



U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN

2.3.5 LONG-TERM ATMOSPHERIC DISPERSION ESTIMATES FOR ROUTINE RELEASES**REVIEW RESPONSIBILITIES**

Primary - Organization responsible for the review of long-term atmospheric dispersion estimates for routine releases.

Secondary - None

I. AREAS OF REVIEW

Chapter 2 of the SRP discusses the site characteristics that could affect the safe design and siting of the plant. The staff reviews information presented by the applicant for a Construction Permit (CP), Operating License (OL), Design Certification (DC), Early Site Permit (ESP), or Combined License (COL) concerning atmospheric dispersion and dry deposition estimates for routine releases of radiological effluents to the atmosphere. This SRP section applies to reviews performed for each of these types of applications. The review covers the following specific areas:

1. Atmospheric dispersion and deposition models used to calculate concentrations in air and amount of material deposited as a result of routine releases of radioactive material to the atmosphere.
2. Meteorological data and other assumptions used as input to the atmospheric dispersion models.
3. Derivation of diffusion parameters (e.g., σ_z).

Rev. 3 - [Month] 2007

USNRC STANDARD REVIEW PLAN

This Standard Review Plan, NUREG-0800, has been prepared to establish criteria that the U.S. Nuclear Regulatory Commission staff responsible for the review of applications to construct and operate nuclear power plants intends to use in evaluating whether an applicant/licensee meets the NRC's regulations. The Standard Review Plan is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide an acceptable method of complying with the NRC regulations.

The standard review plan sections are numbered in accordance with corresponding sections in the Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Not all sections of the standard format have a corresponding review plan section. The SRP sections applicable to a combined license application for a new light-water reactor (LWR) are based on Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)."

These documents are made available to the public as part of the NRC's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Individual sections of NUREG-0800 will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience. Comments may be submitted electronically by email to NRR_SRP@nrc.gov.

Requests for single copies of draft or active SRP sections (which may be reproduced) should be made to the U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Reproduction and Distribution Services Section, or by fax to (301) 415-2289; or by email to DISTRIBUTION@nrc.gov. Electronic copies of this section are available through the NRC's public Web site at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0800/>, or in the NRC's Agencywide Documents Access and Management System (ADAMS), at <http://www.nrc.gov/reading-rm/adams.html>, under Accession # [MLxxxxxxx](#).

4. Atmospheric dispersion factors (χ/Q values) and deposition factors (D/Q values) used for assessment of consequences of routine airborne radioactive releases.
5. Points of routine release of radioactive material to the atmosphere, the characteristics of each release mode, and the location of potential receptors for dose computations.
6. **Additional Information for 10 CFR Part 52 Applications:** Additional information will be presented dependent on the type of application. For a COL application, the additional information is dependent on whether the application references an ESP, a DC, both or neither. Information requirements are prescribed within the "Contents of Application" sections of the applicable Subparts to 10 CFR Part 52.

Review Interfaces

The listed SRP sections interface with this section as follows:

1. A review of local meteorological conditions that could affect the atmospheric dispersion and deposition estimates that are reviewed in this SRP section is performed under SRP Section 2.3.2.
2. A review of the onsite meteorological monitoring program and the resulting meteorological database that may be used in this SRP section as input to the atmospheric dispersion and deposition estimates is performed under SRP Section 2.3.3.
3. A review of the criteria to be used for determining release point characteristics as well as the specific location of potential receptors of interest that may be used in this SRP section as input to the atmospheric dispersion estimates is performed under SRP Section 11.3.
4. The χ/Q and D/Q values reviewed in this SRP section are provided as input to the review of the calculated concentrations and dose consequences of routine airborne radioactive releases that is performed in SRP Section 11.3.
5. For DC applications and COL applications referencing a DC rule or DC application, review of the site parameters in the Design Control Document (DCD) Tier 1, Chapter 2 of the DCD Tier 2, and the supporting information in DCD Tier 2 submitted by the applicant is performed under SRP Section 2.0, "Site Characteristics/ Site Parameters."

