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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO ACCEPTANCE OF THE OFFSITE DOSE CALCULATION MANUAL

UPDATED THROUGH REVISION 12

COMMONWEALTH EDISON

LA SALLE COUNTY STATION, UNITS 1 AND 2

DOCKET NOS. 50-373 AND 50-374

1.0 INTRODUCTION

On April 17, 1982 and December 16, 1983, the staff issued Operating License Nos. NPF-11 and NPF-18 for the LaSalle County Station Unit Nos. 1 & 2 (La Salle). The licenses included the Radiological Effluent Technical Specifications (RETS) in the La Salle Technical Specifications (TS). Section 6.8 of the TS referenced an Offsite Dose Calculation Manual (ODCM) and prescribed the methods for its change.

2.0 EVALUATION

The docketed submittal on February 24, 1982, of an ODCM by Commonwealth Edison (licensee) received NRC approval by letter dated April 1, 1982, from R. Tedesco to the licensee.

Since 1982, a number of changes have been made in the La Salle ODCM and reported to NRC in ODCM revisions in accordance with La Salle TS 6.8.2. A recent revision, Revision 11, dated November 1985, and submitted in the November 1985 monthly operating report has been reviewed for us by EG&G Idaho, Inc. (EG&G) as part of our technical assistance contract program. The contractor's Technical Evaluation Report (TER), which is enclosed as Appendix D, EGG-PHY-7261, provides a technical evaluation of the compliance of the licensee's submittal with NRC criteria. The staff has reviewed this report and agrees with the evaluation that the La Salle ODCM, updated through Revision 11, generally uses documented and approved methods that are consistent with the methodology and guidelines in NUREG-0133. Although this ODCM is at present an acceptable reference, the licensee may find it advantageous to make the changes outlined below in order to bring the La Salle ODCM more into line with the ODCMs of other licensees and to make available to the operators the appropriate reference material on which the document is based.

Two items have been identified in the TER by the contractor which call for consideration of refinements in interpretation of NRC guidance developed during the implementation of RETS in operating reactors (OR). The La Salle TS were developed in 1981 and 1982 for a near term operating license (NTOL); thus, the licensee's RETS are based on early staff guidance in these areas. Present staff understanding directs that the calculation of the limiting gaseous effluent dose rate corresponding to the inhalation pathway be made with respect to the thyroid of a child instead of an infant.

The basis for this is that the dose rate due to the combination of the breathing rate and the dose factor for a child is more restrictive than the dose rate due to the same combination for an infant. The basis statements for the Gaseous Effluent Dose Rate TS in current staff guidance for BWRs are included for information as Appendix A to this Safety Evaluation (SE).

Similarly, TS 3.11.2.1 and 3.11.2.3 on the dose rate for gaseous effluents and on the dose for "radioiodines, radioactive material in particulate form and radionuclides other than noble gases" incorporated in the La Salle RETS are based on an early revision of the staff's model RETS guidance. More recent guidance, enclosed as Appendix B to this SE, provides the current wording for these requirements. The commitment relative to these TS in the first sentence of Section 2.1.2.2 of the generic part of the La Salle ODCM appears to be overly broad, probably representing a typographical mistake. This sentence should be reviewed so as to record accurately the commitments made by the licensee. Furthermore, although the present La Salle TS 3.11.2.1 and 3.11.2.3 are acceptable, the licensee may want to consider the clarification provided by the alternate wording of Appendix B.

Since these two problems involve refinements to a basically sound ODCM document, there is no need for immediate action. However, they should be considered in the next revision to the ODCM. Similarly the several other questions raised by the contractor in the TER should also be considered in the next ODCM revision.

One further set of additions to the ODCM should also be considered. As the implementation of the RETS progressed, the function of the ODCM for some operating reactors was extended to include not only calculational parameters and methodology but also documentation of details, approaches, or interpretations not included in the TS. Since the ODCM is a staff-reviewed document, it can be used to add perspective to the commitments of the RETS and the rationale of the basis statements. Examples of such documentation are given below.

a) The licensee indicates that Table 3-3 from NEDO-10871 is representative of the composition of the radioactivity mixture in the exhaust air. The licensee may want to include in Section 8.1 a copy of this table, along with comments as to how well this mixture fits the known La Salle effluent pattern.

b) La Salle TS 3.11.2.3 includes carbon-14 in the dose commitment, yet carbon-14 is not measured in the effluents. How is its contribution considered?

c) The La Salle TS for radiological environmental monitoring are based on early staff guidance. Present guidance, enclosed as Appendix C, provides for a generic description of the sample location commitments in the TS, and a listing of specific locations in the ODCM.

