U.S. ATOMIC ENERGY COMMISSION

September 1974

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

REGULATORY GUIDE 4.7

DRAFT

GENERAL SITE SUITABILITY CRITERIA FOR NUCLEAR POWER STATIONS

A. INTRODUCTION

The Atomic Energy Act of 1954 places on the U.S. Atomic Energy Commission the responsibility for the licensing and regulation of private nuclear facilities from the standpoint of public health and safety. Paragraphs 100.10(b) and (c) of 10 CFR Part 100, "Reactor Site Criteria," require that the population density, use of the site environs, and the physical characteristics of the site, including seismology, meteorology, geology, and hydrology, be taken into account in determining the acceptability of a site for a nuclear power reactor. Seismic and geologic site criteria for nuclear power plants are provided in Appendix A to 10 CFR Part 100. Appendix A to 10 CFR Part 50 establishes the minimum requirements for the principal design criteria for water-cooled nuclear power plants; a number of these criteria are directly related to site characteristics as well as to events and conditions outside the nuclear power unit.

The National Environmental Policy Act of 1969 (83 Stat. 852), implemented by Executive order 11514 and the Council on Environmental Quality's Guidelines of August 1, 1973 (38 FR 20550), requires that all agencies of the Federal Government prepare detailed environmental statements on proposed major Federal actions which can significantly affect the quality of the human environment. A principal objective of the National Environmental Policy Act of 1969 (NEPA) is to require the agency to consider, in its decision-making process, the environmental impacts of each proposed major action and the available alternative actions.

Part 51, "Licensing and Regulatory Policy and Procedures for Environmental Protection," of Title 10, Code of Federal Regulations, sets forth the Atomic

Energy Commission's policy and procedures for the preparation and processing of environmental impact statements and related documents pursuant to section 102(2)(C) of the NEPA. The limitations on the Commission's authority and responsibility pursuant to the NEPA imposed by the Federal Water Pollution Control Act (86 Stat. 916) are addressed in an Interim Policy Statement published in the Federal Register on January 29, 1973 (38 FR 2679).

This guide discusses the major site characteristics related to safety, public health, and environmental issues which the Regulatory staff considers in determining the suitability of sites for nuclear power stations. The guidelines should be used in a screening process to identify suitable candidate sites for nuclear power stations. The decision that a plant may be built on a specific candidate site is based on a detailed evaluation of the proposed site-plant combination and a cost-benefit analysis comparing it with alternative site-plant combinations as discussed in Regulatory Guide 4.2.*

A site having characteristics that are acceptable according to the guidelines set forth in this guide would be compatible with nuclear power station** designs that meet public health and safety and environmental requirements current at the time of review.

The safety issues discussed include geologic/seismic, hydrologic, and atmospheric characteristics of proposed sites; potential effects on the plant from accidents associated with nearby industrial, transportation, and military facilities; and population distribution and densities in the site environs as they relate to protecting the general public from the potential radiation hazards of postulated serious accidents. The environmental issues discussed concern potential impacts from the construction and operation of nuclear stations on biota and ecological systems, land use, the atmosphere, aesthetics, and socioeconomics. This guide does not discuss details of the engineering designs required to assure the compatibility of the nuclear station and the site or the detailed information required for the preparation of the safety analysis and environmental reports. This guide does not address power reactor site suitability as it may be affected by the Commission's materials safeguards and plant protection requirements for nuclear power plants.

*Regulatory Guide 4.2, "Preparation of Environmental Reports for Nuclear Power Plants," March 1973.

**Nuclear power station refers to the nuclear steam supply, electric generating units, auxiliary systems, including the cooling system, structures such as docks that are located on a given site, and any new transmission lines erected in connection with the facility.

An extensive commitment of time and resources may be required to select a site for a nuclear power station, including safety and environmental considerations, and to develop a design for that site. Site selection involves considerations of public health and safety, engineering and design, economics, institutional requirements, and environmental impacts. The potential impacts of the construction and operation of nuclear power stations on the physical and biological environment and on social, cultural, and economic features* are similar for the site of any major industrial facility, but nuclear power stations are unique in the degree to which potential impacts of the environment on their safety must be considered. The safety considerations have been primary determinants of the suitability of a site for nuclear power stations, but considerations of environmental impacts and public acceptance have become increasingly important.

Chapter 9 of Regulatory Guide 4.2 presents the basis for the choice of a site from among alternative sites. Although it recognizes that planning methods will differ among applicants, it states that the applicant should present its site-plant selection process as the consequence of an analysis of alternatives whose environmental costs and benefits were evaluated and compared and then weighed against those of the proposed facility.

An acceptable evaluation of the site characteristics discussed in this guide can generally be based on existing information and on information derived from site reconnaissance by specialists knowledgeable of the local region of interest.

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* Biological and physical environment includes geology (underground and surficial), geomorphology (landform and topography), hydrology (surface and subsurface), climatology, air quality, limnology, water quality, fisheries, wildlife (large mammals, small mammals, birds), and vegetation. Social and cultural features include scenic resources, recreation resources, archeological/historical resources, and community resources (land use patterns, economic base, housing, transportation, sewer, water, police, fire, educational). From "Development and the Environment: Legal Reforms to Facilitate Industrial Site Selection." Final report by the Committee on Environmental Law, American Bar Association, February 1974.

** Site selection methodologies that have been used by the nuclear power industry are described in "Nuclear Power Plant Siting, A Generalized Process," Atomic Industrial Forum, August 1974, National Environmental Studies Project, R-1578.

B. DISCUSSION

Geology/Seismology

Nuclear power plants must be designed to prevent the loss of safety-related functions. Generally, the most restrictive safety-related site characteristics considered in determining the suitability of a site are surface faulting, potential ground motion and foundation conditions* (including liquefaction, subsidence, and landslide potential), and seismically induced floods. Criteria that describe the nature of the investigations required to obtain the geologic and seismic data necessary to determine site suitability are provided by Appendix A, "Seismic and Geologic Criteria for Nuclear Power Plants," to 10 CFR Part 100. Safety-related site characteristics are identified in Regulatory Guide 1.70, Section 2.5** and Regulatory Guide 1.59.*** In addition to geologic and seismic evaluation for assessing seismically induced flooding potential, Section 2.4 of Regulatory Guide 1.70 and Regulatory Guide 1.59 describe hydrologic criteria, including coincident flood events that should be considered.

Meteorology

The potential effect of atmospheric extremes (for example, tornadoes# and exceptional icing conditions##) on the safety-related structures of a nuclear station must be considered; however, the atmospheric extremes that may occur at a site are not critical in determining the suitability of a site because safety-related structures, systems, and components can be designed to withstand atmospheric extremes.

The atmospheric characteristics at a site are an important consideration in evaluating the dispersion of radioactive effluents both from postulated

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* "Classification, Engineering Properties and Field Exploration of Soils, Intact Rock and In Situ Rock Masses," WASH-1301, March 1974, outlines some of the procedures used to evaluate site foundation properties.

** Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," October 1972.

*** Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," August 1973.

\# Regulatory Guide 1.76, "Design Basis Tornado for Nuclear Power Plants," April 1974.

Regulatory Guide 1.70.1, "Additional Information--Hydrological Considerations for Nuclear Power Plants," December 1973.

accidents and from routine releases in gaseous effluents.* In addition to meeting the AEC requirements for the dispersion of airborne radioactive material, the station must meet the requirements of the Clean Air Amendments of 1970 (PL 91-604); this is unlikely to be an important consideration for nuclear power stations** unless (1) a proposed site is in an area where existing air quality is near or exceeds the limits set under the Clean Air Amendments or (2) there is a potential for interaction of the cooling system plume with a plume containing noxious or toxic substances from a nearby facility.

The meteorological data necessary for adequate assessment of the potential dispersion of radioactive material from design basis accidents are described in Regulatory Guide 1.23.*** Models and assumptions used for evaluating the potential radiological consequences of certain accidents are provided in

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* Routine releases of airborne radioactive material must be kept "as low as practicable." (See 10 CFR Part 20, § 20.1(c).)

Section 50.34a of 10 CFR Part 50 sets forth the requirements for design objectives for equipment to control releases of radioactive material in effluents from nuclear power reactors.

Section 50.36a further provides that, in order to keep power reactor effluent releases as low as practicable (ALAP), each license authorizing operation of such a facility will include technical specifications regarding the establishment of operating procedures for effluent control, installation and maintenance of effluent control equipment, and reporting of actual releases.

