



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

SECTION 2.3.1

REGIONAL CLIMATOLOGY

REVIEW RESPONSIBILITIES

Primary - Site Analysis Branch (SAB)

Secondary - None

I. AREAS OF REVIEW

Information is presented by the applicant and reviewed by the staff concerning averages and extremes of climatic conditions and regional meteorological phenomena which affect the safe design and siting of the plant. 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 air-flow 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, waterspouts, thunderstorms, lightning, hail (including probable maximum size), freezing rain, dust (sand) storms, and high air pollution potential.
3. Meteorological conditions used as design and operating bases including:
 - a. The maximum snow and ice load (water equivalent) that the roofs of safety-related structures are capable of withstanding during plant operation.
 - b. Ultimate heat sink meteorological conditions resulting in maximum evaporation and drift loss of water and minimum water cooling.
 - c. Tornado parameters including translational speed, rotational speed, and maximum pressure differential with the associated time interval.
 - d. 100-year return period "fastest mile of wind" including vertical velocity distribution and gust factor.
 - e. Probable maximum annual frequency of occurrence and time duration of freezing

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 part of the Commission'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 Commission's regulations and compliance with them is not required. The standard review plan sections are keyed to Revision 2 of the Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. Not all sections of the Standard Format have a corresponding review plan.

Published standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555.

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rain (ice storms) and, where applicable, dust (sand) storms.

- f. Other meteorological and air quality conditions used for design and operating basis considerations.

II. ACCEPTANCE CRITERIA

The information in this section will be acceptable if the regional meteorological conditions and phenomena which affect the safe design and siting of the plant are presented and substantiated in accordance with acceptable practice and data as promulgated by the National Oceanic and Atmospheric Administration (NOAA), industry standards, and Commission guides, criteria, and regulations. More specifically the following criteria are used to determine acceptability.

The description of the general climate of the region should be based on standard climatic summaries compiled by NOAA. Consideration of the relationships between regional synoptic-scale atmospheric processes and local (site) meteorological conditions should be based on appropriate meteorological data.

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 which have long periods of record. The applicability of these data to represent site conditions during the expected period of reactor operation must be substantiated using sound meteorological judgment and data.

Design basis tornado parameters should be based on Regulatory Guide 1.76 (Ref. 2) or an adequately substantiated study must have been performed to demonstrate that lower values apply to the specific site. Operating basis wind velocity (fastest mile of wind) should be based on a standard such as that published by the American National Standards Institute (ANSI) with suitable corrections for local conditions. The ultimate heat sink meteorological data, as stated in Regulatory Guide 1.27 (Ref. 1) should be based on long-period regional records which represent site conditions. Freezing rain estimates are to be based on representative NWS station data. All other meteorological and air quality data used for safety-related plant design and operating bases should be documented and substantiated.

High air pollution potential information should be based on U.S. Environmental Protection Agency (EPA) studies.

III. REVIEW PROCEDURES

1. General Climate

The general climatic description of the region in which the site is located is reviewed for completeness and authenticity. Climatic parameters such as air masses, general airflow, pressure patterns, frontal systems, and temperature and humidity conditions reported by the applicant are checked against standard references (Ref. 3 and 4) 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 4 and 5 and the reviewer's knowledge of the area.

2. Regional Meteorological Averages and Extremes

Since meteorological averages and extremes can only be obtained from stations in the region of the site which have long periods of record, and the stations are not usually very close to the site, a determination of the representativeness of the data to site conditions is the primary concern in the review. A determination of the adequacy of the stations and their data is also made.

Recorded meteorological averages and extremes are checked against standard publications such as Reference 6. Snow and ice load adequacy is confirmed using ANSI A58.1-1972 (Ref. 7) and regional data available in References 4,5, and 6. References 4 and 5 provide information on other averages and extremes. References 8 and 9 provide information on high air pollution potential for verification. Extreme winds and specific vertical velocity distribution are checked against References 7 and 11. Gust factors are checked against Reference 7. The design basis tornado parameters are checked for agreement with Regulatory Guide 1.76 (Ref. 2) and tornado data are verified using the procedures and data in WASH-1300 (Ref.10).

IV. EVALUATION FINDINGS

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

"The applicant has provided an adequate description of the regional meteorological conditions of importance to the safe design and siting of this plant."

This statement will be followed by a resume of the general climate and the meteorological design parameters used for the plant.

V. REFERENCES

1. Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants," Revision 1.
2. Regulatory Guide 1.76, "Design Basis Tornado for Nuclear Power Plants."
3. U.S. Department of Commerce, "Climatic Atlas of the United States," Environmental Data Service, NOAA, June 1968.
4. U.S. Department of Commerce, "Local Climatological Data and Comparative Data," Environmental Data Service, NOAA, published annually for all first-order NWS Stations.

5. U.S. Department of Commerce, "State Climatological Summary," Environmental Data Service, NOAA, published annually by state.
6. U.S. Department of Commerce, "Storm Data," Environmental Data Service, NOAA, published monthly.
7. ANSI A58.1-1972, "Building Code Requirements for Minimum Design Loads in Buildings and other Structures," American National Standards Institute (1972).
8. G. C. Holzworth, "Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States," AP-101, Office of Air Programs, USEPA, January 1972.
9. J. Korshover, "Climatology of Stagnating Anticyclones East of the Rocky Mountains, 1936-1965," Publication No. 99-AP-34, Public Health Service (1967).
10. E.H. Markee Jr., "Technical Basis for Interim Regional Tornado Criteria," WASH-1300, USAEC, May 1974.
11. H.C.S. Thom, "New Distribution of Extreme Winds in the United States," Journal of the Structural Division, Proceedings of the American Society of Civil Engineers, pp. 1787-1801, July 1968.

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