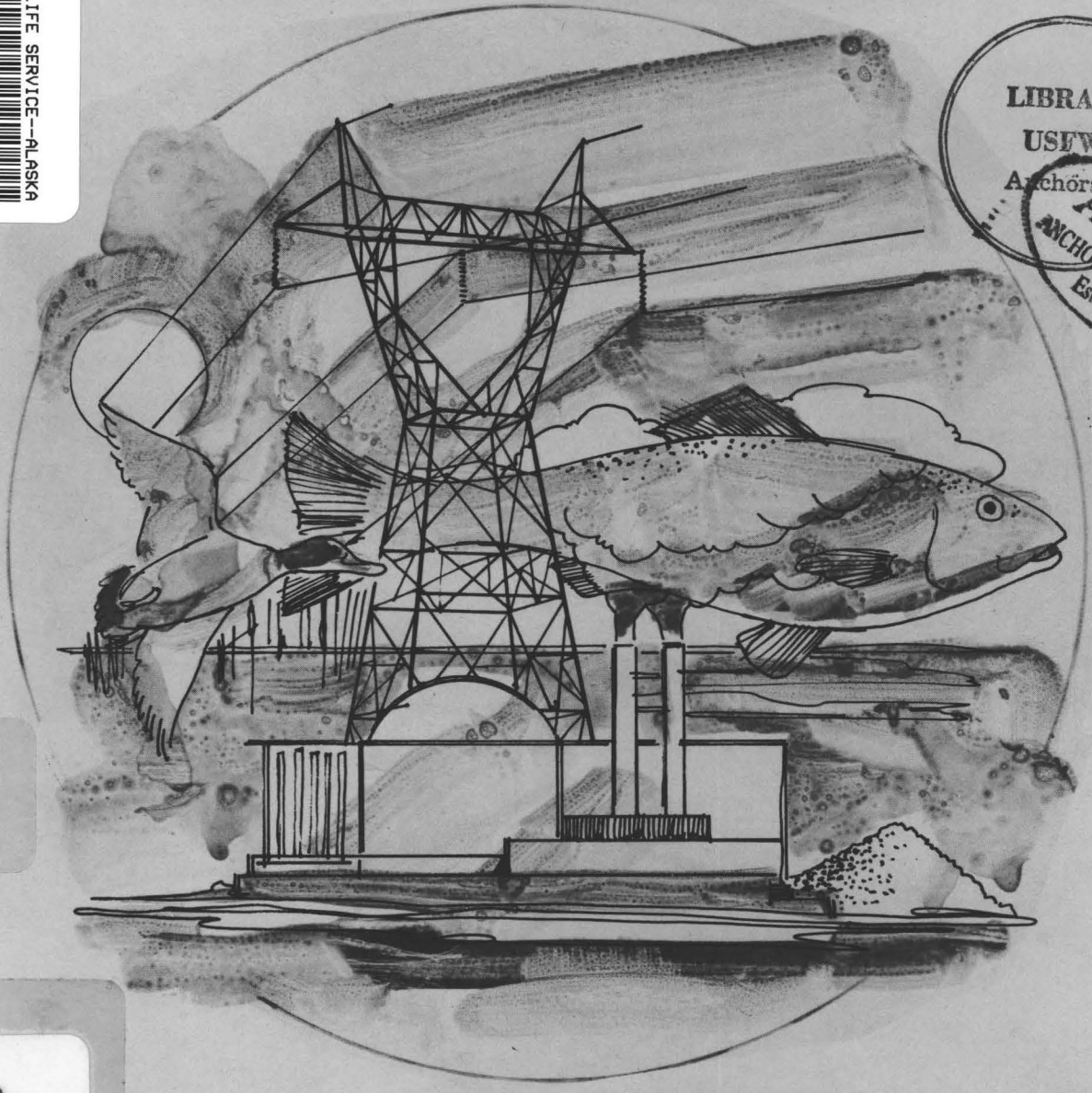
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July 1978

Electric Power Generation and Transmission Decisions Affecting Fish and Wildlife Resources



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The Biological Services Program was established within the U.S. Fish and Wildlife Service to supply scientific information and methodologies on key environmental issues which impact fish and wildlife resources and their supporting ecosystems. The mission of the Program is as follows:

1. To strengthen the Fish and Wildlife Service in its role as a primary source of information on national fish and wildlife resources, particularly in respect to environmental impact assessment.

2. To gather, analyze, and present information that will aid decision makers in the identification and resolution of problems associated with major land and water use changes.

3. To provide better ecological information and evaluation for Department of the Interior development programs, such as those relating to energy development.

Information developed by the Biological Services Program is intended for use in the planning and decision making process to prevent or minimize the impact of development on fish and wildlife. Biological Services research activities and technical assistance services are based on an analysis of the issues, the decision makers involved and their information needs, and an evaluation of the state of the art to identify information gaps and determine priorities. This is a strategy to assure that the products produced and disseminated will be timely and useful.

Biological Services projects have been initiated in the following areas:

- Coal extraction and conversion
- Power plants
- Geothermal, mineral, and oil shale development
- Water resource analysis, including stream alterations and western water allocation
- Coastal ecosystems and Outer Continental Shelf development
- Systems and inventory, including National Wetlands Inventory, habitat classification and analysis, and information transfer

The Program consists of the Office of Biological Services in Washington, D.C., which is responsible for overall planning and management; National Teams which provide the Program's central scientific and technical expertise and who arrange for contracting Biological Services studies with States, universities, consulting firms, and others; Regional staff who provide a link to problems at the operating level; and staff at certain Fish and Wildlife Service research facilities who conduct in-house research studies.

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ELECTRIC POWER GENERATION AND TRANSMISSION DECISIONS AFFECTING FISH AND WILDLIFE RESOURCES

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PREFACE

In the preparation of this document, a minimum understanding of electric power generation licensing procedures was assumed, hence, the material presented may be elementary for some readers. It is hoped the document will provide a foundation of understanding for those not fully involved in regulatory procedures, on which they can proceed to more complex licensing issues.

The document is organized in a sequential manner, starting with an overview of the Federal and State agencies entrusted with the responsibilities of implementing regulations and enforcing laws related to the power generation industry. The states are categorized as to their regulatory stringency. A general description of the organization of the utility industry is also included.

The decisions made prior to notification to the general public and most regulatory agencies of a new electric generating facility or transmission route are discussed in detail.

Preconstruction licensing schedules are given for each facility and are keyed to show where potential decisions affecting fish and wildlife resources could be made. Federal and State licensing requirements are outlined and typical licensing schedules depicted.

The interrelationships between the various decision makers are illustrated through analysis of the general organization and decision making levels for power plant construction and through milestone schedules showing various agency involvements and the primary steps in the licensing process on a month-to-month basis. These milestone schedules are made for each state category and for each type of facility discussed--nuclear, fossil-fueled, hydroelectric, and transmission lines.

Potential impacts of decisions on fish and wildlife resources are discussed for each type of facility. Areas of possible interest to Fish and Wildlife Service personnel are highlighted.

Consideration is given to recent events in the legislative arena and how these actions will affect future trends within the electric power generation industry. Finally, the primary laws that govern the planning and construction of an electric generating facility are reviewed.

The reader who is amply familiar with the various regulations and the interplay of agencies and utilities may find the most useful portions of this document to be the figures giving preconstruction and milestone schedules. These figures show graphically, from the start of site selection to the construction permit stage, each of the agencies involved and the steps necessary for licensing an electric power facility.

It is highly recommended that for full comprehension of the licensing processes a thorough review of the document is made.

AVAILABILITY

For information regarding the availability of this and other reports prepared under the auspices of the National Power Plant Team, contact:

Information Transfer Specialist
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1451 Green Road
Ann Arbor, Michigan 48105

This report was submitted in fulfillment of Government Contract No. 14-16-0008-2149. Work was completed as of February, 1978.

EXECUTIVE SUMMARY

OVERVIEW

It is the purpose of this document to familiarize Fish and Wildlife Service (FWS) personnel with decision processes in the electric power generating industry, the timing of these decisions, their chronological sequence, the relationship of organizations involved, and the potential impact of these decisions on fish and wildlife resources.

Fish and Wildlife Service biologists at times review power generation and transmission lines projects. This document specifically describes those instances in which decisions by industry and regulatory agencies have the greatest potential effect on fish and wildlife resources and attempts to point out the places in the decision making processes in which biological considerations relate to overall project decision making.

DISCUSSION

This report discusses, in a broad scope, the existing regulatory operations of Federal and State agencies and describes the operations of utilities as they relate to the planning and construction of energy systems. It also defines the timing and requirements of key events within the decision making process as they affect the licensing (construction/operation permits) of electric generation facilities. Key decisions which may affect fish and wildlife resources have been identified and discussed.

"Electric Power Generation and Transmission Decisions Affecting Fish and Wildlife Resources" is divided into the following chapters:

THE DECISION MAKERS

Federal Agency Operations

Under the National Environmental Policy Act of 1969 (NEPA), Federal agencies are required to prepare a detailed Environmental Impact Statement (EIS) on any proposal for legislation and other major Federal actions significantly affecting the quality of the human environment. The issuance of a permit, grant, license, contract, or right-of-way easement by a Federal agency to an electric generating facility requires an EIS.

When more than one agency is directly involved in granting the facility's permits or licenses, a "lead agency" is selected to prepare the EIS and coordinate regulatory activities with the other agencies. The EIS is issued in draft form for comments, revised upon receipt of comments and a public hearing process, and then submitted to the Environmental Protection Agency for final endorsement prior to regulatory action.

In general, Federal agencies that have lead responsibilities in power plant projects include:

Rural Electrification Administration (REA) - makes loans to qualified borrowers to help finance generation, transmission, and distribution lines.

U.S. Army Corps of Engineers (COE) - issues permits for any construction in navigable waters of the United States.

Bureau of Indian Affairs (BIA) - acts as trustee of Indian and Alaskan people and their lands; participates in the sale or lease of lands and granting of water rights relative to construction and operation of energy facilities.

Bureau of Land Management (BLM) - is involved with energy facility development of Federal lands as is the BIA on Indian lands.

Bureau of Reclamation (BR) - concerned primarily with irrigation, yet has the responsibility for the sale, interchange, or transmission of electric power generated at most hydro plants in the arid and semi-arid lands.

Environmental Protection Agency (EPA) - the administrator of permit programs for the abatement and control of air and water pollution.

The Nuclear Regulatory Commission (NRC) - responsible for nuclear generation and transmission from generation source, the NRC is always the lead agency in matters pertaining to nuclear power generation.

Department of Energy (DOE) - created in 1977, the DOE incorporates many programs and functions from other Federal agencies. Its intent is to reshape existing programs to fit the national energy policy.

Federal Energy Regulatory Commission (FERC) - issues permits and licenses for non-Federal hydroelectric power projects; is part of the DOE, yet is an independent regulatory body.

Bonneville Power Administration (BPA) - created in 1937 to market power at the Bonneville Dam on the Columbia River in Oregon, this DOE agency was later given responsibility for transmitting and distributing power at more than a dozen other dams in the Northwest.

The Southwestern and Southeastern Power Administrations (SWPA, SEPA) - SWPA markets power generated at COE projects in Arkansas, Missouri, Oklahoma, and Texas; SEPA sells power generated at COE projects in the southern and southeastern states.

Tennessee Valley Authority (TVA) - the largest single electric power system in the world; TVA is charged with the development of the Tennessee River; more than three-quarters of its power generation is by steam electric and the remainder by hydroelectric plants.

Federal agencies have, over the past few years, given serious consideration to streamlining the licensing process for energy producing facilities. At the present time, however, none of these agencies have come up with a plan for streamlining regulatory requirements that is acceptable to all parties involved.

State Agency Operations

As is the case with Federal agencies, the objectives and functions of some State agencies include the regulation of electric power generating and transmission facilities. The agency titles and proceedings differ from state-to-state, but a Public Service Commission, a State Department of Natural Resources, Conservation and/or Environment, and, more recently, a State Siting Authority are similar in the implementation of their responsibilities for the protection of the environment.

States can be categorized into four types, according to their regulatory stringency and requirements. Going from most structured to least are:

Type 1 states - these have a Siting Authority, one- or two-stop siting, and require an EIS.

Type 2 states - these have a Siting Authority, one- or two-stop siting, and do not require an EIS.

Type 3 states - have no Siting Authority but do require an EIS.

Type 4 states - do not have a Siting Authority and do not require an EIS.

One- or two-stop siting is a procedure that allows a single agency or two State agencies to issue all the required permits. The trend for states is a movement toward Type 1.

In an attempt to expedite the licensing process of power generation facilities, State and Federal agencies have undertaken joint hearings relating to site acceptability.

Utility Operations

Electric Generating Utilities have been vested with the power and the responsibility to generate, produce, transmit, transfer, exchange or sell electric energy, and to enter into contracts for any or all such purposes. The primary role of the electric utilities is to provide electrical energy in a cost-effective, reliable and environmentally acceptable manner. Utilities meet but seldom exceed the requirements in the laws and regulations pertaining to construction and operation of generating and transmission facilities.

A utility is often presided over by a Board of Directors or Board of Trustees, which is involved in utility decisions of basic economic and political nature. The responsibility for utility operations usually falls upon a Managing Director, President, or Executive Vice-President who oversees four major divisions or groups: 1) Planning, 2) Construction, 3) Operations, and 4) Administration.

The utility must provide reports and electrical generation information to Federal and State agencies which regulate the growth of the industry, the rates charged consumers, and the environmental impacts of electric power generation.

In the majority of cases an Architect-Engineer (AE) firm is hired by an Electric Generating Utility (EGU) to provide a degree of expertise in the various architectural and engineering fields not generally available within an EGU staff. AEs perform as a complement to EGUs in the support of design and engineering functions. Depending on the size of a utility's staff, this support may influence either just a few or all the decision making steps through their analyses and recommendations.

The project team organization is preferred by most AEs. Under this approach, a group of technical personnel serve as members of a task force on a full time basis working directly under a project manager. The project manager has responsibility for overall project performance, its planning and scheduling, and responds, in turn, as a single contact point to the EGU's project manager. AE firms may have environmental divisions which provide support for the architectural and engineering divisions. EGUs often retain AEs that can provide total architectural design, engineering, and environmental capabilities. In more recent years, the trend has been for environmental consulting firms to work directly with an AE firm or the utility on power generation and transmission projects. Many utilities find it beneficial to have one firm doing the design and engineering and another the environmental studies.

The present trend is to hire the environmental consultant in the early stages of site selection. Past experience has shown that environmental consultants have been engaged late in the site selection process, or after a site has been selected. In the past, and in some cases today, the plant has been, or is in the process of being built, before ecological data are collected. In these cases, initial advice on environmental matters is usually based on limited data pertinent to the site and on the consultant's past experience at similar sites. After ecological data are gathered, more specific recommendations are made and include modifications in the initial design.

CHRONOLOGICAL SEQUENCE OF DECISION MAKING

Many decisions involving environmental protection may be made and changed a number of times before the plant goes into operation and, occasionally, after a plant is operating. This happens because of: 1) the long lead time, particularly for nuclear plants; 2) frequent

changes in regulatory requirements; 3) advances and changes in technology for reducing environmental impact; and 4) inadequate environmental planning and advice during the design stages of the project.

Changes to solve various design or engineering problems often occur during actual construction and the final structure may differ significantly from the initial design. If these changes have a detrimental environmental impact once the plant starts operation, the environmental consultant may recommend additional modifications. Thus, decisions may be made, changed, and modified a number of times, even during the early operation of the plant.

Pre-Public/Agency Notification

Prior to notification to the general public and most regulatory agencies of a new electric generating facility or transmission route, the utility identifies: unit or line size, schedule for commercial operations, and site location or route. It is highly unlikely that these decisions, made in essence by the utility's Board of Directors or similar entity, will be subject to influence by regulatory bodies except possibly for the last step in site selection, identification of the optimum site. Those utility decisions which may affect fish and wildlife resources in an intangible manner are summarized below.

Load Components. The duties of EGUs (outlined above) coupled with the long lead times usually associated with base load unit's commercial operations and Federal (FERC) and State agency requirements, require utilities to make extensive use of techniques for projecting load demands ten and twenty years into the future.

By breaking the load into its major component parts--residential, commercial, industrial, and miscellaneous--and examining historical factors and future trends affecting growth in each component, load projections for long- and short-range predictions are developed.

Interconnection. The investment cost of generating capacity per kilowatt is usually lower as generating unit size increases, making the use of larger units economically beneficial. Larger systems can be assembled by interconnecting two or more smaller systems, thus enabling the use of a larger generator unit. Interconnection results in considerable economic benefits to all parties involved.

To find out how much generating capacity should be built into an interconnecting electric power system, a number of variables are considered. Foremost is the maximum peak load on the system. Emergency conditions, such as a fault in a generating station, transmission lines or substations, must be considered, as well as scheduled outages for regular repair and maintenance.

Site Selection. Increasingly, the problem facing each electric utility is finding the best location both economically and environmentally for power generating plants and rights-of-way to provide the desired increase of electric power supply at the lowest cost. Important factors in plant site selection include fuel supply, load distribution, load growth, availability of land, foundation conditions, and availability of cooling water. Utilities have to consider water quality and air pollution problems. Generally, availability and cost of fuel are basic to the location of a large generating station.

In the selection of a site for nuclear or fossil electric generating station, preliminary physical, biological, and social studies are prepared. The outcome of these studies will ultimately determine the adequacy of a site.

Preconstruction Licensing Schedules

The time frame for planning and construction of electric generating facilities is long and many decisions are made and changed a number of times before a plant goes into operation. Licensing schedules vary from nuclear plants, which require typically 10 years from start of site selection to commercial operation; hydroelectric power stations taking 9 1/2 years; fossil-fueled power stations 7 1/2 years; to transmission lines which ordinarily require 5 to 6 years to be constructed.

INTERRELATIONSHIPS AMONG DECISION MAKERS

Various levels of decision making for power plant construction can be defined as follows:

Level A - Policy Decisions

Level B - Project Control Decisions

Level C - Project Engineering Decisions

Level D - Detailed Engineering Decisions

Level E - Technical Decisions

The various Federal and State agencies interact with the utility industry whenever a new electric power generating facility is proposed. Milestone schedules for the various types of facilities reflect this involvement.

The lengthy licensing process for nuclear power plants has resulted from mandatory Federal agency involvement and the requirements established by the various State and Federal regulatory agencies. Milestone schedules for fossil-fueled facilities show a reduction in licensing time between the Type 1 states and the others. This difference is further accentuated in instances where no Federal involvement is mandatory.

For hydroelectric power plants, sequential State and Federal licensing causes a relatively long licensing schedule for Type 1 states. Most regions of the country have a limited hydroelectric potential. In the case of transmission lines, milestone schedules indicate that as overall design, engineering, and construction schedules become shorter, the significance of State licensing procedures becomes more evident.

POTENTIAL IMPACTS OF DECISIONS UPON FISH AND WILDLIFE RESOURCES

Areas of prime decision making importance to fish and wildlife resources are summarized in the chart below:

Type of Facility	Decision Relating to:	Impacts Aquatic	Impacts Terrestrial
NUCLEAR AND FOSSIL-FUELED	Site Selection	x	x
	Development of Plot Plan		x
	Engineering Design Systems	x	x
	circulating water cooling system	x	
	intake system	x	
	discharge system	x	
	chemical waste treatment	x	
	biocide waste treatment	x	
	sanitary waste system	x	
	liquid radwaste (nuclear)	x	
	gaseous radwaste (nuclear)	x	
	air quality control (fossil)		x
	Transmission Facilities		x
	Construction Schedule	x	x
	Site Dewatering Requirements and Yard Drainage	x	x
	Solid Waste Storage	x	x
	Coal Handling		x
	Water Treatment Facilities	x	
	Unit Capacity	x	x
HYDROELECTRIC	Site Location Selection	x	x
	size of impoundment(s)	x	x
	Development of Plot Plan	x	x
	orientation of plant	x	x
	location of intake	x	
	location of discharge	x	
	Engineering Design Systems	x	x
	flood control	x	x
	amount of head (pumped storage systems)	x	x
	seepage prevention	x	
	intake system	x	
	discharge system	x	
	sanitary waste system	x	
	Fish Protection Studies	x	

Type of Facility	Decision Relating to:	Impacts Aquatic	Terrestrial
HYDROELECTRIC (continued)	fish passage	x	
	Transmission Facilities		x
	location of towers/sub-stations		x
	location of access roads		x
	tower design		x
	Recreational Facilities	x	x
	Construction Activities	x	x
	Unit Capacity	x	x
TRANSMISSION LINES AND FACILITIES	Right-of-Way Selection	x	x
	type of transmission system (overhead vs. underground)	x	x
	location of ROW	x	x
	Tower Design		x
	type of towers		x
	materials & design		x
	height of tower		x
	distance between towers		x
	Footing Design	x	x
	area disturbed	x	x
	construction method	x	x
	Development of Plan and Profile Sheets	x	x
	length & width of ROW	x	x
	clearing	x	x
	replanting	x	x
	tower location		x
	method of tower erection		x
	method of conductor stringing		x
	Construction Schedule	x	x
	Load, Terminal Points, and Reliability	x	x

FUTURE TRENDS

Two major legislative actions, one creating the Department of Energy and the other amending the Clean Air Act, are having significant impacts on electric power generation in this country. With the shift of coal as an energy source, much closer attention to the atmospheric discharges generated is required. Better management techniques for our limited water resources are becoming essential with increased need for electric power generation.