Proposed Appendix I to 10 CFR Part 50 would provide numerical guidance for design objectives and technical specification requirements for limiting conditions of operation for light-water-cooled nuclear power plants.

The Commission held oral arguments on proposed Appendix I on June 6, 1974. The matter is now pending before the Commission for decision.

The following draft Regulatory Guides have been prepared to assist in application of the numerical guidance in proposed Appendix I: Attachment to Concluding Statement of Position of the Regulatory Staff, Public Rulemaking Hearing on: Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Practicable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactors, Draft Regulatory Guides for Implementation. February 20, 1974. Docket No. RM-50-2.

1.AA, "Calculation of Annual Average Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Implementing Appendix I."

1.BB, "Calculations of Releases of Radioactive Materials in Liquid and Gaseous Effluents from Pressurized Water Reactors (PWR's)."

1.CC, "Calculation of Releases of Radioactive Materials in Liquid and Gaseous Effluents from Boiling Water Reactors (BWR's)."

1.DD, "Methods for Estimating Atmospheric Dispersion of Gaseous Effluents from Routine Releases."

**Station capacity is assumed to be 5000 MWe or less. Stations of larger size may have climatic impacts that are not considered in this guide.

***Regulatory Guide 1.23, "On-Site Meteorological Programs." Feb. 1972.

Regulatory Guides 1.3, 1.4, 1.5, 1.24, and 1.25;* however, the meteorological assumptions in the guides may not be appropriate for sites with unusual meteorological conditions.

In the evaluation of potential sites within an area, onsite meteorological reconnaissance can be made to determine if the meteorological conditions at the site are representative of the area. Canyons or deep valleys frequently have atmospheric variables that are substantially different from those in the area as a whole. Other topographical features such as hills, mountain ranges, and lake or ocean shorelines can affect the local meteorology at a site and may make the dispersion characteristics less favorable than those in the general area or region. More stringent design or effluent limits or a larger exclusion area may be required in such cases.

While it is the concentration of radioactivity in the atmosphere at any distance from the point of release, $\chi(Ci/m^3)$, that must be controlled, the ratio χ/Q, where Q(Ci/sec) is the rate of release of radioactivity from the source, has become a commonly evaluated term because it depends only on atmospheric variables and distance from the source.

If the meteorology is unfavorable with respect to dispersion characteristics at a proposed site, the exclusion area may have to be unusually large to satisfy the dose criteria of 10 CFR Part 100. If under assumed unfavorable meteorological conditions (see Regulatory Guides 1.3 and 1.4) the dispersion of radioactivity released following a design-basis accident is insufficient at the boundary of the exclusion area (see the following section, "Population Density") and the outer boundary of the low population zone, the proposed site would not satisfy the requirements of 10 CFR Part 100 and would require that the design of the station include appropriate and adequate compensating engineered safety features.

*Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors," Revised June 1974.

Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors," Revised June 1974.

Regulatory Guide 1.5, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Steam Line Break Accident for Boiling Water Reactors," March 1971.

Regulatory Guide 1.24, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Pressurized Water Reactor Radioactive Gas Storage Tank Failure," March 1972.

Regulatory Guide 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors," March 1972.

Local fogging and icing can result from plumes from cooling towers, lakes, canals, or spray ponds but can generally be acceptably mitigated by station design and operational practices. However, some sites have the potential for unusual fogging or icing due to local meteorological conditions. For example, areas of unusually high moisture content that are protected from large-scale airflow patterns are especially likely to experience these conditions. The impacts are generally of greatest potential importance relative to transportation or electrical transmission corridors in the vicinity of a site.

The sensitivity of the natural vegetation or the crops in the vicinity of the site may require a cooling system with little or no salt drift. The vulnerability of existing industries or other facilities in the vicinity of the site to corrosion from cooling tower drift should also be considered. None of these considerations is critical in evaluating the suitability of a site, but they could result in special cooling system design requirements or in the need for a larger site to confine the effects of salt drift within the site boundary. The environmental effects of salt drift from evaporative cooling systems are most severe where saline water or waters with high mineral content are used for cooling.

Population Density

As set forth in 10 CFR Part 100, a nuclear power plant site must have a low population zone (LPZ) immediately surrounding the exclusion area in which the population is sufficiently limited in number and distributed in such a way that there is a reasonable probability that appropriate measures could be taken in their behalf in the event of a serious accident. A proposed site will also have a "population center distance," defined as the distance from the nuclear reactor to the nearest boundary of a densely populated center containing more than about 25,000 residents. The population center distance must be at least 1-1/3 times the distance to the outer boundary of the LPZ; however, 10 CFR Part 100 requires that the LPZ boundary be sufficiently remote that a release of fission products (calculated as a consequence of a postulated accident) will not result in radiation doses to individuals on the outer boundary of the LPZ greater than certain specified values.

A reactor licensee is required by 10 CFR Part 100 to designate an exclusion area and to have authority to determine all activities within the designated area, including removal of personnel and property. In selecting a site for a nuclear power plant, it is necessary to provide for an exclusion area in which

the applicant has such authority. The exclusion area must be of such size that doses to individuals at any point on its boundary for 2 hours immediately following the onset of a postulated fission product release are less than certain prescribed values.

Hydrology

Flooding. Criteria for evaluation of seismically induced floods are provided in Appendix A to 10 CFR Part 100. Regulatory Guide 1.59* describes an acceptable method of determining the design basis floods for sites along streams or rivers and discusses the phenomena producing comparable design basis floods for coastal, estuary, and Great Lakes sites. The effect of a probable maximum flood, as defined in Regulatory Guide 1.59, seiche, surge, or seismically induced flood such as might be caused by dam failures or tsunami on plant safety functions can generally be controlled by engineering design or protection of the safety-related structures, systems, and components which are identified in Regulatory Guide 1.29.** For some river valleys, flood plains, or areas along coastlines, there may not be sufficient information to make the evaluations needed to satisfy the criteria for seismically induced flooding. In such cases, extensive study of the potential for dam failure, river blockage, or diversion in the river system or distantly and locally generated "sea-waves" may be needed to establish the suitability of a site. In lieu of detailed investigations, Regulatory Guides 1.70*** (Sec. 2.4) and 1.59* present acceptable analytical techniques for evaluating seismically induced flooding.

Nuclear power stations require reliable sources of water for steam condensation, service water, and the emergency core cooling system. In regions where water is in short supply, the recirculation of the hot cooling water through cooling towers or manmade lakes or ponds has been practiced.

The essential water requirements for nuclear power plants are that sufficient water be available for cooling during plant operation and normal shutdown, for the ultimate heat sink,# and for fire protection. The limitations imposed by existing laws or allocation policies govern the use of

* Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," August 1973.

** Regulatory Guide 1.29, "Seismic Design Classification," Revision 1, August 1973.

*** Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," October 1972.

\# Regulatory Guide 127, "Ultimate Heat Sink for Nuclear Power Plants," provides guidance on water supply for the ultimate heat sink, March 1974.

cooling water at potential sites* for normal operation. Regulatory Guide 1.27 discusses safety requirements. Consumptive use of water may necessitate an evaluation of existing and future water uses in the area to ensure adequate water supply during droughts both for plant operation and the highest water use (i.e., nuclear power station requirement vs. public water supply). Regulatory agencies should be consulted to ensure acceptable use.

Where required by applicable law, demonstration of a request for certification of the rights to withdraw or consume water and an indication that the request is consistent with appropriate State and regional programs and policies should be provided as part of the application for a construction permit or operating license.

The availability of required water during periods of low flow or low water level is an important first consideration for potential sites on rivers, or small shallow lakes, or along coastlines. Both the frequency and duration of periods of low flow or level should be determined from the historical record and, if the cooling water is to be drawn from impoundments, from projected operational practices.

Water Quality. Cooling water discharges to waters are governed by the Federal Water Pollution Control Act (FWPCA, PL 92-500). It will be necessary to determine regulations current at the time sites are under consideration. Section 401 (a)(1) of that Act requires, in part, that any applicant for an AEC construction permit for a nuclear power station provide to the AEC certification from the State that any discharge will comply with applicable effluent limitations and other water pollution control requirements. In the absence of such certification, no construction permit can be issued by the AEC unless the requirement is waived by the State or the State fails to act within a reasonable period of time. A permit pursuant to section 402 of that Act may be required for a nuclear power station to operate in compliance with the Act, but is not a prerequisite to an AEC license or permit.

