-02
I-132	2.53 ~~2.54~~E-06	3.24 ~~3.29~~E-06
I-133	2.46E-05	1.13E-02
I-135	7.26 ~~7.12~~E-06	4.31 ~~4.17~~E-04
Cs-134	2.79E-02	3.12E-02
Cs-137	2.92E-02	3.41E-02
Ba-140	1.54E-04	3.41~~E-03~~ E-02
Ce-141	2.81E-05	9.13E-03
W-187	6.28E-06	1.32E-03
Ag-110m	7.92E-03	6.26E-01
Sb-125	4.81E-03	6.81E-03
Other	1.51E-01	3.40E+00

Correct #s

exponents are correct

exponents are correct

number is correct

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OFF-SITE DOSE CALCULATION MANUAL

4.0 GASEOUS EFFLUENT DOSE CALCULATIONS

4.1 Gaseous Effluent Dose Rate

Section 2.2.3.1 limits the dose rate (when averaged over 1 hour) due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary:

a. for noble gases: less than or equal to 500 mrem/yr to the total body, and less than or equal to 3000 mrem/yr to the skin, and;

b. for Iodine-131, Iodine-133, tritium, and radioactive materials in particulate form with half-lives greater than 8 days; less than or equal to 1500 mrem/yr to any organ.

4.1.1.a Dose Rate to the Total Body From Noble Gases (Method I)

The total body dose rate in mrem/yr from noble gases released via the plant stack is.

$$\dot{D}_{tb} = 1.40 \sum \dot{Q}_i \ DFB_i \qquad (4-1)$$

where:

$\dot{Q}_i$ is the release rate of noble gas i released via the plant stack, in uCi/sec; and

$\dot{DFB}_i$ is the total body dose rate factor for noble gas i, in mrem/m^3/pCi/yr (see Table 4.1).

Incorrect units
Correct units = mrem-m^3/pCi-yr

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4.1.2.a Dose Rate to the Skin From Noble Gases (Method I)

The skin dose rate in mrem/yr from noble gases released via the plant stack is:

$$\dot{D}_{skin} = \sum_i \dot{Q}_i DF'_i \qquad (4-2)$$

where:

$\dot{Q}_i$ is the release rate of noble gas i released via the plant stack, in uCi/sec; and

DF'_i is ~~the combined~~ skin dose rate factor for noble gas i, in mrem/sec/ Ci/yr (see Table 4.1). incorrect units. Correct units mrem-sec/uCi-yr

4.1.2.b Dose Rate to the Skin From Noble Gases (Method II)

Method II consists of the model and input data (skin dose factors) in Regulatory Guide 1.109, Revision 1 (Reference 1), except where site-specific data or assumptions have been identified in this ODCM. The general equation (B-9) taken from Regulatory Guide 1.109, and used in the derivation of the simplified Method I approach as described in the Bases Section A.3, is also applied to a Method II assessment. No credit for a shielding factor (S_F) associated with residential structures is assumed. Concurrent meteorology with the release period may be utilized for the gamma atmospheric dispersion factor and undepleted atmospheric dispersion factor identified in ODCM Appendix B for the release point from which recorded effluents have been discharged. In sectors where the site boundary is adjacent to Back River, the Skin Dose Rate will be evaluated on the nearest opposite shoreline where the potential exist for uncontrolled occupancy. On-site areas or areas with limited and controlled occupancy will be evaluated with those occupancy factors included. The most restrictive location in any of the 16 sectors will be used in determining the dose rate.