The licensee may want to consider modifying the TS to commit to the generic information of the current guidance. If not, the licensee may want to augment the ODCM to provide this generic information for the sample locations. Similarly, if the tables of reporting levels and LLD are not changed to reflect the present guidance, the licensee may want to include comments explaining these differences in the ODCM.

After receipt of the TER from the contractor, a copy of Revision 12 to the La Salle ODCM was received by the staff for review. This revision, dated May 1986, and submitted in the June 1986 monthly operating report, contained changes only to the Environmental Radiological Monitoring Program of Section 8.4 of the ODCM. This revised program was also forwarded independently to NRC with a letter dated July 28, 1986. The staff has reviewed these pages of Revision 12 and finds that they are also consistent with the methodology and guidelines of NUREG-0133.

3.0 CONCLUSIONS

The La Salle ODCM, updated through Revision 12, is an acceptable reference for use with La Salle TS 6.8. The changes incorporated in Revisions 11 and 12 are in compliance with La Salle TS 6.8.2.

APPENDIX A

BASES

Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

This specification applies to the release of liquid effluents from each reactor at the site. For units with shared radwaste treatment systems, the liquid effluents from the shared system are proportioned among the units sharing that system.

3/4.11.1.3 LIQUID RADWASTE TREATMENT SYSTEM

The requirement that the appropriate portions of this system be used, when specified, provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable". This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and the design objective given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the liquid radwaste treatment system were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

This specification applies to the release of liquid effluents from each reactor at the site. For units with shared radwaste treatment systems, the liquid effluents from the shared system are proportioned among the units sharing that system.

3/4.11.1.4 LIQUID HOLDUP TANKS

The tanks listed in this Specification include all those outdoor tanks that are not surrounded by liners, dikes, or walls capable of holding the tank contents and that do not have tank overflows and surrounding area drains connected to the liquid radwaste treatment system.

Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, Table II, Column 2, at the nearest potable water supply and the nearest surface water supply in an UNRESTRICTED AREA.

3/4.11.2 GASEOUS EFFLUENTS

3/4.11.2.1 DOSE RATE

This specification is provided to ensure that the dose at any time at and beyond the SITE BOUNDARY from gaseous effluents from all units on the site will be within the annual dose limits of 10 CFR Part 20 to UNRESTRICTED AREAS. The annual dose limits are the doses associated with the concentrations of 10 CFR Part 20, Appendix B, Table II, Column 1. These limits provide reasonable

assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a MEMBER OF THE PUBLIC in an UNRESTRICTED AREA, either within or outside the SITE BOUNDARY, to annual average concentrations exceeding the limits specified in Appendix B, Table II of 10 CFR Part 20 (10 CFR Part 20.106(b)). For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of that MEMBER OF THE PUBLIC will usually be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. Examples of calculations for such MEMBERS OF THE PUBLIC, with the appropriate occupancy factors, shall be given in the ODCM. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrems/year to the total body or to less than or equal to 3000 mrems/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrems/year.

This specification applies to the release of gaseous effluents from all reactors at the site.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the lower limits of detection (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J. K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

3/4.11.2.2 DOSE - NOBLE GASES

This specification is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977.

APPENDIX B

RADIOACTIVE EFFLUENTS

3/4.11.2 GASEOUS EFFLUENTS

DOSE RATE

LIMITING CONDITION FOR OPERATION

3.11.2.1 The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY (see Figure 5.1-3) shall be limited to the following:

a. For noble gases: Less than or equal to 500 mrems/yr to the total body and less than or equal to 3000 mrems/yr to the skin, and

b. For iodine-131, for iodine-133, for tritium, and for all radionuclides in particulate form with half lives greater than 8 days: Less than or equal to 1500 mrems/yr to any organ.

APPLICABILITY: At all times.

ACTION:

a. With the dose rate(s) exceeding the above limits, without delay restore the release rate to within the above limit(s).

b. The provisions of Specification 6.9.1.9.b are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.1.1 The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in the ODCM.