Conservative calculations of the dispersion and dilution capabilities and potential contamination pathways of the groundwater environment under operating and accident conditions with respect to present and future users

*To the extent that site selection is dependent on water diversions for consumptive use, allocation of water supply is a function of state statutory and administrative procedures.

A discussion of the establishment of state regulation of water use is set forth in "Industrial Developments and the Environment, Legal Reforms to Improve the Decision-Making Process in Industrial Site Selection," Special Committee on Environmental Law of the American Bar Association, August 1973.

Revised 1B @ 8/21/12 mtg w/ OCIMS staff (hashed out @ mtg w/..)

REQUEST FOR RECORDS DISPOSITION AUTHORITY

REQUEST FOR RECORDS DISPOSITION AUTHORITY		LEAVE BLANK (NARA Use Only)	
TO NATIONAL ARCHIVES AND RECORDS ADMINISTRATION WASHINGTON, DC 20408		JOB NUMBER	
1 FROM (Agency or establishment) U.S. Nuclear Regulatory Commission		DATE RECEIVED	
2. MAJOR SUBDIVISION or PROGRAM Office of Nuclear Security and Incident Response (NSIR)		NOTIFICATION TO AGENCY In accordance with the provisions of 44 U.S.C. 3303a, the disposition request, including amendments, is approved except for items that may be marked "disposition not approved" or "withdrawn" in column 10	
3. MINOR SUBDIVISION			
4 NAME OF PERSON WITH WHOM TO CONFER: Deborah H. Armentrout, CRM	5 TELEPHONE: 301-415-7228	DATE	ARCHIVIST OF THE UNITED STATES

6. AGENCY CERTIFICATION

I hereby certify that I am authorized to act for this agency in matters pertaining to the disposition of its records and that the records proposed for disposal on the attached _6_ page(s) are not now needed for the business of this agency or will not be needed after the retention periods specified; and that written concurrence from the General Accounting Office, under the provisions of Title 8 of the GAO Manual for Guidance of Federal Agencies,

☒ is not required; ☐ is attached, or ☐ has been requested

DATE	SIGNATURE OF AGENCY REPRESENTATIVE	TITLE
	Russell Nichols	NRC Records Officer

7 Item No	8 DESCRIPTION OF ITEM AND PROPOSED DISPOSITION	9. GRS or Superseded Job Citation	10 Action Taken (NARA Use Only)
	Title: Operations Center Information Management System (OCIMS) Program PMDA Director Date Office of General Counsel Date		

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U. S. Nuclear Regulatory Commission
OPERATIONS CENTER INFORMATION MANAGEMENT SYSTEM (OCIMS)

OPERATIONS CENTER INFORMATION MANAGEMENT SYSTEM (OCIMS)

The NRC Operations Center Information Management System (OCIMS) supports the NRC Operations Center during daily activities, regularly scheduled exercises, and reported emergencies by providing common access to data for the staff located at the NRC Headquarters Operations Center (HOC) and NRC Regional Incident Response Centers (IRC). OCIMS is a suite of interactive information systems in five functional areas listed below:

1. Headquarters Operations Officer databases (HOOdb) collects information in the following subsystems:
   a. Events
   b. Radioactive Materials of Interest
   ~~c. Suspicious Activity (Into part of PWS)~~
   ~~d.~~ Headquarters Operations Officer's Log (HOO Log)
   ~~e.~~ Call List~~(Into part of PWS)~~
2. ~~Response Computer System (RCS)~~ now Incident Response Management System IRMS (same data)
3. Automated Notification System (ANS)
4. Operations Center Telephone System
5. Protected Web Server (PWS).

The OCIMS systems provide working access to the information collected and created during operation of the Operations Center.

A. Subsystem Inputs, Master Files, and Outputs

1. Headquarters Operations Officer databases (HOOdb)

Information received by the Headquarters Operations Center related to Events and ~~-~~Shipment of Radioactive Materials of Interest~~, or Suspicious Activity, placed in PWS, in the vicinity of a licensed facility is recorded in the HOOdb~~ for reactors, fuel facilities, and materials, including those in Agreement States. Additionally, HOOdb is used to record daily ~~(for agreement states).~~ routine Operations Center activities.

a. Inputs/Source Records

Routine information and significant operational data received by the Operations Center are entered by the Headquarters Operations Center staff from telephone, fax, or other information sources into the appropriate HOOdb database.

Disposition: TEMPORARY. Cut off when data entry is verified. Destroy/delete source material one month after cutoff. ~~two months after cutoff or when no longer required for business purposes.~~

b. HOOdb Master Files

Information is maintained in five primary databases:

i. Events -- Chronological information related to an event or emergency at a licensed nuclear power plant or facility. Information maintained in the database may include:
- Licensee identification (Name, Plant name, Docket number, Contact numbers)
- Event or Emergency Description (Equipment involved, Initial cause evaluation, Individual reporting the event, etc.)
- Times of Event Notification and Closure
- ~~Activation of the Automatic Notification System~~ (don't record in database)
- Significant actions reported, including times

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- Plant status including (proprietary ~~b/o of the~~information related to the status of equipment)

Disposition: PERMANENT. Cut off at the end of the calendar year. Transfer a ~~copy of the~~ files to the National Archives ~~five years~~ ten years after cutoff according to NARA guidance in 36 CFR 1228.270. ~~Delete NRC copy once transfer has been verified.~~ Transfer to NARA via snapshots - Records should be sent to NARA in 5 year blocks when the oldest record is 15 years old~~Retain the information and supporting data in OCIMS~~

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ii. Radioactive Materials Shipment (RAM QC) – Information describing the shipment of radioactive materials of interest, including the following:
- Licensee Identification
- Materials, Isotopes and Activity to be Shipped
- Anticipated Shipping Dates (departure and arrival) - different
- Anticipated Shipping Route
- Shipment Completed Date.

10 CFR pt.37

Δ to 5 yrs

Disposition: TEMPORARY. Retain a copy of the information concerning the shipment and cutoff when shipment is completed. Destroy/delete ten years ~~five years~~ after the end of the fiscal year in which the shipment was completed.

> Comment [kb2]: Not sure what the number of years of data to keep. I will check with OIP regarding the imports part of RAMQC and Clyde Ragland for the rest.

iii. ~~Suspicious Activity (PWS) – Information collected describing reports of suspicious activity in the vicinity of or related to a licensee's facility or operations, including the following:~~
- ~~Licensee Identification~~
- ~~Date and Time Reported~~
- ~~Description of Threat~~
- ~~Assessment of Significance.~~

~~This information is Law Enforcement Sensitive. The data are copied from the HOOdb to PWS for analysis and dissemination to involved local governmental entities and law enforcement organizations.~~

~~**Disposition**: TEMPORARY. Cut off information at the end of the fiscal year. Destroy/delete from HOOdb ten years five years after cutoff. (Output is PWS)~~

> Comment [kb3]: Since Suspicious Activity was deleted this Disposition section should be deleted too.

iv. HOO Log – Chronological log of Operations Center activities including:
- Staff Shift Change (personnel and times)
- Licensee's Notifications
- Routine Shift Activities.

Disposition: TEMPORARY. Cut off information accumulated during the year at the end of the fiscal year. Destroy/delete ~~ten~~ 10 years? ~~five years~~ after cutoff.

Δ to 5yrs.

v. Call List ~~(PWS)~~ – Contact information for NRC, State, and other Federal Agency Operating Center support individuals including:
- Name
- Telephone numbers and e-mail addresses
- Function or Team assignments.

Disposition: TEMPORARY. ~~Cut off names and contact information when superseded and remove from the Call List~~Delete when superseded.

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c. HOOdb Outputs

~~i. Licensee Daily Reports~~

~~HOOdb information is acquired retrieved daily and provided (queried) by the Operations Center to the by the NRC Office of Nuclear Reactor Regulation (NRR) for the Daily Report (partially posted on website), and to NRC Office of Federal and State Materials and Environmental Management Programs (FSME) for entry into the Nuclear Materials Event Database (NMED).~~

~~**Disposition**: See NRO N1-431-XX-XXXX and NMED retention schedule N1-431-09XX-01XX.TEMPORARY. Cut off at the end of the fiscal year. Destroy/delete one year after cutoff. Doesn't happen because not separate entity to be destroyed (Equipment deficiency report exported to NRR and put into ADAMS by them. Copy of HooDB report – manufacturer, Part 21 issue?~~

> Comment [kb4]: After reviewing this, the group (Omar, Bob Stransky, Bill Gott and myself) determined that sections c.i and c.ii can be deleted. The section c.iii is the only one needed
>
> Comment [D5]: Doesn't happen because not separate entity to be destroyed (Equipment deficiency report exported to NRR and put into ADAMS by them. Copy of HooDB report – manufacturer Part 21 issue?

