



U.S. NUCLEAR REGULATORY COMMISSION
STANDARD REVIEW PLAN
OFFICE OF NUCLEAR REACTOR REGULATION

2.3.1 REGIONAL CLIMATOLOGY

REVIEW RESPONSIBILITIES

Primary - Accident Dose Branch (AADB)

Secondary - None

I. AREAS OF REVIEW

The staff reviews information presented by the applicant for a construction permit (CP), operating license (OL), standard design certification (SDC), early site permit (ESP), or combined license (COL) concerning averages and extremes of climatic conditions and regional meteorological phenomena that could affect the safe design and siting of the plant. Where applicable, the review covers the following specific areas:

1. A description of the general climate of the region with respect to types of air masses, synoptic features (high- and low-pressure systems and frontal systems), general airflow patterns (wind direction and speed), temperature and humidity, precipitation (rain, snow, and sleet), and relationships between synoptic-scale atmospheric processes and local (site) meteorological conditions.
2. Seasonal and annual frequencies of severe weather phenomena, including hurricanes, tornadoes and waterspouts, thunderstorms, lightning, hail (including probable maximum size), freezing rain (ice storms), dust (sand storms), and high air pollution potential.
3. Meteorological conditions identified as (1) site characteristics for ESP applications, (2) design and operating bases for CP, OL, and COL applications, and (3) site parameters for SDC applications, including the following:
 - a. The weight of the 100-year return period snowpack and the weight of the 48-hour probable maximum winter precipitation (PMWP) for use in determining the weight of snow and ice on the roofs of safety-related structures.
 - b. The ultimate heat sink (UHS) meteorological conditions resulting in the maximum evaporation and drift loss of water, minimum water cooling, and, if applicable, the potential for water freezing in the UHS water storage facility.

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USNRC STANDARD REVIEW PLAN

Standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for the review of applications to construct and operate nuclear power plants. These documents are made available to the public, as sections of NUREG-0800, as part of the NRC's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Standard review plans are not substitutes for regulatory guides or the NRC's regulations, and compliance with them is not required. The standard review plan sections are keyed to the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (Regulatory Guide 1.70). Not all sections of the standard format have a corresponding review plan.

Public comments are being solicited on this draft Standard Review Plan section. Comments should be accompanied by appropriate supporting data. Written comments may be submitted to the Rules and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Comments may be submitted electronically by email to NRCREP@nrc.gov or through the NRC's Draft NUREG-Series Publications for Comment Web page at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/docs4comment.html>. The comment period is 60 days from issuance of a notice of availability in the *Federal Register*. The notice of availability is expected within 1 week of publication of this standard review plan section. Comments submitted after the comment period will be considered as long as it is practicable to do so.

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/#c2>, or in the NRC's Agencywide Documents Access and Management System (ADAMS), at <http://www.nrc.gov/reading-rm/adams.html>, under Accession #ML053570372.

- c. The tornado parameters (including maximum wind speed, translational speed, rotational speed, and maximum pressure differential with the associated time interval) to be used in establishing pressure and tornado missile loadings on structures, systems, and components (SSCs) important to safety.
- d. The 100-year return period (straight-line) 3-second gust wind speed to be used in establishing wind loading on plant structures.
- e. Ambient temperature and humidity statistics (e.g., 0.4%, 2%, 99%, and 99.6% annual exceedance dry-bulb temperatures; 0.4% annual exceedance wet-bulb temperature; 100-year return period maximum dry-bulb and wet-bulb temperatures; 100-year return period minimum dry-bulb temperature) for use in establishing heat loads for the design of normal plant heat sink systems, post-accident containment heat removal systems, and plant heating, ventilating, and air conditioning systems.
- f. Other meteorological and air quality conditions identified by the applicant as climate site characteristics for ESP applications or used as design and operating bases for CP, OL, or COL applications.

Review Interfaces

The reviewer provides findings on site meteorological conditions to the Geosciences & Civil Engineering Branch (EGCB) and other branches, as necessary, to ensure that SSCs important to safety are adequately designed. The EGCB, under SRP Section 2.3.6 (proposed), reviews the adequacy of the site parameter envelope specified in SDC applications.

