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Document Control Desk
U.S. NUCLEAR REGULATORY COMMISSION
Mail Station P1-137
Washington, D.C. 20555

Gentlemen:

DOCKET NOS. 50-266 AND 50-301
OFFSITE DOSE CALCULATION MANUAL (ODCM)
TAC NOS. M71628 AND M61629
POINT BEACH NUCLEAR PLANT

Your letter of May 12 transmitted the results of your review of our ODCM. Your review concluded that our ODCM uses methods which are consistent with staff guidelines but requested our response to certain items identified in your report.

Attached is a set of our detailed responses to each item. For ease of referencing, we have numbered the bullets in the conclusion to your report in the original order presented. Our responses include commitments to modify certain aspects of the ODCM. Since none of these items are of sufficient importance to affect control of effluents during current operation, we plan to submit the next revision of the ODCM along with our next scheduled Semiannual Monitoring Report in early 1989.

Please contact us if you have any questions regarding our responses.

Very truly yours,

C. W. Fay
Vice President
Nuclear Power

Copies to NRC Resident Inspector, PBNP
NRC Regional Administrator, Region III

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ATTACHMENT
RESPONSES TO ODCM QUESTIONS
POINT BEACH NUCLEAR PLANT

(1) In Section 3.5, it is not clear how the mix of nuclides in the calibration source used to determine the calibration constant for the liquid effluent monitors is representative of the mix of nuclides in the actual release. It is this mix of radionuclides that are equated to an equivalent concentration of Co-60. If the calibration source is obtained via a well mixed grab sample of the radwaste intended for release, then it would be representative.

RESPONSE

The calibration of the liquid effluent monitors is done in accordance with the appropriate HP calibration procedure as stated in Section 3.5 of the ODCM. Because the HP calibration procedure addresses this item, it is not included in the ODCM. The procedure identifies the liquid radionuclide source to be used for calibrating the monitors. Currently, partially decayed primary coolant obtained from the refueling water storage tank is used. The isotopic composition of the liquid is determined by gamma isotopic analysis. Liquid effluents could result from either primary system sources or waste stream sources. We believe that either category is appropriate for the standard mix, although a primary system mix may exhibit somewhat less variation from time to time.

(2) In Section 3.0 of the ODCM, there is no provision or consideration of simultaneous releases from each of the four gaseous release points when determining the alarm trip setpoints for the noble gas monitors.

RESPONSE

Simultaneous elevated releases from each of the four gaseous release points at PBNP are not considered when determining alarm setpoints because no set of credible operating circumstances (other than accidents involving multiple failures) can be identified which would cause simultaneous elevated releases at all four release points.

In addition to the alarm setpoints, each release point monitor has an alert setpoint. The alert setpoint is set at approximately two times the steady-state reading for each monitor. The alert setpoint provides an early warning of changing plant radiological conditions, and PBNP procedures then require increased surveillance of the indicated system.

To further reduce the possibility of simultaneous elevated multiple releases, monitors utilized on the Auxiliary Building Exhaust Vent and Unit 1 and Unit 2 Purge Exhaust Vents have control functions associated with the release path to isolate or reduce releases. The Unit 1 and Unit 2 Purge Exhaust Vent monitors will cause containment ventilation isolation upon receipt of an alarm trip setpoint. Exceeding the Auxiliary Building Exhaust Vent monitor alarm setpoint will cause the gas release valve to shut and shifts the Auxiliary Building exhaust to be routed through charcoal filters in addition to the normal roughing and HEPA filters.

Other factors add to the conservatisms: containments are never purged at power; gas decay tank releases are procedurally limited to a small fraction of MPC by flow rate control; and, as a practical matter, a number of the alarm points are set well below MPC due to instrument design. Hence as a practical matter, it is not credible for all four release points to operate at levels which would be just under 4 MPC in total, and the issue need not be explicitly addressed in the ODCM.

(3) In Section 3.5, it is not clear how the mix of nuclides in the calibration source used to determine the calibration constant for the gaseous effluent monitors is representative of the mix of nuclides in the actual release. It is this mix of radionuclides that are equated to an equivalent concentration of Xe-133.