The specific acceptance criteria and review procedures are contained in the referenced SRP sections.

II. ACCEPTANCE CRITERIA

Requirements

Acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

1. 10 CFR 20 (Ref. 1), Subpart D, with respect to demonstrating compliance with dose limits for individual members of the public.

2. 10 CFR 50.34a (Ref. 2) and Sections II.B, II.C and II.D of Appendix I of 10 CFR Part 50 (Ref. 3) with respect to the numerical guides for design objectives and limiting conditions for operation to meet the requirements that radioactive material in effluents released to unrestricted areas be kept as low as is reasonably achievable.
3. 10 CFR 100.21(c)(2) (Ref. 4), with respect to establishing atmospheric dispersion site characteristics such that radiological effluent release limits associated with normal operation can be met for any individual located offsite.

SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for the review described in this SRP section. The SRP is not a substitute for the NRC's regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide acceptable methods of compliance with the NRC regulations.

Appropriate sections of the following Regulatory Guides are used by the staff for the identified acceptance criteria.

Regulatory Guide 1.23 (Ref. 5) presents criteria for an acceptable onsite meteorological monitoring program and the resulting meteorological database that may be used in this SRP section as input to the atmospheric dispersion estimates.

Regulatory Guide 1.109 (Ref. 6) presents criteria to be used for identifying specific locations of potential receptors of interest.

Regulatory Guide 1.111 (Ref. 7) presents criteria for characterizing atmospheric dispersion and deposition conditions for evaluating the consequences of routine releases.

Regulatory Guide 1.112 (Ref. 8) presents criteria for identifying release points and release characteristics.

Specifically, for CP, OL, COL, or ESP reviews, the following information should be provided by the applicant in the safety analysis report (SAR):

1. A detailed description of the atmospheric dispersion and deposition models used by the applicant to calculate annual average concentrations in air and amount of material deposited as a result of routine releases of radioactive materials to the atmosphere. The models should be sufficiently documented and substantiated to allow a review of their accuracy and validity, source configuration, suitability of input parameters, topography, and appropriateness for the site, plant, and release characteristics.
2. A discussion of atmospheric diffusion parameters, such as vertical plume spread (σ_z) as a function of distance, topography, and atmospheric conditions. Use of these parameters should be substantiated as to their appropriateness for use in estimating the consequences of routine releases from the site boundary to a radius of 50 miles (80 kilometers) from the plant.

3. Meteorological data summaries (onsite and regional) used as input to the dispersion and deposition models. Data used for this evaluation should represent hourly average values of wind speed, wind direction, and atmospheric stability which are appropriate for each mode of release and which are characteristic of annual average atmospheric dispersion and deposition conditions in the vicinity of the plant. Guidance on appropriate onsite meteorological data is provided in Regulatory Guide 1.23. This information is also reviewed under SRP section 2.3.3.
4. Points of routine release of radioactive material to the atmosphere, including the characteristics (e.g., location, release mode) of each release point. Guidance for identifying release point characteristics is provided in Regulatory Guide 1.112. This information is also reviewed under SRP section 11.3.
5. The specific location of potential receptors of interest (e.g., nearest vegetable garden, nearest resident, nearest milk animal, and nearest meat cow in each 22½ degree direction sector within a 5-mile (8-kilometer) radius of the site). Guidance for identifying the location of potential receptors of interest is provided in Regulatory Guide 1.109. This information is also reviewed under SRP section 11.3.
6. The χ/Q and D/Q values to be used for assessment of the consequences of routine airborne radiological releases as described in Section 2.3.5.2 of Regulatory Guide 1.70 (Ref. 9) and Section 2.3.5.2 of RG 1.206 (Ref. 10):
 - A. Maximum annual average χ/Q values and D/Q values at or beyond the site boundary and at specific locations of potential receptors of interest utilizing appropriate meteorological data for each routine venting location.
 - B. Estimates of annual average χ/Q values and D/Q values for 16 radial sectors to a distance of 50 miles (80 kilometers) from the plant using appropriate meteorological data.