A streamlining of the licensing process for energy producing facilities is also necessary. At the Federal level this is being accomplished by providing a close liaison with the states on regulatory actions. The states are taking steps towards consolidating authority for granting permits in one body, such as a State Siting Authority, and are convening joint State/Federal hearings for licensing facilities. The power generation industry is shifting to more sophisticated site selection methods and is giving closer attention to their environmental accountability.

It can generally be concluded that sincere attempts are being made at the Federal, State, and utility levels to provide the necessary electric power that the country requires in an environmentally acceptable fashion. However, at this time there does not appear to exist a streamlined set of procedures, through which the three major parties can rapidly reach the common objective of expeditious and cost-effective steam electric power plant construction.

This report was submitted in fulfillment of Contract No. 14-16-008-2149 under the sponsorship of the Power Plant Project, Office of Biological Services, U.S. Fish and Wildlife Service. Work was completed as of February, 1978.

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INTRODUCTION

This report discusses, in a broad scope, the existing regulatory operations of Federal and State agencies and describes the operations of utilities as they relate to the planning and construction of energy systems. It also defines the timing and requirements of key events within the decision making process as they affect the licensing (construction/operation permits) of electric generation facilities. Key decisions which may affect fish and wildlife resources have been identified and discussed.

Fish and Wildlife Service biologists at times are called upon to provide inputs regarding power generation and transmission line projects. They should, therefore, understand the implications and places in time where decisions by industries and regulatory agencies have the greatest potential effect on fish and wildlife resources. This information can enhance the input of biologists into decisions in which biological considerations are currently regarded as related to overall project determination.

It is the purpose of this document to familiarize Fish and Wildlife Service personnel with decision processes in the electric power industry; the timing of these decisions and their chronological sequence; the relationship of the organizations involved; and the potential impacts of these decisions on fish and wildlife resources.

CHAPTER 1 THE DECISION MAKERS

FEDERAL AGENCY OPERATIONS

Historically, it has been the function of certain government agencies to issue permits or licenses for the construction of structures that might interfere with navigation or commerce. With the advent of the National Environmental Policy Act of 1969 (NEPA), Federal agencies have been required to prepare a detailed Environmental Impact Statement (EIS) on any proposal for legislation and other major Federal actions significantly affecting the quality of the human environment. The issuance of a permit, grant, license, contract, or right-of-way by a Federal agency related to electric generating facilities is generally considered to require an EIS. When more than one agency is directly involved in the granting of a facility's permits or licenses, a "lead agency" is selected to prepare the EIS and to coordinate activities with the other agencies to ensure that their jurisdictional interests are adequately covered.

The EIS is prepared by the lead Federal agency. Typically, for energy facilities, the Nuclear Regulatory Commission, Department of the Interior, U.S. Army Corps of Engineers, Environmental Protection Agency, or the Rural Electrification Administration assumes the lead agency status and acts as the public's environmental protector in compliance with the mandates of NEPA.

The detailed statement of environmental and other considerations is issued in draft form for comments, revised upon receipt of comments and a public hearing process, and then submitted to the Environmental Protection Agency for final endorsement prior to regulatory action.

Only those agencies which, in our experience, have been involved in the past in the preparation of EISs relative to energy facilities and are apt to be involved in the future are included in this discussion. Although the objectives and functions of the agencies may extend beyond those which result in their involvement, only those pertinent to the subject at hand are described. Most of these agencies have prepared guideline documents for environmental impact review which are appropriately considered by their decision makers. It is not yet known how the new Department of Energy (DOE) fits into this picture.

Department of Agriculture
Rural Electrification Administration (REA)

REA makes loans to finance electric service in rural areas. In the field of rural electrification, REA is empowered to make loans to those qualified borrowers to help finance the construction and operation of generating plants and transmission and distribution lines or systems which are to provide electric service to persons in rural areas.

In those cases in which REA is the only Federal agency which, by its action of granting a loan, has the responsibility for an action resulting in the construction and operation of a major electric facility, this agency becomes the lead Federal agency.

Department of Defense
U.S. Army Corps of Engineers (Army's Civil Works Program) (COE)

Through the Civil Works Program, the Federal Government protects the navigable waters of the United States under legislation empowering the Secretary of the Army to prohibit activities which would reduce the value of such waters to the nation.

Any construction in navigable waters of the U.S. requires a permit from the Army Corps of Engineers. This permit must be accompanied by an EIS in accordance with NEPA whenever COE is the lead Federal agency.

Department of the Interior
Bureau of Indian Affairs (BIA)

BIA acts as trustee of Indian and Alaskan native people for their lands and monies held in trust by the U.S. and assists them in realizing maximum benefit from such resources.

In this capacity as trustee, the Bureau will participate in the sale or lease of Indian lands, as well as in the granting of water rights relative to the construction and operation of energy facilities. Such involvement and any associated actions must be accompanied by an EIS whenever major impacts are anticipated and the Bureau is the lead Federal agency.

Department of the Interior
Bureau of Land Management (BLM)

BLM programs provide for the protection, orderly development, and use of the national lands and resources under principles of multiple use and sustained yield, while maintaining and enhancing the quality of the environment.

As is the case with BIA, the sale or lease of Federal lands for energy facility development requires the preparation of an EIS in those cases where BLM is the lead Federal agency.

Department of the Interior
Bureau of Reclamation (BR)

The Bureau of Reclamation is concerned primarily with the irrigation of arid and semi-arid lands and the marketing of the power generated at its irrigation projects, at flood-control projects of the Army Corps of

Engineers, and at certain reservoir projects of other Federal or international agencies. Reclamation projects provide for the following purposes: municipal and industrial water supply, hydroelectric power generation and transmission, water quality improvement, fish and wildlife enhancement, and others. The Bureau has responsibility for the sale, interchange, or transmission of electric power and the energy generated at most power plants it constructs and operates. These projects must have an EIS and are classified as public projects.

Environmental Protection Agency (EPA)

The Environmental Protection Agency was created to permit coordinated and effective governmental actions on environmental matters. The Agency endeavors to abate and control pollution systematically and to reinforce efforts among other Federal agencies with respect to the impact of their operations on the environment. It is charged with making public its written comments on EISs and with publishing its determinations when it is held that a proposal is unsatisfactory from the standpoint of public health, welfare, or environmental quality.

The Environmental Protection Agency has a significant role in electric power generation. Through air and water quality regulation, EPA is the administrator of permit programs for the abatement and control of air and water pollution. For air quality, EPA grants permits relative to the Prevention of Significant Air Quality Deterioration (the states themselves grant the construction permits under the Clean Air Act) and must endorse permits by states. For water quality, EPA either issues or endorses (depending on the state) construction and operation permits under the National Pollutant Discharge Elimination System (NPDES) Program, established by the Federal Water Pollution Control Act Amendments of 1972. When designated as lead Federal agency, EPA prepared the EIS for the permits it grants.

Nuclear Regulatory Commission (NRC)

The Nuclear Regulatory Commission's purpose is to assure that the civilian uses of nuclear materials and facilities are conducted in a manner consistent with the public health and safety, environmental quality, national security, and the anti-trust laws. The NRC fulfills its responsibilities through a system of licensing and regulation which includes licensing the construction and all aspects of operation of nuclear reactors, including two stages of EIS preparation (construction and operation). The NRC is the lead Federal agency in matters pertaining to nuclear power generation.

Department of Energy (DOE)

The Department of Energy Organization Act was signed into law August 4, 1977 with an official opening of the Department on October 1, 1977. Among the major programs under the new Department are conservation,

resource development and production, research development, data management, environment and regulation of energy resources.

Although DOE incorporates many programs and functions from other Federal agencies, it is not meant to be an amalgamation of existing agencies with a new tier of leadership. Its intent is to reshape existing programs and functions to fit the national energy policy. The Department groups new or emerging technologies at the Assistant Secretary level by their evolution through the research, development, and application process, rather than by fuel type (such as solar, fossil, nuclear, etc.).

The organization chart of the new Department of Energy (see Figure 1), includes all branches of DOE of interest to industrial energy users. The major issues handled by each branch are listed before the job titles.

Federal Energy Regulatory Commission (FERC). The Federal Energy Regulatory Commission (FERC) assumes most of the powers of the defunct Federal Power Commission (FPC), including natural gas pricing and the interstate sale of electricity. The dotted line between FERC and the Economic Regulatory Administration (ERA) (see Figure 1), is intended to show that these units have a number of shared responsibilities. The dotted line is also intended to show that although FERC is a part of the Department of Energy, it is still an independent regulatory body and is not supposed to be subject to political influences.

FERC issues permits and licenses for non-Federal hydroelectric power projects; conducts continuing investigations of the electric power industry and its relationship to national programs and objectives, including conservation and effective utilization of resources; requires maximum protection of our environment in the construction of new hydroelectric projects consistent with the nation's need for adequate and reliable electric power service; and allocates natural resources consistent with the public interest under the Federal Power Act.

Bonneville Power Administration (BPA). The Bonneville Power Administration was created in 1937 to market power at the Bonneville Dam on the Columbia River in Oregon. Later it was given responsibility for distributing power produced at more than a dozen other dams in the Northwest.

The Southwestern and Southeastern Power Administration (SWPS, SEPA). The Southwestern Power Administration was created in 1943 to market power generated at Corps of Engineers' projects in Arkansas, Missouri, Oklahoma, and Texas, while the Southeastern Power Administration was established in 1950 to sell power generated at 10 Corps of Engineers' projects in the southern and southeastern states.

Tennessee Valley Authority (TVA)

The Tennessee Valley Authority, created by an act of Congress on May 18, 1933, has developed into the largest single electric power

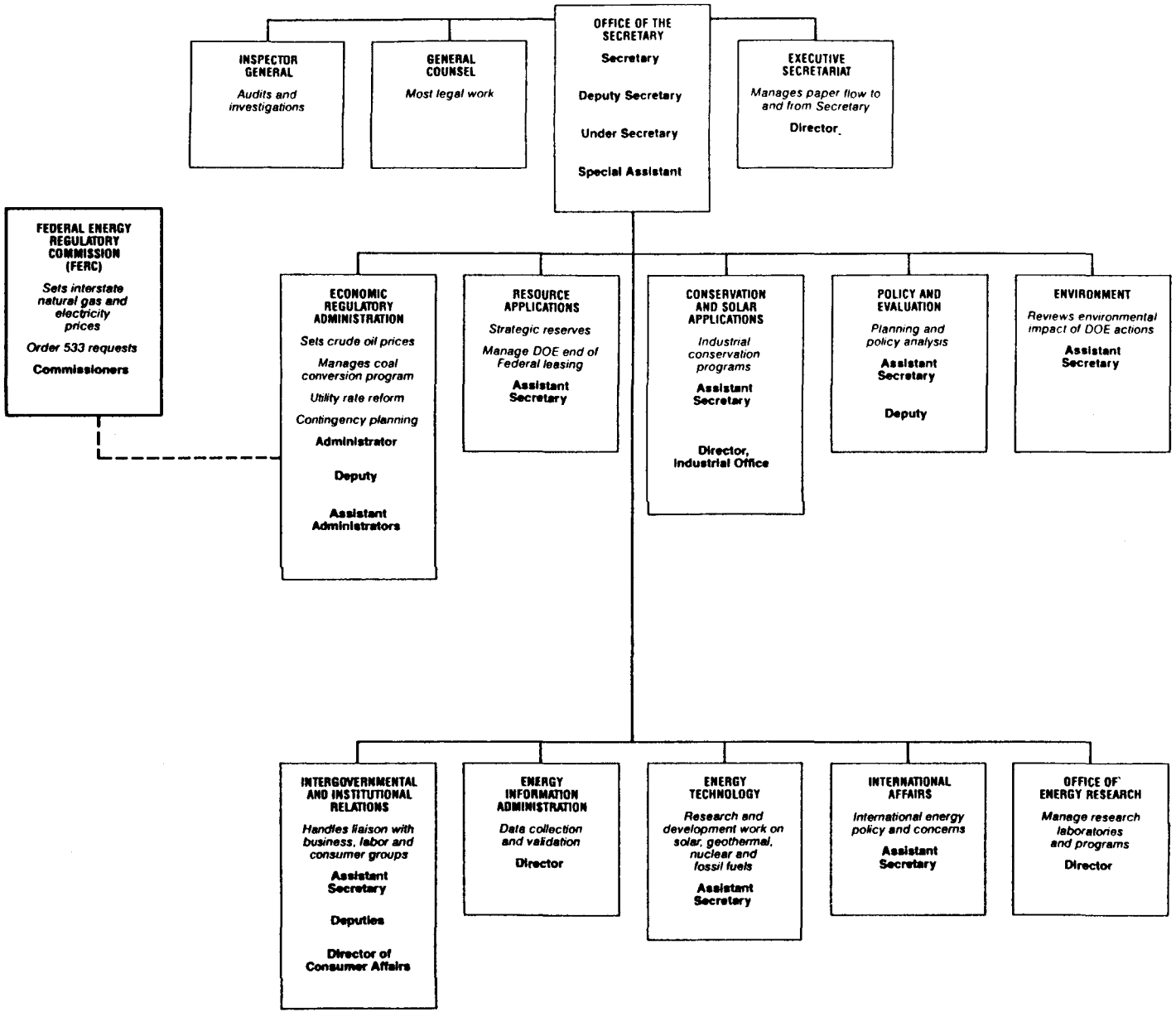


FIGURE 1
DEPARTMENT OF ENERGY ORGANIZATION AND FUNCTIONS

system in the world, with an installed capacity of more than 18,000 megawatts. It is charged with the development of the Tennessee River and its tributaries in the interests of navigation, flood control, and the generation and distribution of electric power. More than three-quarters of this power is generated by steam electric plants and the remainder by hydroelectric plants.

The objective of all four marketing agencies is to dispose of power from Federal projects so as to encourage the most widespread use of electricity at the lowest possible rates to consumers consistent with sound business principles, giving preference to public bodies and rural cooperatives.

STATE AGENCY OPERATIONS

As is the case with Federal agencies, the objectives and functions of some State agencies have put them in a position to regulate power generating facilities. Only the most common agencies are discussed below. Although agency titles and proceedings may be different from state to state, they are similar in the implementation of their responsibilities for the protection of the environment.

State Siting Authority

Perhaps the most significant of all legislative actions aimed at regulating the development of energy facilities has been the enactment of laws creating State Siting Authorities with the power to issue construction and operating permits on behalf of all the involved State agencies in a one-stop siting action.

"One-stop" siting is a device used to overcome the time-consuming procedures inherent in multiple permit systems. It vests a single agency with power to make a final decision, based on consolidated hearing and State agency review processes. The function of the siting body is in many cases to develop long range plans, conduct early site reviews, and grant final certification in a single proceeding. One-stop siting provides coordinated State agency review without veto power from any other source to impair site certification authority.

Where "two-stop" siting is used by a state, one authority may have construction/operation responsibility, while the other has EIS preparation responsibility.

Public Service Commission (PSC) or Public Utilities Commission (PUC)

State Public Service Commissions have, as part of their functions, the responsibility to perform independent evaluations and grant approvals of rate increases, expansion of electrical service, and rights of eminent domain for power plant and transmission line construction.

In some states, this charter has been expanded to include the issuance of construction and operating permits for facilities at specific

sites and the preparation of independent EISs relative to development of energy facilities.

State Department of Natural Resources, Conservation and/or Environment (or State Environmental Protection Agency)

As the tool for implementation of the National Environmental Policy Act, the Federal Water Pollution Control Act, the Clean Air Act, and their state counterparts, many states delegate their environmental responsibilities to a Department of Natural Resources, Conservation and/or Environment. The power and responsibilities of this Department are implied in its name and its activities encompass both regulatory and enforcement functions relative to all human activities including energy facility development which may result in the degradation of the environment.

Categorization of States

Categorization by "environmental requirements" constitutes the most common basis for classifying states into particular groupings. Highly regulated states appeared to favor one- or two-stop siting.

States are categorized into four types:

Type 1 states - have a Siting Authority, one- or two-stop siting and require an EIS.

Type 2 states - have a Siting Authority, one- or two-stop siting and do not require an EIS.

Type 3 states - have no Siting Authority and do require an EIS.

Type 4 states - do not have a Siting Authority and do not require an EIS.

The categorization of states as of November 1977 is shown in Table 1.

It is worth noting that for fossil-fueled and hydroelectric stations the EIS requirement at the Type 1 state level results in a six month increment in schedule, while no difference exists for the other types (2, 3 and 4) of states.

UTILITY OPERATIONS

Information relative to a particular utility can be obtained from various sources. Financial statements and planning documents to justify the need for power and proposed rate structures are available from public utilities commissions or similar bodies. Specific reporting of operating parameters is required by the Federal Energy Regulatory Commission.

TABLE 1. CATEGORIZATION OF STATES BY ENVIRONMENTAL REQUIREMENTS

TYPE 1	TYPE 2	TYPE 3	TYPE 4
State has: • **Siting Authority** • **One/Two Stop Siting** • **Requires EIS**	State has: • **Siting Authority** • **One/Two Stop Siting** • **NO EIS**	State has: • **NO Siting Authority** • **Requires EIS**	State has: • **NO Siting Authority** • **NO EIS**
California Delaware* Florida** Maryland** Massachusetts Minnesota** Montana* New Jersey* New York Oregon Washington Wisconsin**	Arizona** Arkansas Connecticut Illinois Iowa Kansas Kentucky Maine** Nevada New Hampshire New Mexico** North Dakota Ohio South Carolina Vermont Virginia Wyoming	Hawaii Michigan Puerto Rico Texas Utah	Alabama Alaska Colorado Georgia Idaho Indiana Louisiana Mississippi Missouri Nebraska North Carolina Oklahoma Pennsylvania Rhode Island South Dakota Tennessee West Virginia

*Coastal Zone Only

**Two Stop Siting

Note: Categorizations are as of November, 1977.

Annual reports published by the utilities provide a significant body of information readily available for review. In addition, a significant amount of information on the utility and on the specific site characteristics for a particular facility are included in an Environmental Report prepared as support to an application for a license to construct.

Electric power generating utilities generally fall into two categories: public or privately owned. Their internal organizations, however, usually follow the pattern described below (see Figure 2).

A utility is often presided over by a Board of Directors or Board of Trustees, which is involved in utility decisions of basic economic and political nature. The responsibility for utility operations usually falls upon a Managing Director, President, or Executive Vice-President who oversees four major divisions or groups: 1) Planning, 2) Construction, 3) Operations, and 4) Administration.

These four divisions are generally subdivided into departments and their technical groups: 1) the planning division (planning, load forecasting, technical research); 2) the construction division (design and construction of power lines and power stations, engineering standards and specifications); 3) the operation division (power generation, power transmission and distribution load dispatching); and 4) the administration division (all administrative functions).

Planning Division

The system planning engineer is responsible for long-term planning. His responsibility is to anticipate the growth of system load in both time and location since the construction time required for a hydroelectric project varies five to 10 years; for a thermal station three to five years; and for a nuclear power station five to seven years. This planning requires a careful study of civic, residential, commercial, and industrial developments, population growth trends for the district, and plans for roads and bridges. The future availability of fuel resources and cost trends for different fuels in some cases on an international scale must also be considered.

Construction Division

The construction engineer is responsible for constructing power stations and transmission lines, but on major construction he usually works in conjunction with an outside architecture-engineering firm. He generally lays down the broad outlines of all construction work and also does all the work required for substation and transmission line construction.