4.11.2.1.2 The dose rate due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 4.11-2.

RADIOACTIVE EFFLUENTS

DOSE - IODINE-131, IODINE-133, TRITIUM, AND RADIONUCLIDES IN PARTICULATE FORM

LIMITING CONDITION FOR OPERATION

3.11.2.3 The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released, from each reactor unit, to areas at and beyond the SITE BOUNDARY (see Figure 5.1-3) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mrems to any organ and,

b. During any calendar year: Less than or equal to 15 mrems to any organ.

APPLICABILITY: At all times.

ACTION:

a. With the calculated dose from the release of iodine-131, iodine-133, tritium, and radionuclides in particulate form with half lives greater than 8 days, in gaseous effluents exceeding any of the above limits, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

b. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.3 Cumulative dose contributions for the current calendar quarter and current calendar year for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half lives greater than 8 days shall be determined in accordance with the methodology and parameters in the ODCM at least once per 31 days.

APPENDIX C

3/4.12 RADIOLOGICAL ENVIRONMENTAL MONITORING

3/4.12.1 MONITORING PROGRAM

LIMITING CONDITION FOR OPERATION

3.12.1 The radiological environmental monitoring program shall be conducted as specified in Table 3.12-1.

APPLICABILITY: At all times.

ACTION:

a. With the radiological environmental monitoring program not being conducted as specified in Table 3.12-1, in lieu of a Licensee Event Report, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report required by Specification 6.9.1.11, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 3.12-2 when averaged over any calendar quarter, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to A MEMBER OF THE PUBLIC is less than the calendar year limits of Specifications 3.11.1.2, 3.11.2.2, and 3.11.2.3. When more than one of the radionuclides in Table 3.12-2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 3.12-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose* to A MEMBER OF THE PUBLIC is equal to or greater than the calendar year limits of Specifications 3.11.1.2, 3.11.2.2 and 3.11.2.3. 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.

c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 3.12-1, identify locations for obtaining replacement samples and add them to the radiological environmental monitoring program within 30 days. The specific

*The methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in this report.

locations from which samples were unavailable may then be deleted from the monitoring program. In lieu of a Licensee Event Report and pursuant to Specification 6.9.1.12, identify the cause of the unavailability of samples and identify the new location(s) for obtaining replacement samples in the next Semiannual Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

d. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.12.1 The radiological environmental monitoring samples shall be collected pursuant to Table 3.12-1 from the specific locations given in the table and figure(s) in the ODCM, and shall be analyzed pursuant to the requirements of Table 3.12-1 and the detection capabilities required by Table 4.12-1.

TABLE 3.12-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM*

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency	Type and Frequency of Analysis
1. DIRECT RADIATION[b]	40 routine monitoring stations (DR1-DR40) either with two or more dosimeters or with one instrument for measuring and recording dose rate continuously, placed as follows: an inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY (DR1-DR16); an outer ring of stations, one in each meteorological sector in the 6- to 8-km range from the site (DR17-DR32); the balance of the stations (DR33-DR40) to be placed in special interest areas such as population centers, nearby residences, schools, and in 1 or 2 areas to serve as control stations.	Quarterly	Gamma dose quarterly.

*The number, media, frequency, and location of samples may vary from site to site. This table presents an acceptable minimum program for a site at which each entry is applicable. Local site characteristics must be examined to determine if pathways not covered by this table may significantly contribute to an individual's dose and should be included in the sampling program. The code letters in parentheses, e.g. DR1, A1, provide one way of defining generic sample locations in this specification that can be used to identify the specific locations in the map(s) and table in the ODCM.

TABLE 3.12-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency	Type and Frequency of Analysis
2. AIRBORNE			
Radioiodine and Particulates	Samples from 5 locations (A1-A5): 3 samples (A1-A3) from close to the 3 SITE BOUNDARY locations, in different sectors, of the highest calculated annual average groundlevel D/Q. 1 sample (A4) from the vicinity of a community having the highest calculated annual average groundlevel D/Q. 1 sample (A5) from a control location, as for example 15-30 km distant and in the least prevalent wind direction.[c]	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine Cannister: I-131 analysis weekly. Particulate Sampler: Gross beta radioactivity analysis following filter change;[d] Gamma isotopic analysis[e] of composite (by location) quarterly.
3. WATERBORNE			
a. Surface[f]	1 sample upstream (Wa1) 1 sample downstream (Wa2)	Composite sample over 1-month period[g]	Gamma isotopic analysis[e] monthly. Composite for tritium analysis quarterly.
b. Ground	Samples from 1 or 2 sources (Wb1, Wb2), only if likely to be affected[h].	Quarterly	Gamma isotopic[e] and tritium analysis quarterly.
c. Drinking	1 sample of each of 1 to 3 (Wc1 - Wc3) of the nearest water supplies that could be affected by its discharge. 1 sample from a control location (Wc4).	Composite sample over 2-week period[g] when I-131 analysis is performed, monthly composite otherwise	I-131 analysis on each composite when the dose calculated for the consumption of the water is greater than 1 mrem per year.[i] Composite for gross beta and gamma isotopic analyses[e] monthly. Composite for tritium analysis quarterly.

