



## U.S. NUCLEAR REGULATORY COMMISSION

# STANDARD REVIEW PLAN

### 2.3.1 REGIONAL CLIMATOLOGY

#### REVIEW RESPONSIBILITIES

**Primary** - Organization responsible for the review of regional climatic site characteristics

**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 averages and extremes of climatic conditions and regional meteorological phenomena that could affect the safe design and siting of the plant. This SRP section applies to reviews performed for each of these types of applications. 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, sleet, and freezing rain), potential influences from regional topography, and relationships between synoptic-scale atmospheric processes and local (site) meteorological conditions.

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#### USNRC STANDARD REVIEW PLAN

This Standard Review Plan, NUREG-0800, has been prepared to establish criteria that the Office of Nuclear Reactor Regulation 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) will be based on Regulatory Guide DG-1145, "Combined License Applications for Nuclear Power Plants (LWR Edition)," until the SRP itself is updated.

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](mailto: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](mailto: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](#).

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2. Annual (and seasonal, if available) frequencies of severe weather phenomena, including hurricanes, tornadoes and waterspouts, thunderstorms, severe wind events, lightning, hail (including probable maximum size), and high air pollution potential.
3. Annual frequency of occurrence and time duration of freezing rain (ice storms) and dust (sand) storms where applicable.
4. Identification of the state climatic division(s) for the site.
5. The site's air quality, including the site's Air Quality Control Region (AQCR) and its attainment designation with respect to state and national ambient air quality standards.
6. 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 DC 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.
  - 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. All other regional meteorological and air quality conditions that should be classified as climatic site characteristics for ESP applications or used as design and operating bases for CP, OL, or COL applications.

All references to FSAR sections in which these conditions are used should be identified by the applicant.

7. Additional Information for 10 CFR Part 52 Applications: Additional information will be presented depending 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. The reviewer provides findings on extreme climatic conditions and regional meteorological phenomena that could affect the safe design and siting of the plant to the reviewers of the appropriate subsections within SRP Chapter 3, as necessary, to ensure that SSCs important to safety are adequately designed.
2. 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 Section 14.3 submitted by the applicant is performed under SRP Section 14.3.1, "Site Parameters (Tier 1)."

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 Part 50, Appendix A, General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," as it relates to consideration of the most severe of the 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;
2. 10 CFR Part 50, Appendix A, GDC 4, "Environmental and Dynamic Effects Design Bases," as it relates 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;
4. For ESP applications, GDC are not applicable. The GDC 2 requirement to identify climatic site characteristics that consider the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated is specifically identified in 10 CFR 50.17(a)(1)(vi).

### SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are as follows for each review described in Subsection I of 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.

Generally, 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.

1. The description of the general climate of the region should be based on standard climatic summaries compiled by NOAA (e.g., References 5, 6). 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 6, 7).
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 6, 7, 8). The applicability of these data to represent site conditions during the expected period of reactor operation should be substantiated.
3. The tornado parameters should be based on Regulatory Guide 1.76 (Reference 9). Alternatively, an applicant may specify any tornado parameters that are appropriately justified, provided that a technical evaluation of site-specific data is conducted. **Any deviations from Regulatory Guide 1.76 should be identified by the applicant.**
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 10, 11).
5. In accordance with Regulatory Guide 1.27 (Reference 12), 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 13, 14, 15). **The bases and procedures used to select critical meteorological data should be provided and justified.**
6. Consistent with the staff's branch position on winter precipitation loads (Reference 16), 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. **Depending on the location of the site, the 48-hour PMWP may not necessarily be in the form of frozen precipitation.** 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 17) or obtained from appropriate standards with suitable corrections for local conditions (e.g., References 10, 11). 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 those months with the historically highest snowpacks. 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 18–22).

7. Ambient temperature and humidity statistics should be derived from data recorded at nearby representative climatic stations (e.g., Reference 23) or obtained from appropriate standards with suitable corrections for local conditions (e.g., Reference 10). Reference 23 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 24, 25).
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 requirements to reviewing this SRP section is discussed in the following paragraph:

1. GDC 4 requires that structures, systems, and components (SSCs) important to safety be appropriately protected against dynamic effects that may result from events and conditions outside the nuclear power unit. GDC 2 (or 10 CFR 52.17(a)(1)(vi) for ESP applications) requires consideration of the most severe of the natural phenomena. 10 CFR 100.10(c)(2) and 100.20(c)(2) require meteorological characteristics of the site that are necessary for safety analysis or that may have an impact upon plant design (such as maximum probable wind speed and precipitation) to be identified and characterized, so that they may be taken into consideration in determining the acceptability of the site. 10 CFR 100.21(d) requires physical characteristics of the site, including meteorology, to be evaluated and site parameters established such that potential threats from such physical characteristics will pose no undue risk to the type of facility proposed to be located at the site. Application of GDC 2 (or 10 CFR 52.17(a)(1)(vi) for ESP applications), GDC 4, 10 CFR 100.10(c)(2), 100.20(c)(2), and 10 CFR 100.21(d) provides assurance that the most severe meteorological conditions at the chosen plant site have been identified.