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4.1.3.a Dose Rate to the Critical Organ From Radioiodines and Particulates (Method I)

The dose rate to the critical organ in mrem/yr from Iodine-131, Iodine-133, tritium, and radioactive materials in particulate form with half-lives greater than 8 days released via the plant stack is:

$$\dot{D}_{co} = \sum_{i} \dot{Q}_i \, DFG'_{ico} \quad (4\text{-}3)$$

Incorrect units
Correct units
= mrem-sec/uCi-yr

where:

$\dot{Q}_i$ is the release rate of radionuclide i released via the plant stack, in uCi/sec; and

DFG'_{ico} is the site specific critical organ dose rate factor for radionuclide i, in mrem/sec/uCi/yr (see Table 4-1). 4.2 correct #

4.1.3.b Dose Rate to the Critical Organ From Radioiodines and Particulates (Method II)

Method II consists of the models, input data and assumptions in Appendix C of Regulatory Guide 1.109, Revision 1 (Reference 1), except where site-specific data or assumptions have been identified in this ODCM (see Tables A-2 and A-3). The critical organ dose rate will be determined based on the location (site boundary, nearest resident, or farm) of receptor pathways as identified in the most recent annual land use census, or by conservatively assuming the existence of all possible pathways (such as ground plane inhalation, ingestion of stored and leafy vegetables, milk, and meat) at an off-site location of maximum potential dose. Concurrent meteorology with the release period may be utilized for determination of atmospheric dispersion factors in accordance with Appendix B for the release point from which recorded effluents have been discharged. The maximum critical organ dose rates will consider the four age groups independently, and take no credit for a shielding factor (S_F) associated with residential structures. Site boundary locations adjacent to the river will be evaluated on the nearest opposite shoreline. Mud flats exposed at low tide will include an occupancy factor of 0.037 for evaluation of doses at those locations.

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4.2 Gaseous Effluent Dose From Noble Gases

Section 2.2.4.1 limits the air dose due to noble gases released in gaseous effluents to areas at and beyond the site boundary to the following:

a. During any calendar quarter: less than or equal to 5 mrad for gamma radiation, and less than or equal to 10 mrad for beta radiation; and

b. During any calendar year: less than or equal to 10 mrad for gamma radiation, and less than or equal to 20 mrad for beta radiation.

4.2.1.a Gamma Air Dose (Method I)

The gamma air dose in mrad from noble gases released via the plant stack is:

$$D_{air}^{\gamma} = 0.044 \sum_i Q_i \; DF_i^{\gamma} \qquad (4\text{-}4)$$

where:

Q_i is the total activity of noble gas i released via the plant stack during the period of interest, in Ci; and

DF_i^{γ} is the gamma dose factor to air for noble gas i, in mrad/m^3/pCi/yr (see Table 4.1). Incorrect units. Correct units mrad-m^3/pCi-yr

4.2.1.b Gamma Air Dose (Method II)

Method II consists of the models, input data (dose factors) and assumptions in Regulatory Guide 1.109, Revision 1 (Reference 1), except where site-specific data or assumptions have been identified in this ODCM. The general equations (B-4 and B-5) taken from Regulatory Guide 1.109, and used in the derivation of the simplified Method I approach as described in the Bases Section A.5 are also applied to Method II assessments. Concurrent meteorology with the release period may be utilized for the gamma atmospheric dispersion factors (see Appendix B) for the release point from which recorded effluents have been discharged. For sectors adjacent to the Back River the nearest opposite shoreline with an assumed potential occupancy factor of 100% will be used to evaluate doses. On-site areas with limited and controlled occupancy will be evaluated with those occupancy factors included.

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4.2.2.a Beta Air Dose (Method I)

The beta air dose in mrad from noble gases released via the plant stack is:

$$D^{\beta}_{air} = 0.03 \sum_i Q_i \ DF^{\beta}_i \qquad (4\text{-}5)$$

where:

Q_i is the total activity of noble gas i released via the plant stack during the period of interest, in Ci; and

DF^{β}_i is the beta ~~dose~~ factor to air for noble gas i, in ~~mrad/m²/pCi/yr~~ (see Table ~~4.2~~). correct #4.1 mrad-m³/pCi-yr Correct Units

4.2.2.b Beta Air Dose (Method II)

Method II consists of the models, input data (dose factors) and assumptions in Regulatory Guide 1.109, Revision 1 (Reference 1), except where site-specific data or assumptions have been identified in the ODCM. The general equations (B-4 and B-5) taken from Regulatory Guide 1.109, and used in the derivation of the simplified Method I approach as described in the Bases Section A.6, are also applied to Method II assessments. Concurrent meteorology with the release period may be utilized for the atmospheric dispersion factors (see Appendix B) for the release point from which recorded effluents have been discharged. For sectors adjacent to the Back River, the nearest opposite shoreline with an assumed potential occupancy factor of 100% will be used to evaluate doses. On-site areas or areas with limited and controlled occupancy will be evaluated with those occupancy factors included.

