UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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MEMORANDUM FOR: R. Vollmer, Assistant Director
for Site Analysis, DSE

D. Eisenhut, Assistant Director
for Operational Technology, DOR

FROM: I. C. Roberts, Assistant Director
for Site and Health Standards, SD

SUBJECT: REVIEW OF DRAFT APPENDIX I TECHNICAL SPECIFICATIONS

In response to your request dated June 28, 1977, members of my staff have reviewed the Draft Appendix I Technical Specifications and their comments on the format and content of these specifications are enclosed.

You also invited comments as to whether the radiological environmental monitoring technical specifications should be issued as a non-safety specification such as Appendix B or C (DSE recommendation) or as standard Appendix A Safety Specifications (DOR recommendation). Having considered the arguments for both positions, we favor the DSE recommendation. The primary reasons for this are that we do not consider the requirement for radiological environmental monitoring to be a "safety" specification as the term "safety" is used in the context of 10 CFR Part 50, and because the requirement for this type of monitoring is not directly related in the specifications to limits on the operation of the station; in other words, radiological environmental monitoring is "surveillance" which is not associated with any true "limiting" conditions for operation.

I wish to call your attention to item 7c in Fred Anderson's comments. It is important that this issue be addressed and resolved.

I. C. Roberts, Assistant Director
for Site and Health Standards

Enclosure: as stated

cc: R. DeYoung
W. Gammill
K. Goller
H. Thornburg
V. Moore
W. Burke
L. Barrett
F. Congel
L. Cohen
F. Anderson

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Comments on Draft Appendix I Technical Specifications

General comment on location of reporting requirements: Some reporting requirements ("Special Reports") are included under "Action" which is logical because to report is to take one type of action. However, the regular annual and semiannual reports are included under "Surveillance" and this is not logical because surveillance means "the act of observe or the condition of being observed". Suggest the all reporting requirements associated with each LCO be included under "Action".

p. 3/4 3-49 "Action 19": Change "sensitivity" to "limit of detection". ("sensitivity" is the slope of the calibration curve and should not be used to denote detection limit)

p. 3/4 11-2: Bases should be provided for the entries in this table, and particularly in the selection of the particular radionuclides listed.
Last Column: Change heading from "Detection Capabilities" to "Lower Limit of Detection"

p. 3/4 11-3, Para. a: Instead of referring to HASL 300, define the LLD explicitly as it is defined on p. 3/4 12-8 modified to yield concentration units of μCi/ml rather than pCi per unit mass or volume.

p. 3/4 11-3, Para. b, 1st sentence: Change "sensitivity limit" to "detection limit" (see comment for p. 3/4 3-49 abbve.

p. 3/4 11-8, Table 4.11-2: Fe-55 should be included in this table if its determination is required by Table 4.11-1.

p. 3/4 11-14, Table 4.11-5: Fe-55 should be included if it is included in Table 4.11-3. P-32 should be omitted if it is not included in Table 4.11-3.

p. 3/4 11-17, Table 4.11-3: Note that table numbers 4.11-x are not in the order of their appearance in the text; the order is 4.11-1,2,4,5,3.
Bases should be provided for the table entries, particularly the particular radionuclides included.
See comment above on Table 4.11-5 concerning the inconsistency between Tables 4.11-3 and 5 for the radionuclides listed.
Change the heading of the last column from "Detection Capabilities" to "Lower Limit of Detection"

p. 3/4 11-18: In paragraph "b", change "sensitivity limit" to "detection limit"

Section 3/4.12. General Comments on the Format of the Specifications on Radiological Environmental Monitoring

1. The format used is illogical, inconsistent with other specifications in this format, and will lead to confusion and conflict for the following reasons:

1) The "LCO" is actually only a requirement that a monitoring program be conducted. This monitoring requirement is unrelated in these specifications to the control of the station operations (unlike the "LCOs" in the effluent technical specifications and existing App. A Standard Technical Specifications)

2) The "LCO" and the "Surveillance Requirement" are actually both specifications of one and the same environmental monitoring requirement; the "Surveillance Requirement" given is simply a more detailed statement of the monitoring requirement than that given as the "LCO"

3) The treatment of a monitoring requirement as an LCO is inconsistent with the definition of LCO in 10 CFR Part 50: "Limiting Conditions for Operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility" (emphasis added). Neither is it consistent with the definition that has been proposed for addition to 10 CFR Part 51: "Limiting conditions for Operations are controls imposed on plant discharges, operations and other parameters which, if not exceeded, should result in acceptable environmental impacts" (emphasis added).