~~ii. Radioactive Materials Shipment Notifications~~

~~A manual notification (e-mail generated) to pre-identified interested parties concerning shipments of radioactive materials through their jurisdictions is made using the RAMQC system.~~

~~**Disposition**: TEMPORARY. Cut off shipment information at the end of the fiscal year. Destroy/delete one year after cutoff. Delete e-mail as thinking only to enable blindcopy. Destroy immediately after notification is generated. (GRS 23, Item 7, Transitory Files)~~

~~iii.~~i. ~~Ad Hoc~~ Reports

All HOOdb subsystems have the ability to print electronic or paper reports of the data contained in the system. These reports are used to assemble information necessary to perform the activities of the Operations Center and NRC.

Disposition: TEMPORARY. Cut off and destroy/delete when no longer needed for business purposes.

2. ~~Response Computer System (RCS)~~ Incident Response Management System (IRMS)

~~The RCS collects and makes working copies of the electronic documents created by the NRC staff available for use during an event or emergency. These d~~Documentary materials that are collected to allow instantaneous access during an event or emergency. These materials may be analytical information and analyses, chronologies, reports, raw data, briefing materials, faxes, or presentations, personal notes, and documents, such as press releases~~, in ADAMS. (Supplements voice recordings – cannot be modified)~~

> Comment [D6]: These materials are not necessarily pulled from ADAMS but can be from other sources. They are Court acceptable. Supplements some voice recordings (?) Cannot be modified in the IRMS.

a. Inputs/Source Records

Copies of documents created or received by NRC staff during an event or emergency are placed in ~~RCS~~ IRMS (currently called WebEOC) for use by the Center staff during the event or emergency.

Disposition: TEMPORARY. Cut off when the documents have been entered into ~~RCS~~ IRMS ~~and destroy/delete the copies used as input when no longer needed for business purposes.~~

> Comment [D7]: I am not sure that this is a good explanation of how to handle the source documents We may need more explanation.

b. ~~RCS~~ IRMS Master File

~~Documents, with appropriate metadata to provide an index to the documents, are accessible within RCS. Metadata include~~Information is maintained in a database:
- Event Name and Licensee
- Date Created

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are required. The suitability of sites in areas with a complex groundwater hydrology or of sites located over aquifers that are or may be used by large populations for domestic or industrial water supplies or for irrigation water can only be determined after reliable assessments have been made of the potential impacts of the reactor plant on the groundwater.

Although the management of the quality of surface waters is important, water quality per se is not a major consideration in assessing the suitability of a site because adequate design alternatives can generally be developed to meet the requirements of the Federal Water Pollution Control Act and the Commission's regulations implementing NEPA; however, the environmental characteristics or the complexity of the environment at a site and its vicinity may be such that it would be difficult to obtain or develop sufficient information to establish, in a timely manner, that the potential environmental impacts on water quality will be acceptable. Examples of situations that could pose unusual impact assessment or design problems are areas of existing marginal water quality, small bays, estuaries, stratified waters, and sites that would require intake from and discharge to waters of markedly different quality, such as intake of marine water and discharge to an estuary. Examples of potential environmental effects of plant construction and operation that must be assessed are physical and chemical environmental alterations in habitats of important species, including plant-induced rapid changes in environmental conditions that result in injurious shock to the biota, change in normal current direction or velocity of the cooling water source and receiving water, scouring and siltation resulting from construction or cooling water discharge, alterations resulting from dredging and spoil disposal, and interference with shoreline processes.

Biota and Ecological Systems

The impacts of plant construction and operation on the biota and ecological systems can generally be mitigated by design and by construction* and operational practices if justifiable relative to costs and benefits; however, certain conditions or situations present major difficulties in assessing potential impacts on populations of important species or ecological systems. The lack of sufficient information about the population dynamics of an important commercial or sports fishery, for example, could be a major cause of delay in

*A compilation of construction practices is provided in "General Environmental Guidelines for Evaluating and Reporting the Effects of Nuclear Power Plant Site Preparation, Plant and Transmission Facilities Construction," Atomic Industrial Forum, February 1974.

licensing because of the time period required to study the fishery in adequate detail and scope and could result in a requirement for exceptionally conservative design of the station. Of potential major importance are breeding areas (e.g., nesting and spawning areas), nursery, feeding, resting, and wintering areas, or other areas of seasonally high concentrations of individuals of important species.*

In general, the uniqueness of a habitat or ecological system within the region under consideration and the amount of habitat or ecological system destroyed or disrupted relative to the total amount in the region or the vulnerability of the reproductive capacity of important species populations to the effects of construction and operation of the plant and ancillary facilities are the important considerations in the balancing of costs and benefits.

The alteration of one or more of the existing environmental conditions may render a habitat unsuitable as a breeding or nursery area. In some cases, organisms utilize identical breeding and nursery areas each year and if the characteristics of the areas are changed, breeding success may be substantially reduced or enhanced. Destruction of part or all of a breeding or nursery area may cause population shifts that result in increased competition for the remaining suitable areas. Such population shifts cannot compensate for reduced size of the breeding or nursery areas if the remaining suitable area is already occupied by the species. Some species will desert a breeding area because of

*A species, whether animal or plant, is important (for the purpose of this guide):

(1) if it is commercially or recreationally valuable,

(2) if it is endangered or threatened,

(3) if the species or the specific population has important or unique esthetic or scientific value, or

(4) if it affects the well-being of some important species within criteria (1), (2), (3) or if it is critical to the structure and function of a valuable ecological system. Endangered and threatened species are defined by PL 93-205, the Endangered Species Act of 1973, as follows: "The term 'endangered species' means any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man." "The term 'threatened species' means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Lists of endangered species are published periodically in the Federal Register by the Secretary of the Interior.

man's activities in proximity to the area even in the absence of physical disturbance of the area.

Feeding areas of special concern relative to site selection are those that are unique or especially rich feeding areas that might be destroyed, degraded, or made inaccessible to important species by plant construction or operation. Evaluation of feeding areas in relation to potential construction or operational impacts includes consideration of size of the feeding area onsite in relation to the total feeding area offsite, food density, time of use, location in relation to other habitats, topography relative to access routes, and other factors including man's activities. Site modification may reduce the quality of feeding areas by destruction of a portion of the food base, destruction of cover, or both.

Construction and operation of nuclear power plants can create barriers to migration. These apply mainly to the aquatic environment. Narrow zones of passage of migratory animals in some rivers and estuaries may be restricted or blocked by plant operation. Partial or complete blockage of a waterway may result from the discharge of heat or chemicals or the construction and placement of power station structures.

Strong-swimming aquatic animals often avoid waters of adverse quality, but larval and immature forms are usually moved and dispersed by water currents. It is therefore important in site selection that the routes and times of movement of the immature stages be considered in relation to potential plant effects.

Sites where placement of intake or discharge structures could markedly disrupt normal current patterns in migration paths of important species would require a detailed assessment of potential impact on the species population. The orientation to current flow and water depth of some aquatic animals is largely controlled by current direction and strength. The potentials for impingement of organisms on cooling water intake structures and entrainment of organisms through the cooling system are related to the placement of the structures at a site.

Site characteristics should be considered relative to design and placement of cooling system features and their potential to hold fish in an area past their normal period of migration or to entrap resident populations in areas where they would be adversely affected by limited food supply or adverse temperatures. Cooling water effluent mixing zones or discharge canals may hold fish under "summer" temperatures and inhibit their movement out of the area that would normally be triggered by a natural drop in temperature. The

cessation of plant operation during winter can be lethal to these populations because of an abrupt drop in temperature.

When early site inspections and evaluations indicate that critical or exceptionally complex ecological systems will have to be studied in detail to determine the appropriate plant designs, proposals to use such sites should be deferred unless sites with less complex characteristics are not available.

Land Use and Esthetics

Many impacts of construction and operation of the plant, transmission line, and the transportation spur on land use at the site and in the site neighborhood can be mitigated by appropriate designs and practices. Esthetic impacts can be reduced by selecting sites where existing topography and forests can be utilized for screening station structures from nearby scenic, historical, or recreational resources. Restoration of natural vegetation, creative landscaping,* and the use of architectural colors that are integrated with the environment can mitigate adverse visual impacts.