System Operations Division

The operating engineer is responsible for the day-to-day operation of the system. He supervises personnel in charge of the operation and

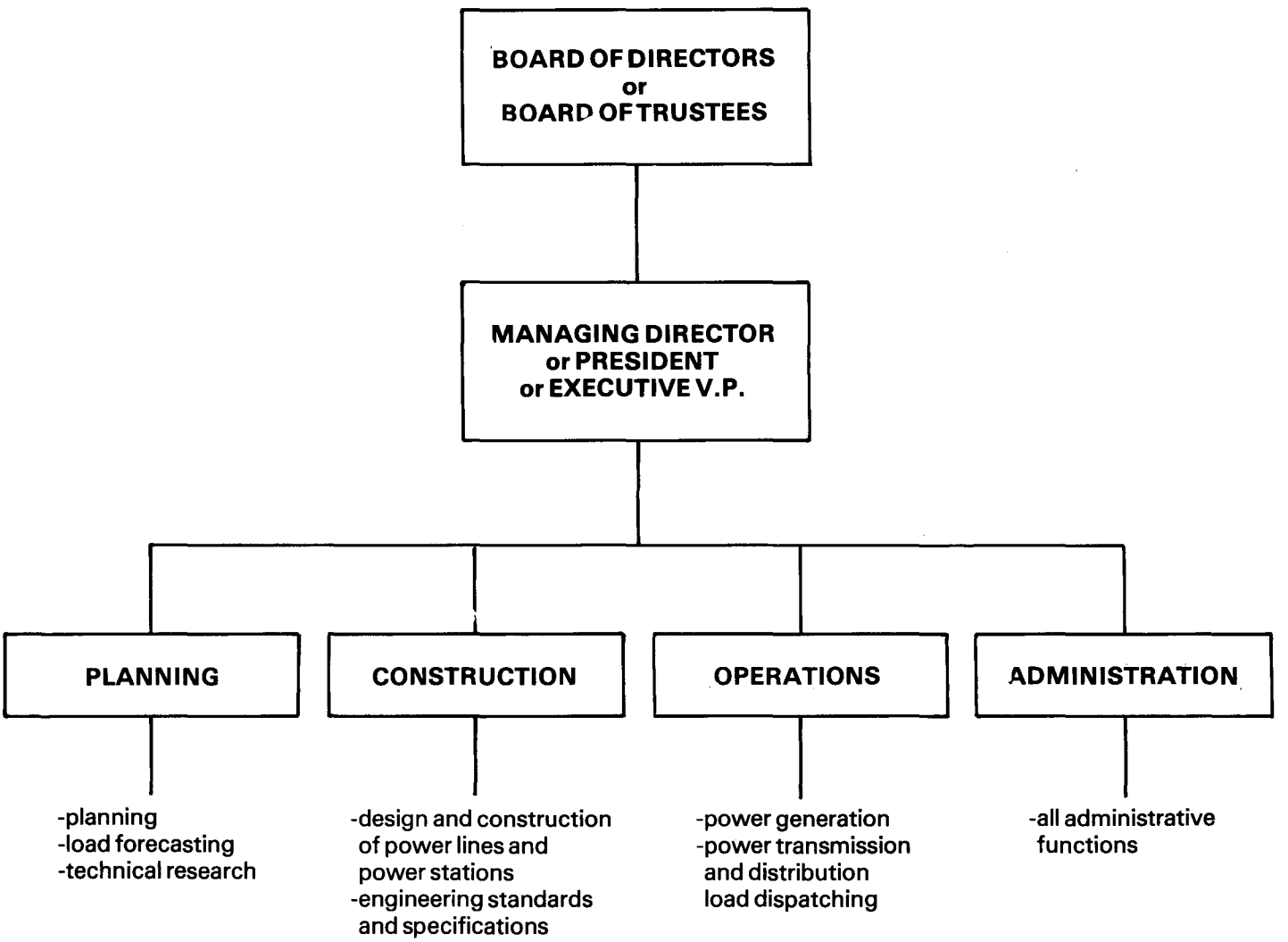


FIGURE 2
INTERNAL ORGANIZATION OF UTILITIES

maintenance of generating stations, transmission lines, and substations. He is also a supervisor of operating systems, usually called the load dispatcher, who knows when and where the loads normally come on and go off and must have available the requisite generating capacity.

Economy of operation is important, and since efficiency of power generation differs for each station at different loadings, the operating engineer must allocate the generating power to each power station so as to make most efficient use of the system facilities. The power loss in the transmission lines must also be estimated. The most economical load dispatching is a very difficult goal to achieve, and on-line digital computers are often employed to determine the best allocation of load for each power station.

It is also the responsibility of the operating engineer to handle emergencies and be prepared to bring the reserve generating capacity of the system into operation immediately while arranging for whatever repair work is necessary.

Administration Division

The Administrative Division performs the various administrative functions of Accounting, Contracts, Security, Billing, etc.

ARCHITECT-ENGINEER OPERATIONS

In the majority of cases, an Architect-Engineer (AE) firm is hired by an Electric Generating Utility (EGU) to provide a degree of expertise in the various architectural and engineering fields not generally available within an EGU staff. AEs perform as a complement to EGUs in the support of design and engineering functions. Depending on the size of a utility's staff, this support may influence either just a few or all the decision making steps through their analyses and recommendations.

The project team organization is preferred by most AEs. Under this approach, a group of technical personnel serve as members of a task force on a full-time basis working directly under a project manager. The project manager has responsibility for overall project performance, its planning and scheduling, and responds, in turn, as a single point contact to the EGU's project manager.

Among the disciplines directed by the project manager are:

- Architecture
- Mechanical Engineering/Systems Engineering
- Mechanical Services
- Structural Engineering

- Electrical Engineering
- Instrumentation and Control
- Nuclear Engineering
- Piping
- Chemical Engineering
- Planning and Scheduling
- Administration
- Quality Assurance and Quality Control
- Purchasing and Expediting
- Accounting
- Environmental and Nuclear Safety Licensing
- Environmental Sciences
- Construction and Field Engineering

ENVIRONMENTAL CONSULTING FIRM OPERATIONS

An environmental consulting firm usually has a Director or President, various project directors, and senior research biologists who are primarily responsible for research, preparation of documents, and testimony. Each project usually has a team of research biologists, field biologists, and technicians. These personnel are often located near the plant site at a laboratory which is established to service the particular contract. However, in some cases, biologists may operate from a home office or centralized laboratory.

Once a project begins, normal communications are usually between the consultant's Project Director and the Project Manager of the utility or his designated representative. Often the contact within the utility is within an Environmental Affairs or Licensing Department. Many utilities have at least one biologist who works closely with the environmental consultant(s). The President and, more frequently, the Project Director are consulted by the utility when problems arise or when expert testimony is required.

The decision scheme within the environmental consulting firm flows from the President to Technical Director or Regional Manager, to Project Leader or Director, to Senior Research Biologist and Section Leader. The latter directs biologists, technicians, and aides.

The present trend is to hire the environmental consultant in the early stages of site selection. Past experience has shown that environmental consultants have been engaged late in the site selection process or after a site has been selected. In the past and in some cases today, the plant has been or is in the process of being built before ecological data are collected. In these cases, initial advice on environmental matters is usually based on limited data pertinent to the site and on the consultant's past experience at similar sites. After ecological data are gathered more specific recommendations are made and include modifications in the initial design.

CHAPTER 2 CHRONOLOGICAL SEQUENCE OF DECISION MAKING

Many decisions involving environmental protection may be made and changed a number of times before the plant goes into operation and, occasionally, after a plant is operating. This happens because of:

1) the long lead time, particularly for nuclear plants;

2) frequent changes in regulatory requirements;

3) advances and changes in technology for reducing environmental impact; and

4) inadequate environmental planning and advice during the design stages of the project.

Equipment for a power plant usually must be ordered very early in the construction schedule. The decision on design and hardware, for example of the intake system, is made early and is usually based on limited site-specific environmental data. Even when a decision is made within the utility on a specific intake design, the final structure may, due to additional field and engineering data, have many modifications. Changes to solve various design or engineering problems often occur during the actual construction and the final structure may differ significantly from the initial design. If these changes have a detrimental environmental impact once the plant starts operation, the environmental consultant may recommend additional modifications. Thus, decisions may be made, changed, and modified a number of times, even during the early operation of the plant.

PRE- PUBLIC/AGENCY NOTIFICATION

Prior to notification to the general public and most regulatory agencies of a new electric generating facility or transmission route, the utility identifies: unit or line size, schedule for commercial operations, and site location or route. It is highly unlikely that these decisions, made in essence by the utility's Board of Directors or similar entity, will be subject to influence by regulatory bodies except possibly for the last step in site selection, identification of the optimum site. Those utility decisions which may affect fish and wildlife resources in an intangible manner are discussed in Chapter 4.

Electric Generating Utilities have been vested with the authority and the responsibility to generate, produce, transmit, transfer, exchange or sell electric energy, and to enter into contracts for any or all such purposes. These duties, coupled with the long lead times usually associated with base load unit's commercial operations and Federal (FERC) and State agency requirements, require utilities to make extensive use of techniques for projecting load demands ten and twenty years into the future.

Load Components

The proper perspective for analyzing past load growth and estimating future load growth can be obtained by comparing and analyzing power needs in four main categories or classes of service:

1. Residential
2. Commercial
3. Industrial
4. Combined use for irrigation, street and highway lighting, and other miscellaneous uses

By breaking the load into these major component parts and examining historical factors and future trends affecting growth in each component, load projections for long-and short-range predictions are developed.

Residential load includes electric lighting, which is used in the evening, electric refrigerators, which are switched on and off by automatic control devices throughout the day and night, electric stoves, electric cleaners, and irons. Radio and television use depends upon individual choice. Further, electric air conditioners and electric heaters comprise a large residential load, their use depending on the weather.

The commercial load demand for offices and department stores is high during business hours but low at other times. Lighting and air conditioning account for the greater part of this total load.

Industrial load is highest during the working hours and is dependent on the nature of the factory and the number of shifts. Motor and heat requirements usually consume the most electricity.

The load on the electric power system is the varying sum of all the residential, commercial, and industrial loads. An example of a system load curve is given in Figure 3. The demand shown is the hourly integrated average value.

A typical yearly load duration curve for a specific system is shown in Figure 4. This curve may be divided into three parts: base, middle, and peak load. The base load, the lowest load of the system, is present continuously, day and night, throughout the year. Peak load is defined rather arbitrarily as the heavy load portion of the heaviest load, accounting for 5 to 15 percent of the hours in the year.

For most economical operation, the base load portion should be supplied by the power stations whose operating costs are lowest; such as hydroelectric stations, the most efficient thermal power stations in the system, and, increasingly, by nuclear power stations. Peak load is relatively high in kilowatts but relatively short in duration, so the total kilowatt-hours are not great. Peak load may be supplied by additional sources of power such as pumped-hydro stations, old thermal power

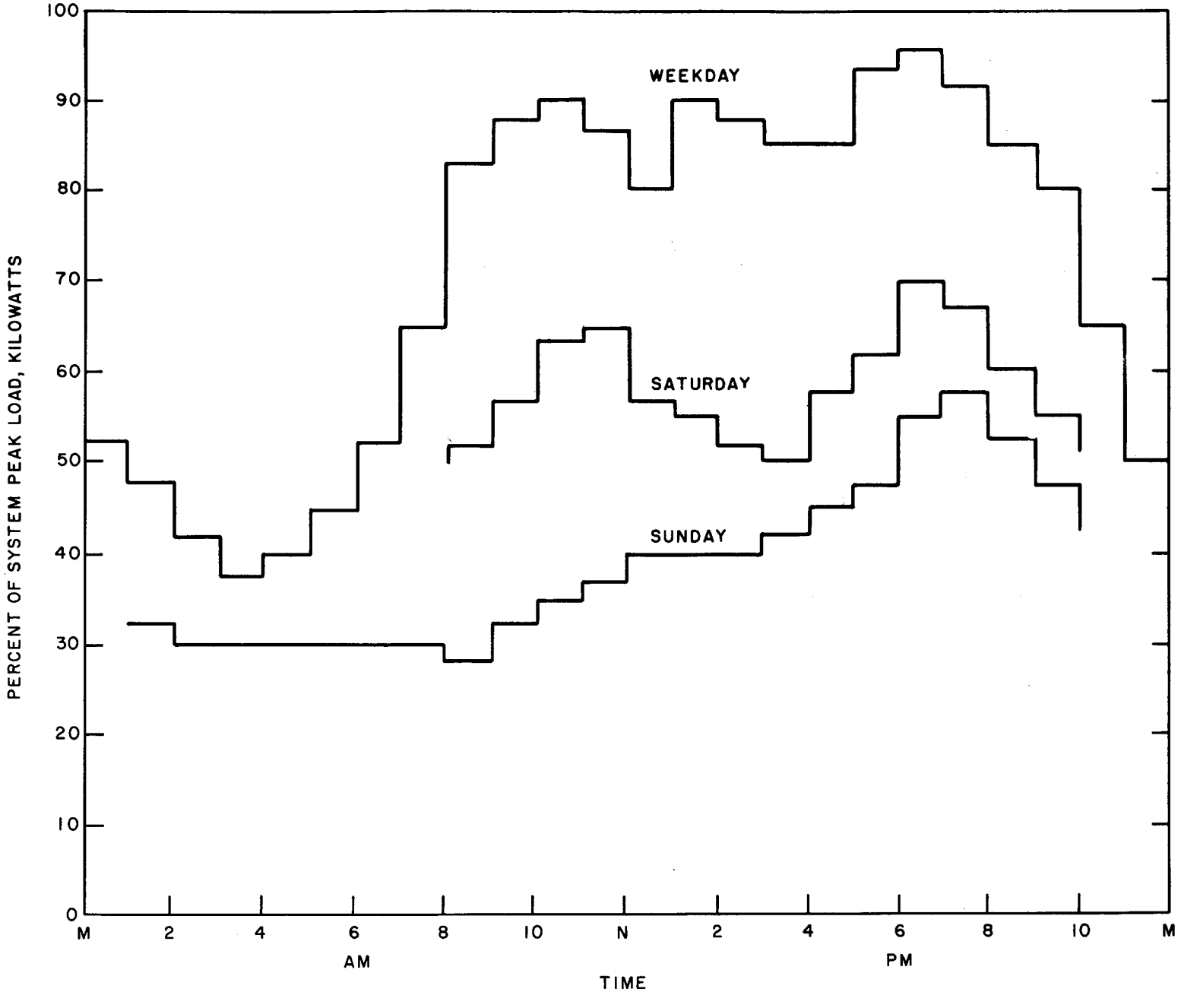


FIGURE 3 TYPICAL LOAD CURVES FOR A POWER STATION. (THE LOAD RECORDED IN HOURLY STEPS.)

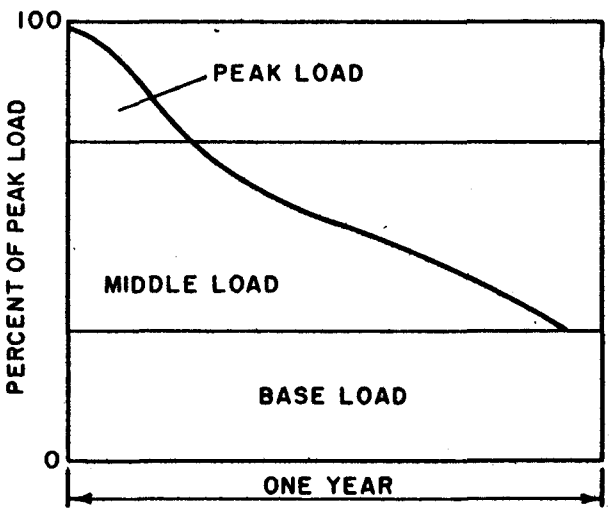


FIGURE 4. TYPICAL LOAD DURATION CURVES FOR ONE-YEAR.

stations, and gas turbine stations. The middle load can then be supplied by older thermal-type stations. Effective system planning requires estimates of future changes in the percentages for the three types of load.

Interconnection

To find out how much generating capacity should be built into an electric power system, a number of variables must be considered. Foremost is the maximum peak load on the system. Emergency conditions, such as a fault in a generating station, transmission lines, or substations, must be considered, as well as scheduled outages for regular repair and maintenance.

The investment cost of generating capacity per kilowatt is usually lower as generating unit size increases, making the use of larger units economically beneficial. Larger systems can be assembled by interconnecting two or more smaller systems, thus enabling the use of a larger generator unit. This can help small systems realize some of these benefits. Interconnections are designed to give an adequate power flow through interconnecting lines in an emergency. If help from neighboring systems can be counted on in case of emergency, as realized by interconnection, reserve margins can be reduced, resulting in considerable economic benefits to all involved.

Interconnection of systems also has economic advantages in day-to-day utility operations. Where system load conditions would normally require the operation of a generating station with a relatively low efficiency if the system were operating independently, interconnection can cut fuel costs by making use of more efficient generators from a neighboring system. Another advantage of interconnection is the flexibility it allows in choosing sites for new generating stations; planning takes into consideration the interconnected systems as a whole, rather than a single independent system. Because of these advantages, electric power systems have grown steadily larger as a result of interconnection between different utilities, even interconnection between countries, an example being that between the United States and Canada.

Site Selection

Increasingly, the problem facing each electric utility is finding the best location both economically and environmentally for large thermal power stations to provide the desired increase in electric power supply at the lowest cost. Important factors in site selection include fuel supply, load distribution, load growth, availability of land, foundation conditions, and availability of cooling water. Utilities have to consider water quality and air pollution problems. Generally, availability and cost of fuel are basic to the location of a large generating station.

PRECONSTRUCTION LICENSING DECISIONS

Once the type of facility, its size, and location have been decided by the utility and approved by the State Public Service Commission or its equivalent, a number of decisions are made, all prior to any construction activities. The Preconstruction Licensing Schedules presented in Figures 5 through 8 are based on actual projects, although in some instances the basic schedules were altered to represent more typical conditions. Using Figure 5 as representative, the figures present the following information:

1) Duration of an Event - On Figure 5, electrical system studies will be conducted over a period of six weeks.

2) Start and Finish Date - Site selection efforts will begin with the third week of the project and extend into the 23rd week.

3) Interrelationships between Events - To determine deficiencies and define sampling programs at the site, the site must have been selected and the published literature survey completed. This interrelationship is evident in the sequential end/start dates for the tasks described. In some cases, a task can be completed long before the next step must begin. This "float" is utilized to normalize manpower resource demands and cash flow.

4) Milestones - Project milestones are identified by triangular dots. Milestones are points in time when significant blocks of work are completed.

5) Key to Potential Decisions - A column displaying roman numerals is keyed to descriptions in Chapter 4 of the nature and relative extent of impacts resulting from decisions made in the course of the projects.

It must be pointed out that while the preconstruction schedules presented are typical in nature, they do not represent a specific project nor can they be used to predict actual projects. This is due to the uncertainties of money market conditions, changes in regulatory climate, and intervention.

REACHING COMMERCIAL OPERATION

Figure 9 summarizes the overall milestone schedules detailed in Chapter 3 of this document from start of a site selection program to commercial operation for the various facilities. All of these schedules assume idealized conditions with no delays due to intervention or other factors. The numbers 1 through 4 refer to state types by environmental requirements, as discussed under State Agency Operations in Chapter 1.

Type 1 states, have the most stringent environmental requirements which result in extended schedules (except in the case of nuclear power plants). This lengthening of the schedule is a combination of existing factors.

1. Sequential licensing at State and Federal levels

2. Mandatory EIS or similar document preparation at both the State and Federal levels

3. One- or two-stop licensing (all necessary permits)

As presented in NEPA, the general outline for an Environmental Impact Statement must include at least the following:

1) Description of the proposed action

2) Statement of purpose of the project

3) Description of the existing conditions of the environment to be affected

4) Probable impact of the proposed action on the environment

5) Probable adverse effects which cannot be avoided should the proposal be implemented.

6) Alternatives to the proposed action

7) Relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity

8) Irreversible and irretrievable commitments of resources

9) Cost-benefit analysis

10) Status of compliance with other local, State and Federal regulatory bodies or agencies.

The typical Federal agency licensing schedule presenting the EIS preparation schedule is shown in Figure 10. This schedule assumes idealized conditions, with no delays due to intervention or other events.