RESPONSE

As stated in Section 3.5 of the ODCM, the calibration of the gaseous effluent monitors is done in accordance with the appropriate HP calibration procedure. Because the HP calibration procedure addresses this item, it is not included in the ODCM. The procedure identifies a radioactive coolant gas obtained from the Letdown Gas Stripper System as the calibration source. Each sample of gas is isotopically quantified by gamma isotopic analysis of two subsamples. The gas sample obtained is considered representative of the nuclide mix at those gaseous monitors having a control function (isolation or termination of release).

(4) In$_3$Section$_3$3.7, a correction factor of 2.12×10^3 sec. ft^3/min. m^3 is omitted in the equation for the setpoint.

RESPONSE

The factor of 2.12E+03 sec-ft^3/min-m^3 has been used in the calculation of all gaseous effluent setpoints but was inadvertently omitted from the equation in the ODCM. It will be added in the next revision of the ODCM.

(5) In Section 4.3.B.1, it is not clear why the total body and not the thyroid is the limiting organ for the radioiodines.

RESPONSE

The description in Section 4.3.B.1 of the OCDM is an oversimplification which will be amplified in the next revision. Indeed the child thyroid is the critical organ for radioiodine in liquid effluents. However, the upward scaling of equivalent curies of radioiodine to obtain equivalent curie release limit for Point Beach was limited by the adult whole body dose:

$$\frac{\text{Appendix I whole body dose x 2 reactors}}{\text{calculated whole body dose}} = \frac{3 \times 2}{0.19} = 31.6$$

$$\frac{\text{Appendix I organ dose x 2 reactors}}{\text{calculated organ (thyroid) dose}} = \frac{10 \times 2}{0.20} = 100.0$$

The upward scaling for radioiodines was limited to the 31.6 scaling factor, tantamount to assuming that the entire calculated whole body dose was due to radioiodine. In reality, very little of the whole body dose is attributable to radioiodine. However, this conservative choice of methodology was purposely selected to leave headroom to accommodate contributions from other nuclides. Carefully choosing the limiting scaling factors in this manner assures that the RETS limits (or Appendix I dose objectives) will not be exceeded, even if all nuclide groups are at their respective equivalent curie release limits.

(6) In Section 4.3.B.2, it is not clear why the total body and not the liver is the limiting organ for tritium and other particulates, i.e., Cs-134 and Cs-137.

RESPONSE

It is true that the teen liver is the critical organ, in the sense of exhibiting a slightly higher dose for the given mix of nuclides. However, the 10 CFR 50 Appendix I design objective for liquid effluents is more restrictive for the whole body (3 mrem/yr/reactor) than for any organ (10 mrem/yr/reactor). The maximum equivalent release limits are established by scaling the FSAR calculated releases as follows:

(1) $$\frac{\text{Appendix I whole body dose x 2 reactors}}{\text{calculated whole body dose}} = \frac{2 \times 3 \text{ mrem}}{0.19 \text{ mrem}} = 31.6$$

(2) $$\frac{\text{Appendix I organ dose x 2 reactors}}{\text{calculated organ dose (liver)}} = \frac{2 \times 10 \text{ mrem}}{0.26 \text{ mrem}} = 76.9$$

Thus the adult whole body is more limiting. Put in another way, the calculated whole body dose is a larger fraction of the design objective for the whole body than is the calculated liver dose as a fraction of the design objective for the liver. In reality, the major contributors to liver dose are a different set of nuclides than the major contributors to whole body dose. However, the conservative choice of the more restrictive scaling factor assures that neither whole body nor liver dose limitations will be exceeded for any given mix of nuclides or nuclide groups.

The discussion in the ODCM will be amplified in the next revision.

(7) In Section 5.2, it is not clear how the individual curies releases for tritium, radioiodines, and others are combined to ensure the dose limit is not exceeded. In other words, if the curies released for tritium, radioiodines, and Co-60 were at the limits stated in Section 5.2, the dose limit would be exceeded by a factor of three.

RESPONSE

This question has been partially answered by our responses to the preceeding two questions. The applicable dose limit(s) will not be exceeded even if all groups (tritium, radioiodines, and others) in liquid effluents were at the stated maximums given in the ODCM and in RETS.