4) The LCO format for radiological monitoring requirements (whether in "Appendix A" or "Appendix B") is inconsistent with the format for non-radiological monitoring requirements. The same format should be used for all monitoring requirements that are not related in the tech. specs. to the control of the facility, whether these monitoring requirements are radiological or non-radiological.

We suggest that the format for monitoring requirements should include the following major elements: 1) Specification of the monitoring requirement(s), 2) Action and 3) Bases. In this format, "Applicability" would be included within the specification of the monitoring requirement (although it seems necessary to specify applicability only when it is not "all modes") and "reports" would be included under "action". However, "applicability" and "reports" could be separate subsections if there is sufficient justification.

p. 3/4 12-1, Action c.: This specification should allow for the fact that it may be impossible to find locations for replacement samples. Suggest adding "...or states that such locations cannot be found" to the end of the first sentence and add "...or the fact that such locations are unavailable has been reported" to the end of the second sentence.

pp. 3/4 12-(3-5), Table 3.12-1 - Number of Samples and Sample Locations
For "Direct Radiation," the original intent was to have ≥ 2 measurements of dose at each location. Using thermoluminescence dosimetry (TLD), this can be accomplished by having ≥ 2 thermoluminescence phosphors, or readout areas, in one dosimeter (See ANSI N545-1975, endorsed by R.G. 4.13 for the definitions of thermoluminescence phosphors and dosimeters). Thus, for "Direct Radiation", suggest changing " ≥ 2 dosimeters..." to "≥ 1 dosimeter containing ≥ 2 thermoluminescence phosphors or readout areas..." (Note: This comment applies also to the RAB Branch Technical Position).

pp. 3/4 12-(3-5), Table 3.12-1: Sampling and Collection Frequency:
Expression of the frequency as "once per 7 days", "once per 31 days", etc., instead of "weekly", "monthly" etc., increases the ambiguity of this specification because it is not at all clear which 7 days, or which 31 days etc. In other words, when do you start counting the specified time period? The intent of those

who originally wrote this specification was "at least once per calendar week", etc. It is desirable to write the specification so as not to allow sampling near the end of one calendar period and the beginning of the next; however, the "Appendix A" language does not eliminate this possibility. We suggest that the frequency be changed to "once per calendar week", once per calendar quarter," etc.

The footnote concerning composite samples (p. 3/4 12-4) is incorrect and is needlessl restrictive. (see footnote "i" to Table 2 of the RAB Branch Technical Postition). Suggest changing this footnote to - "Composite samples shall be collected by continuous sampling or by collecting aliquots at intervals of 1 hour or less".

For "Direct Radiation" the intent is to allow either monthly or quarterly dosimeter exposures. The specification as drafted requires both monthly and quarterly. Suggest adding the word "or" between the "31 day" and "92 day" specs.

pp. 3/4 12-(3-5), Table 3.12-1: Type and Frequency of Analysis
Some of the entries in this column appear to confuse the "type and frequency of analysis" with "sampling and collection frequency" so that it is unclear as to which samples are to be analyzed for what.

"Airborne": Substitute "Determine I-131 in each canister" for "Analyze at least once per 7 days for I-131". Substitute "... of samples collected during each calendar quarter". for "... sample at least once per 92 days".

Direct Radiation: See comment on "Sampling and collection frequency for this type of monitoring. Suggest adding the word "or" between the "31 day" and "92 day" specification.

Waterborne a. Surface: Delete "... sample at least once per 92 days", and add "... of samples collected during each calendar quarter".

Waterborne c. Drinking: Substitute "Determine I-131 in ..." for "Radiodine analysis of ..." (for greater clarity). Delete "... sample at least once per 92 days" and add "... of samples collected during each calendar quarter".

