# American Nuclear Society

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## evaluation of surface-water supplies for nuclear power sites

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# American National Standard Evaluation of Surface-Water Supplies for Nuclear Power Sites

Secretariat
**American Nuclear Society**

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# Foreword

(This Foreword is not a part of American National Standard Evaluation of Surface-Water Supplies for Nuclear Power Sites, ANSI/ANS-2.13-1979.)

The purpose of this document is to specify for light-water cooled, land based nuclear power plants, standards to evaluate the availability of an adequate surface-water supply and the water supply related effects of low flows and levels on plant operation and shutdown. A parallel guideline for ground water is contained in the proposed standard for Evaluating Ground-Water Supply for Nuclear Power Sites, ANS-2.9. Assigned Correspondent: D.L. Siefken, Sargent & Lundy Engineers, Chicago, IL.

Title 10, Code of Federal Regulations, Part 50, "Licensing of Production and Utilization Facilities," requires the submission of safety analysis reports to obtain permits for construction and operation of nuclear power plants. The specific requirements for the determination of water supply are contained in Section 2.4, Hydrologic Engineering, of Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," issued by the Nuclear Regulatory Commission.

These standards contain guidelines and requirements for evaluating both safety-related and nonsafety-related surface-water supplies for a nuclear power site. At a nuclear power site, water sources are usually interrelated, and any action that involves safety-related sources may also affect nonsafety-related sources. In addition, the data and methods used to analyze both sources are similar.

Therefore, Section 4, Description of Hydrologic System, contains guidelines for obtaining data and analyzing sources of water supply, and Section 5, Reliability of Surface-Water Supply contains criteria for determining adequacy of sources for both safety-related and nonsafety-related water supply.

This standard employs a technique using a discrimination device called "boxing." This technique indicates those statements which are nuclear safety-related. The term "nuclear safety" includes those requirements that are felt by the writing group to arise from official and implied NRC policies (including regulations, regulatory guides, branch positions, the Standard Review Plan, and past practice on applications) *as well as* other requirements the group believes are related to nuclear safety. Non-nuclear safety-related requirements include the following types of needs as they exclusively apply to areas not considered to be nuclear safety-related: conventional safety, equipment reliability, plant availability, good engineering practice, and contractual (commercial) requirements.

Before preparing the Safety Analysis Report (SAR) Section 2.4, Hydrologic Engineering, for the licensing of nuclear power plants, the applicant should be aware of hydrologic work which has been done by others in the area of interest. Almost invariably, much work can be saved by utilizing all or parts of studies by local, State, and Federal agencies. Such information as stream-flow data, low-flow frequencies, duration curves, historical droughts, geologic and groundwater data, and water-rights information may be obtained from such sources. Sometimes the probable minimum flow has already been derived at the site or at a point near enough to be transposed.

The prime source of such information is the U.S. Geological Survey. Other Federal agencies which may have useful data are the Bureau of Reclamation, Soil Conservation Service, Weather Service, Corps of Engineers, Tennessee Valley Authority, Environmental Protection Agency, Federal Energy Regulatory Commission and the Nuclear Regulatory Commission. Most states have one or more agencies which are concerned with various aspects of water resources. Power companies, particularly those with hydropower capacity, are another source, as are local or regional water-supply organizations. Safety Analysis Reports for other nuclear plants in the area may also provide useful information. It is also beneficial to discuss the specific site in detail

with the hydrology staff of the NRC prior to starting preparation of Section 2.4. In such discussions, the scope of work can often be reduced and methodologies and procedures can be agreed upon, which will save many man-hours and dollars, both for the applicant and for the NRC staff.

This standard was developed by Working Group ANS-2.13 of the Standards Committee of the American Nuclear Society which had the participation of the following members during the period it prepared the standard:

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Section Page

# Evaluation of Surface-Water Supplies for Nuclear Power Sites

## 1. Scope and Purpose

**1.1 Scope.** This standard presents criteria for determining:

The availability of a surface water supply for plant operation with respect to both safety and nonsafety-related aspects.

Water supply related effects of low flows and low levels on plant operation with respect to both safety and nonsafety-related systems.[1]

**1.2 Exclusions.** This standard does not include guidelines to determine the effect of low water due to tsunamis nor the design aspects of structures and systems required to store or deliver water from the source to the plant.

## 2. Definition of Terms

**adjusted probable minimum flow.** The probable minimum flow adjusted for man's activities.

**blowdown.** Water intentionally discharged from a closed cycle water system to control total dissolved solids (TDS).

**closed cycle circulating water system.** A system in which the same water, with the exception of that lost by evaporation, drift, leakage, and blowdown which is replenished by makeup, is used repeatedly in the circulating water system.

**cycles of concentration.** The ratio of TDS in the water in a closed cycle cooling system to the TDS in the makeup water.

**drift.** Water lost from a cooling tower as liquid droplets entrained in the exhaust air. In the case of spray systems, drift comprises the liquid droplets which become airborne and fall outside the spray collection system.

**lake.** As used in this standard, a lake is a natural body of water whose outlet is not controlled.

**makeup.** Water added to the circulating water system to replace that lost by evaporation, drift, blowdown, and leakage.

**non-nuclear safety-related.** Those requirements, not considered to be nuclear safety-related, whose goal is equipment reliability, unit availability, industrial safety, or good engineering practice.

**nuclear safety-related.** Plant features are safety related if they are necessary to assure the integrity of the reactor coolant pressure boundary, the capability to shut down the reactor and maintain it in a safe shutdown condition, or the capability to prevent or mitigate the consequences of accidents which would result in potential offsite exposures comparable to the guideline exposures of Title 10, Code of Federal Regulations, Part 100, "Reactor Site Criteria." [1][2]

**once through circulating water system.** A system in which water is used one time before it is returned to the environment.

**probable maximum hurricane (PMH).** A hypothetical hurricane having that combination of characteristics which makes it the most severe that can reasonably be expected to occur in the particular region involved. The hurricane should be assumed to approach the point under study along a critical path and at a rate of movement which results in the most adverse conditions.

**probable maximum windstorm (PMWS).** The PMWS is a hypothetical extratropical cyclone that might result from the most severe combination of meteorological storm parame-

[1]This standard also covers portions of the material requested in Section 2.4, Hydrologic Engineering, of Regulatory Guide (RG) 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants."

[2]Numbers in brackets refer to corresponding numbers in Section 7, References.