### III. REVIEW PROCEDURES

The staff will select and emphasize 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 determine whether 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 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 regional climatology is acceptable and whether the technical specifications reflect consideration of any identified unique conditions.

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

### 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 6, 7) 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 6 and 7.

### 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 might 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 is 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 10), American Society of Heating, Refrigerating, and Air-Conditioning Engineers (e.g., Reference 23), 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 11) contains data summaries prepared by the U.S. Air Force Combat Climatology Center. **The historical data used to characterize a site should extend over a significant time interval to capture cyclical extremes. Current literature on possible changes in the weather in the site region should also be reviewed to be confident that the methods used to predict weather extremes are reasonable.**

### 3. Air Quality

**The site's air quality should be described in detail, including identification of the site's AQCR and its attainment designation with respect to state and national ambient air**

quality standards. The designation of AQCRs can be found in Subpart B, "Designation of Air Quality Control Regions," to 40 CFR Part 81, "Designation of Areas for Air Quality Planning Purposes," and AQCR attainment status with regard to national ambient air quality standards can be found in Subpart C, "Section 107 Attainment Status Designations," of 10 CFR Part 81.

#### 4. Review Procedures Specific to 10 CFR 52 Application Types

##### 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.

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 of 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 should be 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 per SRP Section 14.3.1;
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.

##### c. Combined License Reviews

For a COL application referencing a certified standard design, NRC staff reviews that application to ensure that 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 that application to ensure that the applicant has 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. Should the design of the facility not fall within the site characteristics and design parameters, the application should 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 FSERs 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 of site characteristics with the respect to 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 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 site characteristics and parameters used for the plant:

As set forth above, the applicant has presented and substantiated information to establish the regional meteorological characteristics. The staff has reviewed the information provided and, for the reasons given above, concludes that the applicant has established the meteorological characteristics at the site and in the surrounding area acceptable to meet the requirements of 10 CFR 100.10(c)(2) [for applications before January 10, 1997] or 100.20(c)(2) and 100.21(d) [for applications on or after January 19, 1997] with respect to determining the acceptability of the site.

The staff finds that the applicant has considered the most severe natural phenomena historically reported for the site and surrounding area in establishing the design bases for SSCs important to safety. Specifically, the staff has accepted the methodologies used to analyze these natural phenomena and determine the severity of the weather phenomena reflected in these design bases, as documented in safety evaluation reports for previous licensing actions. Because the applicant has correctly implemented these methodologies, as described above, the staff has determined that the applicant has considered these historical phenomena with 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 requirements of 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," with respect to considering severe natural phenomena in establishing the design basis for SSCs important to safety.

The staff finds that 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 summary of the 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 to establish the regional meteorological characteristics. The staff has reviewed the information provided and, for the reasons given above, concludes that the applicant has established site characteristics and design parameters acceptable to meet the requirements of 10 CFR 100.20(c)(2) and 100.21(d).

The staff finds that the applicant has considered the most severe natural phenomena historically reported for the site and surrounding area in establishing the design bases for SSCs important to safety. Specifically, the staff has accepted the methodologies used to analyze these natural phenomena and determine the severity of the weather phenomena reflected in these design bases, as documented in safety evaluation reports for previous licensing actions. Because the applicant has correctly implemented these methodologies, as described above, the staff has determined that the applicant has considered these historical phenomena with margin sufficient for the limited accuracy, quantity, and period of time in which the data have been accumulated. In addition, the staff finds that 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; therefore, the staff concludes that the identified design bases meet the requirements of 10 CFR 52.17(a)(1)(vi) with respect to considering severe natural phenomena in establishing the design basis for SSCs important to safety.

### 3. Design Certification Reviews

The following statement should be preceded by a list of the applicable site parameters used for the plant:

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 values of the actual site characteristics specified in COL or CP application.

## V. IMPLEMENTATION

The staff will use this SRP section in performing safety evaluations of design certifications and license applications submitted by applicants pursuant to 10 CFR Parts 50 or 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 superceded by a later revision.

## 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. 40 CFR Part 81, "Designation of Areas for Air Quality Planning Purposes."
5. U.S. Department of Commerce, "Climate Atlas of the United States," CD-ROM, National Climatic Data Center, NOAA.
6. 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.
7. U.S. Department of Commerce, "State Climatological Summary," National Climatic Data Center, NOAA, published annually by State.