Milk and Food Products: Change "Radioiodine analysis" to "I-131 Analysis" for clarity.

p. 3/4 12-7, Table 4.12-1: The title is incorrect. These are not "minimum" LLD values; they are "maximum" LLD values; i.e., they are upper limits on the lower limits of detection. Change title to "Maximum Values for the Lower Limits of Detection (LLD) a"

Notation for parent-daughter pairs is ambiguous. It is not clear whether the corresponding table entries refer to the (a) the parent or the daughter, or (b) the parent plus the daughter. I believe it should be the parent or the daughter with the notation changed, for example, from "^{95}Zr-Nb" to "^{95}Zr or ^{95}Nb".

p. 3/4 12-9, Footnote c: Correct footnote by adding "... for atmospheric releases and 10 millirems/year for liquid releases..." between "...15 mrem/year..." and "... using the assumptions..."

p. 3/4 12-12, "Cross-Check Program": There are a number of problems with this specification as drafted.

(a) Participation in the EPA "Cross-Check" program, or similar program, is only one part of the total quality assurance program for radiological effluent and environmental monitoring that is described in the Regulatory Guide being developed on this subject. Therefore, we suggest substituting for this specification a more general specification that the licensee (and his contractor) have a quality assurance program containing the program elements presented in this regulatory guide (which is scheduled to be issued this calendar year).

(b) For the specification on the "cross-check program" only, the following comments apply.

The specification omits the important condition (given in the RAB Branch Position) that participation in the "cross-check" program shall include all of the determinations (sample medium - radionuclide combinations) that are offered by EPA and that also are included in Table 3.12-1.

Reference should not be made to the "control limits defined in EPA - 600/4-77-001, January 1977". The basis for these limits is, at best obscure, and the values are open to question. We have requested that EPA document the basis for these values, review them with NRC in the light of current capabilities, and revise them as appropriate and mutually agreeable. Until this has been accomplished, EPA's control limits should not be used as the basis for technical specification requirements.

p. B 3/4 12-1, Specification 3/4.12.1: Add the following to the end of the second sentence in the second paragraph: "... for atmospheric releases and 10 millirems/year for liquid releases.

p. B 3/4 12-2, Section 3/4.12.3: This statement is incorrect, because participation in the "cross-check" program does not "ensure that measurements... are performed with precision and accuracy".

Suggest revising to read: "Participation in the EPA cross-check program is required to provide some measure of the precision and accuracy of measurements of radioactive material in environmental sample matrices in order to help assure that the results of such measurements are reasonably valid".

p. 6-16a, "Annual Radiological Operating Report": Change title in heading and text to "Annual Radiological Environmental Operating Report", for clarity.

Section 6.9.1.6: Change due date of report from April 1 back to May 1 per prior agreement of cognizant staff in response to comments on R.G. 4.8. Change "unit" to "station". (There should be one report covering all units on the station, not separate reports for each unit).

Section 6.9.1.7: The dose calculations called for in the last paragraph should be included with the other dose calculations in the semi-annual radioactive effluent release report, not in this annual radiological environmental report because the dose calculations should be done using the effluent data.

p. 6-16a, footnote 5: This footnote should apply to the "semi-annual radioactive effluent release report" and not to the "annual radiological operating report") (See comment above concerning changing "unit" to "station" in section 6.9.1.6).

p. 6-16b, Table 6.9.1: Add the words "Format for..." to the beginning of the title.

Change footnote (a) to read, "Nominal Lower Limit of Detection (LLD) as defined in footnote (a) to Table 4.12.1".

p. 6-19b, Table 6.9-2: Need to clarify parent-daughter notation to show clearly whether the reporting levels given apply to the parent or the daughter, or the parent plus the daughter. For example, "Zr-Nb-95" should be "Zr-95 or Nb-95", or "Zr-95 + Nb-95", or the two nuclides should be listed separately with different reporting levels.