Guidance for calculating these χ/Q and D/Q values is provided in Regulatory Guide 1.111.

Technical Rationale

The technical rationale for application of these acceptance criteria to the areas of review addressed by this SRP section is discussed in the following paragraphs:

1. Applicants and licensees generally show compliance with 10 CFR 20, Subpart D by demonstrating that the annual average concentrations of radioactive material released in gaseous (and liquid) effluents at the boundary of the restricted area do not exceed the values specified in Table 2 of Appendix B to 10 CFR 20. Section II.B.1 of Appendix I to 10 CFR 50 requires that the calculated annual total quantity of all radioactive material above background to be released to the atmosphere will not result in an estimated annual air dose from gaseous effluents at any location near ground level which could be occupied by individuals in unrestricted areas in excess of prescribed limits. Section II.B.2(b) of Appendix I to 10 CFR 50 requires that reasonable assurance be provided such that the quantity of all radioactive material above background to be released to the atmosphere will not result in an estimated annual external dose from gaseous effluent to any individual in unrestricted areas in excess of prescribed limits. The maximum annual

average χ/Q value at or beyond the boundary of the restricted area is a significant input to the assessment performed to demonstrate compliance with these regulations.

2. Section II.C of Appendix I to 10 CFR 50 requires that the calculated annual total quantity of all radioactive iodine and radioactive material in particulate form above background to be released in effluent to the atmosphere will not result in an estimated annual or dose commitment for any individual in an unrestricted area from all pathways of exposure in excess of prescribed limits. Regulatory Guide 1.109, which provides guidance for implementing Section II.C of Appendix I, makes use of the maximum exposed individual approach where the numerical design objectives of Section C.II of Appendix I are compared to the calculated radiation exposures to maximum individuals in each of four age groups. The pathways of exposure considered include (1) external irradiation from radionuclides deposited onto the ground surface, (2) inhalation of radionuclides in air and (3) ingestion of atmospherically released radionuclides in food (e.g., produce, milk, leafy vegetables, and meat). The annual average χ/Q values and D/Q values at specific locations of potential receptors of interest (e.g., nearest vegetable garden, nearest resident, nearest milk animal, and nearest meat animal in each 22½ degree direction sector within a 5-mile (8-kilometer) radius of the site) are a significant input to the assessment performed to demonstrate compliance with this regulation.
3. Section II.D of Appendix I to 10 CFR 50 requires that liquid and gaseous radwaste systems include all items of reasonably demonstrated technology that, when added to the system sequentially and in order of diminishing cost-benefit return, can, for a favorable cost-benefit ratio, effect reductions in dose to the population reasonably expected to be within 50 miles (80 kilometers) of the reactor. Estimates of annual average χ/Q values and D/Q values for 16 radial sectors to a distance of 50 miles (80 kilometers) from the plant are a significant input to the assessment performed to demonstrate compliance with this regulation.

III. REVIEW PROCEDURES

The reviewer will select material from the procedures described below, as may be appropriate for a particular case.

The procedures outlined below are used to review CP applications, ESP applications, and COL applications that do not reference an ESP to verify that appropriate atmospheric dispersion models, with adequate onsite meteorological data as input to the models, have been used to calculate atmospheric dispersion and deposition factors at appropriate distances and directions from postulated release points during routine airborne releases of radioactive materials. For reviews of OL applications, these procedures are used to verify that the data and analyses remain valid and that the facility's design specifications are consistent with these data. As applicable, reviews of OLs and COLs include a determination on whether the content of technical specifications related to long term atmospheric dispersion estimates is acceptable and whether the technical specifications reflect consideration of any identified unique conditions.

These review procedures are based on identified SRP acceptance criteria. For deviations from these specific acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives provide an acceptable method of complying with the relevant NRC requirements identified in Subsection II.

1. Atmospheric Dispersion Models

The applicant's models are compared to the general modeling criteria presented in Regulatory Guide 1.111. The models should be suitable to the topography of the site and vicinity, plant configuration, and release characteristics. Additional information for determining model suitability may be found in standard references such as "Meteorology and Atomic Energy - 1968" (Ref. 11) and "Atmospheric Science and Power Production" (Ref. 12).