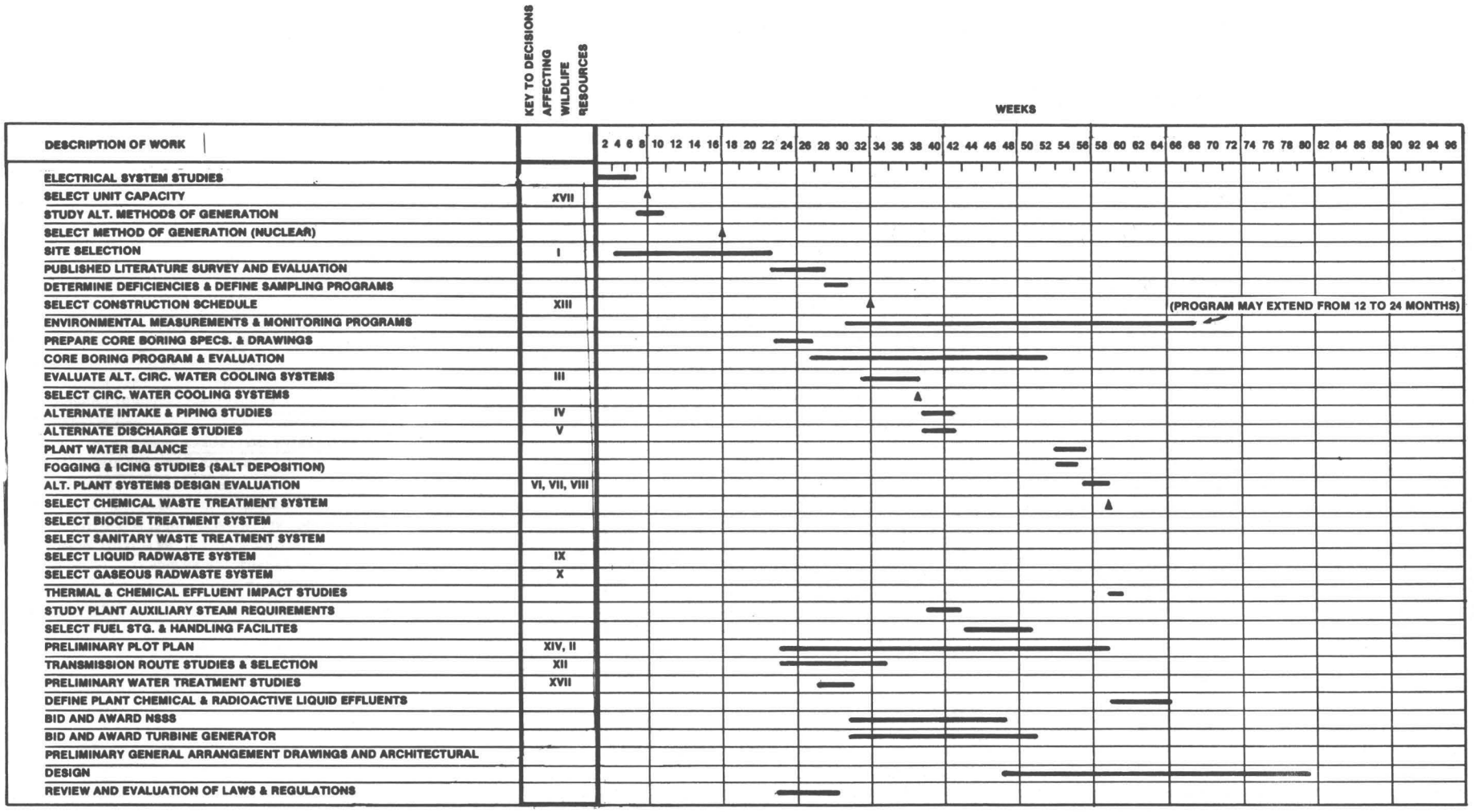
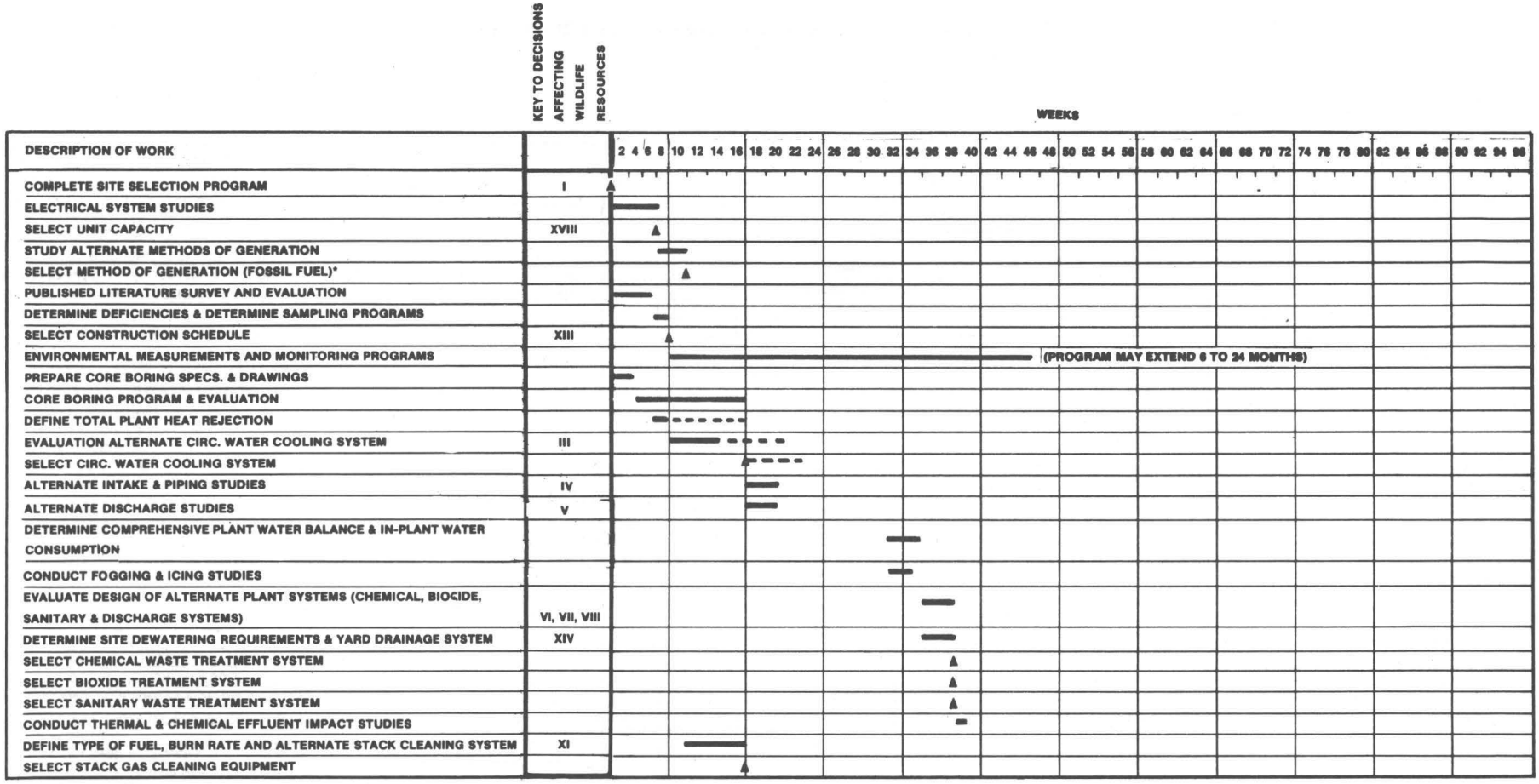
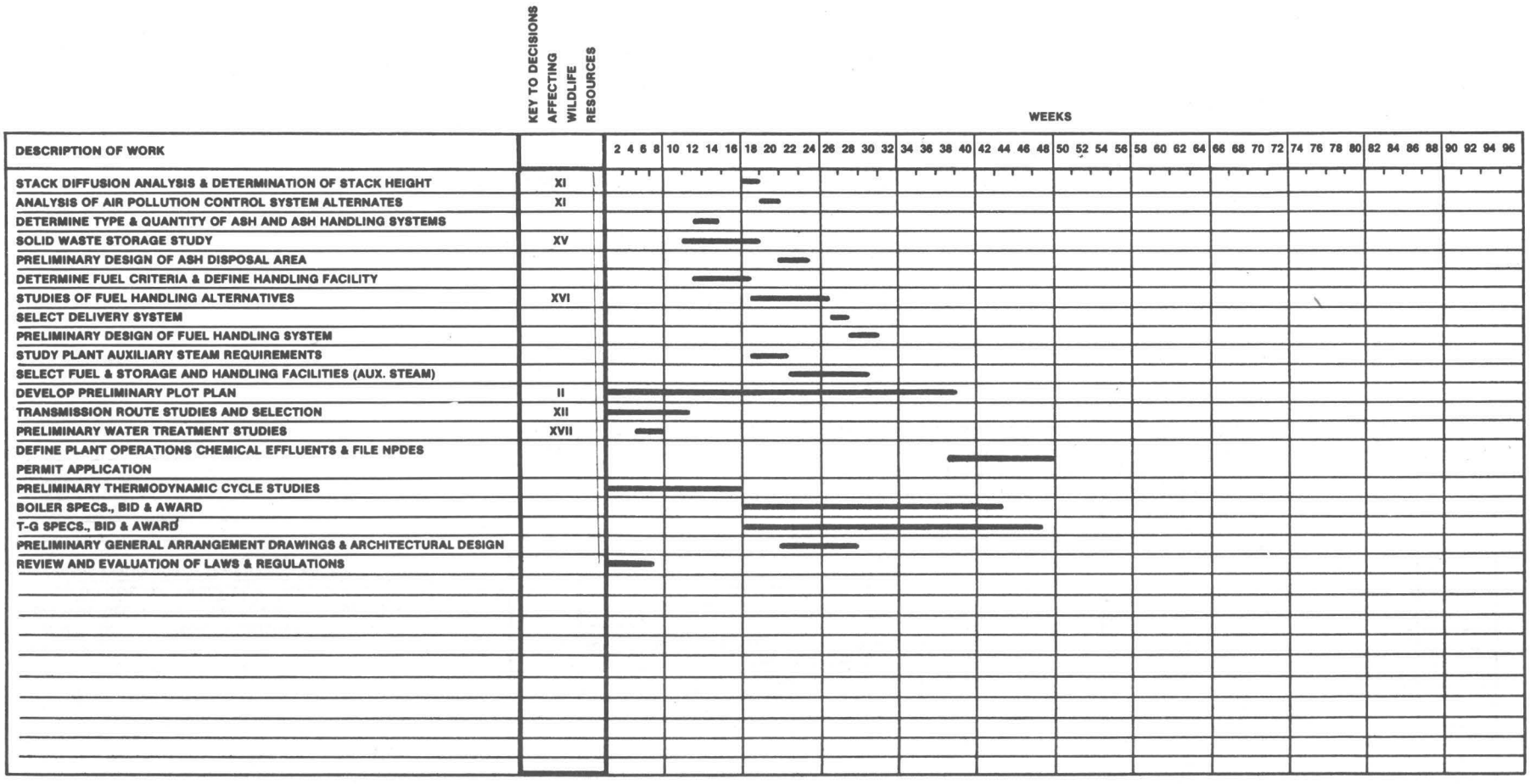


FIGURE 5. NUCLEAR POWER PLANT - PRECONSTRUCTION SCHEDULE



▲ MILESTONES

FIGURE 6. (SHEET 1) FOSSIL POWER PLANT - PRECONSTRUCTION SCHEDULE (OIL FIRED - COAL FIRED)



* INCLUDED GAS, OIL & COAL

FIGURE 6. (SHEET 2) FOSSIL POWER PLANT - PRECONSTRUCTION SCHEDULE (OIL FIRED - COAL FIRED) (CONT.)

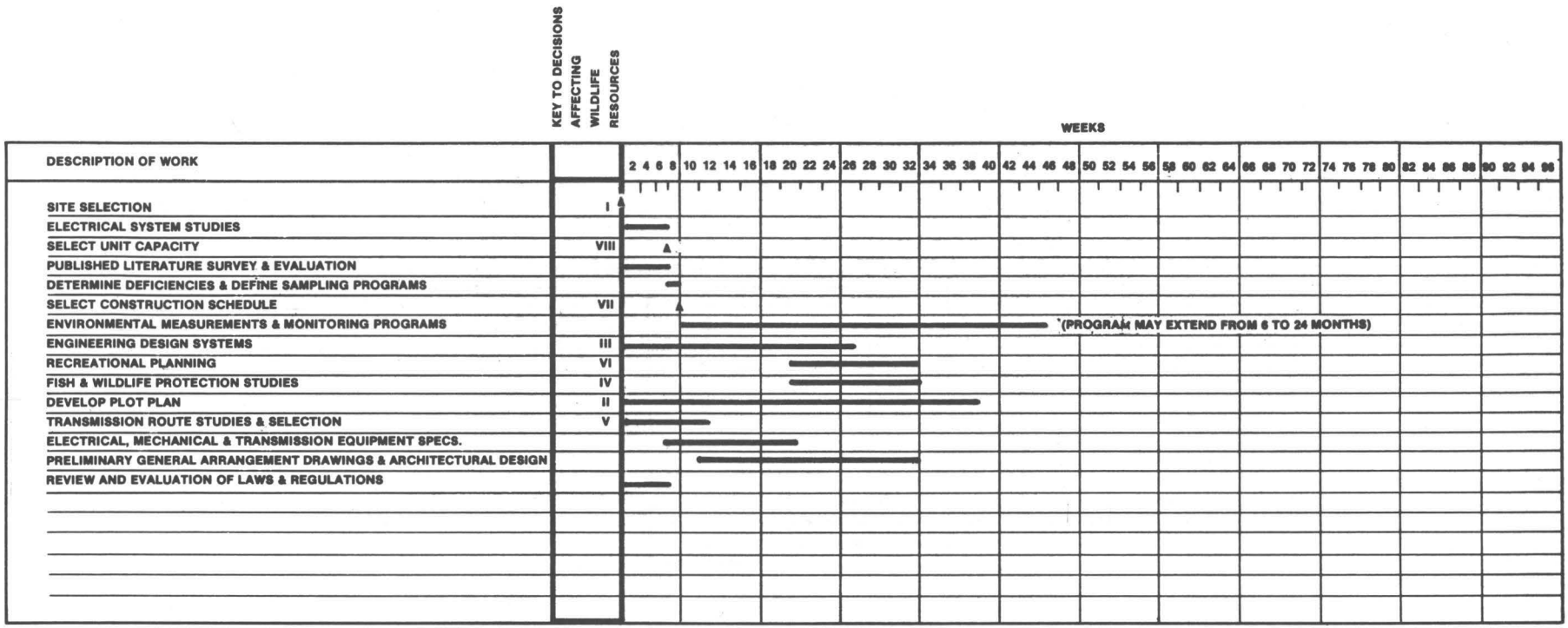
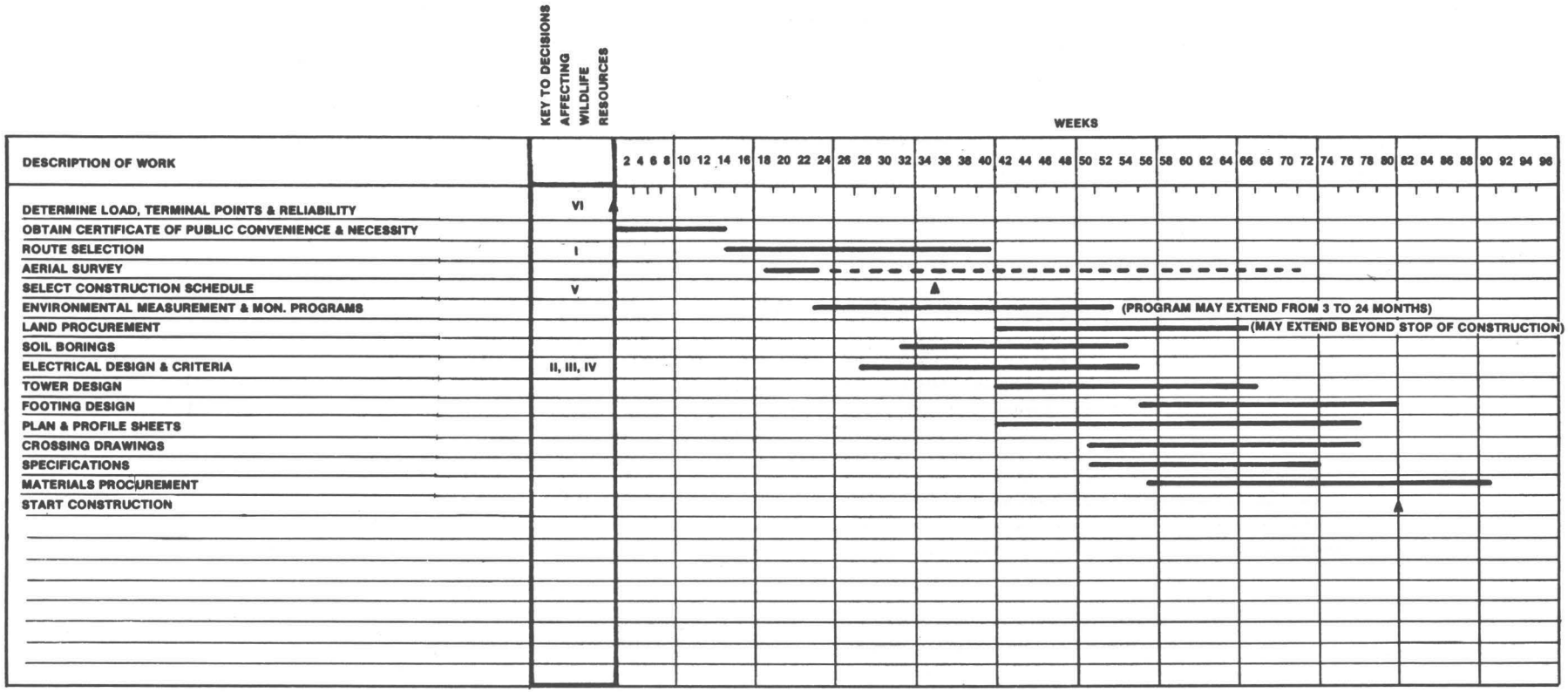


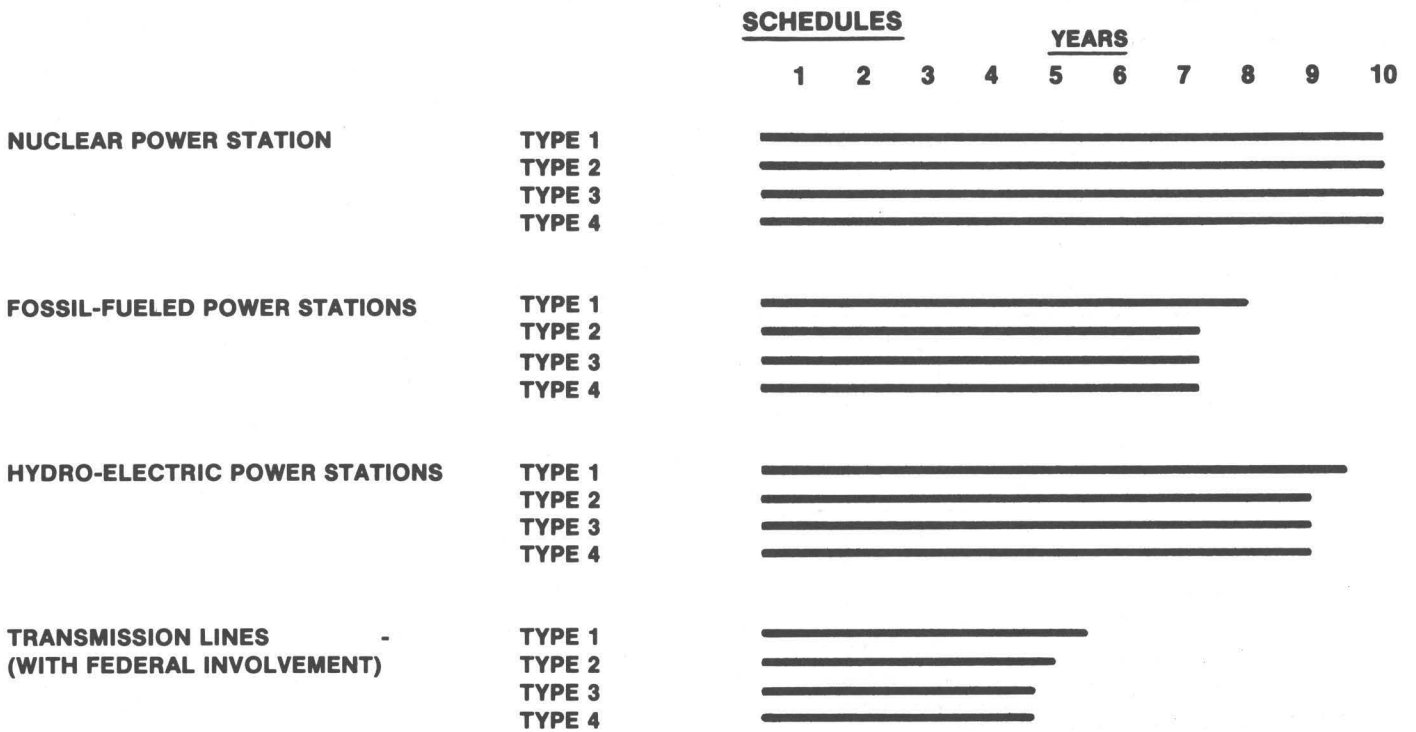
FIGURE 7. HYDROELECTRIC POWER PLANT - PRECONSTRUCTION SCHEDULE



▲ MILESTONES

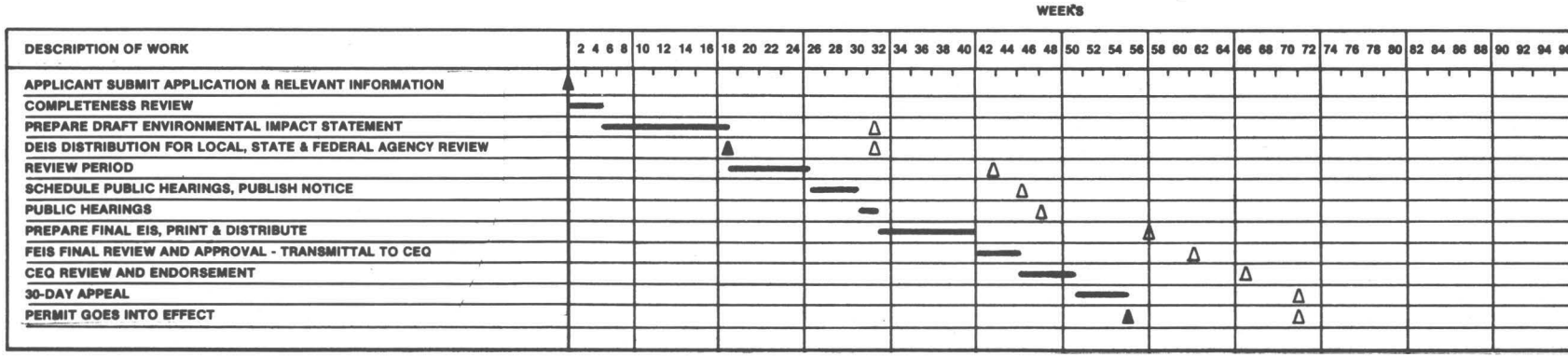
NOTES: TYPICALLY RIGHT-OF-WAY PROCUREMENT REQUIRES A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY IN ORDER FOR THE UTILITY TO EXERCISE THE RIGHT OF EMINENT DOMAIN. FEDERAL AGENCY SCHEDULE IS TYPICAL.