Preconstruction archeological excavations can eliminate archeological losses.

Proposed alternative uses of some lands may render a site unsuitable for a nuclear power station. One general class of such lands is that specified by a community as planned for other uses or as restricted to compatible uses vis-a-vis other lands. Official land use plans developed by governments at any level and by regional agencies must be consulted for possible conflicts with power plant siting. A list of Federal agencies that have jurisdiction or expertise in land use planning, regulation, or management has been published by the Council on Environmental Quality.**

Another class of impacts involves the preempting of existing land use at the site itself. For example, nuclear power plant siting where specialty crops (e.g., cranberries or artichokes) are grown may be considered a type of land conversion involving unacceptable economic dislocation.

Sites adjacent to some lands devoted to public use may be considered unsuitable. In particular, the use of some sites or transmission line or transportation corridors close to special areas administered by Federal, State, or local agencies for scenic or recreational use may cause unacceptable

* Station protection requirements for nuclear safeguards may influence landscape design and clearing of vegetation.

** U.S. Council on Environmental Quality, "Preparation of Environmental Impact Statements: Guidelines," 38 FR 20549, 8/1/73.

impacts regardless of design parameters. Such cases are most apt to arise in areas adjacent to natural-resource oriented areas (e.g., Yellowstone National Park) as opposed to recreation-oriented areas (e.g., Lake Mead National Recreation Area). Some historical and archeological sites may also fall into this category. The acceptability of sites near special areas of public use should be determined by consulting cognizant government agencies.*

It should be recognized that some as yet undesignated areas may be unsuitable for siting because of public interest in future dedication to public scenic, recreational, or cultural use. Relatively rare land types such as sand dunes and wetlands are prime candidates for such future designation.

*The following Federal agencies should be consulted for the special areas listed:

National Park Service (U.S. Department of the Interior)

National Parks; International Parks; National Memorial Parks; National Battlefield, Battlefield Parks and Battlefield Sites; National Military Parks; Historic Areas and National Historic Sites; National Capital Parks; National Monuments and Cemeteries; National Seashores and Lakeshores; National Rivers and Scenic Riverways; National Recreation Areas; National Scenic Trails and Scientific Reserves; National Parkways.

National Park Service Preservation Program

National Landmarks Program; Historic American Buildings Survey; National Register of Historic Places; National Historical Landmarks Program; National Park Service Archeological Program.

Bureau of Sport Fisheries and Wildlife (U.S. Department of Interior)

National Wildlife Refuges

Forest Service (U.S. Department of Agriculture)

National Forest Wilderness, Primitive Areas, National Forests.

Individual States and local governments administer parks, recreation areas, and other public use and benefit areas. Information on these areas should be obtained from cognizant State agencies such as State departments of natural resources. (See publications such as the "Conservation Directory 1973: A Listing of Organizations, Agencies and Officials Concerned with Natural Resource Use and Management," published by the National Wildlife Federation for state-by-state references.) The Advisory Council on Historic Preservation or the appropriate State historical society should be contacted for information on historic areas. For areas of archeological interest, the Chief Archeologist of the National Park Service is an information source, as is the State Archeologist and the State Liaison Officer responsible for the National Historic Preservation Act activities for a particular State.

Industrial, Military, and Transportation Facilities

Potential accidents at present or projected nearby industrial, military, and transportation facilities may affect the safety of a nuclear power plant.* A site should not be selected if, in the event of such an accident, it is not possible to safely shut down a plant at that site or if it is not possible to have nearby facilities alter their mode of operation or incorporate features to reduce to an acceptable level the likelihood and severity of such potential accidents.

In the event of an accident at a nearby industrial facility such as a chemical plant, refinery, mining and quarrying operation, oil or gas well, or gas and petroleum product storage installation, it is possible that missiles, shock waves, flammable vapor clouds, toxic chemicals, or incendiary fragments may result. These may affect the plant itself or the plant operators in a way that jeopardizes plant safety.

Regulatory Guide 1.78** describes assumptions acceptable to the Regulatory staff for use in assessing the habitability of the control room during and after a postulated external release of hazardous chemicals and describes criteria that are generally acceptable to the Regulatory staff for the protection of the control room operators.

Nearby military facilities such as munitions storage areas and ordnance test ranges may threaten plant safety. The acceptability of a site depends on establishing, among other things, that the nuclear power plant can be designed so its safety will not be affected by an accident at the military installation. Alternatively, an otherwise unacceptable site may become acceptable if the cognizant military organization agrees to change the installation or mode of operation to reduce the likelihood and severity of potential accidents involving the nuclear plant to an acceptable level.

An accident during the transport of hazardous materials (e.g., by air, waterway, railroad, highway, or pipeline) near a nuclear power plant may generate shock waves, missiles, and toxic or corrosive gases which can affect the safe operation of the plant. The consequences of the accident will depend on the proximity of the transportation facility to the site and the nature and maximum quantity of the hazardous material per shipment. Unless a

*Section 2.2 of Regulatory Guide 1.70 lists these safety considerations.

**Regulatory Guide 1.78, "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," June 1974.

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firm and enforceable agreement can be reached to limit the transport of hazardous materials or unless the transportation link can be relocated, the proposed site may not be acceptable.

Airports are transportation facilities that pose specialized hazards to nearby nuclear power plants. Potential threats to plants from aircraft result from the aircraft itself as a missile and from secondary effects of a crash such as fire.

Socioeconomics

Social and economic issues are important determinants of siting policy. It is difficult both to assess the nature of the impacts involved and to determine value schemes for predicting the level or the acceptability of potential impacts.

The siting and construction of a nuclear power station may have significant impacts on the socioeconomic structure of a community and may place severe stresses on local labor supply, transportation facilities, and community services in general. There may be changes in tax bases and in community expenditures, and problems may occur in determining equitable levels of compensation for persons relocated as a result of the siting. It is usually possible to resolve such difficulties by proper coordination with impacted communities; however, some impacts may be both locally unacceptable and too costly to avoid by any reasonable program for mitigation of impacts. Evaluation of the suitability of a site should therefore include consideration of purpose and probable adequacy of socioeconomic impact mitigation plans for such economic impacts on any community where local acceptance problems can be reasonably foreseen.

Certain communities in a site neighborhood may be subject to unusual impacts that would be excessively costly to mitigate. Among such communities are towns that possess a markedly distinctive cultural character; i.e., towns that have preserved or restored numerous places of historic interest, have specialized in an industry or avocational activity of an unusual kind, or have otherwise markedly distinguished themselves from other communities. Such communities may provide an important cultural amenity and concomitant economic service industries.

C. REGULATORY POSITION

1. Geology/Seismology

Sites that include capable faults, as defined in Appendix A to 10 CFR Part 100, are not suitable for nuclear power stations. The state of the art

has not progressed to the point at which it is possible to design a nuclear power plant for surface or near-surface displacement with a sufficiently high level of confidence to ensure that the integrity of the safety-related features of the plant will remain intact.

Sites within about 5 miles of a surface capable fault greater than 1000 feet in length are generally not suitable for a nuclear power station. In any case, extensive and detailed geologic and seismic field studies and analyses will be required for such a proposed site.

Sites located near geologic structures for which an adequate data base to determine "capability" does not exist at the time of application are likely to be subject to a longer licensing process in view of the need for extensive and detailed geologic and seismic investigations of the site and surrounding region and for rigorous analyses of the site-plant combination.

Sites with unfractured bedrock for foundations generally have suitable foundation conditions. In regions where there are few or no such sites, it is prudent to select sites in areas known to have low liquefaction potential. Investigations will be required to determine the static and dynamic engineering properties of the material underlying the site in accordance with Sections IV(A)(4) and V(d) of Appendix A to 10 CFR Part 100.

2. Meteorology

As noted in the "Discussion" section, site meteorology is a site suitability characteristic principally with respect to the calculation of radiation doses resulting from the release of fission products as a consequence of a postulated accident and the establishment of exclusion area boundary, low population zone boundary, and distance to a population center. Accordingly, the Regulatory position on this issue is incorporated into the section "Population Density."

3. Population Density

Areas of low population density are preferred for nuclear power station sites. High population densities projected for any time during the lifetime of a station have been a source of contention during both the Regulatory staff review and the public hearing phases of the Licensing process. If the population density at a proposed site is not acceptably low, then the applicant will be required to give special attention to alternative sites with lower population densities.