II. ACCEPTANCE CRITERIA

The information regarding the regional meteorological conditions and phenomena that could affect the design and siting of the plant may be expressed as actual climatic site characteristics for CP, OL, COL, or ESP licensing actions or as part of the site parameter envelope for SDC licensing actions. The information is acceptable if it meets the requirements of the following regulations:

1. 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," with respect to information on severe regional weather phenomena that have historically been reported for the region and are reflected in the design bases for SSCs important to safety
2. 10 CFR Part 50, Appendix A, GDC 4, "Environmental and Dynamic Effects Design Bases," with respect to information on tornadoes that could generate missiles
3. 10 CFR Part 100, §100.10(c)(2), §100.20(c)(2), and §100.21(d) with respect to the consideration given to the regional meteorological characteristics of the site

Although an ESP applicant need not demonstrate compliance with the GDC with respect to regional climatology, the ESP applicant should propose climate site characteristics that will form a set of minimum values for the design and construction of a new plant to be built at the site.

The information should be presented and substantiated in accordance with acceptable practice and data as promulgated by the National Oceanic and Atmospheric Administration (NOAA), industry standards, and regulatory guides.

Regulatory positions and specific criteria necessary to meet the Commission's regulations identified above are as follows:

1. The description of the general climate of the region should be based on standard climatic summaries compiled by NOAA (e.g., References 4, 5). Consideration of the relationships between regional synoptic-scale atmospheric processes and local (site) meteorological conditions should be based on appropriate meteorological data (e.g., References 5, 6).
2. Data on severe weather phenomena should be based on standard meteorological records from nearby representative National Weather Service (NWS), military, or other stations recognized as standard installations that have long periods of data on record (e.g., References 5, 6, 7). The applicability of these data to represent site conditions during the expected period of reactor operation must be substantiated.
3. The tornado parameters should be based on Regulatory Guide 1.76 (Reference 8). Alternatively, an applicant may specify any tornado parameters that are appropriately justified, provided that a technical evaluation of site-specific data is conducted.
4. The basic (straight-line) 100-year return period 3-second gust wind speed should be based on appropriate standards, with suitable corrections for local conditions (e.g., References 9, 10).
5. In accordance with Regulatory Guide 1.27 (Reference 11), the UHS meteorological data that would result in the maximum evaporation and drift loss of water and minimum water cooling should be based on long-period regional records that represent site conditions. If applicable, the potential for water freezing in the UHS water storage facility should also be analyzed. The maximum accumulated degree-days below freezing recorded in the site region during the winter (or during the worst-case freezing spell in warmer climates) may be a reasonable conservative site characteristic for evaluating the potential for water freezing in a UHS water storage facility. Suitable information should be compiled from at least 30 years of meteorological data found in databases for nearby representative locations (e.g., References 12, 13, 14).
6. Consistent with the staff's branch position on winter precipitation loads (Reference 15), the winter precipitation loads to be included in the combination of normal live loads to be considered in the design of a nuclear power plant that might be constructed on the proposed site should be based on the weight of the 100-year snowpack or snowfall, whichever is greater, recorded at ground level. Likewise, the winter precipitation loads to be included in the combination of extreme live loads to be considered in the design of a nuclear power plant that might be constructed on the proposed site should be based on the weight of the 100-year snowpack at ground level plus the weight of the 48-hour PMWP at ground level for the month corresponding to the selected snowpack. A CP, OL, or COL applicant may choose and justify an alternative method for defining the extreme winter precipitation load by demonstrating that the 48-hour PMWP could neither fall nor remain on the top of the snowpack and/or building roofs.

The weight of the 100-year return period snowpack should be based on data recorded at nearby representative climatic stations (e.g., Reference 16) or obtained from appropriate standards with suitable corrections for local conditions (e.g., References 9, 10). For the purposes of determining the extreme winter precipitation load, the 48-hour PMWP is defined as the theoretically greatest depth of precipitation for a 48-hour period that is physically possible over a 25.9-square-kilometer (10-square-mile) area at a particular geographical location during the winter months (e.g., December, January, February). The weight of the 48-hour PMWP should be determined in accordance with reports published by NOAA's Hydrometeorological Design Studies Center (e.g., References 17–21).

7. Ambient temperature and humidity statistics should be derived from data recorded at nearby representative climatic stations (e.g., Reference 22) or obtained from appropriate standards with suitable corrections for local conditions (e.g., Reference 10). Reference 22 provides a method for estimating 100-year return period extreme temperature values as a function of annual extreme temperature values.
8. High air pollution potential information should be based on U.S. Environmental Protection Agency (EPA) studies (e.g., References 23, 24).
9. All other meteorological and air quality conditions identified by the applicant as climate site characteristics for ESP applications or used as design and operating bases for CP, OL, or COL applications should be documented and substantiated.