FIGURE 8. TRANSMISSION LINES (150 MILES CASE) - PRECONSTRUCTION SCHEDULE



NOTE: TYPE REFERS TO STATES HAVING THE FOLLOWING:
TYPE 1 - SITING AUTHORITY, ONE/TWO STOP SITING, REQUIRES EIS
TYPE 2 - SITING AUTHORITY, ONE/TWO STOP SITING, NO EIS
TYPE 3 - NO SITING AUTHORITY, REQUIRES EIS
TYPE 4 - NO SITING AUTHORITY, NO EIS

FIGURE 9. SCHEDULES FROM START OF SITE SELECTION TO COMMERCIAL OPERATION



NOTE: ALTHOUGH IN GENERAL, FEDERAL AGENCIES SCHEDULE 39 WEEKS FOR LICENSING, A REALISTIC PERIOD IS 54 WEEKS AS SHOWN IN THE FIGURE; HOWEVER, FOR PROJECTS WITH MODERATE PUBLIC OPPOSITION, OR NUCLEAR POWER PLANTS THE PROCESS MAY LAST APPROXIMATELY 70 WEEKS

Δ MAXIMUM TIME PERIOD FOR COMPLETION OF ACTIVITY.

▲ MILESTONES

FIGURE 10. TYPICAL FEDERAL AGENCY LICENSING SCHEDULE

CHAPTER 3 INTERRELATIONSHIPS AMONG DECISION MAKERS

GENERAL ORGANIZATION AND DECISION MAKING LEVELS FOR POWER PLANT CONSTRUCTION

Figure 11 indicates the general organization and decision making levels for power plant construction. The various levels can be defined as follows:

Level A - Policy Decisions

Decisions made at this level usually represent utility positions with respect to industry-wide requirements, such as a particular stand in response to laws, rules, and regulations.

Level B - Project Control Decisions

The best implementation of utility policies is decided by a managing director with the pertinent advice of consultants. It is at this level that cost-benefit analyses are formally appraised, although their formulations have been generated at lower levels.

Level C - Project Engineering Decisions

The project engineering decisions are those which can be actually related to a physical action. This level is characterized by the materialization of the policy implementation into actual impacts on a project scale.

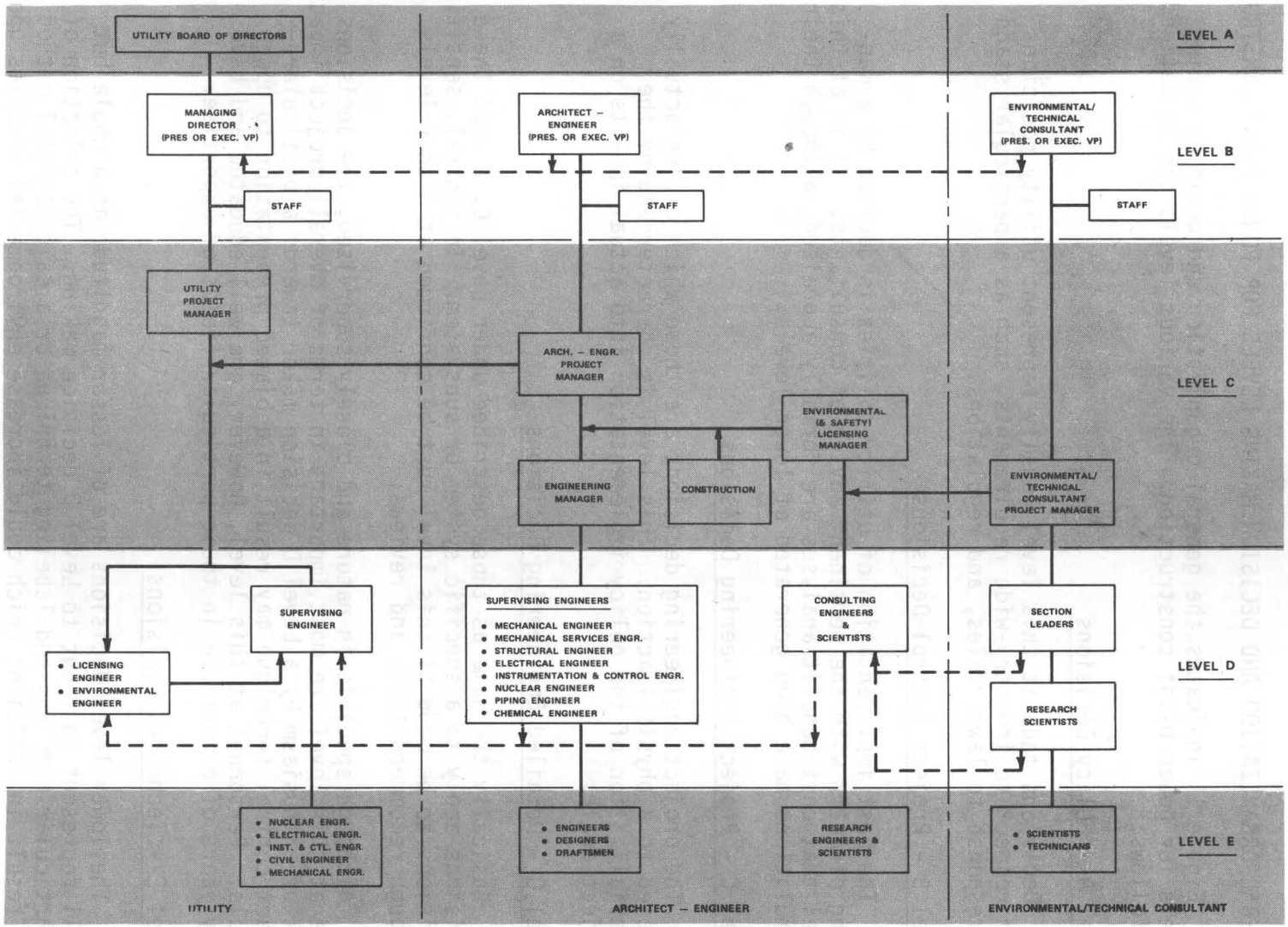
Level D - Detailed Engineering Decisions

Basically the same as those described under Level C, except these decisions apply to a specific system or subsystem. In general, sensitive decisions to be made at this level must be confirmed at higher levels through recommendations and reviews.

Although specific in nature and closely supervised, the decisions made at this level are most important in terms of overall project impact. Lack of enthusiasm by a Level D decision maker towards a particular impact control technique may result in a biased presentation to upper levels. Personnel at this level, however, are well educated and have many years of experience in their particular fields of expertise.

Level E - Technical Decisions

The lower level decisions are of lesser magnitude as a whole but still represent an input to Level D decision making. The selection of a particular sampling and labeling technique or a calculational method may result in decisions which could increase environmental stresses upon natural resources not sufficient in themselves to be irreversibly harmful but potentially determined when in combination with others of the same nature.



NOTE; This figure assumes construction is performed by an A–E. However, another firm or utility could perform construction.

FIGURE 1 GENERAL ORGANIZATION AND DECISION MAKING LEVELS FOR POWER PLANT CONSTRUCTION

MILESTONE SCHEDULES FOR VARIOUS ENERGY SYSTEMS

In the preparation of the licensing milestone schedules (Figures 12 through 15) a number of factors were considered. Federal agency involvement was assumed for all cases investigated.

The milestones selected under Federal and State agency schedules were generally those which fit the definition of regulatory actions which significantly affect the quality of the human environment. These actions are generally limited to the issuance of permits and, as such, have been presented in this document.

For the utility schedules, the milestones selected are also those associated with actions significantly affecting the quality of the human environment, but in a more physical sense. Nonetheless, the study took into consideration that the human environment is not limited to the natural environment, but includes also those things developed by man which contribute to his physical and emotional well being and which promote his health and safety within the natural order.

These schedules are idealized in the sense that they do not consider delays due to intervention by the public, other agencies, or other delays. Hence, the reported schedules represent only mechanisms that are requirements in the law.

The schedules attempt to cover each state categorized in Table 1 (Categorization of States by Environmental Requirements) for nuclear, fossil-fueled and hydroelectric power plants, as well as transmission facilities.

Reading the figures from top to bottom they indicate, in chronological order on a monthly basis, the sequence of key decisions and events which may impact fish and wildlife resources. Three areas of decision making have been considered in the preparation of the charts:

1) Federal Agency Decisions - For those projects in which a Federal agency grants a construction or operation permit agency activities are described in a column. (The sequencing of events corresponds to that in Figure 10 - Typical Federal Agency Licensing Schedule.) A column was given to the U.S. Army Corps of Engineers which is usually involved in Federal licensing activities for the construction of barge facilities and intake and discharge facilities in navigable waters.

2) State Agency Decisions - This area was divided into Public Service Commission and State Siting Authority, where applicable, and agencies which typically participate in the permit issuing activities relative to the development of energy facilities (these agencies vary in name and function among states).

3) Utility Decision Schedule - As is the case with Federal and State agencies, the utility schedule column is limited to decisions and events which may impact fish and wildlife resources. Since environmental measurements and monitoring programs and engineering and design activities encompass a number of decision and events and extend over long periods of time, their starting points have been shown in separate columns.

In summary, preconstruction schedules in Figures 5 through 8 have been used in developing these generic milestone schedules. The milestone schedules represent a chronological sequence of major decisions and events which may affect fish and wildlife resources. The chronological sequence is read from top to bottom on the charts with each year divided into 12 monthly segments. The decision making entities are divided by columns, with the organization indicated at the top of each. Some decision making organizations utilize two columns when separate construction and operation permits are involved.

Interrelationships between decision makers have been incorporated in the milestone schedules, thus construction cannot be started until all Federal and State permits have been issued. Throughout these charts, it has been assumed that Federal agencies will not issue construction and operation permits until State agencies have issued theirs; this interrelationship is reflected in the figures.

Not shown are agencies, organizations, groups or individuals who become involved in the decision making process during comment periods following the utilities' application for permits.

Nuclear Power Plants

Analysis of milestone schedules (Figure 12) for Type 1 states indicates that the period for developing a nuclear power plant project is not typically altered by state considerations. This condition will persist unless the State licensing process, for the Type 1 and 2 states, extends beyond the typically scheduled 16 month period. If the licensing process does not exceed the 16 month period, planning, engineering and construction is the next critical item for the timely completion of the project.

The lengthy licensing process for nuclear power plants has resulted from mandatory Federal agency involvement and the requirements established by the various State and Federal regulatory agencies.

Fossil-Fueled Power Plants

Milestone schedules for fossil-fueled facilities show a reduction in licensing time between the Type 1 states and the others. This difference would be further accentuated for instances where no Federal

involvement is mandatory. Where Federal agencies are involved "sequential" licensing and thus a lengthening of the licensing period is apt to occur.

As is the case with nuclear power plants, licensing at the state level has been scheduled for 16 months for Type 1 states and in a 11 month period for Type 2 states. These are the limiting steps in each case; thus, any lengthening of the state licensing schedule would delay commercial operation by the same period of time. In the case of Type 1 states, expediency in the licensing by the states would result in a shortened schedule (similar to the other type).

For cases with no Federal agency involvement, improvements of four months, on the average, can be achieved in the overall plant schedule through elimination of sequential steps.

Hydroelectric Power Plants

These facilities typically have mandatory Federal agency involvement through the Federal Energy Regulatory Commission (FERC). As is the case with fossil-fueled power plants, sequential State and Federal licensing causes a relatively long licensing schedule for Type 1 states. Due to the limited hydroelectric potential of most regions in the country, there are only a small number of states that have developed licensing procedures for hydroelectric facilities and most of these are Type 1 states.

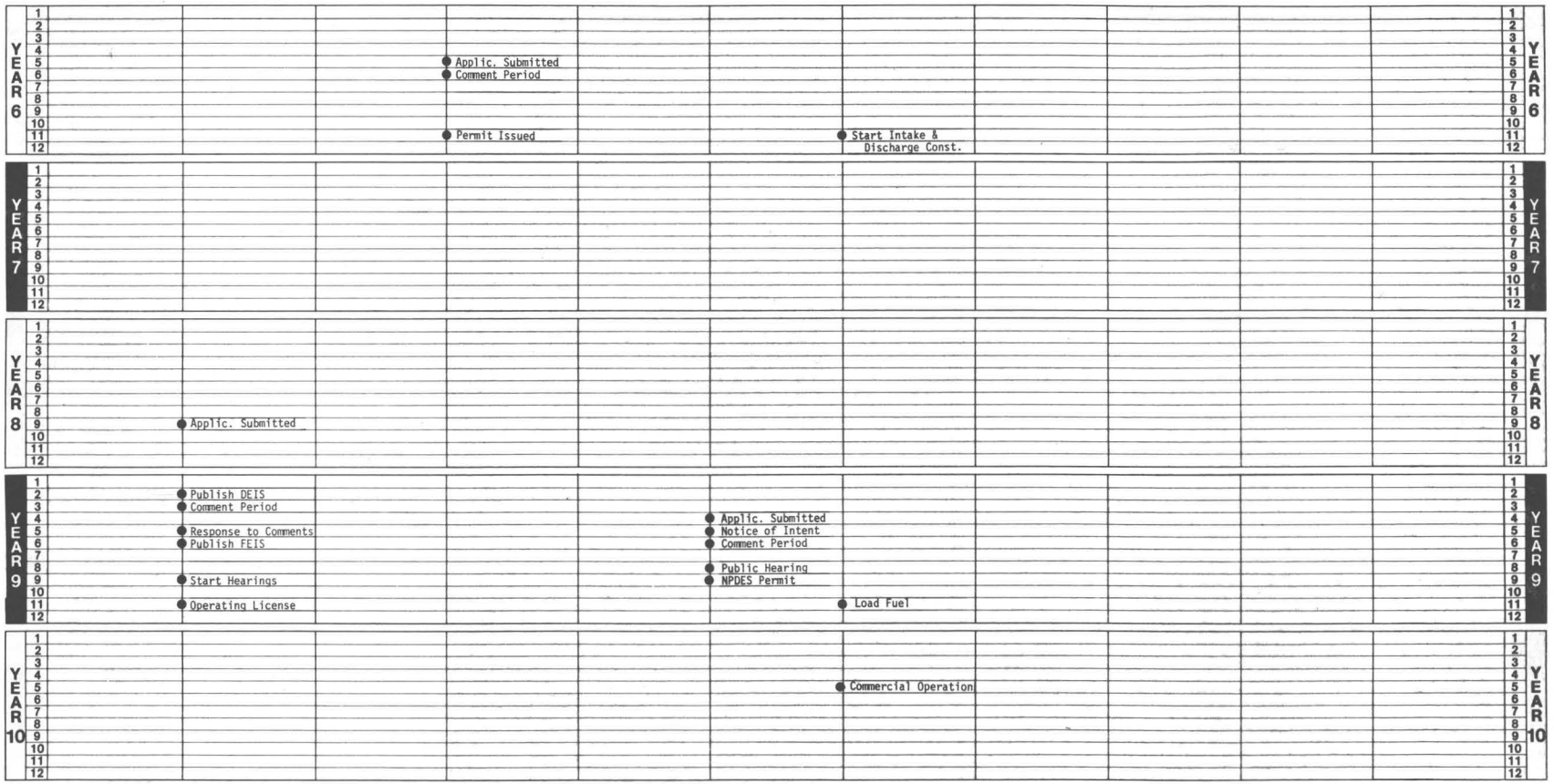
Transmission Lines

Milestone schedules indicate that as the overall design, engineering, and construction schedules becomes shorter, the significance of state licensing procedures becomes more evident. Most transmission lines and substations when built and operated within a single state are not subject to Federal involvement. For facilities without Federal agency involvement schedules are typically shortened an average of four months.

The lengthening of state licensing schedules beyond 16 months in Type 1 states would cause an extension of the overall schedule in view of the sequential scheduling shown. Any transmission lines schedule is extremely sensitive to line length and number and size of conductors. The figures shown here are basically for a 100-150 mile line within one state and with Federal involvement.