The key to understanding this approach lies in the choice of scaling factors, which are used to calculate the release limits. Recall that:

$$\text{Release limit (equivalent curies)} = \text{Scaling Factor} \times \text{FSAR Calculated Release (equivalent curies)}$$

$$\text{Scaling Factor} = \frac{\text{Applicable Appendix I Design Objective Dose}}{\text{Calculated Dose}}$$

For each nuclide group, scaling factors were reviewed for the obvious critical organs (adult whole body, teen liver, and child thryoid). Two conservatisms were applied:

1) The most retrictive scaling factor was chosen, as described in our response to the previous two questions;

2) The total calculated dose to the critical organ of interest was used in calculating the scaling factor, rather than just that portion of the calculated dose attributable to the radionuclide group of interest.

These conservatisms assure that the applicable dose limits will not be exceeded, even if each of the nuclide groups is at its specified equivalent curie release limit.

(8) In Section 6.4.C.2, the U_a is identified as 370 l/year instead of 730 l/year.

RESPONSE

Section 6.4.C.2 of the ODCM identifies the average adult with a consumption of 370 ℓ/year as to be used for calculating the H-3 dose. This constant will be changed to 730 ℓ/year for the maximally exposed adult. The equation in Section 6.4.C.2 will also be changed to reflect this modification. The Ua of 730 ℓ/year was correctly used in the FSAR dose calculations. Hence, no other changes are required as a result of this change to 6.4.C.2 of the ODCM.

(9) In Section 5.3, it is not clear how the individual curies released for tritium, noble gases, radioiodines, and particulates are combined to ensure the dose limit is not exceeded. In other words, if the curies released for tritium, noble gas, radioiodines, and Co-60 were at the limits stated in Section 5.3, the dose limit would be exceeded by a factor of four.

RESPONSE

If all four radionuclide groups were at their respective equivalent curie release limits for airborne materials, the 10 CFR 50 Appendix I dose objectives would not be exceeded. Our approach to calculating curie limits is similar, but not identical, to the methodology used for liquid effluents. The only difference between the airborne and gaseous methodologies is occasioned by the manner in which airborne effluent design objectives are established in Appendix I as discussed in the following.

In 10 CFR 50, Appendix I, Section II, paragraph B.1 establishes "air dose" limits; paragraph B.2. establishes limits for "external dose... to the whole body", and paragraph C establishes limits for "organ" doses from radioiodine and particulates. Since Appendix I provides external dose limits to the whole body independent of the internal contribution to whole body dose from radioiodine and particulates, the ODCM similarly establishes independent release limits for noble gases based on external dose.

The other radionuclide groups are viewed together in a manner similar to that used for liquid effluents to assure that Appendix I dose objectives are not exceeded:

(1) The scaling factor used for tritium is:

$$\frac{\text{Appendix I dose (organ) x 2 reactors}}{\text{FSAR dose (liver)}} = \frac{15 \times 2}{.63} = 48$$

This approach leaves adequate room for the contributions from radioiodines and particulates. At the tritium release limit specified in the ODCM, the dose to the whole body or to any other organ from tritium alone would only be 0.5 mrem per year, thereby demonstrating the conservatism of the approach.

(2) The scaling factor used for particulates is:

$$\frac{\text{Appendix I dose (organ) x 2 reactors}}{\text{FSAR DOSE (liver)}} \times \frac{15 \times 2}{.63} = 48$$

The FSAR dose used here includes the dose from radioiodine and tritium; thus adequate headroom is allowed for the organ (liver) dose contributions from radioiodine and tritium.

(3) The scaling factor used for radioiodine is:

$$\frac{\text{Appendix I Dose (organ) x reactors}}{\text{FSAR dose (infant thyroid)}} = \frac{15 \times 2}{15} = 2$$

Since the radioiodine scaling factor is less than for tritium and particulates, there is a theoretical potential for nonconservatism here.

However, the following observations can be made:

(1) In the limiting case of the infant thyroid, the contribution to thyroid dose from non-radioiodine particulates by either ingestion or inhalation pathways is negligible.