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TABLE 5.1 (Continued)

Radiological Environmental Monitoring Stations[a]

Exposure Pathway and/or Sample		Sample Location and Designated Code[b]	Distance From the Plant (km)	Direction From the Plant
4.	INGESTION			
	a. Milk	TM-16 Baker Farm	7.2	W
		TM-17 Leeman Farm	7.9	SW
		TM-25 Hanson Farm	16.0	W
	b. Fish and Invertebrates[d]	FH/MU/CA/HA-11 Long Ledge Area	1.1	S
		MU/CA/HA/24 Sheepscot River	11.2	S
	c. Food Crop Vegetation	TV-1X Indicator (to be determined)	-	-
		TV-1X Indicator (to be determined)	-	-
		TV-2X to be determined	-	-

Footnotes:

a Sample locations are shown on Figures 5.1 to 5.6.
b Station-1X's are indicator stations and Station 2-X's are control stations.
c A dilution factor of 10 shall be applied to any radioactivity detected in a sample at this station.
d The station code letters will vary with the sample media collected. The sampling of all four media types is not required during each sampling period.
e Food crop sampling is not required while milk sampling is being done.

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There should be a line in the margin to indicate that the figure #'s went from 4.1 to 4.6 to 5.1 to 5.6.

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6.1.2 Monitor Response for Liquid Effluents

The response of each liquid effluent monitor is established by combining the appropriate concentration, flow rate, dilution, principal gamma emitter, geometry, and detector efficiency.

The radiation monitor alarm/trip setpoint for a test tank release is set such that the sum of the MPC ratios of the diluted nuclides is less than or equal to 0.6 at the discharge to the Back River. The setpoints is determined in the following manner:

typo should be -60

1. The CPM of each undiluted nuclide is determined from the response graphs. If a nuclide other than Co-58, Co-600, I-131, I-133, Cs-134, and Cs-137 or unidentified nuclides contributes more than 10% of the total activity use, the conservative I-131 response curve to determine the CPM. (Unidentified nuclide activity is determined by subtracting identified activity from gross gamma activity.)

2. Set the alarm setpoint at background plus the calculated CMP from Step 1.

typo should be CPM

3. If the discharge MPC ratio is calculated to be less than 0.6, you can increase the alarm setpoint CMP by a factor of 0.6/actual ratio.

4. The MPC ratio for a test tank discharge may be increased to less than 1 if it is determined that no other radioactivity is being released to the Back River.