FIGURE 12-A
NUCLEAR POWER PLANT MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE I STATE

YEAR / MONTH	Nuclear Regulatory Commission: Construction Permit	Nuclear Regulatory Commission: Operating License	U.S. Army Corps of Engineers[1]: Permit to Construct Barge Facilities	U.S. Army Corps of Engineers[1]: Permit to Construct Intake & Discharge	Public Service Commission[2]: Cert. of Public Convenience & Necessity	State Siting Authority[3]: Site Certification	Utility Schedule: Engineering, Design and Construction				
YEAR 1 — 1					● Applic. Submitted		● Start Site Selection				
2							● Sel. Unit Capacity				
3					● Public Hearing		● Sel. Meth. of Gen				
4					● Certificate Granted						
5											
6							● Complete Site Selection				
7											
8								● Env. Measurements & Monitoring Programs			
9											
10							● Sel. Circ. Wtr. Sys.				
11							● Purchase NSSS				
12							● Purchase T/G				
YEAR 2 — 1											
2											
3							● Select Plant Systems		● Engineering & Design		
4											
5											
6											
7											
8											
9											
10						● Applic. Submitted						
11											
12						● Pre-hearing Conf.					
YEAR 3 — 1											
2	● ER Submittal					● Notice of Intent					
3	● Acceptance					● Comment Period					
4	(Docket No.)										
5											
6						● DEIS Published					
7	● Publish DEIS					● Comment Period					
8	● Comment Period										
9						● FEIS Published					
10	● Response to Comments		● Applic. Submitted			● Public Hearings					
11	● Publish FEIS		● Comment Period			Start					
12											
YEAR 4 — 1						● Certificate Granted	● Purchase Major Mech. Equipment				
2	● Start LWA Hearings										
3											
4	● LWA Issued		● Permit Issued				● Start Site Prep.				
5							● Pur. Cooling Towers				
6											
7											
8											
9							● Purchase Intake Equipment				
10											
11											
12	● CP Issued										
YEAR 5 — 1							● Start Construction				
2											
3											
4							● Start Reactor Bldg. & Other Major Structures				
5											
6											
7											
8											
9											
10											
11							● Start Cooling Tower Construction				
12											



DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
CP - Construction Permit
ER - Environmental Report
LWA - Limited Work Authorization
T/G - Turbine - Generator
NPDES - National Pollutant Discharge Elimination System
NSSS - Nuclear Steam Supply System

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

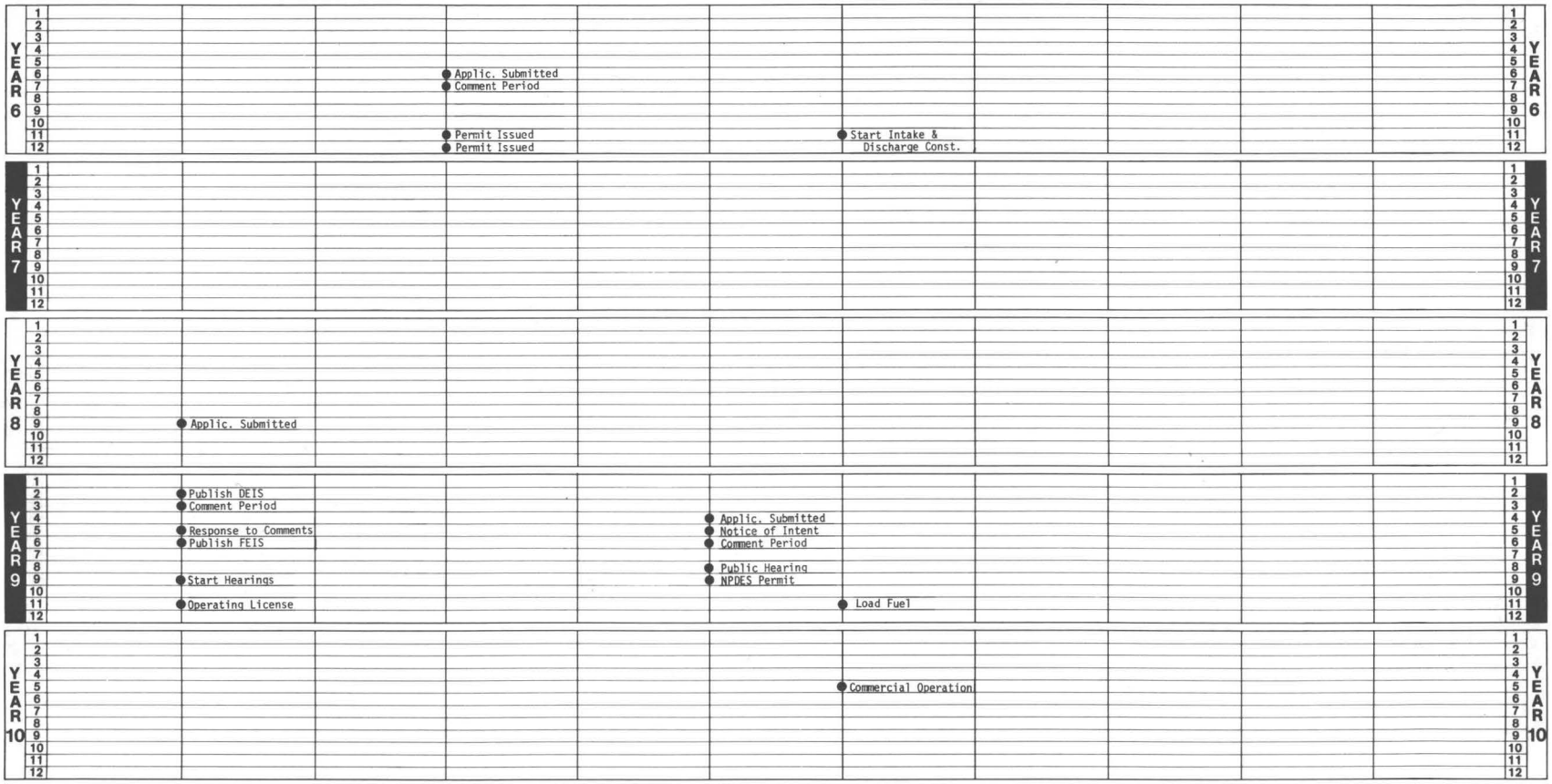
(2) In some states, the siting authority is the Public Service Commission.

(3) All state permits are issued by the State Siting Authority, including NPDES permits. Where the NPDES permit is granted by EPA, the schedule is not changed.

(4) In certain category 1 states (i.e., California, Maryland, & New York), the beginning of construction is dependent on that state's particular legislative structure for siting plants and may not begin for as long as four years or more from start of site selection.

FIGURE 12-B
NUCLEAR POWER PLANT MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE II STATE

YEAR / MONTH	Nuclear Regulatory Commission: Construction Permit	Nuclear Regulatory Commission: Operating License	U.S. Army Corps of Engineers[1]: Permit to Construct Barge Facilities	U.S. Army Corps of Engineers[1]: Permit to Construct Intake & Discharge	Public Service Commission[2]: Cert. of Public Convenience & Necessity	State Siting Authority[3]: Site Certification	Utility Schedule: Design, Engineering and Construction				
YEAR 1 — 1					● Applic. Submitted		● Start Site Selection				
2							● Sel. Unit Capacity				
3					● Public Hearings		● Sel. Method of Gen.				
4					● Certificate Granted						
5											
6							● Complete Site Sel.				
7											
8								● Env. Measurements & Monitoring Program			
9											
10							● Sel. Circ. Wtr. Sys.				
11							● Purchase NSSS				
12							● Purchase T/G				
YEAR 2 — 1											
2											
3							● Select Plant Systms.		● Engineering & Design		
4											
5											
6											
7											
8											
9											
10											
11											
12											
YEAR 3 — 1											
2	● ER Submittal										
3	● Acceptance					● Applic. Submitted					
4	(Docket No.)										
5						● Pre-hearing Conference					
6											
7	● Publish DEIS					● Notice of Intent					
8	● Comment Period					● Comment Period					
9											
10	● Response to Comments		● Applic. Submitted			● Public Hearing					
11	● Publish FEIS		● Comment Period								
12											
YEAR 4 — 1						● Certificate Issued	● Purchase Major Mech. Equipment				
2	● Start LWA Hearings										
3											
4	● LWA Issued		● Permit Issued				● Start Site Prep.				
5							● Purchase Cool. Twrs.				
6											
7											
8											
9							● Purchase Intake Equipment				
10											
11											
12	● CP Issued										
YEAR 5 — 1							● Start Construction				
2											
3											
4							● Start Reactor Bldg. & Other Major Structures				
5											
6											
7											
8											
9											
10											
11							● Start Cooling Twr. Construction				
12											



DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
EPA - Environmental Protection Agency
ROW - Right-of-way
NPDES - National Pollutant Discharge Elimination System
NSSS - Nuclear Steam Supply System

(1) An application for construction must be filed for each structure; a single permit is shown for simplification.

(2) In some states, the siting authority is the Public Service Commission.

(3) All state permits are issued by the State Siting Authority, including NPDES permits. Where the NPDES permit is granted by EPA, the schedule is not changed.

FIGURE 12-C
NUCLEAR POWER PLANT MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE III STATE

YEAR	MONTH	Nuclear Regulatory Commission: Construction Permit	Nuclear Regulatory Commission: Operating Permit	U.S. Army Corps of Engineers[1]: Permit to Construct Barge Facilities	U.S. Army Corps of Engineers[1]: Permit to Construct Intake and Discharge	State Dept. of Natural Resources, Conservation, or Environment: NPDES Permit for Construction (2)	State Dept. of Natural Resources, Conservation, or Environment: NPDES Permit for Operation[2]	State Dept. of Transportation	Public Service Commission: Cert. of Public Convenience & Necessity Railroad Const.	Public Service Commission: Cert. of Public Convenience & Necessity Power Plant Const.	Utility Schedule		MONTH	YEAR
YEAR 1	1										● Start Site Selection		1	YEAR 1
	2										● Select Unit Capacity		2	
	3									● Applic. Submitted	● Select Method of Gen.		3	
	4												4	
	5												5	
	6										● Complete Site Sel.		6	
	7									● Public Hearings			7	
	8											● Environmental	8	
	9											Measurements &	9	
	10										● Select Circ. Wtr. Sys.	Monitoring	10	
	11									● Certificate Granted	● Purchase NSSS	Program	11	
	12										● Purchase T/G		12	
YEAR 2	1												1	YEAR 2
	2												2	
	3										● Select Plant Systems	● Engineering & Design	3	
	4												4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12												12	
YEAR 3	1												1	YEAR 3
	2	● ER Submittal											2	
	3	● Acceptance											3	
	4	(Docket No.)											4	
	5												5	
	6												6	
	7	● Publish DEIS											7	
	8	● DEIS Comment Period				● Applic. Submitted							8	
	9	↓				Comment Period ↓							9	
	10	● Response to Comments		● Applic. Submitted									10	
	11	● Publish FEIS		Comment Period ↓									11	
	12												12	
YEAR 4	1					● Public Hearings					● Purchase Major Mech-		1	YEAR 4
	2	● Start LWA Hearings				● Permit Issued		● Applic. Submitted	● Permit Application		anical Equipment		2	
	3								● Public Hearing				3	
	4	● LWA Issued		● Permit Issued				● Permit Issued	● Certificate Granted		● Start Site Prep.		4	
	5										● Purchase Cooling Twr.		5	
	6												6	
	7												7	
	8												8	
	9										● Pur. Intake Equip.		9	
	10												10	
	11												11	
	12	● CP Issued											12	
YEAR 5	1										● Start Construction		1	YEAR 5
	2												2	
	3												3	
	4										● Start React. Bldg.&		4	
	5										other Major Struc-		5	
	6										tures		6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12										● Start Cooling Twr. Construction		12	



CP - Construction Permit
ER - Environmental Report
DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
LWA - Limited Work Authorization
OL - Operating License
T/G - Turbine-Generator
NPDES - National Pollutant Discharge Elimination System
NSSS - Nuclear Steam Supply System

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) For states without NPDES granting authority, the issuing agency is the Environmental Protection Agency. The state must issue a water quality certificate confirming compliance with state water laws.

FIGURE 12-D
NUCLEAR POWER PLANT MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE IV STATE

YEAR	MONTH	Nuclear Regulatory Commission: Construction Permit	Nuclear Regulatory Commission: Operating License	U.S. Army Corps of Engineers[1]: Permit to Construct Barge Facilities	U.S. Army Corps of Engineers[1]: Permit to Construct Intake & Discharge	Environmental Protection Agency[2]: NPDES Permit for Construction	Environmental Protection Agency[2]: NPDES Permit for Operation	State Dept. of Highways: Permit for Roadwork	Public Service Commission: Cert. of Public Convenience & Necessity Railroad	Public Service Commission: Cert. of Public Convenience & Necessity Power Plant	Utility Schedule: Design & Engineering & Construction	Utility Schedule	MONTH	YEAR
YEAR 1	1										Start Site Selection		1	YEAR 1
	2										Sel. Unit Capacity		2	
	3									Applic. Submittal	Sel. Method of Gen.		3	
	4												4	
	5												5	
	6										Complete Site Sel.		6	
	7									Public Hearings			7	
	8											Env. Meas. & Monitoring Programs	8	
	9												9	
	10										Sel. Circ. Wtr. Sys.		10	
	11									Certificate Granted	Purchase NSSS		11	
	12										Purchase T/G		12	
YEAR 2	1												1	YEAR 2
	2												2	
	3										Select Plant Sys.	Engineering & Design	3	
	4												4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12												12	
YEAR 3	1												1	YEAR 3
	2	ER Submittal											2	
	3	Acceptance											3	
	4	(Docket No.)											4	
	5												5	
	6												6	
	7	Publish DEIS				Applic. Submitted							7	
	8	Comment Period											8	
	9					Notice of Intent							9	
	10	Response to Comments		Applic. Submitted		Comment Period							10	
	11	Publish FEIS		Comment Period									11	
	12												12	
YEAR 4	1					Public Hearings					Purchase Major Mech. Equipment		1	YEAR 4
	2	Start LWA Hearings				Permit Issued		Applic. Submitted	Permit Application				2	
	3								Public Hearing				3	
	4	LWA Issued		Permit Issued				Permit Issued	Certificate Granted		Start Site Prep.		4	
	5										Purchase Cooling Towers		5	
	6												6	
	7												7	
	8												8	
	9										Purchase Intake Equipment		9	
	10												10	
	11												11	
	12	CP Issued											12	
YEAR 5	1										Start Construction		1	YEAR 5
	2												2	
	3												3	
	4										Start Reactor Bldg. & Other Major Structures		4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12										Start Cooling Tower Construction		12	



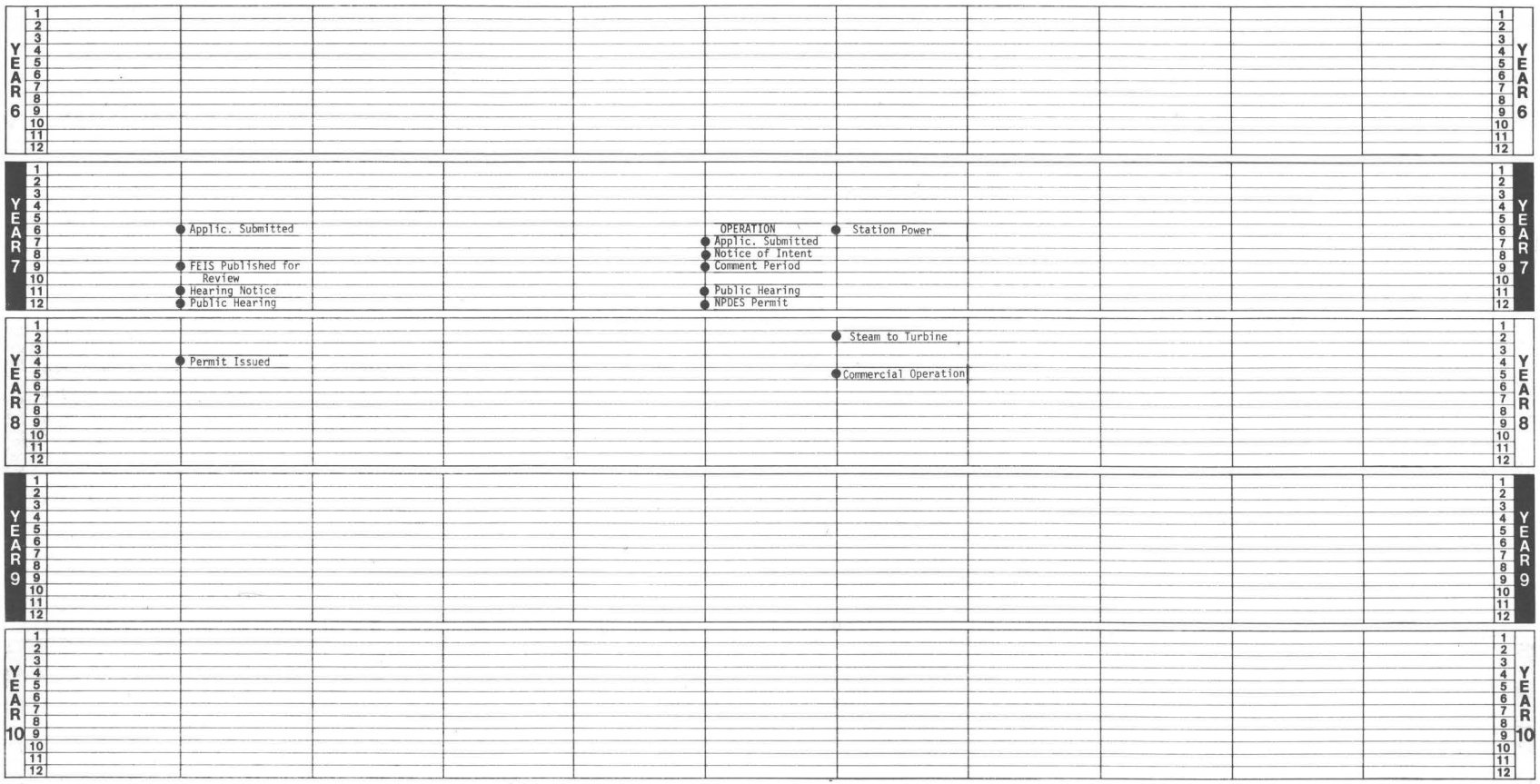
CP - Construction Permit
ER - Environmental Report
DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
LWA - Limited Work Authorization
OL - Operating License
T/G - Turbine-Generator
NPDES - National Pollutant Discharge Elimination System
NSSS - Nuclear Steam Supply System

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) For states without NPDES granting authority, the issuing agency is the Environmental Protection Agency. The state must issue a water quality certificate confirming compliance with state water laws.

FIGURE 13-A
FOSSIL-FUELED POWER PLANT MILESTONE SCHEDULE (IN MONTHS) FOR A TYPE I STATE

YEAR	MONTH	Federal Lead Agency: Construction	Federal Lead Agency: Operation	U.S. Army Corps of Engineers(1): Permit to Construct Barge Facilities	U.S. Army Corps of Engineers(1): Permit to Construct Intake & Discharge	Public Service Commission(2): Cert. of Public Convenience & Necessity	State Siting Authority(3): Site Certification	Utility Schedule: Engineering, Design and Construction
YEAR 1	1					● Applic. Submitted		● Start Site Selection
	2							
	3					● Public Hearing		
	4					● Certificate Granted		
	5							● Complete Site Sel.
	6							
	7							● Env. Measurements &
	8							Monitoring Programs
	9							
	10							
	11							
	12							
YEAR 2	1							
	2							● Select Unit Capacity
	3							● Select Meth. of Gen.
	4							● Select Clean. Equip.
	5							● Select Circ. Wtr.Sys.
	6							
	7							
	8						CONSTRUCTION	● Select Plant Systems
	9						● Applic. Submitted	
	10							● Purchase Boiler
	11						● Pre-hearing Conf.	● Purchase T/G
	12							
YEAR 3	1						● Notice of Intent	
	2						● Comment Period	
	3							
	4							● Purchase Intake
	5						● DEIS Published	Equipment
	6	● Applic. Submitted					● Comment Period	
	7							● Purchase Cooling
	8						● FEIS Published	Towers
	9	● DEIS Published for					● Public Hearing	
	10	Review		● Applic. Submitted				
	11	● Hearing Notice		● Comment Period				
	12	● Public Hearing					● Certificate Issued	
YEAR 4	1							
	2	● EPA Review/Appeal						
	3	Period						
	4	● Permit Issued		● Permit Issued				
	5							● Start Site Prep.
	6							● Purchase Major Mech.
	7							Equipment
	8							
	9							
	10							
	11							● Start Cool. Twr. Con.
	12							● Start Stack Erect.
YEAR 5	1							● Pur. SO_2 Rem. Equip.
	2							● Start Boiler Erect.
	3							& T/G Bldg. Const.
	4							
	5				● Applic. Submitted			
	6				● Comment Period			
	7							
	8							
	9							
	10							
	11				● Permit Issued			● Start Intake Const.
	12							



DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
EPA - Environmental Protection Agency
T/G - Turbine-Generator
NPDES - National Pollutant Discharge Elimination System

* For facilities with no Federal involvement, schedule is shortened four months since site preparation can begin as soon as the state certificate is granted (for this case only).

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) In some states, the siting authority is the Public Service Commission.

(3) All state permits are issued by the State Siting Authority, including NPDES and Air Quality permits; where the NPDES permit is granted by EPA, the schedule is not changed.

(4) In certain Category 1 states (i.e., California, Maryland, New York), the beginning of construction is dependent on that state's particular legislative structure for siting plants and may not begin for as long as four years or more from start of site selection.