Technical Rationale

The technical rationale for application of these acceptance criteria is as follows:

1. Compliance with GDC 2 requires that nuclear power plant SSCs important to safety must be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions.

To ensure that the nuclear plant is designed to withstand specified natural phenomena associated with the meteorology of the region in which the nuclear plant is to be sited, it is necessary to specify the most severe meteorological event that may occur as a function of frequency of occurrence. Thus, historical data must be obtained from regional observation of snow and ice load; meteorological conditions affecting the ultimate heat sink; tornado parameters; wind speed; etc. To meet GDC 2 requirements for all meteorological phenomena, appropriate consideration must be given to the most severe natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. These data are then used to specify plant design requirements for a CP, OL, or COL, or climatic site characteristics in the case of an ESP, thereby ensuring that components will continue to function as required.

Meeting these requirements will provide assurance that equipment and structures will be designed to withstand the effects of natural phenomena, thus minimizing the probability that climatology-related natural phenomena will initiate an accident or prevent safety systems from performing their intended functions.

2. Compliance with GDC 4 requires that SSCs important to safety must be designed to accommodate the effects of, and be compatible with, environmental conditions associated with normal operation, maintenance, testing, and postulated accidents. The criterion also requires that such SSCs must be appropriately protected against dynamic effects, including missiles.

The requirements of GDC 4 are imposed on facility structures and other components that may be subject to tornado-generated missiles. Tornado missiles could cause loss of function for some safety-related structures or components, thereby compromising the safety of the nuclear plant.

Meeting these requirements will provide assurance that tornado-generated missiles will not result in loss of function for safety-related portions of the nuclear plant.

3. 10 CFR Part 100, §100.10(c)(2), §100.20(c)(2), and §100.21(d), specify that meteorological conditions at or near the site should be considered when evaluating the acceptability of proposed sites for nuclear power plants.

The requirement to consider meteorological conditions at or near the site of a proposed nuclear power plant is imposed to provide assurance that these conditions will not compromise the safety of the nuclear plant. Accordingly, plants must be designed to withstand the effects of all forms of severe weather historically associated with the proposed site, including snow, ice, rain, high winds, tornadoes, dust, sand, and any other meteorological condition that may affect the safe operation of the plant.

Meeting this requirement provides assurance that severe weather conditions will not compromise the safety of the proposed nuclear power plant.

III. REVIEW PROCEDURES

The procedures outlined below are used to review CP applications, ESP applications, and COL applications that do not reference an ESP to determine whether the meteorological data and analyses for the proposed site meet the acceptance criteria given in Subsection II of this SRP section. For reviews of OL applications, these procedures are used to verify that the meteorological data and analyses remain valid and that the facility's design specifications are consistent with these data. Reviews of OLs and COLs include a determination that the content and intent of technical specifications related to continued meteorological surveillance are acceptable and consider any identified unique meteorological conditions.

1. General Climate

The general climatic description of the region in which the site is located is reviewed for completeness and authenticity. Climatic descriptions of air masses, general airflow, pressure patterns, frontal systems, and temperature and humidity conditions reported by the applicant are checked against standard references (References 5, 6) for appropriateness with respect to location and period of record.

The applicant's description of the role of synoptic-scale atmospheric processes on local (site) meteorological conditions is checked against the descriptions provided in References 5 and 6.

2. Regional Meteorological Averages and Extremes

Estimates of meteorological averages and extremes are best obtained from stations that have long periods of record. Meteorological stations used to describe the regional climatology may not be near the site, with the possible exception of stations at existing nuclear power plants near which the site might be located. Therefore, one primary concern of this review is to determine the representativeness of the available data for the site. Proximity to the site and differences in topography, terrain elevation, land use (e.g., urban versus rural), and closeness to large bodies of water between the site and an offsite data source should be taken into consideration when evaluating the representativeness of an offsite data source. The adequacy of the meteorological stations and their data are also evaluated.