(2) If tritium were at its maximum release limit, it would contribute less than 2% of the thyroid Appendix I limit. This is less than the inaccuracy of overall dose estimation.

(3) The tritium release limit in the ODCM is on the order of an order of magnitude higher than the total plant inventory of tritium; hence the potential tritium contribution is negligible in reality.

(4) The FSAR infant thyroid dose assumes a goat-milk pathway; in fact no goats have been noted in the readily observable limiting south sector. This leaves a headroom of 6 mrem for thyroid dose contributions from tritium and particulates.

For these reasons, further refinement of the iodine release limits is not needed.

(10) According to Section 6.2.a, the Auxiliary Building Vent is the release point for the gas decay tanks and Table I.4-2 assigns the dispersion values for the Auxiliary Building Vent to Category IIB. This is in disagreement with Section 6.3.A which states that all releases shall be grouped into Categories IA or IIA.

RESPONSE

We assume the first sentence of your question contains a typographical error and should end with the words "to Category IB". The two-fold categorization recommended as a simplification in the ODCM was based on the observation that the χ/Q's for Category I fall within the same order of magnitude (i.e., $3 - 9 \times 10^{-7}$), while all the remaining categories fall within another order of magnitude (i.e., $2 - 7 \times 10^{-6}$). Further refinement is within the error of dose estimation. However, in the next revision of the ODCM, a sentence will be added to require the specific use of Category IB if the gas decay tanks are a major contributor to releases through the Auxiliary Building Vent.

(11) In Section 4.4.4 of the ODCM and in Technical Specification 15.7.5.H, it is not clear if the contribution to the total dose from the nearby Kewaunee plant is considered in a total dose calculation.

RESPONSE

Using the Point Beach annual average χ/Q data and assuming that all three reactors (Point Beach Unit 1, Point Beach Unit 2, and Kewaunee) were operating with identical source terms, the contribution from Kewaunee at the critical point (highest total dose) along the Point Beach site boundary would add only from 1% to 8% above the dose from the Point Beach units, depending on the release mode.

If Point Beach were operating at twice the Appendix I objectives and Kewaunee were operating at an effluent level similar to either of the Point Beach units, the small percentage contribution from Kewaunee would not be sufficient to exceed 40 CFR 190 limits. Since it is highly unlikely that both Point Beach and Kewaunee would operate at twice the Appendix I levels for an entire year and even more improbable that such levels would be simultaneously exceeded at both plants, we elected not to add a separate discussion to the OCDM.

The identified critical sector for combined doses is along the site boundary in the south sector. Although a point along the boundary in the north sector was identified as having the highest percentage contribution from Kewaunee, the total dose at this point is less than that from Point Beach alone in the critical south sector for the stated release conditions.

(12) In Table 5-1, the ratio term for Te-131m should be 1.49E-01 instead of 1.49E-02.

(13) A simplified diagram for the gaseous waste treatment system is supposed to be in Figure 2-2. However, Figure 2-2 is a repeat of the liquid radwaste treatment system which is shown in Figure 2-1 of the ODCM.

RESPONSE

The ratio term to Te-131m in Table 5-1 and the gaseous waste treatment system diagram of Figure 2-2 were corrected in the September 1987 revision to the ODCM. A copy of the correct figure is attached herewith.

(14) A simplified diagram showing the solid waste treatment is not contained in the ODCM.

RESPONSE

The portions of solid waste treatment activities which could contribute to the off-site doses in the area surrounding PBNP are included in OCDM Figure 2-1 and Figure 2-2.

Liquids generated during the processing of radioactive waste are returned to the PBNP liquid waste treatment system via the flow path labelled Units 1 & 2 Miscellaneous Waste on Figure 2-1 of the ODCM. Effluents from the liquid waste treatment system to the environs surrounding PBNP are included in the "10 CFR 50, Appendix I, Evaluation of Radioactive Releases from PBNP."

Radioactive waste preparation activities for shipment off-site are completed in the Drumming and Truck Access areas. Gases and particulates generated during these activities are processed and released via the Drumming Area Exhaust Vent as shown in Figure 2-2 of the ODCM. Gaseous and particulate releases to the enrivons surrounding PBNP from these processes are included in the 10 CFR 50, Appendix I evaluation.