FIGURE 13-B
FOSSIL-FUELED POWER PLANT MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE II STATE

YEAR / MONTH	Federal Lead Agency: Construction	Federal Lead Agency: Operation	U.S. Army Corps of Engineers[1]: Permit to Construct Barge Facilities	U.S. Army Corps of Engineers[1]: Permit to Construct Intake & Discharge	Public Service Commission[2]: Cert. of Public Convenience & Necessity	State Siting Authority[3]	Utility Schedule: Design, Engineering and Construction				
YEAR 1 — 1					● Applic. Submitted		● Start Site Selection				
2											
3					● Public Hearings						
4					● Certificate Granted						
5							● Complete Site Sel.				
6											
7							● Sel. Unit Capacity	● Env. Measurements & Monitoring Programs			
8							● Sel. Meth. of Gen.				
9							● Sel. Clean Equip.				
10							● Sel. Circ. Wtr. Sys.				
11											
12											
YEAR 2 — 1							● Select Plant Systems		● Engineering & Design		
2											
3							● Purchase Boiler				
4							● Purchase T/G				
5											
6						CONSTRUCTION					
7						● Applic. Submitted					
8											
9						● Pre-Hearing Conference	● Purchase Intake Equipment				
10											
11	● Applic. Submitted					● Notice of Intent					
12						● Comment Period	● Pur. Cool. Towers				
YEAR 3 — 1											
2	● DEIS Published for Review					● Public Hearings					
3											
4	● Hearing Notice		● Applic. Submitted								
5	● Public Hearings		● Comment Period			● Certificate Issued					
6											
7	● EPA Review/Appeal										
8	Period										
9	● Permit Issued		● Permit Issued								
10							● Start Site Prep.				
11							● Purchase Major Mech. Equipment				
12											
YEAR 4 — 1											
2											
3											
4							● Start Cool. Twr. Con				
5							● Start Stack Erect.				
6							● Pur. SO_2 Rem. Eqpt.				
7							● Start Boiler Erect. and T/G Bldg. Con.				
8											
9											
10				● Applic. Submitted							
11				● Comment Period							
12											
YEAR 5 — 1											
2											
3											
4				● Permit Issued			● Start Intake Const.				
5											
6											
7											
8											
9											
10											
11											
12											



DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
EPA - Environmental Protection Agency
T/G - Turbine-Generator
NPDES - National Pollutant Discharge Elimination System

* For facilities with no Federal involvement, schedule is shortened four months since site preparation can begin as soon as the state certificate is granted (for this case only).

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) In some states, the siting authority is the Public Service Commission.

(3) All state permits are issued by the State Siting Authority, including NPDES and Air Quality permits; where the NPDES permit is granted by EPA, the schedule is not changed.

FIGURE 13-C
FOSSIL-FUELED POWER PLANT MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE III STATE

YEAR / MONTH	Federal Lead Agency		U.S. Army Corps of Engineers[1]		State Dept. of Health	State Dept. of Transportation	State Dept. of Natural Resources		Public Service Commission	Utility Schedule		MONTH / YEAR
	Construction	Operation	Permit to Construct Barge Facilities	Permit to Construct Intake & Discharge	Permit for Solid Waste Disposal	Permit for Roadwork	NPDES Permit[2] Construction/ Operation	Air Permit for Construction/ Operation	Cert. of Public Convenience & Necessity for RR & Plant Const.	Engineering, Design and Construction		
YEAR 1										Start Site Selection		1
												2
												3
												4
										Complete Site. Sel.		5
									PLANT CONSTRUCTION			6
									Applic. Submitted	Select Unit Capacity	Environmental	7
										Select Method of Gen	Measurement &	8
										Select Clean. Equip.	Monitoring	9
									Public Hearings	Select Circ. Wtr. Sys.	Program	10
												11
												12
YEAR 2										Select Plant Systems	Engineering & Design	1
									Certificate Granted			2
										Purchase Boiler		3
										Purchase T/G		4
												5
												6
												7
												8
										Purchase Intake Equipment		9
							CONSTRUCTION	CONSTRUCTION				10
	Applic. Submitted						Applic. Submitted					11
										Purchase Cool. Twrs.		12
YEAR 3							Notice of Intent	(2)				1
	DEIS Pub. for Rev.						Comment Period	Applic. Submitted				2
								Comment Period				3
	Hearing Notice		Applic. Submitted									4
	Public Hearings		Comment Period				Public Hearings	Permit Issued				5
							Permit Issued					6
	EPA Review				Applic. Submitted				RAILROAD CONSTRUCTION			7
	Appeal Period					Applic. Submitted			Applic. Submitted			8
	Permit Issued		Permit Issued						Public Hearing			9
					Permit Issued	Permit Issued			Certificate Granted	Start Site Pre.		10
										Pur. Major Mech. Equipment		11
												12
YEAR 4												1
												2
												3
										Start Cool. Twr. Con		4
										Start Stack Erect.		5
										Pur. SO_2 Rem. Eqpt		6
										Start Boiler Erect.		7
										& T/G Bldg. Const.		8
												9
				Applic. Submitted								10
				Comment Period								11
												12
YEAR 5												1
												2
												3
				Permit Issued						Start Intake Const.		4
												5
												6
												7
												8
												9
												10
												11
												12



DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
EPA - Environmental Protection Agency
T/G - Turbine-Generator
NPDES - National Pollutant Discharge Elimination System

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) For states without NPDES granting authority the issuing agency is the Environmental Protection Agency. The state must issue a water quality certificate confirming compliance with state water laws.

FIGURE 13-D
FOSSIL-FUELED POWER PLANT MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE IV STATE

YEAR	MONTH	Federal Lead Agency: Construction	Federal Lead Agency: Operation	U.S. Army Corps of Engineers[1]: Permit to Construct Barge Facilities	U.S. Army Corps of Engineers[1]: Permit to Construct Intake & Discharge	Environmental Protection Agency[2]: NPDES Permit Construction/Operation (2) (3)	State Dept. of Health: Permit for Solid Waste Disposal	State Dept. of Highways: Permit for Roadwork	State Air Quality Control Board: Air Permit for Construction/Operation	Public Service Commission: Cert. of Public Convenience & Necessity	Utility Schedule: Design, Engineering and Construction	Utility Schedule	MONTH	YEAR
YEAR 1	1										● Start Site Selection		1	YEAR 1
	2												2	
	3												3	
	4									PLANT CONSTRUCTION			4	
	5										● Complete Site Sel.		5	
	6									● Applic. Submitted	● Sel. Unit Capacity	● Env. Measurements &	6	
	7										● Sel. Method of Gen.	Monitoring Pro-	7	
	8										● Sel. Cleaning Equip.	grams	8	
	9									● Public Hearings	● Sel. Circ. Wtr. Sys.		9	
	10												10	
	11												11	
	12												12	
YEAR 2	1										● Select Plant Systems	● Engineering &	1	YEAR 2
	2									● Certificate Granted		Design	2	
	3										● Purchase Boiler		3	
	4										● Purchase T/G		4	
	5												5	
	6												6	
	7												7	
	8												8	
	9										● Purchase Intake		9	
	10					CONSTRUCTION					Equipment		10	
	11	● Applic. Submitted				● Applic. Submitted							11	
	12								CONSTRUCTION		● Pur. Cool. Towers		12	
YEAR 3	1					● Notice of Intent							1	YEAR 3
	2	● DEIS Published for				● Comment Period			● Applic. Submitted				2	
	3	Review							● Comment Period				3	
	4	● Hearing Notice		● Applic. Submitted									4	
	5	● Public Hearing		● Comment Period		● Public Hearings			● Permit Issued				5	
	6					● Permit Issued				RAILROAD CONSTRUCTION			6	
	7	● EPA Review/Appeal					● Applic. Submitted						7	
	8	Period						● Applic. Submitted		● Applic. Submitted			8	
	9	● Permit Issued		● Permit Issued						● Public Hearing			9	
	10						● Permit Issued	● Permit Issued		● Certificate Granted	● Start Site Prep.		10	
	11										● Purchase Major		11	
	12										Mechanical Equip.		12	
YEAR 4	1												1	YEAR 4
	2												2	
	3												3	
	4										● Start Cool. Twr. Con.		4	
	5										● Start Stack Erect./		5	
	6										Pur. SO2 Rem. Eqpt.		6	
	7										● Start Boiler Erect./		7	
	8										T/G Bldg. Const.		8	
	9												9	
	10				● Applic. Submitted								10	
	11				● Comment Period								11	
	12												12	
YEAR 5	1												1	YEAR 5
	2												2	
	3												3	
	4				● Permit Issued						● Start Intake Const.		4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12												12	



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(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) For cases in which the EPA is the Lead Federal Agency, this column should be omitted.

(3) Where the state has NPDES granting authority, these permits are issued by the state agency; the schedule is not altered.

FIGURE 14-A
HYDROELECTRIC FACILITY MILESTONE SCHEDULE (IN MONTHS) FOR A TYPE I STATE

YEAR	MONTH	Federal Lead Agency: Construction and Operation	U.S. Army Corps of Engineers[1]: Permit to Construct in Navigable Waters	Public Service Commission[2]: Cert. of Public Convenience & Necessity	State Siting Authority[3]: Site Certification	Utility Schedule: Design, Engineering and Construction						MONTH	YEAR
YEAR 1	1					● Start Site Selection						1	YEAR 1
	2											2	
	3			● Applic. Submitted								3	
	4			● Public Hearings								4	
	5			● Certificate Granted		● Complete Site Select.						5	
	6											6	
	7					● Select Unit Capacity		● Env. Measurements & Monitoring Program				7	
	8											8	
	9						● Engineering & Design					9	
	10											10	
	11											11	
	12											12	
YEAR 2	1				● Applic. Submitted							1	YEAR 2
	2											2	
	3				● Pre-hearing Conf.	● Start Recreation Plans and Fish & Wildlife Protect. Studies						3	
	4											4	
	5				● Notice of Intent							5	
	6				● Comment Period							6	
	7											7	
	8											8	
	9				● DEIS Published							9	
	10	● Applic. Submitted			● Comment Period							10	
	11											11	
	12				● FEIS Published							12	
YEAR 3	1	● DEIS Published for Review			● Public Hearings							1	YEAR 3
	2											2	
	3											3	
	4	● Public Hearings			● Certificate Issued							4	
	5											5	
	6	● EPA Review/Appeal Period										6	
	7											7	
	8	● Permit Issued										8	
	9					● Begin ROW Acquisition						9	
	10											10	
	11											11	
	12											12	
YEAR 4	1											1	YEAR 4
	2											2	
	3											3	
	4											4	
	5											5	
	6											6	
	7											7	
	8											8	
	9											9	
	10											10	
	11											11	
	12											12	
YEAR 5	1											1	YEAR 5
	2											2	
	3											3	
	4											4	
	5											5	
	6											6	
	7											7	
	8											8	
	9		● Applic. Submitted									9	
	10		● Comment Period									10	
	11											11	
	12											12	



DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
EPA - Environmental Protection Agency
ROW - Right-of-way
NPDES - National Pollutant Discharge Elimination System

* This milestone schedule is applicable to non-Federal projects licensed by the Federal Power Commission. Water conservation projects without electric power generation are not included.

(1) An application for construction must be filed with the COE for each structure, a single permit is shown for simplification.

(2) In some states, the siting authority is the Public Service Commission.

(3) All state permits are issued by the State Siting Authority, including NPDES permits; where the NPDES permit is granted by EPA, the schedule is not changed.

FIGURE 14-B
HYDROELECTRIC FACILITY MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE II STATE

YEAR	MONTH	Federal Lead Agency	U.S. Army Corps of Engineers[1]	Public Service Commission[2]	State Siting Authority[3]	Utility Schedule							MONTH	YEAR
		Construction and Operation	Permit to Construct in Navigable Waters	Cert. of Public Convenience & Necessity	Site Certification	Design, Engineering and Construction								
YEAR 1	1			● Applic. Submitted		● Start Site Selection							1	YEAR 1
	2												2	
	3			● Public Hearings									3	
	4			● Certificate Granted			● Engineering & Design						4	
	5					● Complete Site Select							5	
	6												6	
	7					● Select Unit Capacity		● Env. Measurements & Monitoring Prog.					7	
	8												8	
	9					● Start Recreation Plans and Fish & Wildlife Protection Studies							9	
	10												10	
	11												11	
	12				● Applic. Submitted								12	
YEAR 2	1												1	YEAR 2
	2				● Pre-hearing Conference								2	
	3												3	
	4	● Applic. Submitted			● Notice of Intent								4	
	5				● Comment Period								5	
	6	● DEIS Published for Review											6	
	7				● Public Hearing								7	
	8												8	
	9	● Public Hearings											9	
	10				● Certificate Issued								10	
	11	● EPA Review/Appeal Period											11	
	12												12	
YEAR 3	1	● Permit Issued											1	YEAR 3
	2												2	
	3					● Begin ROW Acquisition							3	
	4												4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12												12	
YEAR 4	1												1	YEAR 4
	2												2	
	3												3	
	4												4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12												12	
YEAR 5	1												1	YEAR 5
	2												2	
	3		● Applic. Submitted										3	
	4		● Comment Period										4	
	5												5	
	6												6	
	7					● Purchase Generating Equipment							7	
	8												8	
	9		● Permit Issued			● Start Dam Construction & Clearing of Reservoir							9	
	10												10	
	11												11	
	12												12	



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ROW - Right-of-way
NPDES - National Pollutant Discharge Elimination System

* For facilities with no Federal involvement, schedule is shortened four months since ROW clearing can begin as soon as the state certificate is granted.

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) In some states the siting authority is the Public Service Commission.

(3) All state permits are issued by the State Siting Authority, including NPDES permits; where the NPDES permit is granted by EPA, the schedule is not changed.

FIGURE 14-C
HYDROELECTRIC FACILITY MILESTONE SCHEDULE (IN MONTHS)*
FOR A TYPE III STATE

YEAR	MONTH	Federal Lead Agency	U.S. Army Corps of Engineers(1)	State Dept. of Transportation	State Dept. of Natural Resources (2)	Public Service Commission	Utility Schedule						MONTH	YEAR
		Construction and Operation	Permit for Construction in Navigable Waters	Permit for Roadwork	NPDES Permit for Construction	Cert. of Public Convenience & Necessity for Dam Construction	Design, Engineering and Construction							
YEAR 1	1					● Applic. Submitted	● Start Site Selection						1	YEAR 1
	2												2	
	3												3	
	4					● Public Hearing		● Engineering & Design					4	
	5						● Complete Site Sel.						5	
	6												6	
	7					● Certificate Granted	● Select Unit Capacity						7	
	8								● Environmental				8	
	9						● Start Recreation		Measurements &				9	
	10						Plans and Fish &		Monitoring Programs				10	
	11						Wildlife Protection Studies						11	
	12												12	
YEAR 2	1												1	YEAR 2
	2												2	
	3												3	
	4	● Applic. Submitted			● Applic. Submitted								4	
	5				● Comment Period								5	
	6												6	
	7	● DEIS Published for											7	
	8	Review											8	
	9												9	
	10	● Public Hearings			● Public Hearing								10	
	11				● Permit Issued								11	
	12	● EPA Review/Appeal		● Applic. Submitted									12	
YEAR 3	1	Period											1	YEAR 3
	2	● Permit Issued		● Permit Issued									2	
	3						● Begin ROW Acquisition and Relocation						3	
	4												4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12												12	
YEAR 4	1												1	YEAR 4
	2												2	
	3												3	
	4												4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	
	10												10	
	11												11	
	12												12	
YEAR 5	1												1	YEAR 5
	2												2	
	3		● Applic. Submitted										3	
	4		● Comment Period										4	
	5												5	
	6												6	
	7						● Purchase Generating Equipment						7	
	8												8	
	9						● Start Dam Const. & Clearing of Reservoir						9	
	10												10	
	11												11	
	12												12	



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NPDES - National Pollutant Discharge Elimination System

* This milestone schedule is applicable to non-Federal projects licensed by the Federal Power Commission. Water conservation projects without electric power generation are not included.

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) For states without NPDES granting authority, the issuing agency is the Environmental Protection Agency. The state must issue a water quality certificate confirming compliance with state water laws.

FIGURE 14-D
HYDROELECTRIC FACILITY MILESTONE SCHEDULE (IN MONTHS)
FOR A TYPE IV STATE

YEAR / MONTH	Federal Lead Agency: Construction and Operation	U.S. Army Corps of Engineers[1]: Permit for Construct. in Navigable Waters	Environmental Protection Agency[2]: NPDES Permit for Construction	State Dept. of Highways: Permit for Roadwork	Public Service Commission: Cert. of Public Convenience & Necessity	Utility Schedule: Design, Engineering and Construction					MONTH / YEAR
YEAR 1 — 1					● Applic. Submitted	● Start Site Selection					1
2											2
3											3
4					● Public Hearing		● Engineering & Design				4
5						● Complete Site Sel.					5
6											6
7					● Certificate Granted	● Select Unit Capacity		● Env. Measurements & Monitoring Program			7
8											8
9						● Start Recreation Plans and Fish & Wildlife Protection Studies					9
10											10
11											11
12											12
YEAR 2 — 1											1
2											2
3											3
4	● Applic. Submitted										4
5											5
6											6
7	● DEIS Published for Review		● Applic. Submitted								7
8											8
9			● Notice of Intent								9
10	● Public Hearings		● Comment Period								10
11											11
12	● EPA Review/Appeal			● Applic. Submitted							12
YEAR 3 — 1	Period		● Public Hearings								1
2	● Permit Issued		● Permit Issued	● Permit Issued							2
3						● Begin ROW Acquisition and Relocations					3
4											4
5											5
6											6
7											7
8											8
9											9
10											10
11											11
12											12
YEAR 4 — 1											1
2											2
3											3
4											4
5											5
6											6
7											7
8											8
9											9
10											10
11											11
12											12
YEAR 5 — 1											1
2		● Applic. Submitted									2
3		● Comment Period									3
4											4
5											5
6											6
7						● Purchase Generating Equipment					7
8											8
9		● Permit Issued				● Start Dam Construction and Clearing of Reservoir					9
10											10
11											11
12											12



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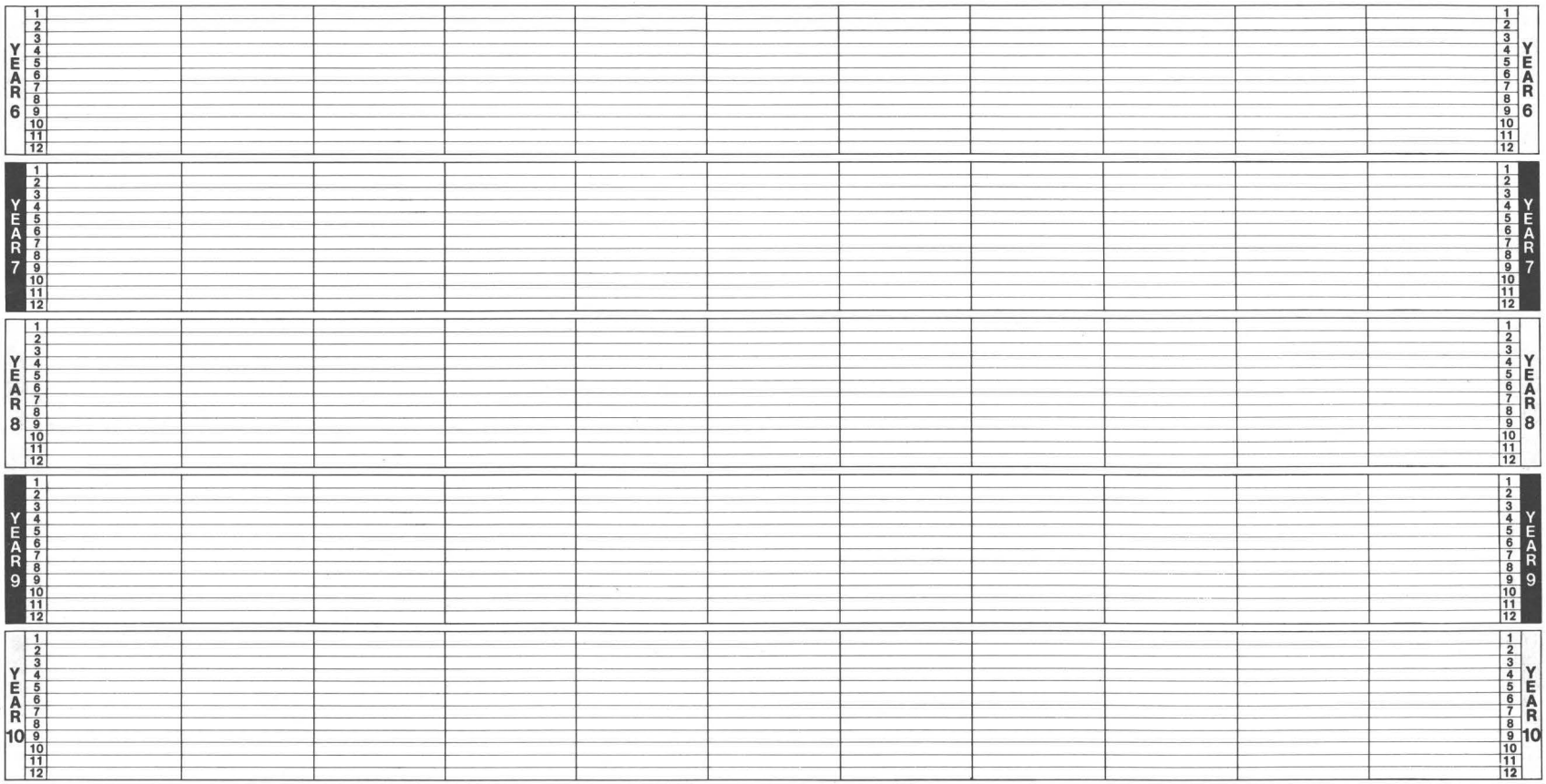
* This milestone schedule is applicable to non-Federal projects licensed by the Federal Power Commission. Water conservation projects without electric power generation are not included.