Meteorological averages and extremes are checked against standard publications to determine whether the site characteristics are reasonable for ESP applications or design and operating bases for CP, OL, or COL applications. Climatological data summaries suitable for review of the applicant's values are published by organizations such as the American Society of Civil Engineers (e.g., Reference 9), American Society of Heating, Refrigerating, and Air-Conditioning Engineers (e.g., Reference 22), and American Standards Institute. Climatological data suitable for use in this review are available from NOAA's National Climatic Data Center. For example, the Engineering Weather Data CD-ROM (Reference 10) contains data summaries prepared by the U.S. Air Force Combat Climatology Center.

3. Early Site Permit Reviews

Subpart A to 10 CFR Part 52 specifies the requirements and procedures applicable to the Commission's issuance of ESPs for approval of a proposed site. Information required for an ESP includes the number, type, and thermal power level of the facilities for which the site may be used; the types of cooling systems used; and a description of the meteorological characteristics of the proposed site. For an ESP permit, the scope and level of detail for reviewing meteorological data parallel those used for a CP review. The applicant should propose climate site characteristics that will form a set of minimum values for the design and construction of a new plant to be built at the site.

In identifying the climate site characteristics for an ESP application, the reviewer should ensure that the applicant has considered a full range of severe natural phenomena relevant to the locale for which an ESP is being sought. The ESP needs to resolve all issues with respect to the severity of natural phenomena under GDC 2 that may arise for a future design. In the absence of the compliance or adequate protection issue, 10 CFR 52.39 precludes the staff from revisiting the site characteristics 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 climatic site characteristics.

4. Standard Design Certification Reviews

SDC applications do not contain general climatic descriptions because this information is site-specific and will be addressed by the COL applicant. However, the SDC applicant must provide meteorological site parameters postulated for the design. The reviewer verifies that meteorological parameters in the site parameter envelope are consistent with the acceptance criteria given in Subsection II of this SRP section and the appropriate meteorological site parameters are included as Tier 1 information per SRP Section 14.3.1.

5. Combined License Reviews

For a COL application referencing a certified standard design, the actual climatic site characteristics for the proposed site should be bounded by the meteorological site parameters identified in the site parameter envelope included in the SDC application. Should the certified standard design site parameters not encompass the actual site characteristics, 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 reanalyzing or redesigning the proposed facility.

For a COL application referencing an ESP, long-term climatic change resulting from human or natural causes may have introduced changes in climate trends that should be factored into design conditions. Consequently, the procedures discussed above should be followed to ensure the ESP site is still in compliance with the terms and conditions of the ESP (e.g., ensure that there is no new and significant information based on advances in climatology that shows that the climatic site characteristics no longer represent the site's extreme weather conditions due to climate change). If the ESP site is found to be no longer in compliance with the terms and conditions of the ESP, the staff should seek to modify the ESP or impose requirements on the site in accordance with the provisions of 10 CFR 52.39, if necessary, to bring the site into compliance with Commission requirements to ensure adequate protection of public health and safety.

The review should document the staff's evaluation of regional climatology against the relevant regulatory criteria. 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 submittal. The staff's evaluation may include verification that the applicant followed applicable regulatory guidance, performance of independent calculations, and/or validation that the appropriate assumptions were made. 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.

IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided and that the staff's evaluation supports concluding statements of the following types to be included in the staff's safety evaluation report.

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

The following statements should be preceded by a resume of the general climate and meteorological design parameters used for the plant:

As set forth above, the applicant has presented and substantiated information relative to the regional meteorological conditions important to the design and siting of this plant. The staff has reviewed the available information provided and, for the reasons given above, concludes that the identification and consideration of the meteorological characteristics at the site and in the surrounding area are acceptable and meet the requirements of 10 CFR 100.10(c)(2) [for CP and OL reviews] or 100.20(c) and 100.21(d) [for COL reviews] with respect to determining the acceptability of the site.

The staff finds that the applicant has considered the most severe regional weather phenomena in establishing the design bases for SSCs important to safety. The staff has generally accepted the methodologies used to determine the severity of the weather phenomena reflected in these design bases, as documented in safety evaluation reports for previous licensing actions. Accordingly, the staff concludes that the use of these methodologies results in design bases containing margin sufficient for the limited accuracy, quantity, and period of time in which the data have been accumulated. The staff concludes that the identified design bases meet the requirement of 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," with respect to establishing the design basis for SSCs important to safety.