The processed radioactive waste is shipped off-site for disposal at a licensed disposal facility. This portion of the solid waste treatment activities does not impact the ingestion and inhalation pathways in the area surrounding PBNP and are therefore not included in the PBNP ODCM.

We believe your question may have been occasioned, at least in part, by the absence of the correct Figure 2-2 in Revision 0 of the ODCM. We trust the above explanation together with the attached, corrected copy of Figure 2-2 resolves the issue.

(15) Table 15.7.7-1 of the Technical Specifications identifies 23 TLDs whereas Section 2.4.2 of the Environmental Manual states that TLDs will be posted at only 22 locations.

RESPONSE

One of the 23 TLDs is used as a transportation control; the remaining 22 TLDs are placed at the designated locations. This is consistent with the breakdown further specified in the table.

(16) Table 15.7.7-1 of the Technical Specifications identifies [illegible] TLDs to be located in the general area of the site boundary. In Figure 2-1 of the Environmental Manual, there appears to be only seven TLDs in the general area of the site boundary.

RESPONSE

Geographical considerations led to the exact locations of TLDs, including consideration of accessibility in winter months. As a result, locations #16 and #22 were placed somewhat further west of the boundary. The boundary in these areas is in a field; the actual TLD locations are along a road. In addition, a TLD (#12) is located along the lake at the eastern edge of the site. With about 20 years of data, it would not be prudent to change these locations, and additional sites would add little, if any, useful information. Historically, the locations have not changed since our RETS negotiations with the NRC staff, and the existing locations were understood to fall within the term "general area".

(17) Figure 2-1 in the Environmental Manual is illegible and must be replaced.

RESPONSE

This will be done in the next revision.

(18) Another figure must be included in the Environmental Manual providing more plant detail to show sample locations within the site boundary, the liquid and gaseous release points, and boundaries for the unrestricted areas.

RESPONSE

A figure will be added to the next revision of the PBNP Environmental Manual. This will be similar to Figure 15.7.2-1 of the Point Beach Technical Specifications, with additional sampling locations shown.

(19) The Environmental Manual describes the soil and shoreline sediment sampling program. However, these samples are not included in the technical specifications.

RESPONSE

In the course of developing RETS for Point Beach, both we and the NRC Staff agreed that neither soil nor shoreline sediment samples were required. However, we chose to continue these samples for historical continuity. There is no commitment or requirement to continue the samples, and thus no need to address them in the technical specifications.