The staff performs an independent evaluation of long-term dispersion characteristics. Release points, release characteristics, and specific locations of potential receptors of interest are identified. Each release should be characterized as continuous or intermittent. Using the criteria presented in Regulatory Guide 1.111, each release is classified as completely elevated, partially elevated, or completely ground level. Turbulent mixing of the effluent into the wake of plant structures is considered where appropriate in accordance with Regulatory Guide 1.111.

Topographic characteristics in the vicinity of the site are examined for restrictions of horizontal and/or vertical plume spread, channeling or other changes in airflow trajectories, and other unusual conditions affecting atmospheric transport and diffusion between the source and receptors of interest. Examples of conditions where modifications to standard approaches may be necessary are narrow, deep valleys; land-sea (lake) breeze regimes; and low-level subsidence inversions of temperature. "Fumigation" may be a concern for infrequent releases of short duration from elevated sources.

The atmospheric dispersion and deposition model used by the staff, XOQDOQ, is described in NUREG/CR-2919 (Ref. 13). This program provides independent meteorological evaluation of routine or anticipated intermittent releases at nuclear power stations. For unusual topographic and meteorological conditions, correction factors to the straight-line Gaussian XOQDOQ model or a variable trajectory model may be used on a case-by-case basis.

2. Atmospheric Diffusion Parameters

The vertical plume spread parameter, σ_z , as a function of distance and atmospheric stability is reviewed. Atmospheric stability should be defined by measurement of vertical temperature gradient, particularly during stable conditions. Other classification schemes (Refs. 14 and 15) may be used to estimate atmospheric stability class or to determine the plume spread parameter directly for unstable and neutral conditions. These alternative classification schemes are reviewed for appropriateness to site, plant, and release characteristics. Standard curves of σ_z with distance are presented in Regulatory Guide 1.111. Modified plume spread parameters may also be considered for unique terrain features such as deserts (Ref. 16) and large bodies of water (Ref. 17).

3. Meteorological Data

Meteorological data are reviewed for compatibility with the models utilized, representativeness of conditions within the area of interest, and representativeness of annual average meteorological characteristics in the vicinity of the plant. General criteria for collection and presentation of onsite meteorological data are stated in Regulatory Guide 1.23 and in SRP section 2.3.3. If adequate onsite meteorological data

are not available, the reviewer must ensure that adequate conservatism is applied to prevent significant underestimates of airborne concentrations and amount of material deposited.

4. **Atmospheric Dispersion and Deposition Factors Used for Routine Releases**

The atmospheric dispersion factors (χ/Q values) and deposition factors (D/Q values) used for assessment of the consequences of routine radioactive releases are reviewed for appropriateness to site conditions, plant configuration, and release characteristics.

Annual average χ/Q and D/Q values are calculated for 16 radial sectors from the site boundary to a distance of 50 miles (80 kilometers) from the plant, as well as for specific locations of potential receptors of interest (e.g., site boundary, residence, garden, cow) as identified by the applicant and as reviewed by the staff in SRP section 11.3.

Adjustments of the χ/Q and D/Q values may be necessary to reflect consideration of unusual site and/or meteorological conditions. The resulting χ/Q and D/Q values are provided to the organization responsible for the review of the calculated concentrations and dose consequences of routine airborne radioactive releases as discussed in SRP Section 11.3.

5. **Review Procedures Specific to 10 CFR Part 52 Application Type**

A. **Early Site Permit Reviews**

Subpart A to 10 CFR Part 52 specifies the requirements and procedures applicable to the Commission's review of an ESP application for approval of a proposed site. Information required in an ESP application includes a description of the site characteristics and design parameters of the proposed site. The scope and level of detail of review of data parallel that used for a CP review.