John Buchanan

John Buchanan
Environmental Standards Branch

Comments on Draft Appendix I

Technical Specifications (June 27, 1977)

This draft of Appendix I technical specifications represents a vast improvement in the organization and separation of subject matter. These changes, unfortunately, have raised additional questions regarding guidance to the user and bases for specific requirements which have been added. Specific comments as requested by the cover memorandum of June 28, 1977, are as follows:

1. A general question is raised regarding Tables 3.3-11 and 3.3-12. What will be the basis for the alarm/trip setpoint levels and how will these values be established by the licensee or NRC staff? Since a relationship is assumed to exist between the activity level set point and the flow rate set point, these set points should be jointly established in the tables with ranges provided. The need for liquid waste tank level set points as limiting conditions for operation is not understood but the total gross activity may be an important condition which is not indicated by volume in tanks. In most cases of monitoring for radioactivity releases, both a high and a low level alarm set point are needed for operator information. There is no indication that the "to be established" set points for the activity monitors, either liquid or gas, will be appropriate for a range of flow rates as related to needed accuracy for system responses. The relationship of samples flow rate to either the monitor set point or the main flow rate for the gaseous effluent is not provided. The need for these flow rate set points is not provided. Do the hydrogen and/or the oxygen monitors depend upon a knowledge of the flow rates or are these monitoring systems independent of the waste gas holdup system?

2. In Specification 3.11.1.1, the specification needs to reference the notes applicable to Table II and that these limits apply to releases in liquid effluents only. The referenced noble gas limit is appropriate for <u>any mixture of dissolved</u> noble gases.

3. In Specification 3.11.1.2, the levels stated are not limits and can not be so specified in contradiction to the regulations. These levels can only require the stated surveillance actions of Appendix I. The level given in b. does not exist in the regulation and should be deleted. We recommend the use of the wording from the proposed technical specification guidance given in Appendix I.

   "3.11.1.2 If the quantity of radioactive material actually released in liquid effluents to unrestricted areas during any calendar quarter is such that the resulting radiation exposure, calculated on the same basis as used in the final Environmental Statement, would exceed 1.5 mrems to the total

body or 5 mrems to any organ, the licensee shall:

a. Make an investigation to identify the cause for such release rates;

b. Define and initiate a program of corrective action; and

c. Provide a special report pursuant to Specification 6.9.2 describing these actions within 30 days from the end of the quarter during which the release occurred."

The Actions stated are not actions but regulations whereas b. is contradictory to the regulations. The action that should be stated is that the licensee shall take the corrective action described in the Special Report as soon as practical and reduce the radioactive material releases to as low as reasonably achievable. Action c. should remain.

4. In Specification 4.11.1.2.2, Specifications 6.9.1.8 and 6.9.1.9 should be referenced as to the location of the required report in the semi-annual report. Such cross-referencing should be done throughout the specifications wherever appropriate.

5. Specification 3.11.1.3 requires operation of the cleanup systems at 10 percent of annual design objectives on a daily basis. This requirement is to be based upon a calculation and not a known release/dose relationship. We consider this specification to be contradictory to both the intent and purpose of ALARA as given in Appendix I. We recommend that, if a daily dose level is to be used for system operation, the level be increased to the ALARA design objectives. We consider the daily dose analysis to be more than adequate to assure operation of the system on a reasonable cost/benefit relationship. The specification should state as indicated in Comment 3 for a rewrite of Specification 3.11.1.2 that the predicted exposure will be calculated on the same basis as used in the FES.

The proposed action does not result in any penalty except another report that will not be read and does not respond to any worthwhile need. If the specification is really an LCO, the releases should be stopped until the equipment is operable. If the releases at these levels are not that serious, a seven day or fourteen day period of grace should be permitted before releases need be stopped if the equipment is not fixed. We recommend that a seven day period be used in the Action section before releases need be restricted. Reporting of such events should be provided in the semi-annual report only - not another Special Report.

6. For Section 3/4.11.2, the subtitle should not be Dose Rate but Annual Dose.

7. Specification 3.11.2.1 requires many changes to comply with the regulations and to represent current knowledge in radiation protection. The gaseous effluent requirements relating to Part 20 limits should be written in the same format as used in Specification 3.11.1.1 for liquid effluents.