TABLE 3.12-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency	Type and Frequency of Analysis
d. Sediment from shoreline	1 sample from downstream area with existing or potential recreational value (Wd1).	Semiannually	Gamma isotopic analysis[e] semiannually.
4. INGESTION			
a. Milk	Samples from milking animals in 3 locations (Ia1 - Ia3) within 5 km distance having the highest dose potential. If there are none, then, 1 sample from milking animals in each of 3 areas (Ia1 - Ia3) between 5 to 8 km distant where doses are calculated to be greater than 1 mrem per yr[i].	Semimonthly when animals are on pasture, monthly at other times	Gamma isotopic[e] and I-131 analysis semimonthly when animals are on pasture; monthly at other times.
	1 sample from milking animals at a control location (Ia4), 15-30 km distant and in the least prevalent wind direction.		
b. Fish and invertebrates	1 sample of each commercially and recreationally important species in vicinity of plant discharge area. (Ib1 - Ib__).	Sample in season, or semiannually if they are not seasonal	Gamma isotopic analysis[e] on edible portions.
	1 sample of same species in areas not influenced by plant discharge (Ib10 - Ib__).		
c. Food Products	1 sample of each principal class of food products from any area that is irrigated by water in which liquid plant wastes have been discharged (Ic1 - Ic__).	At time of harvest[j]	Gamma isotopic analyses[e] on edible portion.

TABLE 3.12-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency	Type and Frequency of Analysis
c. Food Products (cont'd)	Samples of 3 different kinds of broad leaf vegetation grown nearest each of two different offsite locations of highest predicted annual average ground-level D/Q if milk sampling is not performed (Ic10 - Ic13).	Monthly when available	Gamma isotopic[e] and I-131 analysis.
	1 sample of each of the similar broad leaf vegetation grown 15-30 km distant in the least prevalent wind direction if milk sampling is not performed (Ic20 - Ic23).	Monthly when available	Gamma isotopic[e] and I-131 analysis.

TABLE 3.12-1 (Continued)

TABLE NOTATION

[a] Specific parameters of distance and direction sector from the centerline of one reactor, and additional description where pertinent, shall be provided for each and every sample location in Table 3.12-1 in a table and figure(s) in the ODCM. Refer to NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978, and to Radiological Assessment Branch Technical Position, Revision 1, November 1979. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report pursuant to Specification 6.9.1.11. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the radiological environmental monitoring program. In lieu of a Licensee Event Report and pursuant to Specification 6.9.1.12, identify the cause of the unavailability of samples for that pathway and identify the new location(s) for obtaining replacement samples in the next Semiannual Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

[b] One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor; two or more phosphors in a packet are considered as two or more dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. The 40 stations is not an absolute number. The number of direct radiation monitoring stations may be reduced according to geographical limitations; e.g., at an ocean site, some sectors will be over water so that the number of dosimeters may be reduced accordingly. The freqency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.

[c] The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites that provide valid background data may be substituted.

TABLE 3.12-1 (Continued)

TABLE NOTATION

[d] Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

[e] Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

[f] The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream" sample shall be taken in an area beyond but near the mixing zone. "Upstream" samples in an estuary must be taken far enough upstream to be beyond the plant influence. Salt water shall be sampled only when the receiving water is utilized for recreational activities.

[g] A composite sample is one in which the quantity (aliquot) of liquid sampled is proportional to the quantity of flowing liquid and in which the method of sampling employed results in a specimen that is representative of the liquid flow. In this program composite sample aliquots shall be collected at time intervals that are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure obtaining a representative sample.

[h] Groundwater samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

[i] The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in the ODCM.

[j] If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be monthly. Attention shall be paid to including samples of tuborous and root food products.