The applicant's ESP site characteristics should include the maximum χ/Q and D/Q values calculated at the specific locations of potential receptors of interest (e.g., site boundary, nearest vegetable garden, nearest resident, nearest milk animal, and nearest meat animal). If the exact plant configuration and location is not known at the ESP stage, the maximum χ/Q and D/Q values at specific locations of potential receptors of interest should be based on conservative assumptions (e.g., ground level releases with vent flow rates of zero). The staff should also issue a COL Action Item stating that a COL or CP applicant should verify specific release point characteristics and specific location of potential receptors of interest used to generate the ESP long-term (routine release) atmospheric dispersion site characteristics.

The applicant's ESP site characteristics need not include annual average χ/Q and D/Q values for 16 radial sectors from the site boundary to a distance of 50 miles (80 kilometers) from the plant. Compliance with Section II.D of Appendix I to 10 CFR 50 need not be demonstrated at the ESP stage.

In the absence of a compliance or adequate protection issue, 10 CFR 52.39 precludes the staff from imposing new site characteristics, design parameters, or terms and conditions on the early site permit at the COL stage. Accordingly, the reviewer should ensure that all physical attributes of the site that could affect the

design basis of SSCs important to safety are reflected in the site characteristics, design parameters, or terms and conditions on the early site permit.

B. Standard Design Certification Reviews

DC applications do not contain general descriptions of site characteristics because this information is site-specific and will be addressed by the COL applicant. However, pursuant to 10 CFR 52.47(a)(1), a DC applicant must provide site parameters postulated for the design. The reviewer verifies that:

1. The postulated site parameters are representative of a reasonable number of sites that may be considered within a COL application; e.g., the site parameter values should be reasonable as compared to site characteristics listed in previously docketed ESP applications;
2. The appropriate site parameters are included as Tier 1 information. This convention has been used by previous DC applicants. Site parameters are addressed in SRP Section 2.0;
3. Pertinent parameters are stated in a site parameters summary table; and
4. The applicant has provided a technical basis for each of the site parameters.

The staff should ensure that the DC applicant has included the maximum annual average site boundary χ/Q value in the list of site parameters.

C. Combined License Reviews

For a COL application referencing a certified standard design, NRC staff reviews that application to ensure sufficient information was presented to demonstrate that the characteristics of the site fall within the site parameters specified in the DC rule. Should the actual site characteristics not fall within the certified standard design site parameters, the COL applicant will need to demonstrate by some other means that the proposed facility is acceptable at the proposed site. This might be done by re-analyzing or redesigning the proposed facility.

For a COL application referencing an ESP, NRC staff reviews the application to ensure the applicant provided sufficient information to demonstrate that the design of the facility falls within the site characteristics and design parameters specified in the early site permit as applicable to this SRP section. Per 10 CFR 52.79(b)(2), should the design of the facility not fall within the site characteristics and design parameters, the application shall include a request for a variance from the ESP that complies with the requirements of §§ 52.39 and 52.93.

In addition, long-term environmental changes and changes to the region resulting from human or natural causes may have introduced changes to the site characteristics that could be relevant to the design basis. The requirements of 10 CFR 52.39 preclude the Commission from changing or imposing new site characteristics, design parameters, or terms and conditions on an ESP, unless the change is necessary to assure adequate protection of the public health and safety or to bring the permit or site into compliance with the Commission's

regulatory requirements in effect when the permit was issued. Consequently, the staff's review of a COL application referencing an ESP should not include a re-investigation of the site characteristics that have previously been accepted in the referenced ESP. However, in accordance with 10 CFR 52.6, "Completeness and Accuracy of Information," the applicant or licensee is responsible for identifying changes of which it is aware, that would satisfy the criteria specified in 10 CFR 52.39. Information provided by the applicant in accordance with 10 CFR 52.6(b) will be addressed by the staff during the review of a COL application referencing an ESP or a DC.

For a COL application referencing either an ESP or DC or both, the staff should review the corresponding sections of the ESP and DC FSER to ensure that any unresolved items, commitments, assumptions, and deferred issues identified in the FSERs are appropriately handled in the COL application.