The applicant has conformed with the position set forth in Regulatory Guide 1.76 (or has conducted a technical assessment of site-specific tornado data sufficient to justify tornado parameters that deviate from Regulatory Guide 1.76). The staff finds that these tornado parameters are acceptable and meet the requirements of 10 CFR Part 50, Appendix A, General Design Criterion 4, "Environmental and Dynamic Effects Design Bases," with respect to determining the design-basis tornado for the generation of missiles.

2. Early Site Permit Reviews

The following statements should be preceded by a resume of the general climate and a description of the climatic site characteristics to be included in any ESP that might be issued for the ESP site:

As set forth above, the applicant has presented and substantiated information relative to the regional meteorological conditions important to the design and siting of a nuclear power plant or plants falling within the applicant's plant parameter envelope that might be constructed on the proposed site. The staff has reviewed the available information provided and, for the reasons given above, concludes

that the identification and consideration of the climatic site characteristics set forth above are acceptable and meet the requirements of 10 CFR 100.20(c) and 10 CFR 100.21(d).

The staff finds that the applicant has considered the most severe regional weather phenomena in establishing the above site characteristics. The staff has generally accepted the methodologies used to determine the severity of the weather phenomena reflected in these site characteristics, as documented in safety evaluation reports for previous licensing actions. Accordingly, the staff concludes that the use of these methodologies results in site characteristics containing sufficient margin for the limited accuracy, quantity, and period of time in which the data have been accumulated. In view of the above, the site characteristics previously identified are acceptable for use as part of the design bases for SSCs important to safety, as may be proposed in a COL or CP application.

The applicant has conformed with the position set forth in Regulatory Guide 1.76 (or has conducted a technical assessment of site-specific tornado data sufficient to justify tornado site characteristics that deviate from Regulatory Guide 1.76). Therefore, the staff concludes that the identification and consideration of tornadoes are acceptable and that the resulting tornado site characteristics are acceptable for the tornado used for the generation of missiles.

The staff reviewed the applicant's proposed site characteristics related to climatology for inclusion in an ESP for the applicant's site, should one be issued, and finds these characteristics to be acceptable.

3. Design Certification Reviews

The following statement should be preceded by a resume of the meteorological design parameters used for the plant:

The NRC staff acknowledges that the applicant has selected the 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 regional climatology is 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 site parameters specified by the siting review.

V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this SRP section.

The NRC staff will use this SRP section in performing safety evaluations of license applications submitted by applicants pursuant to 10 CFR Part 50 or 10 CFR Part 52. Except in those cases in which 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 in its evaluation of conformance with Commission regulations.

The provisions of this SRP section apply to reviews of applications docketed 6 months or more after the date of issuance of this SRP section.

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides.

VI. REFERENCES

1. 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."
2. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."
3. 10 CFR Part 100, "Reactor Site Criteria."
4. U.S. Department of Commerce, "Climate Atlas of the United States," CD-ROM, National Climatic Data Center, NOAA.
5. U.S. Department of Commerce, "Local Climatological Data — Annual Summary with Comparative Data," National Climatic Data Center, NOAA, published annually for all first-order NWS stations.
6. U.S. Department of Commerce, "State Climatological Summary," National Climatic Data Center, NOAA, published annually by State.
7. U.S. Department of Commerce, "Storm Data," National Climatic Data Center, NOAA, published monthly.
8. Regulatory Guide 1.76, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants."
9. ASCE Standard No. 7-05, "Minimum Design Loads for Buildings and Other Structures," ASCE/SEI 7-05, American Society of Civil Engineers, 2006.
10. U.S. Department of Commerce, "Engineering Weather Data," CD-ROM, National Climatic Data Center, NOAA.
11. Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants."
12. U.S. Department of Commerce, "Solar and Meteorological Surface Observational Network (SAMSON)," 3-volume CD-ROM set divided geographically into regions (Eastern, Central, and Western United States) covering 1961–1990, National Climatic Data Center, NOAA.
13. U.S. Department of Commerce, "Hourly United States Weather Observations 1990–1995," CD-ROM, National Climatic Data Center, NOAA.
14. U.S. Department of Commerce, "Integrated Surface Hourly Observations," 24-volume CD-ROM set divided by geographic region and time period covering 1995–2002, National Climatic Data Center, NOAA.