8. U.S. Department of Commerce, "Storm Data," National Climatic Data Center, NOAA, published monthly.
9. Regulatory Guide 1.76, Rev. 1, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants."
10. ASCE Standard No. 7-05, "Minimum Design Loads for Buildings and Other Structures," ASCE/SEI 7-05, American Society of Civil Engineers, 2006.
11. U.S. Department of Commerce, "Engineering Weather Data," CD-ROM, National Climatic Data Center, NOAA.
12. Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants."
13. 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.
14. U.S. Department of Commerce, "Hourly United States Weather Observations 1990–1995," CD-ROM, National Climatic Data Center, NOAA.
15. 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.
16. "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.
17. 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.
18. U.S. Department of Commerce, "Probable Maximum Precipitation Estimates: Colorado River and Great Basin Drainage," Hydrometeorological Report No. 49, NOAA, Reprinted 1984.
19. U.S. Department of Commerce, "Seasonal Variation of 10-Square-Mile Probable Maximum Precipitation Estimates, United States East of the 105<sup>th</sup> Meridian," Hydrometeorological Report No. 53, NOAA, April 1980.
20. U.S. Department of Commerce, "Probable Maximum Precipitation Estimates: United States, Between the Continental Divide and the 103<sup>rd</sup> Meridian," Hydrometeorological Report No. 55A, NOAA, June 1988.
21. 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.
22. U.S. Department of Commerce, "Probable Maximum Precipitation for California," Hydrometeorological Report No. 59, NOAA, February 1999.

23. American Society of Heating, Refrigeration, and Air Conditioning Engineers, "2005 ASHRAE Handbook — Fundamentals," 2005.
24. 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.
25. J. X. L. Wang and J. K. Angell, "Air Stagnation Climatology for the United States (1948-1998)," NOAA Air Resources Laboratory Atlas No. 1, Air Resources Laboratory, Environmental Research Laboratories, Office of Oceanic and Atmospheric Research, Silver Spring, MD, April 1999.

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#### **PAPERWORK REDUCTION ACT STATEMENT**

The information collections contained in the draft Standard Review Plan are covered by the requirements of 10 CFR Part 50 and 52, which 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.

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### **SRP Section 2.3.1** Description of Changes

This SRP section affirms the technical accuracy and adequacy of the guidance previously provided in (Draft) Revision 3, dated January 2006 of this SRP. See ADAMS accession number ML053570372.

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 200X.

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

The following summarizes the technical changes incorporated into the version published for public comment in the Federal Register Notice dated February 2, 2006 (71FRN5695).

#### **I. AREAS OF REVIEW**

- a. Added freezing rain and potential influences from regional topography as part of the description of the general climate of the region to be reviewed.
- b. Clarified that seasonal frequencies of severe weather phenomena need to be reviewed only if available.
- c. Added severe wind events to the types of severe weather phenomena that should be reviewed.
- d. Added annual frequency of occurrence and time duration of freezing rain (ice storms) and dust (sand storms) as part of the review.
- e. Added the identification of the state climatic division(s) for the site as part of the review.
- f. Added the site's air quality, including the site's AQCR and its attainment designation with respect to state and national ambient air quality standards, as part of the review.

#### **II. ACCEPTANCE CRITERIA**

- a. Clarified that (1) GDC are not applicable for ESP applications and (2) 10 CFR 52.17(a)(1)(vi) states that the application must contain the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.
- b. Provided citation to 10 CFR 52.17(a)(1)(vi) for applicability for Early Site Permit applications.

- c. Added that any deviations from Regulatory Guide 1.76 should be identified by the applicant.
- d. Added that the bases and procedures used to select critical meteorological data for the design of the UHS should be provided and justified.
- e. Clarified that, depending on the location of the site, the 48-hour PMWP may not necessarily be in the form of frozen precipitation. This change was made in response to a comment received during the ACRS ESP Lessons Learned Subcommittee Meeting on September 6, 2006 in Rockville, MD.
- f. Change the definition of the 48-hour PMWP from “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” to “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 those months with the historically highest snowpacks.” This change was made in response to Written Public Comment #1.

### III. REVIEW PROCEDURES

- a. Added that (1) the historical data used to characterize a site should extend over a significant time interval to capture cyclical extremes and (2) current literature on possible changes in the weather in the site region should be reviewed to be confident that the methods used to predict weather extremes are reasonable. These changes were made in response to a comment received during the ACRS ESP Lessons Learned Subcommittee Meeting on September 6, 2006 in Rockville, MD.
- b. Added a section on ambient air quality. The applicant should now identify the site’s Air Quality Control Region and its attainment designation with respect to state and national ambient air quality standards (40 CFR 81).
- c. For DC reviews, added that the reviewer should ensure the applicant has provided a technical basis for each of the site parameters and the site parameter values are reasonable as compared to site characteristics listed in previously docketed ESP applications.

### IV. EVALUATION FINDINGS

None.

### V. IMPLEMENTATION

None.

VI. REFERENCES

- a. Added a reference to 40 CFR 81, "Designation of Areas for Air Quality Planning Purposes."
- b. Added "Rev.1" to the reference to Regulatory Guide 1.76. This change was made in response to Written Public Comment #3.
- c. Replaced J. Korshover, "Climatology of Stagnating Anticyclones East of the Rocky Mountains, 1936–1970" reference with J. X. L. Wang and J. K. Angell, "Air Stagnation Climatology for the United States (1948-1998)."