IV. EVALUATION FINDINGS

The review should document the staff's evaluation that appropriate atmospheric dispersion models, with adequate onsite meteorological data as input to the models, have been used to calculate atmospheric dispersion and deposition factors at appropriate distances and directions from postulated release points during routine airborne releases of radioactive material. The evaluation should support the staff's conclusions as to whether the regulations are met. The reviewer should state what was done to evaluate the applicant's safety analysis report. The staff's evaluation may include verification that the applicant followed applicable regulatory guidance, performance of independent calculations, and/or validation of appropriate assumptions. The reviewer may state that certain information provided by the applicant was not considered essential to the staff's review and was not reviewed by the staff. While the reviewer may summarize or quote the information offered by the applicant in support of its application, the reviewer should clearly articulate the bases for the staff's conclusions.

The reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the following type to be included in the staff's safety evaluation report. The reviewer also states the bases for those conclusions.

1. Construction Permit, Operating License, and Combined License Reviews

The following statements should be preceded by a summary of the long term (routine release) atmospheric dispersion estimates used for the plant:

Based on the meteorological data provided by the applicant and an atmospheric dispersion model that is appropriate for the characteristics of the site and release points, the staff concludes that representative atmospheric dispersion and deposition factors have been calculated for 16 radial sectors from the site boundary to a distance of 50 miles (80 kilometers) as well as for specific locations of potential receptors of interest. The characterization of atmospheric dispersion and deposition conditions are acceptable to meet the criteria described in Regulatory Guide 1.111 and are appropriate for the evaluation to demonstrate compliance with the numerical guides for doses contained in Subpart D of 10 CFR Part 20 and Appendix I to 10 CFR Part 50.

2. Early Site Permit Reviews

The following statements should be preceded by a summary of the long term (routine release) atmospheric dispersion site characteristics to be included in any ESP that might be issued for the ESP site:

As set forth above, the applicant has provided meteorological data and an atmospheric dispersion model that is appropriate for the characteristics of the site and release points. Therefore, the staff concludes that representative atmospheric dispersion and deposition conditions have been calculated for specific locations of potential receptors of interest. The characterization of atmospheric dispersion and deposition conditions satisfies the criteria described in Regulatory Guide 1.111 and are appropriate for the evaluation to demonstrate compliance with the numerical guides for doses for any individual located offsite contained in 10 CFR Part 50, Appendix I and 10 CFR Part 20, Subpart D. Atmospheric dispersion and deposition from specific release points having specific release characteristics, as well as for 16 radial sectors from the site boundary to a distance of 50 miles (80 kilometers), will be evaluated at the combined license (COL) stage.

3. Design Certification Reviews

The following statement should be preceded by a list of the applicable long term (routine release) site parameters used for the plant:

The applicant has selected the long term (routine release) site parameters referenced above for plant design inputs (a subset of which is included as Tier 1 information), but does not claim that they are representative of any particular percentile of possible sites in the United States, and does not assert the acceptability of the basis for the choice of values with respect to siting. The long term atmospheric dispersion and deposition characteristics are site-specific and will be addressed by the COL applicant. This should include the provision of information sufficient to demonstrate that the design of the plant falls within the values of the actual site characteristics specified in a COL or CP application.

V. IMPLEMENTATION

The staff will use this SRP section in performing safety evaluations of DC applications and license applications submitted by applicants pursuant to 10 CFR Part 50 or Part 52. Except when the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the staff will use the method described herein to evaluate conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications docketed six months or more after the date of issuance of this SRP section, unless superseded by a later revision.

VI. REFERENCES

1. 10 CFR Part 20, "Standards for Protection Against Radiation," Subpart D, "Radiation Dose Limits for Individual Members of the Public."
2. 10 CFR 50.34a, "Design objectives for equipment to control releases of radioactive material in effluents-nuclear power reactors."

3. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," 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."
4. 10 CFR Part 100, "Reactor Site Criteria."
5. Regulatory Guide 1.23, "Onsite Meteorological Programs."
6. 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."
7. Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents In Routine Releases From Light-Water-Cooled Reactors."
8. Regulatory Guide 1.112, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Power Reactors."
9. Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants."
10. Regulatory Guide RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)."
11. D. H. Slade (ed.), "Meteorology and Atomic Energy - 1968," TID-24190, Division of Technical Information, USAEC (1968).
12. D. Randerson (ed.), "Atmospheric Science and Power Production," DOE/TIC-27601, Technical Information Center, USDOE (1984).
13. NUREG/CR-2919, "XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations" (September 1982).
14. S. R. Hanna, G. A. Briggs, J. Deardorff, B. A. Egan, F.A. Gifford, and F. Pasquill, "AMS Workshop on Stability Classification Schemes and Sigma Curves--Summary of Recommendations," Bulletin of the American Meteorological Society, Vol. 58, No. 12 (December 1977).
15. F. O. Hoffman (General Chairman), "Proceedings of a Workshop on the Evaluation of Modes Used for the Environmental Assessment of Radionuclide Releases," CONF-770901, Oak Ridge National Laboratory (April 1978).
16. G. R. Yanskey, E. H. Markee, and A. P. Richter, "Climatology of the National Reactor Testing Station," IDO-12048, Idaho Operations Office, USAEC (1966).
17. R. P. Hosker, Jr., "A Comparison of Estimation Procedures for Over-Water Plume Dispersion." Paper Presented at the Symposium on Atmospheric Diffusion and Air Pollution in Santa Barbara, California, American Meteorological Society (September 9-13, 1974).

PAPERWORK REDUCTION ACT STATEMENT

The information collections contained in the Standard Review Plan are covered by the requirements of 10 CFR Part 50 and 10 CFR Part 52, and were approved by the Office of Management and Budget, approval number 3150-0011 and 3150-0151.

PUBLIC PROTECTION NOTIFICATION

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

SRP Section 2.3.5 Description of Changes

This SRP section affirms the technical accuracy and adequacy of the guidance previously provided in Draft Revision 3, dated April 1996, of this SRP. See ADAMS accession number ML052070237.

In addition this SRP section was administratively updated in accordance with NRR Office Instruction, LIC-200, Revision 1, "Standard Review Plan (SRP) Process." The revision also adds standard paragraphs to extend application of the updated SRP section to prospective submittals by applicants pursuant to 10 CFR Part 52.

The technical changes are incorporated in Revision 3, dated [Month] 2007.

Review Responsibilities - Reflects changes in review branches resulting from reorganization and branch consolidation. Change is reflected throughout the SRP.

TITLE

- A. Changed title to clarify that this SRP section is applicable to evaluating atmospheric dispersion estimates for routine releases.
- B. Changed the term "diffusion" to "atmospheric dispersion."

I. AREAS OF REVIEW

- A. Added design certification (DC) as a potential type of licensing action.
- B. Changed the wording in the first paragraph from "atmospheric diffusion estimates" to "atmospheric dispersion and dry deposition estimates."
- C. Added "deposition models" to the specific areas of review in item 1.
- D. Expanded the areas of review to include other assumptions (beyond the meteorological data) used as input to the atmospheric dispersion models in item 2.
- E. Changed the terms "diffusion" and "relative concentrations" to "atmospheric dispersion" throughout the document.
- F. Listed σ_z as an example of a diffusion parameter.
- G. Added a paragraph from LIC-200 describing that additional information may be presented for 10 CFR Part 52 applicants dependent upon the type of application.
- H. Expanded the subsection on "Review Interfaces."

II. ACCEPTANCE CRITERIA

- A. Added the following applicable regulations:
 - **10 CFR 20, Subpart D** - For demonstrating compliance with dose limits for individual members of the public