Based on past experience, the Regulatory staff has found that a minimum exclusion distance of 0.4 mile, even with unfavorable design basis atmospheric dispersion characteristics, usually provides assurance that engineered safety

features can be designed to bring the calculated dose from a postulated accident within the guidelines of 10 CFR Part 100. If the minimum exclusion distance is less than 0.4 mile, it may be necessary to place special conditions on station design (e.g., added engineered safety features) before the site can be considered acceptable. Also, based on past experience, the Regulatory staff has found that a distance of 3 miles to the outer boundary of the LPZ is usually adequate.

4. Hydrology

Sites located in river valleys, on flood plains, or along coastlines where there is a potential for flooding will not be evaluated for site suitability until the studies described in Regulatory Guide 1.59 have been made.

A highly dependable system of water supply sources must be shown to be available under postulated occurrences of natural and site-related accidental phenomena or combinations of such phenomena as discussed in Regulatory Guide 1.59.

There must be reasonable assurance that permits for consumptive use of water in the quantities needed for a nuclear power plant of stated approximate capacity and type of cooling system can be obtained by the applicant from the appropriate State, local, or regional bodies before the Regulatory staff will evaluate the suitability of a proposed site.

The potential impacts of nuclear power stations on water quality are likely to be acceptable if effluent limitations or other requirements promulgated pursuant to the Federal Water Pollution Control Act are applicable and satisfied.

The criteria provided in 10 CFR Parts 20 and 50 will be used by the Regulatory staff for determining permissible concentrations of radioactive materials discharged to surface water or to groundwater.*

Aquifers that are or may be used by large populations for domestic, municipal, industrial, or irrigation water supplies provide potential pathways for radioactive material to man in the event of an accident. The suitability of sites located over such aquifers cannot be evaluated until detailed studies of factors identified in Section 2.4.13 of Regulatory Guide 1.70 have been completed.

5. Biota and Ecological Systems

The biota and ecological systems at proposed sites and their environs should be sufficiently well known to allow reasonably certain predictions of

* Proposed Appendix I to 10 CFR Part 50 would provide numerical guidance for design objectives and technical specification requirements for limiting conditions of operation for light-water-cooled nuclear power plants.

whether there would be unacceptable or unnecessary deleterious impacts on populations of important species or on ecological systems with which they are associated from the construction or operation of a nuclear power station at the site.

It should be determined whether any important species (as defined in "Biota and Ecological Systems" in the Discussion) inhabit or use the proposed site or its environs, and the size and distribution of their populations should be estimated. Potential adverse impacts on important species should be identified and assessed. The estimated number of individuals of an important species inhabiting a potential site should be compared to the total estimated local population and any predicted impacts on the species should be evaluated relative to effects on the total estimated local population. The destruction of, or sublethal effects on, a number of individuals which would not adversely affect the reproductive capacity and vitality of a population or the crop of an economically important harvestable population should generally be acceptable except in the case of certain endangered species. If there are endangered or threatened species at a site, the potential effects should be evaluated relative to the impact on the local population and the total estimated population in the entire range of the species.

It should be determined whether any important ecological systems are included at a site or in its environs and whether they are especially vulnerable to change or whether they contain important species habitats such as breeding areas (e.g., nesting and spawning areas), nursery, feeding, resting, and wintering areas, or other areas of seasonally high concentrations of individuals of important species.

In general, the uniqueness of a habitat or ecological system within the region under consideration, the amount of the habitat or ecological system destroyed or disrupted relative to the total amount in the region, and the vulnerability of the reproductive capacity of important species populations to the effects of construction and operation of the plant and ancillary facilities are the important considerations in the balancing of costs and benefits.

If sites contain, are adjacent to, or may impact on important ecological systems or habitats that are unique, limited in extent, or necessary to the productivity of populations of important species (e.g., wetlands and estuaries), they cannot be evaluated as to suitability for a nuclear power station until adequate assessments for the reliable prediction of impacts have been completed and the facility design characteristics that would satisfactorily mitigate the potential ecological impacts have been defined. In areas where reliable and

sufficent data are not available, at least one year of data collection may be required.

Migrations of important species and migration routes that pass through the site or its environs should be identified.

Generally the most critical migratory routes relative to nuclear power station siting are those of aquatic species in water bodies associated with the cooling systems. Site conditions that should be identified and evaluated in assessing potential impacts on important aquatic migratory species include (1) narrow zones of passage, (2) migration periods that are coincident with maximum ambient temperatures, (3) potential for major modification of currents by plant structures, (4) potential for increased turbidity during construction, and (5) potential for entrapment, entrainment, or impingement by or in the cooling water system or blocking of migration by facility structures or effluents.

The potential blockage of movements of populations of important terrestrial animals by use of the site for a nuclear power station and the availability of alternative routes that would provide for maintenance of the species' breeding population should be assessed.

If justifiable relative to costs and benefits, potential impacts of plant construction and operation on the biota and ecological systems can generally be mitigated by adequate engineering design and site planning and by proper construction and operation practice when there is adequate information about the vulnerability of the important species and ecological systems.

A summary of considerations, parameters, and regulatory positions for use in evaluating the suitability of sites for nuclear power plants is provided in Appendix B to this guide. A discussion of ecological systems and habitats, the level of detail that should be addressed in the site selection process, and the survey, monitoring, and analytical techniques for assessing impacts on important species and ecological systems will be summarized in subsequent appendices to this guide.

6. Land Use

Land use plans adopted by Federal, State, regional, or local governmental entities must be examined, and any conflict between these plans and use of a proposed site must be resolved by consultation with the appropriate governmental entity.

Potential sites on land devoted to specialty crop production where change in land use might result in severe market dislocations will require detailed investigation to demonstrate that potential problems have been identified and resolved.

The potential visual impact of nuclear power stations at sites near "natural-resource oriented" public use areas is of particular concern and evaluation of the suitability of such sites is dependent on consideration of specific plant design and station layout.

7. Industrial, Military, and Transportation Facilities

Potentially hazardous facilities and activities within 5 miles of a proposed site should be identified. If a preliminary evaluation of potential accidents at these facilities indicates that the potential hazards from shock waves and missiles approach or exceed those of the design-basis tornado for the region (the design basis tornado is described in Regulatory Guide 1.76) or potential hazards such as flammable vapor clouds, toxic chemicals, or incendiary fragments exist, the suitability of the site can only be determined by detailed evaluation of the potential hazard.

A specific analysis of such factors as frequency and type of aircraft movement, flight patterns, local meteorology, and topography should be performed for (1) sites located within 5 miles of an existing or projected commercial or military airport, (2) sites located between 5 and 10 miles from an existing or projected commercial or military airport with more than approximately $500 \times d^2$ (where d is in miles) aircraft movements per year, and (3) sites located at distances greater than 10 miles from an airport with more than approximately $1000 \times d^2$ aircraft movements per year. The analysis should demonstrate that the probability of any potential aircraft affecting the plant in such a way as to cause the release of radioactivity in excess of the guidelines of 10 CFR Part 100 is less than about 10^{-7} per year. If the probability is on the order of 10^{-7} per year or greater, aircraft impact should be considered in the design of the facility.

8. Socioeconomics

The Regulatory staff considers that the suitability of nuclear power plant sites near distinctive communities is contingent on demonstration that the construction and operation of the nuclear station, including transmission and transportation corridors, will not adversely affect the distinctive character of the community or cause a disruption of tourist trade. A preliminary investigation should be made to determine and analyze problems arising from the proximity of a distinctive community to a proposed site.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the Regulatory staff's plans for using this regulatory guide. Since this guide generally reflects recognized Regulatory staff practice with regard to the implementation of existing regulations concerning site suitability, it will be used immediately to indicate considerations that are addressed in evaluating site suitability.

APPENDIX A

SAFETY-RELATED SITE CONSIDERATIONS
FOR ASSESSING SITE SUITABILITY
FOR NUCLEAR POWER STATIONS

This appendix has been prepared to provide a checklist of safety-related site characteristics, relevant regulations and regulatory guides, and regulatory experience and position for assessing site suitability for nuclear power stations.