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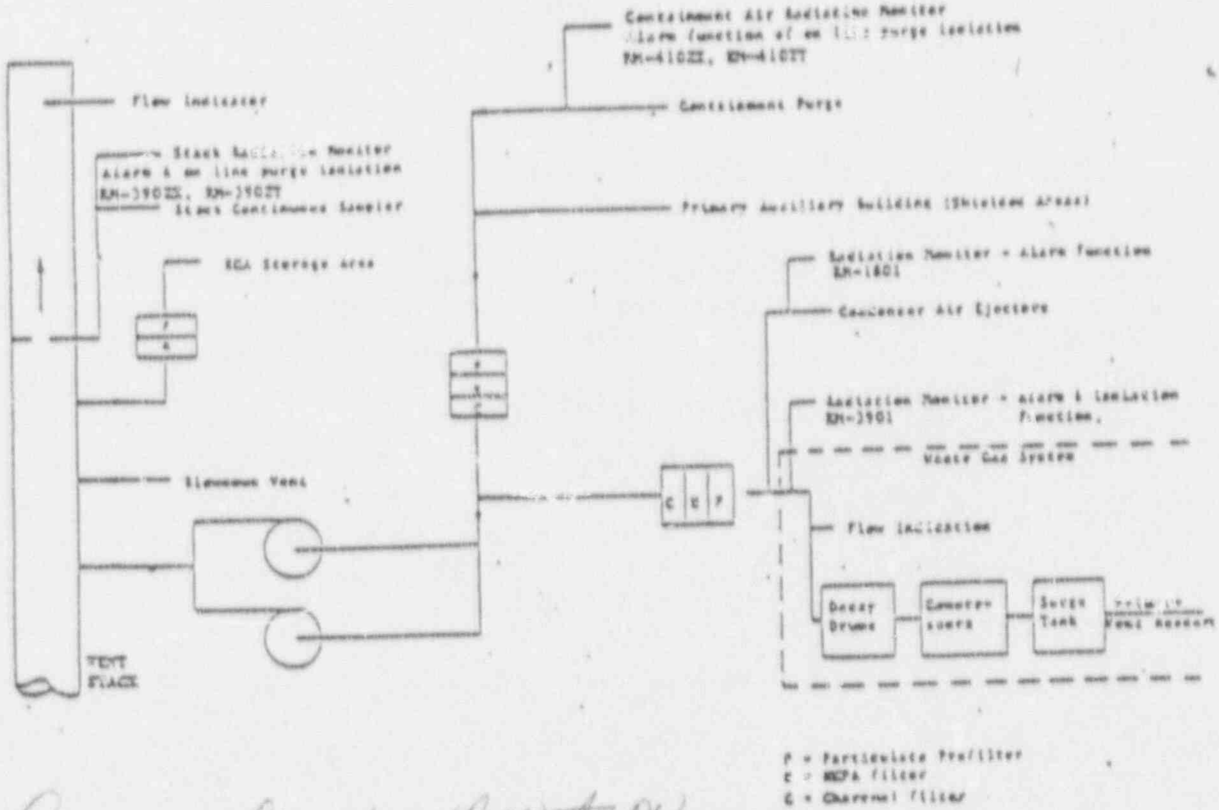
FIGURE 6.2

Maine Yankee

Gaseous Radwaste System



Comment here is that text on this diagram should be as legible as that of figure 6.1 on the previous page!

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7.0 METEOROLOGY

The atmospheric dilution factors in the dose calculation methods assume an individual whose behavior leads to a dose higher than expected for anyone else. Since long term (5-year) average meteorology is expected to be representative of the area, the location of the critical receptor can be predicted by scanning all the reasonable off-site locations to find the location with the most limiting dilution factors. Important off-site locations are: site boundaries and nearest residences in each of the sixteen meteorological sectors, as well as all milk farm locations within five miles of the plant.

Exposure pathways assumed to exist at site boundary locations are direct exposure from radioactive materials in the air, direct exposure from radioactive materials deposited on the ground, and exposure from inhalation of radioactive materials. In addition to the pathways present at site boundary locations, exposure pathways present at each residence are assumed to include ingestion of radionuclides in home grown vegetables. Farm locations include all exposure pathways found at residences plus ingestion of radionuclides in meat and milk.

Meteorological data for the year 1981 through 1985 were analyzed for the values of the maximum average dilution factors at the important receptor locations described above. Yankee Atomic Electric Company's (YAEC) AEOLUS computer code (Reference 2) calculated all atmospheric dilution factors. Appendix B briefly describes the YAEC AEOLUS computer code model. Table 7.1 lists the maximum average dilution factors for all important receptor locations for releases via the plant stack.

Each dose and dose rate calculation method incorporates the maximum applicable off-site average dilution factors listed in Table 7.1. The maximum potential dose to a member of the public due to plant stack releases in any year will be conservatively estimated by the dose calculated for a full-time resident living on a hypothetical milk farm 670 to 700 meters from the plant in the southeast sector.

Although I realize met data does not change significantly over time, should Maine Yankee not use more current data such as the years 1986 through 1990?