"3.11.2.1 The annual dose from radioactive material released in gaseous effluents from the site to unrestricted areas (see Figure 3.11-2) shall be limited by the following expressions:"

Figure 3.11-2 as was used for Figure 3.11-1 on liquid effluents should show the appropriate areas designated as unrestricted for purposes of radioactive effluents within Part 20 definitions for areas beyond site boundaries. Usually this area sill be represented by the fenced property line around the site.

The complexity of the equations for the gasous effluents is unwarranted by the purpose for their existence, i.e., to establish isolation of the off-gas system or to stop the release of radioactive material to the environs. The approach used for the equivalent LCO limits on liquid effluents should be used on the gaseous effluents. Other points which are related to technical matters are discussed below.

a. Use of semi-infinite cloud geometry with highly accurate dose conversion factors is inconsistent. We recommend the use of finite cloud geometry in the equations.

b. Separation of the gaseous effluents into isotopic families in some cases and into the form of the radioactive material in others for the limits is difficult to follow. We recommend the use of total radioactive material for determining dose to whole (total) body and the skin. The use of the noble gases and daughters as the major contributors is appropriate and should be the basis for the actual analysis.

c. The correct depth dose analysis should be performed. The use of 5 cm for depth of total body dose is not defendable.

NCRP Report No. 44 and ICRP Report No. 23 have provided additional information on standard man parameters and depth dose considerations that reflect on these comments. The

recommended NCRP skin depth for skin dose calculations is 0.05 mm (5 mg/cm^2) as compared to the subject documents value of 7 mg/cm^2. The recommended NCRP lenses of the eyes depth is 3 to 4 mm (300 to 400 mg/cm^2) which is a critical organ as compared to the subject documents value for total body depth of 5 cm (5000 mg/cm^2). The ICRP data indicates that most of the red bone marrow present in man is located in surface located bones such as chest, vertebrae, cranium and hips. The indicated depth for this critical organ would be about 3 mm (300 mg/cm^2) as compared to the total body depth of 5 cm used by the NRR staff which was assumed to apply to the bone depth. Obviously this assumption cannot be correct. The ICRP and NCRP indicate a testes depth of 2 to 3 mm (200 to 300 mg/cm^2) for genetic depth dose rather than the 1 cm (1000 mg/cm^2) depth value given in the subject documents. These ICRP and NCRP depth values indicate that a single depth dose analysis at a depth of 3 mm (300 mg/cm^2) would qualify to assess the genetic dose and the total body dose representing the critical organs of head, lenses of the eyes, red bone marrow and testes. The use of 5 or 7 mg/cm^2 depth for the skin depth dose analysis would appear to be academic. The conversion factors recommended for use in the equations have been derived using the stated depths for dose analysis. We recommend the use of 0.3 cm (300 mg/cm^2) for total body and 0.005 cm (5 mg/cm^2) for skin.

d. The thyroid dose limit should be analyzed on the basis of total radioiodine with the appropriate factors to assess the cow-milk-infant pathway unless this pathway is not the most critical.

e. From experience, the bone and lung dose limit should be analyzed on the basis of total radioactive particulate matter with the appropriate factors to assess the most critical pathway. These factors will not be the same as those used to determine infant thyroid dose through the cow-milk-infant pathway as implied by the proposed equations. The critical organ for particulate matter in the gaseous effluents will not be the same as implied by the proposed equations. We recommend that the Part equivalent release limits be separated into thyroid (radioiodine) dose levels and bone or lung (radioactive particulates) dose levels.

8. In Table 4.11-4, the columns for air dose factors should be deleted. As a matter of fact, unless these dose conversion factors are site related, the entire table should not be given in the technical specifications. This comment would apply to Table 4.11-5 as well.

9. In the ACTION Section of Specification 3.11.2.1, the requirement is for prompt notification in accordance with Specification 6.9.1.12. An instantaneous release rate of the magnitude associated with these limits does not warrant such action as proposed. A more appropriate reporting requirement would be Specification 6.9.1.13 as a 30 day report of an unplanned offsite release so that the consequences would be evaluated and reported. We recommend this change in reporting requirements as an action item. The same comment would be appropriate for Specification 3.11.1.1 on liquid effluents under action items.