- **10 CFR 50.34a** - Numerical guides for design objectives and limiting conditions for operation to meet the requirements that radioactive material in effluents released to unrestricted areas be kept as low as reasonably achievable.
 - **10 CFR 100.21(c)(2)** - For reactor applications on or after January 10, 1997 with respect to the atmospheric dispersion characteristics use in the evaluation of dose consequences.
- B. Clarified the portions of Appendix I to 10 CFR 50 which are applicable.
 - C. Added a paragraph on SRP Acceptance Criteria from LIC-200.
 - D. Added a reference to Regulatory Guide 1.23, "Onsite Meteorological Programs."
 - E. Added that RG 1.111 presents criteria for characterizing atmospheric deposition conditions.
 - F. Deleted the reference to NUREG/CR-2919 under the discussion of RG 1.111 and moved it to the Review Procedures section.
 - G. Added that deposition models should be described in detail.
 - H. Noted that calculated concentrations should be annual averages.
 - I. Changed the term "radioactive gases" to "radioactive materials."
 - J. Added that dispersion and deposition models should be reviewed for their accuracy and validity, source configuration, suitability of input parameters, and topography.
 - K. Added topography and replace "wind speed" with "atmospheric conditions" as parameters to be discussed for vertical plume spread.
 - L. Added that both onsite and regional meteorological data summaries used as input to dispersion and deposition models should be provided by the applicant.
 - M. Changed the term "atmospheric transport and diffusion" to "atmospheric dispersion and deposition" throughout the document.
 - N. Added that guidance for identifying release point characteristics is provided in RG 1.112 and the applicant's information is reviewed in SRP section 11.3.
 - O. Added the specific location of potential receptors (e.g., nearest vegetable garden, nearest resident, nearest mil animal, and nearest meat cow) of interest in each 22½ degree direction sector within a 5-mile radius of the site is required as necessary acceptance criteria. Added that guidance for identifying the location of potential receptors of interest is provided in RG 1.109 and the applicant's information is reviewed in SRP section 11.3.
 - P. Added the word "airborne" to routine radioactive gas releases.

- Q. Added a reference to RG 1.206.
- R. Added clarification for the required calculations for airborne radiological releases, including (1) maximum annual average χ/Q values and D/Q values at or beyond the site boundary and at specific location for potential receptors of interest and (2) annual average χ/Q values and D/Q values for 16 radial sectors to a distance of 50 miles.
- S. Added a reference to Regulatory Guide 1.111 for guidance on calculating χ/Q values and D/Q values.

Technical Rational

- T. Revised to link the calculation of maximum annual average χ/Q values at or beyond the site boundary, annual average χ/Q and D/Q values at specific locations of potential receptors of interest, and annual average χ/Q and D/Q values out to 50 miles to specific regulations.

III. REVIEW PROCEDURES

- A. Added standard paragraphs from LIC-200.

Atmospheric Dispersion Models

- B. Added a reference to "Atmospheric Science and Power Production - 1984" (Ref. 12).
- C. Replaced "the diffusion model used by the staff" with "the atmospheric dispersion and deposition model used by the staff".
- D. Added that correction factors to the XOQDOQ model may be used on case-by-case basis for unusual topographic and meteorological conditions.

Atmospheric Dispersion and Deposition Factors Used for Routine Releases

- E. Changed the subsection title from "Relative Concentrations Used for Routine Releases" to "Atmospheric Dispersion and Deposition Factors Used for Routine Releases."
- F. Added that the staff reviews the specific locations of potential receptors of interest in SRP Section 11.3.
- G. Added that calculated χ/Q values and D/Q values are provided to the organization responsible for the review of the calculated concentrations and dose consequences of routine airborne radioactive releases as discussed in SRP Section 11.3.

Review Procedures Specific to 10 CFR Part 52 Application Types

- H. Changed to include standard paragraphs from LIC-200.

IV. EVALUATION FINDINGS

A. Changed to include standard paragraphs from LIC-200.

V. IMPLEMENTATION

A. Changed to include standard paragraphs from LIC-200.

VI. REFERENCES

A. Added Subpart D, "Radiation Dose Limits for Individual Members of the Public" to the 10 CFR 20 reference.

B. Added the following references:

- 10 CFR 50.34a, "Design objectives for equipment to control releases of radioactive material in effluents-nuclear power reactors."
- 10 CFR 100, "Reactor Site Criteria."
- Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)."
- D. Randerson (ed.), "Atmospheric Science and Power Production," DOE/TIC-27601, Technical Information Center, USDOE (1984).