TABLE 3.12-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Reporting Levels: Water (pCi/ℓ)	Airborne Particulate or Gases (pCi/m³)	Fish (pCi/kg, wet)	Milk (pCi/ℓ)	Food Products (pCi/kg, wet)
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. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/ℓ may be used.

BWR-STS-I
PWR-STS-I

TABLE 4.12-1

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS[a]

LOWER LIMIT OF DETECTION (LLD)[b,c]

Analysis	Water (pCi/ℓ)	Airborne Particulate or Gas (pCi/m³)	Fish (pCi/kg,wet)	Milk (pCi/ℓ)	Food Products (pCi/kg,wet)	Sediment (pCi/kg,dry)
gross beta	4	0.01				
H-3	2000*					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1[d]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

*If no drinking water pathway exists, a value of 3000 pCi/l may be used.

9/3/82

TABLE 4.12-1 (Continued)

TABLE NOTATION

[a]This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Specification 6.9.1.11.

[b]Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13.

[c]The LLD is defined, for purposes of these specifications, as 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 with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ s_b}{E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

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

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 disintegrations per minute per picocurie,

Y is the fractional radiochemical yield, when applicable,

λ is the radioactive decay constant for the particular radionuclide, and

Δt for environmental samples is the elapsed time between sample collection, or end of the sample collection period, and time of counting

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

TABLE 4.12-1 (Continued)

TABLE NOTATION

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. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report pursuant to Specification 6.9.1.11.

[d] LLD for drinking water samples. If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.

SALP INPUT FROM THE PLANT SYSTEMS BRANCH FOR LaSalle County Station
(TAC. #62095 & 62096)

Functional Area: Radiological Controls (ODCM Upgrade and Review of Radioactive Effluent Reports)

A. Licensing Activities

1. Management Involvement in Assuring Quality

There was positive involvement by management to assure the timeliness of the revisions. Recent inspection reports show more management attention should be devoted to the accuracy of the radioactive effluent reports.

Rating: 2

2. Approach to Resolution of Technical Issues from a Safety Standpoint.

Company technical personnel understand the issues, and present detailed explanations for changes to the ODCM. It is questionable as to just how much plant personnel understand portions of the ODCM.

Rating: 2

3. Responsiveness to NRC Initiatives

Rating: N/A

4. Staffing (including Management)

Rating: N/A

5. Reporting and Analysis of Reportable Events

Rating: N/A

6. Training Effectiveness and Qualifications

Rating: N/A

7. Overall Rating for Licensing Activity Functional Area: 2

APPENDIX D

Evaluation of Changes to the ODCM

(La Salle County Station Units 1 and 2)

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D.1 EVALUATION OF CHANGES TO THE ODCM

The Commonwealth Edison Company (CECo), the Licensee for the La Salle County Station Units 1 and 2, prepared an Offsite Dose Calculation Manual (ODCM) consisting of a generic section common to all nuclear facilities operated by CECo and site-specific Sections 7.2 and 8.0 for each of the Utility's nuclear facilities. The present version of the generic section is Revision 11 dated March 1985 submitted to the Nuclear Regulatory Commission (NRC) with letter dated April 26, 1985.[1] The present version of site-specific Sections 7.2 and 8.0 for La Salle is Revision 11 dated November 1985[2] containing changes reported by the Licensee.[3] Changes to the ODCM are required by the Licensee's Technical Specifications to be reported to NRC in the Monthly Operating Reports. The ODCM changes were submitted by NRC to EG&G Idaho for review.

These changes have been incorporated into the Licensee's existing ODCM and reviewed as a whole. The result of the evaluation is intended to be a stand-alone document, and is given in Supplement 1 to this Appendix.

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D.4 REFERENCES

1. Letter from K. Licari (CECo) to D. Eisenhut (NRC), Subject: Offsite Dose Calculation Manual, April 26, 1985.

2. Letter from D. M. Kenealy (CECo) to D. Eisenhut (NRC), Subject: La Salle Offsite Dose Calculation Manual, Site Specific Sections 7.2 and 8.0 Revision 11, December 1985.