15. "Site Analysis Branch Position — Winter Precipitation Loads," NRC memorandum from H.R. Denton to R.R. Maccary, March 24, 1975, available in ADAMS under Accession #ML050630277.
16. U.S. Department of Commerce, "NCDC Cooperative Station Data," 3-volume CD-ROM set divided geographically into regions (Eastern, Central, and Western United States) with the period-of-record varying among stations but falling within the period from the 1850s through 2001, National Climatic Data Center, NOAA.
17. U.S. Department of Commerce, "Probable Maximum Precipitation Estimates: Colorado River and Great Basin Drainage," Hydrometeorological Report No. 49, NOAA, Reprinted 1984.
18. U.S. Department of Commerce, "Seasonal Variation of 10-Square-Mile Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," Hydrometeorological Report No. 53, NOAA, April 1980.
19. U.S. Department of Commerce, "Probable Maximum Precipitation Estimates: United States, Between the Continental Divide and the 103rd Meridian," Hydrometeorological Report No. 55A, NOAA, June 1988.
20. U.S. Department of Commerce, "Probable Maximum Precipitation: Pacific Northwest States, Columbia River (including portions of Canada), Snake River and Pacific Coastal Drainages," Hydrometeorological Report No. 57, NOAA, October 1994.
21. U.S. Department of Commerce, "Probable Maximum Precipitation for California," Hydrometeorological Report No. 59, NOAA, February 1999.
22. American Society of Heating, Refrigeration, and Air Conditioning Engineers, "2005 ASHRAE Handbook — Fundamentals," 2005.
23. G.C. Holzworth, "Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States," AP-101, Office of Air Programs, EPA, January 1972.
24. J. Korshover, "Climatology of Stagnating Anticyclones East of the Rocky Mountains, 1936–1970," Publication No. 99-AP-34, Public Health Service, October 1971.

Paperwork Reduction Act Statement

The information collections contained in the Standard Review Plan are covered by the requirements of 10 CFR Part 50, which the Office of Management and Budget (OMB) approved under OMB control number 3150-0011.

Public Protection Notification

The NRC may neither conduct, nor 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.

Description of Changes

1. Review Responsibilities
 - a. Revised the name of the primary review branch to reflect the NRC's current organizational structure.

2. Areas of Review
 - a. Listed construction permits (CPs), operating licenses (OLs), standard design certifications (SDCs), early site permits (ESPs), and combined licences (COLs) as the types of licensing actions covered by SRP Section 2.3.1.
 - b. Added hurricanes to the list of severe weather phenomena to be described.
 - c. Moved freezing rain (ice storms) and dust (sand storms) from the list of meteorological conditions to be considered for design and operating bases to the list of severe weather phenomena to be described. Freezing rain (ice storms) and dust (sand storms) have not typically impacted the design and operating bases for nuclear power plants.
 - d. Clarified that severe weather phenomena to be considered for design and operating bases should be included in lists of (1) site characteristics for ESP applications; (2) design and operating bases for CP, OL, and COL applications; and (3) site parameters for SDC applications.
 - e. Clarified that the severe weather phenomena to be considered in determining the weight of snow and ice on the roofs of safety-related structures should include the weight of the 100-year return period snowpack and the 48-hour probable maximum winter precipitation (PMWP). This change reflects guidance provided in the staff's branch position on winter precipitation loads (Reference 15).
 - f. Added the potential for water freezing in the UHS water storage facility as a type of meteorological condition to be considered for design and operating bases.
 - g. Clarified that the tornado maximum wind speed should be one of the tornado parameters to be considered for design and operating bases.
 - h. Replaced the 100-year return period "fast mile of wind" with the 100-year return period "3-second gust wind speed" as a type of meteorological condition to be considered for design and operating bases. The 3-second gust wind speed is the definition of the "basic" wind speed specified in ASCE/SEI building load Standard No. 7-05 (Reference 9). Also eliminated references to vertical profiles and gust factors because these parameters are no longer inputs to the ASCE/SEI 7-05 building wind load designs.