Considerations	Relevant Regulations and Regulatory Guides	Regulatory Experience and Position
A.1 Geology and Seismology		
Geologic and seismic characteristics of a site, such as surface faulting, ground motion, and foundation conditions (including liquefaction, subsidence, and landslide potential), may affect the safety of a nuclear power station.	10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." Regulatory Guide 1.70, Chapter 2 (identifies safety-related site characteristics), October 1972. Regulatory Guide 1.29 (discusses plant safety features which should be controlled by engineering design), August 1973.	Sites that include capable faults are not suitable for a nuclear power station. Sites within about 5 miles of a surface capable fault (greater than 1000 feet in length) are generally not suitable for a nuclear power station. Sites should be selected in areas for which an adequate geologic data base exists to determine "capability." Delays in licensing can result from a need for extensive geologic and seismic investigations. Conservative design of safety-related structures will be required when geologic and seismic information is questionable. Sites with unfractured bedrock generally have suitable foundation conditions. If bedrock sites are not available, it is prudent to select sites in areas known to have a low liquefaction potential. Investigations will be required to determine the static and dynamic engineering properties of the material underlying the site as stated in 10 CFR Part 100, Sec. IV(A) (4) and Sec. V(d).

Considerations	Relevant Regulations and Regulatory Guides	Regulatory Experience and Position
A.2 Atmospheric Dispersion		
The meteorological conditions at a site should provide sufficient dispersion of radioactive materials released during a postulated accident to reduce the radiation exposures of individuals at the exclusion area and low population zone boundaries to the values prescribed in 10 CFR Part 100.	10 CFR Part 100, "Reactor Site Criteria." Regulatory Guide 1.23, "On-Site Meteorological Programs," February 1972. Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors," June 1974. Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors," June 1974. Regulatory Guide 1.5, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Steam Line Break Accident for Boiling Water Reactors," March 1971. Regulatory Guide 1.24, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Pressurized Water Reactor Radioactive Gas Storage Tank Failure," March 1972. Regulatory Guide 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors," March 1972.	Unfavorable safety-related design basis atmospheric dispersion characteristics can be compensated for by an adequate exclusion distance and engineered safety features (see A.3 of this appendix).

Considerations	Relevant Regulations and Regulatory Guides	Regulatory Experience and Position
A.3 Population Density in the Site Environs		
In the event of a serious accident at a nuclear power station, it must be possible to take effective action to minimize exposure of individuals outside the station to any radioactive materials which may be released during the accident. To provide this assurance, the nuclear power station must not be located in a densely populated area.	10 CFR Part 100, "Reactor Site Criteria." Requires: • An exclusion area" surrounding the reactor, in which the reactor licensee has the authority to determine all activities, including removal of personnel and property; • A "low population zone" (LPZ) which immediately surrounds the exclusion area and in which the population number and distribution is such that "there is a reasonable probability that appropriate measures could be taken in their behalf in the event of a serious accident;" • That at any point on the exclusion area boundary and on the outer boundary of the LPZ the exposure of individuals to a postulated release of fission products (as a consequence of an accident) be less than certain prescribed values; • That the "population center distance," defined as the distance from the nuclear reactor to the nearest boundary of a densely populated center having more than 25,000 residents, be at least 1-1/3 times the distance from the reactor to the outer boundary of the LPZ. Regulatory Guides 1.3, 1.4, 1.5, 1.24, and 1.25 give calculational methods (see A.2 of this appendix).	Based on past experience, the Regulatory staff has found that a minimum exclusion of 0.4 mile, even with the most unfavorable design basis atmospheric dispersion characteristics, provides assurance that engineered safety features can be added that will bring the calculated doses from a postulated accident within the guidelines of 10 CFR Part 100. If the minimum exclusion distance is less than 0.4 mile, it may be necessary to place special conditions on station design (e.g., added engineered safety features) before the site can be considered acceptable. Also, based on past experience, the Regulatory staff has found that a distance of 3 miles to the outer boundary of the LPZ is usually adequate.

* The transient population must be taken into account by weighting the transient population according to the fraction of the time the transients are in the area.

Considerations	Relevant Regulations and Regulatory Guides	Regulatory Experience and Position
A.4 Hydrology		
a. Flooding		
Precipitation, wind, or seismically induced flooding (e.g., resulting from dam failure, from river blockage or diversion, or from distantly and locally generated sea waves) can affect the safety of a nuclear power station.	10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," August 1973. Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," October 1972 (Sec. 2.4). 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants." Criterion 2, "Design Bases for Protection Against Natural Phenomena." 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." Regulatory Guide 1.59, "Design Basis Floods for Nuclear Power Plants," August 1973. Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants," March 1974.	Sites located in river valleys, on flood plains, or along coastlines where there is a potential for flooding will not be evaluated for site suitability until the studies described in Regulatory Guide 1.59 have been made. A highly dependable system of water supply sources must be shown to be available under postulated occurrences of site-related accidental phenomena or combinations of such phenomena as discussed in Regulatory Guide 1.59. There must be reasonable assurance that permits for consumptive use of water in the quantities needed for a nuclear power plant of stated approximate capacity and type of cooling system can be obtained by the applicant from the appropriate State, local, or regional bodies before the Regulatory staff will evaluate the suitability of a proposed site.
b. Water Supply		
A safety-related water supply is required for normal or emergency shutdown and cooldown.		

Considerations	Relevant Regulations and Regulatory Guides	Regulatory Experience and Position
A.5 Industrial, Military and Transportation Facilities Near the Site		
Accidents at present or projected nearby industrial, military, and transportation facilities may affect the safety of the nuclear power station.	10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 4, "Environmental and Missile Design Basis." Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports," Section 2.2 (lists types of facilities and potential accidents) October 1972. Regulatory Guide 1.78, "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," June 1974.	Potentially hazardous facilities and activities within 5 miles of a proposed site must be identified. If a preliminary evaluation of potential accidents of these facilities indicates that the potential hazards from shock waves and missiles approach or exceed those of the design-basis tornado for the region (the design basis tornado is described in Regulatory Guide 1.76), or potential hazards such as flammable vapor clouds, toxic chemicals or incendiary fragments exist, the suitability of the site can only be determined by detailed evaluation of the potential hazard. A specific analysis of such factors as frequency and type of aircraft movement, flight patterns, local meteorology, and topography should be performed for (1) sites located within 5 miles of any existing or projected commercial or military airport, (2) sites located between 5 and 10 miles from an existing or projected commercial or military airport with more than approximately 500 d^2 (where d is in miles) aircraft movements per year, and (3) sites located at distances greater than 10 miles from an airport with more than approximately 1000 d^2 aircraft movements per year. The analysis should demonstrate that the probability of any potential aircraft affecting the plant in such a way as to cause the release of radioactive materials in excess of the guidelines of 10 CFR Part 100 is less than about 10^{-7} per year. If the probability is on the order of 10^{-7} per year or greater, aircraft impact should be considered in the design of the facility.

APPENDIX B

ENVIRONMENTAL CONSIDERATIONS, REGULATORY CRITERIA, AND PARAMETERS FOR ASSESSING SITE SUITABILITY FOR NUCLEAR POWER PLANTS

This appendix summarizes site characteristics related to environmental considerations that should be addressed in the early site selection process. The relative importance of the different factors to be considered varies with the region or State in which the potential sites are located.

Site selection processes can be facilitated by establishing limits for various parameters based on the best judgement of specialists knowledgeable of the region under consideration. For example, limits can be chosen for the fraction of water that can be diverted in certain situations without adversely affecting the local populations of important species. Although simplistic because important factors such as the distribution of important species in the water body are not taken into account, such limits can be useful in a screening process for site selection.

Considerations	Parameters	Regulatory Position
B.1 Preservation of Important Habitats		
Important habitats are those that are essential to maintaining the reproductive capacity and vitality of populations of important species* or the harvestable crop of economically important species. Such habitats include breeding areas (e.g., nesting and spawning areas), nursery, feeding, resting and wintering areas or other areas of seasonally high concentrations of individuals of important species.	The proportion of an important habitat that would be destroyed or significantly altered in relation to the total habitat within the region in which the proposed site is to be located is a useful parameter for estimating potential impacts of the construction or operation of a nuclear power station. The value of the proportion varies among species and among habitats. The region considered in determining proportions is the normal geographic range of the specific population in question.	In general, the Regulatory staff will require detailed justification when the destruction or significant alteration of more than a few percent of important habitat types is proposed.
The construction and operation of nuclear power stations (including new transmission lines and access corridors constructed in conjunction with the station) can result in the destruction or alteration of habitats of important species leading to changes in the abundance of a species or in the species composition of a community.	If endangered or threatened species occur at a site, the potential effects of the construction and operation of a nuclear power station should be evaluated relative to the potential impact on the local population and the total estimated population in the entire range of the species.	The reproductive capacity of populations of important species and the harvestable crop of economically important populations must be maintained unless justification for proposed or probable changes can be provided.