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APPENDIX A

Basis for the Dose Calculation Methods

A.1 Liquid Effluent Doses

Method I is used to demonstrate compliance with Section 2.1.4 which limits the dose commitment to a member of the public from radioactive materials in liquid effluents.

Liquid pathways contributing to individual doses at the Maine Yankee Nuclear Power Station are: ingestion of fish and shellfish, and direct exposure from shoreline deposits. The potable water pathway and the irrigated foods pathway are not considered since the receiving water is not suitable for either drinking or irrigation. Method I is derived from Equations A-3 and A-7 of Regulatory Guide 1.109 (Reference 1). Equation A-3 calculates radiation doses from aquatic foods. Equation A-7 from shoreline deposits.

Correct table # is 3.1

The use of the methodology of Equations A-3 and A-7 for a 1 curie release of each radionuclide in liquid effluents yielded the dose impact to the critical organ. Table X.1 lists the resulting site specific total body and critical organ dose conversion factors giving the number of millirem per curie released for each radionuclide. Since the dose factors of Table 3.1 represent a variety of critical organs, Method I conservatively calculates a critical organ dose consisting of the maximum critical organ for each radionuclide of any of the four age groups, and combines them into a composite individual independent of age.

Except for the site specific values noted below, the parameter values recommended in Regulatory Guide 1.109 (Reference 1) were used to derive the liquid dose factors for Method I. Table A-1 lists the usage factors for liquid pathways utilized in the dose analysis.

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APPENDIX A

DFS_i is the beta skin dose factor for a semi-infinite cloud of radionuclide i, which includes the attenuation by the outer "dead" layer of the skin, in mrem-m^3/pCi-yr (taken from Reference 1, Table B-1).

The maximum effective five year average gamma dilution factor $[X/Q]^{\gamma}$, is 1.40E-06 sec/m^3 (see Table 7.1), and the maximum five year average undepleted dilution factor, X/Q, is 9.46E-07 sec/m^3 (see Table 7.1). Incorporating these constants into Equation A-3 and converting from annual release Q (Ci/yr) to maximum instantaneous release rate $\dot{Q}$ (uCi/sec) and multiplying by the conversion factor 31.54

Ci-sec/uCi-yr yields:

$$\dot{D}_{skin} = 1.56 \sum_i \dot{Q}_i DF_i^{\gamma} + 0.946 \sum_i \dot{Q}_i DFS_i \qquad (A-4)$$

$$= \sum_i Q_i [1.56 DF_i^{\gamma} + 0.946 DFS_i].$$

A combined skin dose factor, DF_i^{γ}, may be defined:

$$DF_i^{\gamma} = 1.56 DF_i^{\gamma} + 0.946 DFS_i.$$

Incorporating the combined skin dose factor, DF_i', into Equation A-4 yields the method to calculate skin dose rate from noble gases:

$$\dot{D}_{skin} = \sum_i \dot{Q}_i DF_i^{\gamma}$$

Superscript in both places is inappropriate and not consistent with current procedure or even previous procedure. Should use a different superscript such as an apostrophe ' like symbol. For example DF_i'. This is what is used in the current (as well as the old) procedure.

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MAINE YANKEE ATOMIC POWER COMPANY
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APPENDIX A

A.4 Critical Organ Dose Rate From Iodines and Particulates

Method I is used to demonstrate compliance with Section 2.2.5, which limits the dose rate from Iodine-131, Iodine-133, tritium, and radioactive materials in particulate form with half-lives greater than 8 days.

The method to calculate the critical organ dose rate from radioactive iodines and particulates is derived from ODCM Equation 4-6 which limits the dose to the critical organ from radioactive iodines and particulates.

$$D_{co} = \sum_i Q_i \, DFG_{ico} \qquad \text{(A-5)}$$

where:

D_{co} is the dose to the critical organ from Iodine-131, Iodine-133, tritium, and radioactive materials in particulate form with half-lives greater than 8 days, in mrem;

Q_i is the total activity of radionuclide i released via the plant stack during the period of interest, in Ci; and

DFG_{ico} is the site specific critical organ dose factor for radionuclide i for a gaseous release, in mrem/Ci (see Table 4.2).