3. November Monthly Operating Report, December 9, 1985.

SUPPLEMENT 1

to

APPENDIX D

EVALUATION OF CHANGES TO THE ODCM

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INTRODUCTION

Purpose of Review

The purpose of this document is to review and evaluate the changes made to the Offsite Dose Calculation Manual (ODCM) by the Licensee of the La Salle County Station Units 1 and 2. The ODCM is a supplementary document for implementing the Radiological Effluent Technical Specifications (RETS) in compliance with 10 CFR 50, Appendix I requirements.[1]

Scope of Review

As specified in NUREG-0472[2] and NUREG-0473,[3] the ODCM is to be developed by the Licensee to document the methodology and approaches used to calculate offsite doses and maintain the operability of the radioactive effluent systems. As a minimum, the ODCM should provide equations and methodology for the following topics:

- Alarm and trip setpoints on effluent instrumentation
- Liquid effluent concentrations in unrestricted areas
- Gaseous effluent dose rates at or beyond the site boundary
- Liquid and gaseous effluent dose contributions
- Liquid and gaseous effluent dose projections.

In addition, the ODCM should contain flow diagrams, consistent with the systems being used at the station, defining the treatment paths and the components of the radioactive liquid, gaseous, and solid waste management systems. A description and the location of samples in support of the environmental monitoring program are also needed in the ODCM.

Plant-Specific Background

On behalf of La Salle County Station, the Commonwealth Edison Company (CECo) submitted Revision 11 to site specific Sections 7.2 and 8.0 of the ODCM[4] as reported in a letter dated December 1985[5] and in the Monthly Operating Report for November 1985.[6]

The Licensee's changes to the ODCM were transmitted to an independent review team at the Idaho National Engineering Laboratory (INEL) for review. The ODCM review was conducted and the results and conclusions of the evaluation are presented in this supplement.

REVIEW CRITERIA

Review criteria for the ODCM were provided by the NRC in three documents:

NUREG-0472, RETS for PWRs[2]
NUREG-0473, RETS for BWRs[3]
NUREG-0133, Preparation of RETS for Nuclear Power Plants.[7]

In the ODCM review, the following NRC guidelines were also used: "General Contents of the Offsite Dose Calculation Manual," Revision 1,[8] and Regulatory Guide 1.109.[9] The ODCM format is left to the Licensee and may be simplified by tables and grid printouts.

EVALUATION

The Licensee has followed the methodology of NUREG-0133[7] to determine the alarm and trip setpoints for the liquid and gaseous effluent monitors, which ensures that the maximum permissible concentrations (MPCs), as specified in 10 CFR 20,[10] will not be exceeded by discharges from various liquid or gaseous release points. There are four radioactive liquid effluent pathways to the blowdown line for the two-unit site: the Unit 1/2 liquid radwaste effluent line, the Unit 1 service water system, the Unit 2 service water system, and the Unit 1/2 Residual Heat Removal (RHR) Service Water System. Radioactive liquids from the four systems are released to the Illinois River via a common blowdown line from the Cooling Lake as shown in Figure 8.2-2 of the ODCM. There are two radioactive gaseous effluent release pathways for the two-unit site: the station vent stack is shared by both units and the standby gas treatment system (SGTS) stack is shared by both units. To ensure the combined release rate from the station vent and the SGTS vent do not exceed the release limit, the alarm setpoints are set at or below one half the release limit. The Licensee's method for setpoint calculations described in site-specific Section 8.0 of the ODCM is consistent with the guidelines of NUREG-0133.

The Licensee's ODCM contains the methods and calculational relationships that are used to compare the radioactivity concentrations in liquid effluents at the point of release to the 10 CFR 20 limits prior to the release and after the release.

Noble gas discharges are assured to be within the NUREG-0473 dose rate limits by correctly determining the setpoints for the noble gas monitors. Section 2.1.2.2 of the generic ODCM states that the maximum dose rate to any organ from all radionuclides, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than 8 days shall be limited to < 1500 mrem/year. The generic ODCM includes more radionuclides than are required by the gaseous effluent dose rate technical specifications for any of the plants within the CECo system. The CECo prepared a generic ODCM with the intention of addressing