* As defined for the purposes of this guide in Section B, "Discussion."

Considerations	Parameters	Regulatory Position
B.2 Migratory Routes of Important Species		
Seasonal or daily migrations are essential to maintaining the reproductive capacity of some important species populations. Disruption of migratory patterns can result from partial or complete blockage of migratory routes by structures, by discharge plumes, by environmental alterations, or by man's activities (e.g., transportation or transmission corridor clearing, site preparation).	The width or cross-sectional area of a water body at a proposed site relative to the general width or cross-sectional area in the portion of the water body used by migrating species should be estimated. Suggested minimum zones of passage range from 1/4 to 3/4 of the width or cross-sectional areas of narrow water bodies.* Some species migrate in central, deeper areas while others use marginal, shallow areas. Rivers, streams, and estuaries are seldom homogeneous in their lateral dimension with respect to depth, current velocity, and habitat type. Thus, the use of width or cross-sectional area criteria for determining adequate zones of passage should be combined with a knowledge of important species and their migratory requirements.	Narrow reaches of water bodies should be avoided as sites for locating intake or discharge structures. A zone of passage that will permit normal movement of populations of important species and maintenance of the harvestable crop of economically important populations should be provided.

* The Water's Edge: Critical Problems of the Coastal Zone, B. H. Ketchum (ed). MIT Press, Cambridge, Mass., 1972.

Engineering for Resolution of the Energy-Environment Dilemma. National Academy of Engineering. Washington, D.C., 1972.

Considerations	Parameters	Regulatory Position
B.3 Entrainment and Impingement of Aquatic Organisms		
Plankton, including eggs, larvae and juvenile fish, can be killed or injured by entrainment through power station cooling systems or in discharge plumes. The reproductive capacity of important species populations may be impaired by lethal stresses or by sub-lethal stresses that affect reproduction of individuals or result in increased predation upon the affected species population. Fish and other aquatic organisms can be killed or injured by impingement on cooling water intake screens* or by entrainment in discharge plumes.	The depth of the water body at the point of intake relative to the general depth of the water body in the vicinity of the site. The proportion of water withdrawn relative to the net new available water at the site is an indirect measure of the destruction of plankton which in turn is indicative of possible effects on populations of important species. It has been suggested that the fraction of available new water that can be diverted is in the range of 10% to 20% of flow.** This simplistic parameter is suitable for use in a screening process for site selection. However, the other factors such as distribution of important species should be considered and in all cases the advice of experts on the local fisheries should be consulted to assure that proposed withdrawals will not be excessive.	The site should have characteristics that allow placement of intake structures where the relative abundance of important species is small and where low approach velocities can be attained. (Deep regions are generally less productive than shallow areas. It is not implied that benthic intakes are necessary.) Important habitats (see B.1) should be avoided as locations for intake structures.

* Approach velocity and screen face velocity are the principal design criteria for controlling the impingement of larger organisms, principally fish, on intake screens. Acceptable approach and screen-face velocities are based on fish swim speeds and will thus vary with the species, site and season. Maximum acceptable approach velocities are on the order of 0.5 fps.

** The Water's Edge: Critical Problems of the Coastal Zone, B. H. Ketchum (ed). MIT Press, Cambridge, Mass., 1972.
Engineering for Resolution of the Energy-Environment Dilemma. National Academy of Engineering., Washington, D.C., 1972.

Considerations	Parameters	Regulatory Position
B.4 Entrapment of Aquatic Organisms		
Cooling water intake and discharge system features such as canals and thermal plumes can attract and entrap organisms, principally fish. The resulting concentration of important fish species near the plant site can result in higher mortalities from plant related causes such as impingement, cold shock, or gas bubble disease than would otherwise occur. Entrapment can also interrupt normal migratory patterns.	Site characteristics that will accommodate design features that mitigate or prevent entrapment.	Sites where the constuction of intake or discharge canals would be necessary should be avoided unless the site and important species characteristics are such that entry of important species to the canal can be prevented or limited by screening. Sites should be selected where rapid mixing of thermal effluents with the receiving water will minimize or avoid entrapment.

Consideration	Parameters	Regulatory Position
B.5 Water Quality		
Steam electric power plant discharges are governed by the Federal Water Pollution Control Act (PL 92-500).	Applicable EPA approved State Standards.	Pursuant to section 401(a)(1) of the Act, certification from the State that any discharge will comply with applicable effluent limitations and other water pollution control requirements is necessary before the AEC can issue a construction permit unless the requirement is waived by the State or the State fails to act within a reasonable length of time. Issuance of a permit pursuant to section 402 of the Act is not a prerequisite to an AEC license or permit.

Consideration	Parameters	Regulatory Position
B.6 Consumptive Water Use		
The consumptive use of water for cooling may be restricted by statute, may be inconsistent with water use planning and may lead to an unacceptable impact to the water resource.	Statutory requirements. Compatability with water use plan of cognizant water resource planning agency. In the absence of a water use plan, the effect on other water users is evaluated considering flow or volume reduction and the resultant ability of all users to obtain adequate supply and to meet applicable water quality standards (see B.5, Water Quality).	Water use must comply with statutory requirements and be compatible with water use plan of cognizant water resources planning agency. Consumptive use should be restricted such that the supply of other users is not impaired and that applicable surface water quality standards could be met assuming normal plant operational discharges and extreme low flow conditions defined by generally accepted engineering practices. For lakes and reservoirs, consumptive use should be restricted such that the magnitude and frequency of drawdown will not destroy important habitats (see B.1) or be inconsistent with the management goals for the water body.

Considerations	Parameters	Regulatory Position
B.7 Established Public Amenity Areas		
Areas dedicated by Federal, State, or local governments to scenic, recreational, or cultural purposes are generally prohibited areas for siting power stations. Siting nuclear power stations in the vicinity of established public amenity areas could result in the loss or deterioration of important public amenities.	Proximity to public amenity area. Viewability (see B.10, Visual Amenities).	Siting in the vicinity of designated public amenity areas will generally require extensive evaluation and justification. The evaluation of the suitability of sites in the vicinity of public amenity areas is dependent on consideration of a specific plant design and station layout in relation to potential impacts on the public amenity area.
B.8 Prospective Designated Amenity Areas		
Areas containing important resources for scenic, recreational, or cultural use may not currently be designated as such by public agencies but may involve a net loss to the public if converted to power generation. These areas may include locally rare land types such as sand dunes, wetlands, or coastal cliffs.	Comparison of possible amenity areas in number and extent with other similar areas available on a local, regional, or national basis, as appropriate.	Public amenity areas that are distinctive, unique, or rare in a region should be avoided as sites for nuclear power stations.

Considerations	Parameters	Regulatory Position
B.9 Public Planning		
Land use for a nuclear power station should be compatible with established land use or zoning plans of governmental entities.	Officially adopted land use plans.	Land use plans adopted by Federal, State, regional, or local governmental entities must be examined, and any conflict between these plans and use of a proposed site must be resolved by consultation with the appropriate governmental entity.
B.10 Visual Amenities		
The presence of power plant structures may introduce adverse visual impacts to residential, recreational, scenic, or cultural areas or other areas with significant dependence on desirable viewing characteristics.	The solid angle subtended by plant structures at critical viewing points.	The visual intrusion of nuclear power station structures as viewed from nearby residential, recreational, scenic, or cultural areas should be controlled by selecting sites where existing topography and forests can be utilized for screening station structures.

Considerations	Parameters	Regulatory Position
B.11 Local Fogging and Icing		
Water and water vapor released to the atmosphere from recirculating cooling systems can lead to fog and ice resulting in transportation hazards and damage to electric transmission systems.	Increase in number of hours of fogging or icing caused by operation of the station.	The hazards on transportation routes from fog or ice that result from station operation should be evaluated. The evaluation should include estimates of frequency of occurrence of station-induced fogging and icing.
B.12 Economic Impact of Preemptive Land Use		
Nuclear power stations can preempt large land areas, especially when large cooling lakes are constructed. The land requirement is likely to be an important issue when a proposed site is on productive land, such as agricultural land, that is locally limited in availability and is important to the local economy.	The level of local economic dislocation, such as loss of income, jobs, and production, caused by preemptive use of productive land.	If a preliminary evaluation of net local economic impact of the use of productive land for a nuclear power station indicates a potential for large economic dislocation, the Regulatory staff will require a detailed evaluation of the potential impact and justification for the use of the site.

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