Applying the conversion factor, 31.54 (Ci-sec/uCi-yr), to convert DFG_{ico} (mrem/Ci) to an organ dose rate factor DFG'_{ico} (mrem-sec/uCi-yr) for use for iodines and particles and changing the shielding factor (S_F) from 0.7 to 1.0 for exposure from a contaminated ground plan yields a new critical organ dose rate factor DFG^{x}_{ico} (see Table 4.2), and a dose rate equation in the same form as Equation A-5 above, where the activity release rate Q_i is in uCi/sec.

superscript of #1 inappropriate

(1) must use a superscript to denote change in factor → old college days could have a symbol X' where it was read as X prime.

$$\dot{D}_{co} = \sum_i \dot{Q}_i \, DFG_{ico} \qquad \text{(A-6)}$$

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MAINE YANKEE ATOMIC POWER COMPANY
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APPENDIX A

A.5 Gamma Air Dose

Method I is used to demonstrate compliance with Section 2.2.4, which limits the gamma air dose due to noble gases released in gaseous effluents via the plant stack to areas at and beyond the site boundary.

Method I is derived from the methods of Equations B-4 and B-5 in Regulatory Guide 1.109 (Reference 1) which gives:

$$D^{\gamma}_{finite,\ air} = 3.17E{+}04\ [X/Q]^{\gamma}_{i}\ \Sigma_i\ {}_iQ\ DF^{\gamma} \quad \text{(A-7)}$$

needs subscript i

where:

$D^{\gamma}_{finite,air}$ is the gamma air dose, in mrad due to a finite aloud release;

3.17E+04 is the number of pCi per Ci divided by the number of second per year;

$[X/Q]^{\gamma}$ is the effective long-term average gamma dilution factor in sec/m^3 (see Appendix B for use of effective gamma atmospheric dilution factors);

Q_i is the total activity of noble gas i released via the plant stack during the period of interest, in Ci; and

DF_i^{γ} is the gamma dose factor to air for noble gas i, in $mrad\text{-}m^3/pCi\text{-}yr$ (taken from Reference 1).

Incorporating the maximum effective long-term average gamma dilution factor of 1.40E-06 sec/m^3 (see Table 7.1) yields:

$$D_{air} = 0.044\ \Sigma_i\ Q_i\ DF_i^{\gamma} \quad \text{(4-4)}$$

all these terms require the superscript γ (gamma) to be consistent with current + past procedures as well as Reg. Guide 1.109.

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APPENDIX B

- depleted dilution factor for estimating ground level concentrations of elemental radioiodines and other particulates,

- effective gamma dilution factors for evaluating gamma dose rates from a sector-averaged finite cloud (multiple-energy undepleted source), and

- deposition factors for computing dry deposition of elemental radioiodines and other particulates.

Gamma dose rates are calculated throughout the ODCM using the finite cloud model presented in "Meteorology and Atomic Energy - 1968" (Reference 4, Section 7-5.2.5. That model is implemented through the definition of an effective gamma atmospheric dispersion factor, [X/Q] (Reference 2, Section 6), and the replacement of X/Q in infinite cloud dose equations by the [X/Q$^{\$}$].

Correct term in both cases is $[X/Q]^{\gamma}$ — gamma superscript necessary.

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MAINE YANKEE ATOMIC POWER COMPANY
OFF-SITE DOSE CALCULATION MANUAL

TABLE 4.1

Radiological Environmental Monitoring Stations[a]