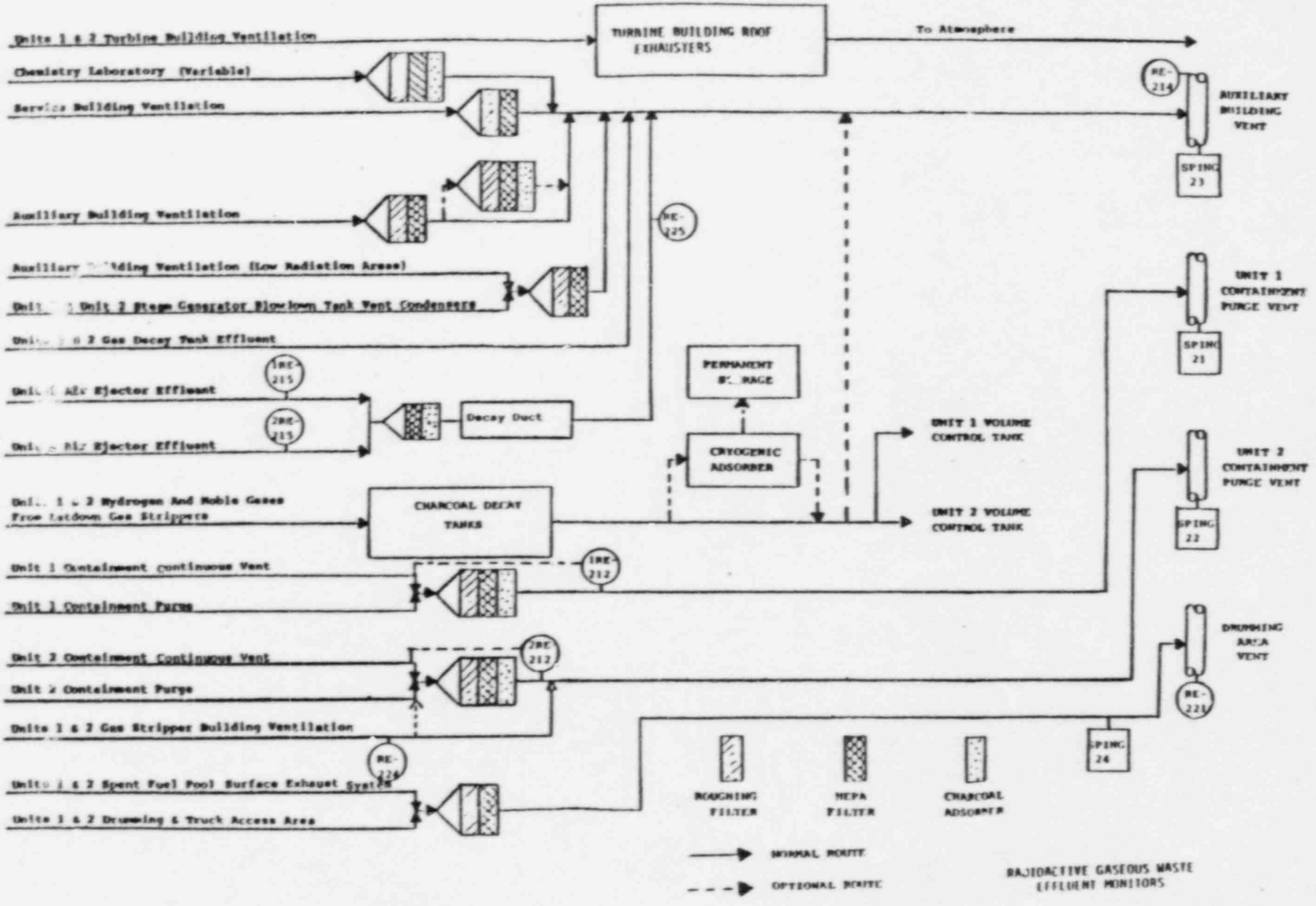
Units 1 & 2 Turbine Building Ventilation
Chemistry Laboratory (Variable)
Service Building Ventilation
TURBINE BUILDING ROOF EXHAUSTERS
To Atmosphere
RE-214
AUXILIARY BUILDING VENT
SPING 23
Auxiliary Building Ventilation
RE-225
Auxiliary Building Ventilation (Low Radiation Areas)
Unit 1 Unit 2 Steam Generator Blowdown Tank Vent Condensers
Units 1 & 2 Gas Decay Tank Effluent
RE-215
Unit 1 Air Ejector Effluent
2RE-215
Unit 2 Air Ejector Effluent
Decay Duct
PERMANENT STORAGE
CRYOGENIC ADSORBER
UNIT 1 VOLUME CONTROL TANK
UNIT 2 VOLUME CONTROL TANK
UNIT 1 CONTAINMENT PURGE VENT
SPING 21
UNIT 2 CONTAINMENT PURGE VENT
SPING 22
Units 1 & 2 Hydrogen And Noble Gases From Letdown Gas Strippers
CHARCOAL DECAY TANKS
Unit 1 Containment Continuous Vent
2RE-212
Unit 1 Containment Purge
Unit 2 Containment Continuous Vent
2RE-212
Unit 2 Containment Purge
DRUMMING AREA VENT
RE-221
Units 1 & 2 Gas Stripper Building Ventilation
RE-224
Units 1 & 2 Spent Fuel Pool Surface Exhaust System
Units 1 & 2 Drumming & Truck Access Area
SPING 24
ROUGHING FILTER
HEPA FILTER
CHARCOAL ADSORBER
NORMAL ROUTE
OPTIONAL ROUTE
RADIOACTIVE GASEOUS WASTE EFFLUENT MONITORS

Figure 2-2