the technical specification requirements for all plants within the CECo system. A difficulty arises in that not all plants within the CECo system have their technical specifications patterned after the same version of NUREG-0472 for PWRs or NUREG-0473 for BWRs. Specifically, LaSalle Technical Specification 3.11.2.1b states "For all radioiodines and for all radioactive materials in particulate form and radionuclides (other than noble gases) with half lives greater than 8 days: Less than or equal to 1500 mrems/yr to any organ via the inhalation pathway" which limits the nuclide list to all radioiodines (e.g., I-129, I-131, I-132, I-133, I-134, I-135, etc.), all particulates with half-lives greater than 8 days, and radionuclides (other than noble gases) with half-lives greater than 8 days (e.g., C-14 and tritium). The LaSalle Technical Specification was patterned after an earlier version of NUREG-0473 and not after Revision 3 Draft 7" of NUREG-0473 which further reduces the nuclide list to I-131, I-133, tritium, and for radionuclides in particulate form with half lives greater than eight days. Although a more extensive list of nuclides than required by the Technical Specification is acceptable, the Licensee should strongly consider rewriting Section 2.1.2.2 to identify a limiting nuclide list for each CECo plant for consistency with each plant's technical specification. Additionally, the dose rate to any organ of the infant from the inhalation pathway using the highest calculated annual average dispersion parameter is considered limiting which is consistent with the earlier version of NUREG-0473. However, Draft 7" of Revision 3 to NUREG-0473 identifies inhalation as the most limiting pathway with the child's thyroid as the critical organ instead of any organ of an infant.

Doses to a member of the public due to radionuclides identified in liquid effluents are calculated monthly to show compliance with 10 CFR 50 Appendix I. The Licensee identifies the fish and water consumption pathways for the dose calculations assuming the adult as the maximum exposed individual. The water usage and fish consumption factors listed on page 7.2-2 of the La Salle ODCM are one-half and one-tenth the values recommended in NUREG-0133, respectively. The same values are included in the Dresden Plant's ODCM and the CECo based the Dresden values for the fish consumption due to the low fish population in the Illinois River as stated on page 4.2-1 of the ODCM. The Licensee states the NRC agreed to

the lower fish consumption rate for the Dresden plant.[11] The La Salle and Dresden plants are each located on the Illinois River. Additionally, the dilution water flow rate on page 7.2-2 of the La Salle ODCM is 1.37×10^4 cfs which is 6.85 times the maximum of 2.0×10^3 cfs allowed in NUREG-0133 for a two unit plant (a comparable situation exists for the Dresden plant). The 1.37×10^4 cfs value appears to be the flow rate of the Illinois River which is the receiving body of water. Consequently, the dose is not to a maximum exposed member of the public because of the low consumption and high dilution values. The La Salle radwaste discharge tanks are released to the cooling lake blowdown line which has an annual average flow rate 50-60 cfs. The cooling lake blowdown value of 50-60 cfs may be adjusted to a limit of 2.0×10^3 cfs to demonstrate compliance to the 10 CFR 50 Appendix I dose limits if it is demonstrated that the dilution would in fact occur. Additionally the bioaccumulation factor for phosphorous in Table 7.1-12 of the ODCM should be 3×10^3 instead of 1×10^5 pCi/kg per pCi/liter.

Air doses resulting from the release of noble gases are calculated monthly to show compliance to 10 CFR 50 Appendix I. The highest calculated annual average relative concentrations for X/Q are used to calculate the maximum air doses. The average dose to an individual in the unrestricted area from radioiodines, radioactive materials in particulate form, and radionuclides, other than noble gases in gaseous effluents released from each reactor with half-lives greater than 8 days are calculated monthly to show compliance to 10 CFR 50 Appendix I. The ODCM includes the same nuclides required by LaSalle Technical Specification 3.11.2.3 but more nuclides than required by Revision 3 Draft 7" to NUREG-0473. Although ODCM Section 2.1.2.1 is consistent with the LaSalle Technical Specification, the section includes more nuclides than required by the technical specifications for other plants within the CECo system. The Licensee should strongly consider rewriting generic Section 2.1.2.1 to identify a limiting nuclide list for each CECo plant for consistency with each plant's technical specification. The highest calculated annual average dispersion parameters are used in the dose calculations. The dose calculation methodology for gaseous effluents satisfies the relationships presented in NUREG-0133.

Methodology, based on dose projections, to determine required use of the liquid and gaseous radwaste treatment systems is described in the ODCM. The projections are based on the dose calculations due to radioactive effluents which satisfies the relationships in NUREG-0133.

The ODCM contains simplified flow diagrams illustrating the treatment paths and the components of the radioactive liquid, gaseous and solid waste management systems.