Exposure Pathway and/or Sample	Sample Location and Designated Code[b]		Distance From the Plant (km)	Direction From the Plant
1. AIRBORNE (Radioiodine and Particulate)	AP/CF-11	Montsweag Brook	2.7	NW
	AP/CF-13	Bailey Farm (ESL)	0.6	NE
	AP/CF-14	Mason Steam Station	4.8	NNE
	AP/CF-16	Westport Firehouse	1.8	S
	AP-CF-29	Dresden Substation	19.8	N
2. DIRECT RADIATION				
	TL-1	Old Ferry Rd.	1.0	N
	TL-2	Old Ferry Rd.	0.8	NNE
	TL-3	Bailey House (ESL)	0.6	NE
	TL-4	Westport Island, Rt. 144	1.2	ENE
	TL-5	MY Information Center	0.2	E
	TL-6	Rt. 144 and Greenleaf Rd.	0.9	E
	TL-7	Westport Island, Rt. 144	0.8	ESE
	TL-8	MY Screenhouse	0.2	SE
	TL-9	Westport Island, Rt. 144	0.9	SE
	TL-10	Bailey Point	0.4	SSE
	TL-11	Mason Station	4.8	NNE
	TL-12	Westport Firehouse	1.8	S
	TL-13	Foxbird Island	0.4	SSW
	TL-14	Eaton Farm	0.8	SW
	TL-15	Eaton Farm	0.8	WSW
	TL-16	Eaton Farm	0.7	W
	TL-17	Eaton Farm Rd.	0.6	WNW
	TL-18	Eaton Farm Rd.	0.8	NW
	TL-19	Eaton Farm Rd.	1.0	NNW
	TL-20	Bradford Rd., Wiscasset	6.5	N
	TL-21	Federal St., Wiscasset	7.2	NNE

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Note change bar

actual change means page 82 of 122 of the RETS package would have to be changed from 0.9 to the 1.0 value above.

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TABLE 4.1 (Continued)

Radiological Environmental Monitoring Stations[a]

Exposure Pathway and/or Sample	Sample Location and Designated Code[b]	Distance From the Plant (km)	Direction From the Plant
4. INGESTION			
a. Milk	TM-16 Baker Farm	7.2	W
	TM-17 Leeman Farm	7.9	SW
	~~TM-25 Hanson Farm~~	~~16.0~~	W
	TM-98 Mitman Farm	5.8	S
b. Fish and Invertebrates[d]	FH/MU/CA/HA-11 Long Ledge Area	1.1	S
	MU/CA/HA/24 Sheepscot River	11.2	S
c. Food Crop Vegetation	TV-1X Indicator (to be determined)		
	TV-1X Indicator (to be determined)		
	TV-2X to be determined		

① No change bar

This information would have to be added on page 84 of 132, the RETS package.

Footnotes:

a Sample locations are shown on Figures 4.1 to 4.6.
b Station-1X's are indicator stations and Station 2-X's are control stations.
c A dilution factor of 10 shall be applied to any radioactivity detected in a sample at this station.
d The station code letters will vary with the sample media collected. The sampling of all four media types is not required during each sampling period.
e Food crop sampling is not required while milk sampling is being done.

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REFERENCES

1. Regulatory Guide 1.109, "Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I", U.S. Nuclear Regulatory Commission, Revision 1, October 1977.

2. Hamawi, J.N., "AEOLUS - A Computer Code for Determining Hourly and Long-Term Atmospheric Dispersion of Power-Plant Effluents and for Computing Statistical Distributions of Dose Intensity from Accidental Releases", Yankee Atomic Electric Company Technical Report, YAEC-1120, January, 1977.

3. Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light Water Cooled Reactors", U.S. Nuclear Regulatory Commission, March 1976.

4. Slade, D. H., "Meteorology and Atomic Energy - 1968," USAEC, July 1968.

5. "Supplemental Information for the Purposes of Evaluation of 10CFR50, Appendix I", Maine Yankee Atomic Power Company, including Amendments 1 and 2, October 1976.

[6. Technical Specification 4.13, "Radioactive Effluent Monitoring".

[7. Technical Specification 3.17, "Release of Gaseous Radioactive Waste".

[8. NUREG 0133, "Preparation of Radiological Effluent Technical Specifications for
[Nuclear Power Plants", US Nuclear Regulation Commission.

[9. 10CFR20.

[10. 10CFR50.

[11. 40CFR190.

Note change bars
Some of these references would probably have to be added to page 122 of 122 of the RETS package