- i. Eliminated the April 1996 draft version reference to maximum rainfall rate as a type of meteorological condition to be considered for design and operating bases. The applicant's estimates of local probable maximum precipitation are reviewed as part of the staff's evaluation of the effects of local intense precipitation in SRP Section 2.4.2, "Floods."
 - j. Added ambient temperature and humidity extremes as types of meteorological conditions to be considered for design and operating bases.
 - k. Added a subsection on "Review Interfaces."
3. Acceptance Criteria
- a. Replaced the term "actual measured values" with "actual climatic site characteristics." Some of the meteorological conditions considered for design and operating bases are not actual measured values but are statistically extrapolated values (e.g., 100-year return period 3-second gust wind speed, 48-hour probable maximum winter precipitation).
 - b. Added 10 CFR 100.20(c)(2) and 100.21(d), to the list of applicable regulations. These regulations pertain to evaluation factors for stationary power reactor site applications submitted on or after January 10, 1997.
 - c. Clarified that ESP applicants need not demonstrate compliance with either GDC 2 or GDC 4 with respect to regional climatology.
 - d. Eliminated the April 1996 draft version reference to SECY-93-087 as a basis for utilizing a maximum tornado wind speed of 482 km/hr (300 mph). Revision 1 of Regulatory Guide 1.76 will show a maximum design-basis wind speed of 134 m/sec (300 mph). Also added that an applicant may specify any tornado site characteristics that are appropriately justified, provided that a technical evaluation of site-specific data is conducted.
 - e. Added that the 100-year return period 3-second gust wind speed should be based on appropriate standards (e.g., ASCE/SEI 7-05, Reference 9).
 - f. Added that the potential for water freezing in the UHS water storage facility should be analyzed and that the maximum accumulated degree-days below freezing recorded in the site region during the winter (or during the worst case freezing spell in warmer climates) may be a reasonable conservative site characteristic for evaluating the potential for water freezing in the UHS water storage facility. Also added that suitable UHS meteorological data should be compiled from at least 30 years of meteorological data found in databases for nearby representative locations.
 - g. Eliminated reference to NWS station data as a source for freezing rain estimates. Freezing rain has been removed from the list of meteorological conditions typically considered for design and operating bases.

- h. Added discussion that, in order to be consistent with the staff's branch position on winter precipitation loads (Reference 15), the winter precipitation normal live loads should be based on the 100-year snowpack and the winter precipitation extreme live loads should be based on the 100-year snowpack plus the 48-hour PMWP. Also added that the 48-hour PMWP should be determined in accordance with NOAA's hydrometeorological reports (References 17–21).
 - i. Added guidance for determining ambient temperature and humidity climatic data.
 - j. Added a subsection on "Technical Rationale."
4. Review Procedures
- a. Added criteria to be considered when evaluating the representativeness of an offsite data source.
 - b. Updated climatic data references, including eliminating reference to WASH-1300 as a basis for verifying tornado data.
 - c. Clarified that an ESP applicant's climatic site characteristics should form a set of minimum design values for the proposed nuclear power plant. Also added that 10 CFR 52.39 states that, in the absence of a compliance or adequate protection issue, the staff is precluded from visiting site characteristics at the COL stage.
 - d. Clarified that SDC applications need not contain general climatic descriptions.
 - e. Eliminated the April 1996 draft version reference to inspections, tests, analysis, and acceptance criteria (ITAAC) for SDC application reviews. The ITAAC associated with this specific issue would be associated with plant design/construction, which is reviewed in other SRP sections.
 - f. Added a subsection on COL reviews.
 - g. Added a paragraph directing the staff to summarize and document its technical review of regional climatology against relevant regulatory criteria.
5. Evaluation Findings
- a. Provided separate evaluation finding statements for (1) CP, OL, and COL reviews, (2) ESP reviews, and (3) SDC reviews.
 - b. Eliminated the April 1996 draft version reference to inspections, tests, analysis, and acceptance criteria (ITAAC) for SDC application reviews. The ITAAC associated with this specific issue would be associated with plant design/construction, which is reviewed in other SRP sections.
6. Implementation
- a. Added references to both 10 CFR Part 50 and 10 CFR Part 52.

7. References

- a. Eliminated references to Thom's 1968 paper, "New Distribution of Extreme Winds in the United States," and the US Atomic Energy Commission's 1974 WASH-1300 Report, "Technical Basis for Interim Regional Tornado Criteria."
- b. Replaced reference to ANSI A58.1-1972 with reference to ASCE/SEI 7-05 (Reference 9).
- c. Added references to 10 CFR Part 52 (Reference 2), NOAA's "Engineering Weather Data" CD-ROM (Reference 10), NOAA's hourly surface observation CD-ROM data sets (References 12–14), the staff's branch position on winter precipitation loads (Reference 15), NOAA's cooperative station CD-ROM data set (Reference 16), NOAA's hydrometeorological reports (References 17-21), and ASHRAE's Handbook — Fundamentals (Reference 22).