10. The comments made regarding Specification 3.11.1.2 in Comment 3 above are appropriate for the requirements stated in Specification 3.11.2.2. The wording recommended for Specification 3.11.2.2. is the following:

"3.11.2.2 If the total quantity of radioactive material actually released in gaseous effluents to unrestricted areas during any calendar quarter is such that the resulting radiation exposure, calculated on the same basis as used in the Final Environmental Statement, would exceed 2.5 mrems to the total body or 7.5 mrems to the skin, the licensee shall:

a. Make an investigation to identify the causes for such release rates;

b. Define and initiate a program of corrective action; and

c. Provide a special report pursuant to Specification 6.9.2 describing these actions within 30 days from the end of the quarter during which the release occurred."

The use of the Appendix I air dose levels for gamma and beta radiation in these specifications would be appropriate if the use of Part 20 dose limits for Specification 3.11.2.1 would use air dose analysis. The use of both methods in the technical specification LCO requirements is not consistent or good practice. If the air dose levels are used to meet Appendix I requirements only the whole body dose limit from Part 20 without depth dose analysis should be used for the requirements in Specification 3.11.2.1, i.e., delete the skin dose release level requirement.

The Action section should be rewritten consistent with Comment 3. and the Appendix I dose levels finally selected as requirements. Specification 4.11.2.2.1 would not require revision if the above suggested changes to reflect air dose levels are made but would require major revision if total body and skin dose levels are to be reflected in the requirements. The attached Figures 3.11-2 and 3 need to be deleted from the technical specifications as inappropriate additions.

11. Comment 3. (Specification 3.11.1.2) and Comment 10 (Specification 3.11.2.2) are applicable to Specification 3.11.2.3. The wording recommended for Specification 3.11.2.3 is the following:

"3.11.2.3 If the total quantity of all radioactive iodines and radioactive material in particulate form actually released in gaseous effluents to unrestricted areas during any calendar quarter is such that the resulting radiation exposure, calculated on the same basis as used in the Final Environmental Statement, would exceed 7.5 mrems to any organ, the licensee shall:

a. Make an investigation to identify the causes for such release rates;

b. Define and initiate a program of corrective action; and

c. Provide a special report pursuant to Specification 6.9.2 describing these actions within 30 days from the end of the quarter during which the release occurred."

The Action section should be rewritten consistent with Comment 3. The rewritten requirements complement the proposed revision to Specification 3.11.2.1 discussed in Comment 7. for the radioiodines and radioactive particulates release limits to meet Part 20 limits. Specification 4.11.23.1 would not require any modifications to agree with the above proposed changes. The attached Figures 3.11-4,5,6 and 7 need to be deleted as inappropriate in technical specifications.

12. Specification 3.11.2.4 needs to be revised in the same manner proposed for Specification 3.11.1.3 as discussed in Comment 5. for the same reasons.

13. The following sections of the technical specifications have not been reviewed so that no comments means non-review, not approval. These sections are: 3/4.11.3 and 3/4.12.

14. In general, the Bases sections are very brief and do not represent adequate justification for the requirements represented. Several specific comments on Bases for 3/4.11.2.1 are that concentrations would be in excess of 10 CFR Part 20 limits on an instantaneous basis for the maximum dose rates specified due to the method used to derive the equivalent levels and the annual dose limits are not necessarily the maximum dose rates as stated in the bases.

15. Table 6.2-1 in the single asterisk note should delete the word "Reactor". Inconsistent with Part 55.

16. Specification 6.9.2 e. indicates a need for a special report for excessive radiation doses rather than excessive releases of radioactive material neither of which would be true for the Specifications referenced. Appendix I requires 30 day reports for releases which if calculated in accordance with FES methods could exceed twice ALARA. Such levels are not excessive even if they could be measured. This item should be written to indicate Appendix I release levels exceeded is cause for the special report.

Fred Anderson
Site Designation Standards Branch