Methodology for demonstrating compliance to 40 CFR 190 is described in the ODCM. The Licensee's RETS and the ODCM state the time period is over 12 consecutive months instead of over a calendar year which is permitted by Draft 7" to Revision 3 of NUREG-0473. The Licensee's ODCM states that compliance to 40 CFR 190 will be demonstrated if the doses exceed the quarterly or annual dose limits of the Technical Specifications. This is a conservative requirement since Draft 7" to Revision 3 of NUREG-0473 requires compliance to be demonstrated when twice the quarterly or twice the annual dose limits are exceeded. The Licensee's RETS is consistent with NUREG-0473.

Specific parameters of distance and the direction sector from the centerline of a reactor and additional information have been provided for each and every sample location identified in RETS Environmental Monitoring Table 3.12-1-1. The data are contained in ODCM Tables 8.4-1, 8.4-2, and 8.4-3 and in ODCM Figures 8.4-1, 8.4-2, and 8.4-3. The reporting level values for food products identified in RETS Table 3.12.1-2 are not included in ODCM Table 8.4-2. The LLD values for food products identified in RETS Table 4.12.1-1 are not included in ODCM Table 8.4-3.

In summary, the Licensee's ODCM as revised used documented and approved methods that are generally consistent with the methodology and guidance in NUREG-0133, and therefore is an acceptable reference.

CONCLUSIONS

The Licensee's Revision 11 to site specific Sections 7.2 and 8.0 in conjunction with Revision 11 to the generic ODCM for CECo uses documented and approved methods and are consistent with the criteria of NUREG-0133 with the following exceptions:

- As described in Section 2.1.2.2 the dose rate is determined for any organ of an infant via the inhalation pathway. The dose rate calculation should be made for the thyroid of a child via the inhalation pathway to be in agreement with Draft 7" of Revision 3 to NUREG-0473.

- The water usage and fish consumption values on page 7.2-2 of the ODCM are one-half and one-tenth the values recommended in NUREG-0133, respectively.

- The bioaccumulation factor for phosphorous in Table 7.1-12 should be 3×10^3 instead of 1×10^5 pCi/kg per pCi/liter.

- The dilution water factors F^w and F^f listed on page 7.2-2 of the ODCM are larger than the values recommended in NUREG-0133.

- The reporting levels and LLDs for food products are not included in ODCM Tables 8.4-2 and 8.4-3, respectively.

The following are not deficiencies of the ODCM but should be considered by the Licensee for modification of the ODCM:

- Section 2.1.2.2 for the dose rate calculation from all radionuclides, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than 8 days includes more nuclides than required by the technical specifications for any plant within the CECo system and more nuclides than required by Revision 3 Draft 7" of NUREG-0472 and NUREG-0473.

- Section 2.1.2.1 for the dose calculation from radioiodines, radioactive materials in particulate form, and radionuclides, other than noble gases with half-lives greater than 8 days includes the same nuclides required by LaSalle Technical Specification 3.11.2.3 but more nuclides than required by the technical specifications for other plants within the CECo system and more nuclides than required by Revision 3 Draft 7" of NUREG-0472 and NUREG-0473.

REFERENCES

1. Title 10, Code of Federal Regulations, Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion, 'As Low As Is Reasonably Achievable,' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents".

2. U. S. Nuclear Regulatory Commission, "Standard Radiological Effluent Technical Specifications for Pressurized Water Reactors," USNRC NUREG-0472, Revision 3, Draft 7", September 1982.

3. U. S. Nuclear Regulatory Commission, "Standard Radiological Effluent Technical Specifications for Boiling Water Reactors," USNRC NUREG-0473, Revision 3, Draft 7", September 1982.

4. Letter from K. Licari (CECo) to D. Eisenhut (NRC), Subject: Offsite Dose Calculation Manual, April 26, 1985.

5. Letter from D. M. Kenealy (CECo) to D. Eisenhut (NRC), Subject: La Salle Offsite Dose Calculation Manual, Site Specific Sections 7.2 and 8.0 Revision 11, December 1985.

6. November Monthly Operating Report, December 9, 1985.

7. U. S. Nuclear Regulatory Commission, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, A Guidance Manual for Users of Standard Technical Specifications," USNRC NUREG-0133, October 1978.

8. U. S. Nuclear Regulatory Commission, "General Contents of the Offsite Dose Calculation Manual," Revision 1, Branch Technical Position, Radiological Assessment Branch, NRC, February 8, 1979.

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

10. Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation."

11. Letter from D. J. Scott (CECo) to Director of Office and Enforcement (NRC), Subject: Dresden Station Operating Data, DJS Ltr: 85-646, June 1, 1985.