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) Where the state has NPDES granting authority, these permits are issued by the state agency. The schedule is not altered.

FIGURE 15-A
TRANSMISSION LINES (NOT RELATED TO POWER PLANT DEVELOPMENT) MILESTONE SCHEDULE (IN MONTHS) FOR A TYPE I STATE

YEAR	MONTH	Federal Lead Agency: Construction and Operation	U.S. Army Corps of Engineers[1]: Permit to Construct in Navigable Waters	Public Service Commission[2]: Cert. of Public Convenience & Necessity	State Siting Authority[3]: ROW Certification	Utility Schedule: Design, Engineering and Construction						MONTH	YEAR
YEAR 1	1			● Applic. Submitted		● Determine Load & Terminal Points						1	YEAR 1
	2											2	
	3			● Public Hearing								3	
	4			● Certificate Granted		● Begin ROW Selection						4	
	5											5	
	6											6	
	7											7	
	8						● Env. Measurements & Monitoring Programs					8	
	9											9	
	10											10	
	11											11	
	12											12	
YEAR 2	1											1	YEAR 2
	2				● Applic. Submitted							2	
	3											3	
	4				● Pre-hearing Conf.							4	
	5											5	
	6				● Notice of Intent							6	
	7				● Comment Period							7	
	8											8	
	9											9	
	10				● DEIS Published							10	
	11	● Applic. Submitted			● Comment Period			● Engineering & Design				11	
	12					● Begin ROW Procurement						12	
YEAR 3	1				● FEIS Published							1	YEAR 3
	2	● DEIS Published for Review			● Public Hearing							2	
	3											3	
	4											4	
	5	● Public Hearing			● Certificate Issued							5	
	6											6	
	7	● EPA Review/Appeal Period				● Purchase Steel						7	
	8											8	
	9	● Permit Issued										9	
	10					● Start ROW Clearing						10	
	11		● Applic. Submittal			● Purchase Cable						11	
	12		● Comment Period			● Purchase Insulation & Hardware						12	
YEAR 4	1											1	YEAR 4
	2											2	
	3											3	
	4											4	
	5		● Permit Issued			● Begin Foundation Installation						5	
	6											6	
	7											7	
	8											8	
	9					● Begin Tower Erect.						9	
	10											10	
	11					● Begin Wire Installation						11	
	12											12	
YEAR 5	1											1	YEAR 5
	2											2	
	3											3	
	4											4	
	5											5	
	6											6	
	7											7	
	8											8	
	9											9	
	10											10	
	11											11	
	12					● Commercial Operation						12	



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* For facilities with no Federal involvement, the schedule is shortened four months since ROW clearing can begin as soon as the state certificate is granted.

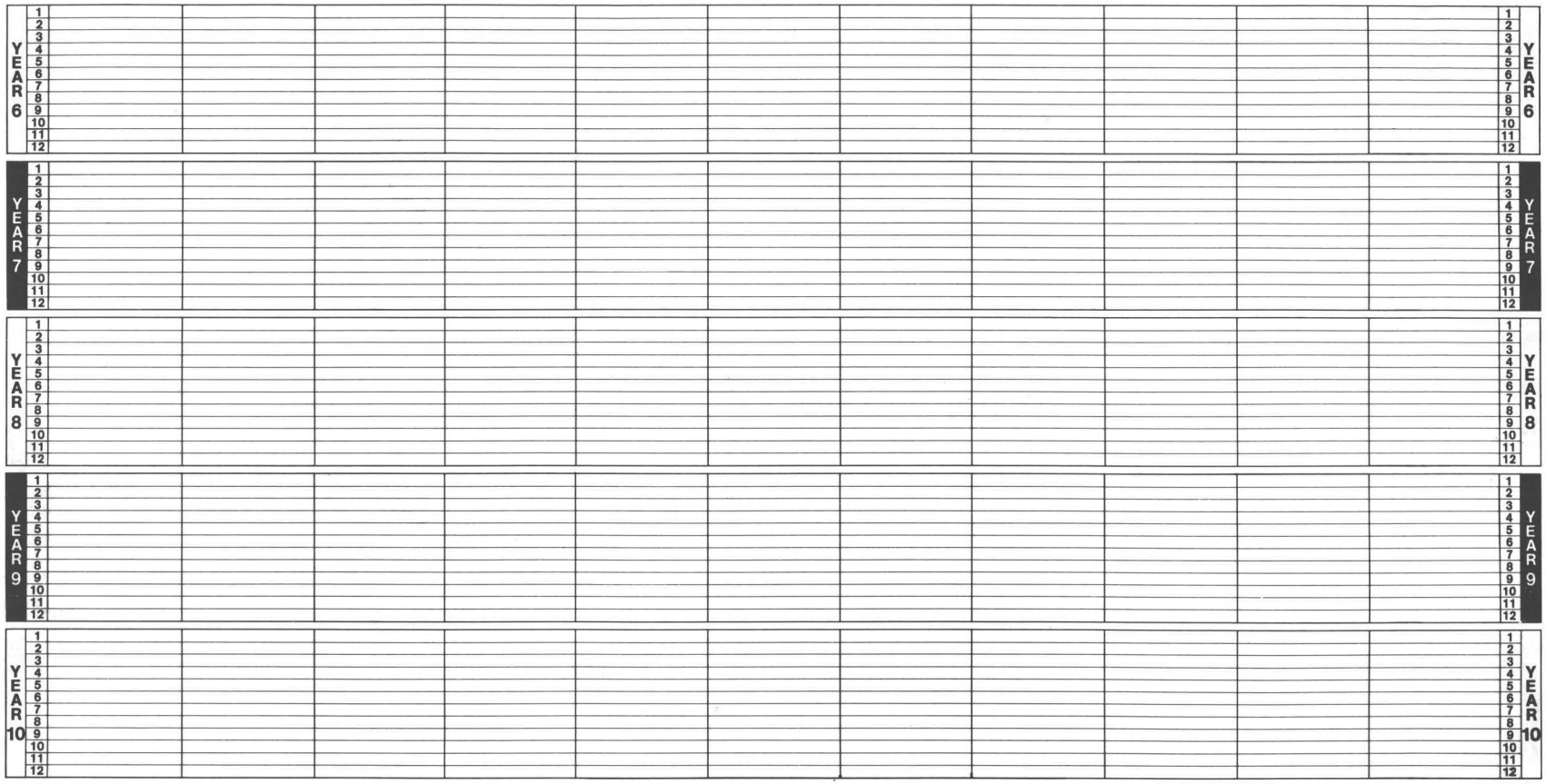
(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) In some states, the siting authority is the Public Service Commission

(3) All state permits are issued by the State Siting Authority, including NPDES permits; where the NPDES permit is granted by EPA the schedule is not changed.

FIGURE 15-B
TRANSMISSION LINES (NOT RELATED TO POWER PLANT DEVELOPMENT) MILESTONE SCHEDULE (IN MONTHS)*
FOR A TYPE II STATE

YEAR / MONTH	Federal Lead Agency: Construction and Operation	U.S. Army Corps of Engineers(1): Permit to Construct in Navigable Waters	Public Service Commission(2): Cert. of Public Convenience & Necessity	State Siting Authority(3): ROW Certification	Utility Schedule: Design, Engineering and Construction						MONTH / YEAR
YEAR 1 — 1					● Determine Load and Terminal Points						1
2											2
3			● Public Hearings								3
4			● Certificate Granted		● Begin ROW Selection						4
5											5
6											6
7											7
8						● Env. Measurements & Monitoring Program					8
9											9
10											10
11											11
12											12
YEAR 2 — 1											1
2				● Applic. Submitted							2
3											3
4				● Pre-hearing Conference							4
5											5
6	● Applic. Submitted			● Notice of Intent			● Engineering & Design				6
7				● Comment Period	● Begin ROW Procurement						7
8											8
9	● DEIS Published for Review			● Public Hearing							9
10											10
11											11
12	● Public Hearing			● Certificate Granted							12
YEAR 3 — 1											1
2	● EPA Review/Appeal Period				● Purchase Steel						2
3											3
4	● Permit Issued										4
5		● Applic. Submitted			● Start ROW Clearing						5
6		● Comment Period			● Purchase Cable						6
7					● Purchase Insulators and Hardware						7
8											8
9											9
10											10
11		● Permit Issued			● Begin Foundation Installation						11
12											12
YEAR 4 — 1											1
2											2
3					● Begin Tower Erection						3
4											4
5					● Begin Wire Installation						5
6											6
7											7
8											8
9											9
10											10
11											11
12											12
YEAR 5 — 1											1
2											2
3											3
4											4
5											5
6											6
7					● Commercial Operation						7
8											8
9											9
10											10
11											11
12											12



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* For facilities with no Federal involvement, schedule is shortened by four months since ROW clearing can begin as soon as the state certificate is granted.

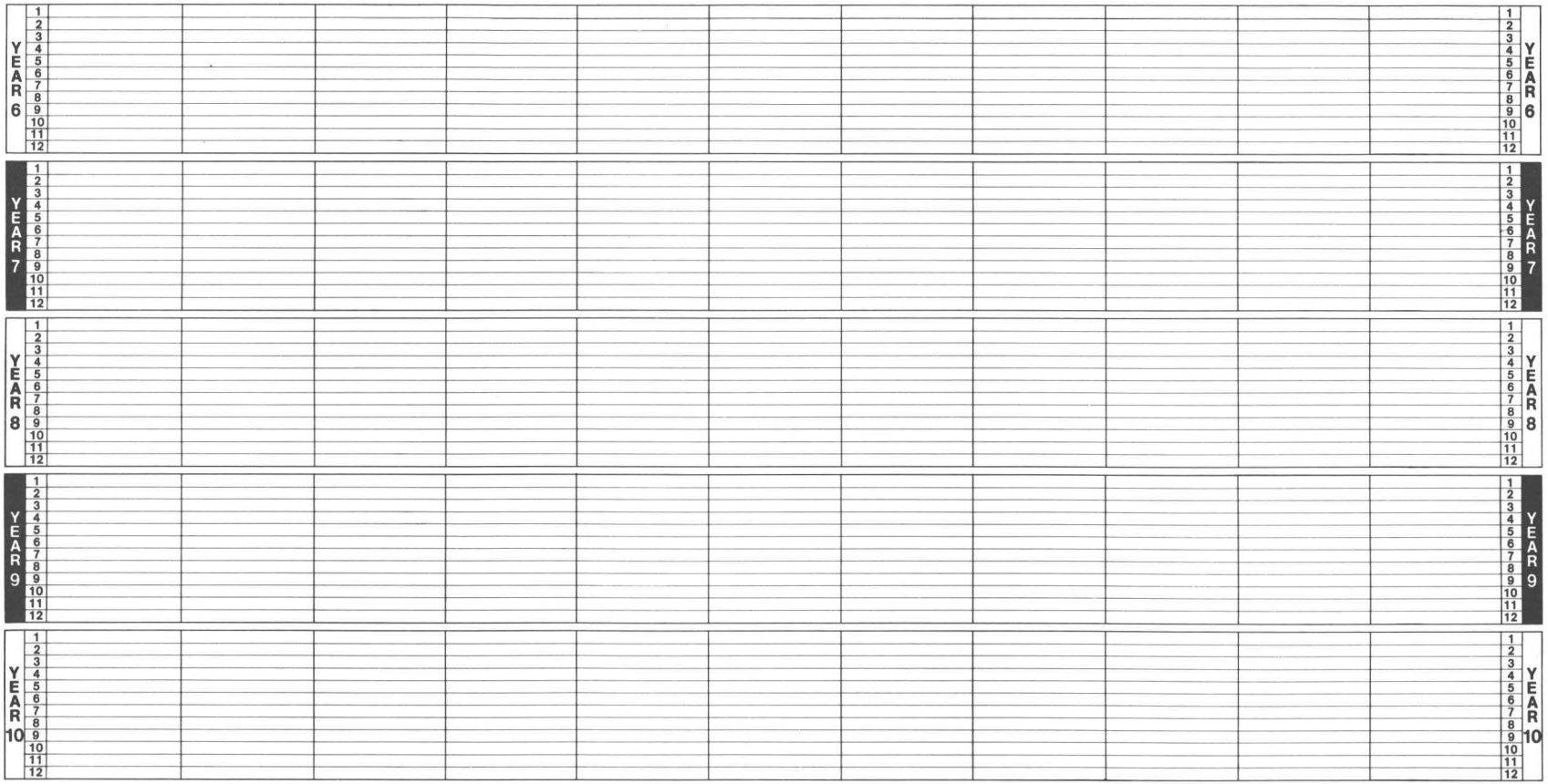
(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) In some states, the siting authority is the Public Service Commission.

(3) All state permits are issued by the State Siting Authority, including NPDES permits; where the NPDES permit is granted by EPA, the schedule is not changed.

FIGURE 15-C
TRANSMISSION LINES (NOT RELATED TO POWER PLANT DEVELOPMENT) MILESTONE SCHEDULE (IN MONTHS) FOR A TYPE III STATE

YEAR	MONTH	Federal Lead Agency: Construction and Operation	U.S. Army Corps of Engineers(1): Permit for Construction in Nav. Waters (River Crossings)	State Dept. of Transportation: Permit for Roadwork (Access Roads)	State Dept. of Natural Resources(2): NPDES Permit for Construction	Public Service Commission: Cert. of Public Convenience & Necessity	Utility Schedule: Design, Engineering and Construction					MONTH	YEAR
YEAR 1	1					● Applic. Submitted	● Determine Load & Terminal Points					1	YEAR 1
	2											2	
	3											3	
	4						● Begin ROW Selection					4	
	5					● Public Hearings ↓						5	
	6											6	
	7											7	
	8							● Env. Measurements & Monitoring Programs				8	
	9											9	
	10					● Certificate Granted						10	
	11											11	
	12											12	
YEAR 2	1											1	YEAR 2
	2	● Applic. Submitted			● Applic. Submitted				● Engineering & Design			2	
	3						● Begin ROW Procurement					3	
	4				● Comment Period							4	
	5	● DEIS Pub. for Rev.										5	
	6											6	
	7				● Public Hearing							7	
	8	● Public Hearings			● Permit Issued							8	
	9											9	
	10	● EPA Review/Appeal					● Purchase Steel					10	
	11	Period		● Applic. Submitted								11	
	12	● Permit Issued										12	
YEAR 3	1		● Applic. Submitted	● Permit Issued			● Start ROW Clearing					1	YEAR 3
	2		● Comment Period				● Purchase Cable					2	
	3						● Purchase Insulators and Hardware					3	
	4											4	
	5											5	
	6											6	
	7		● Permit Issued				● Begin Foundation Installation					7	
	8											8	
	9											9	
	10											10	
	11						● Begin Tower Erection					11	
	12											12	
YEAR 4	1						● Begin Wire Installation					1	YEAR 4
	2											2	
	3											3	
	4											4	
	5											5	
	6											6	
	7											7	
	8											8	
	9											9	
	10											10	
	11											11	
	12											12	
YEAR 5	1											1	YEAR 5
	2											2	
	3						● Commercial Operation					3	
	4											4	
	5											5	
	6											6	
	7											7	
	8											8	
	9											9	
	10											10	
	11											11	
	12											12	



DEIS - Draft Environmental Impact Statement
FEIS - Final Environmental Impact Statement
EPA - Environmental Protection Agency
ROW - Right-of-way
NPDES - National Pollutant Discharge Elimination System

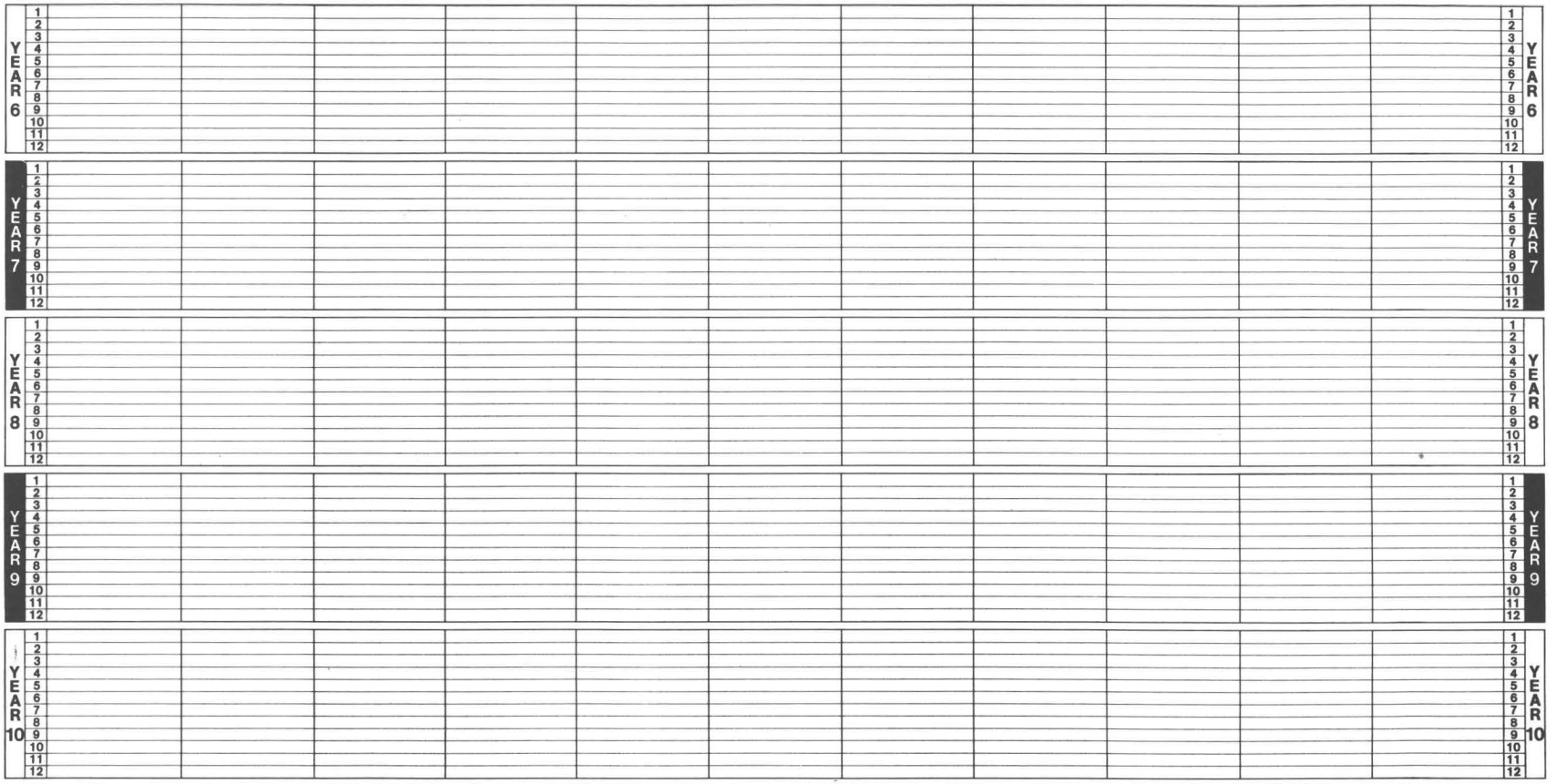
* For facilities with no Federal involvement, schedule is shortened by four months since ROW clearing can begin as soon as the state certificate is granted.

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) For states without NPDES granting authority, the issuing agency is the Environmental Protection Agency. The state must issue a water quality certificate confirming compliance with state water laws.

FIGURE 15-D
TRANSMISSION LINES (NOT RELATED TO POWER PLANT DEVELOPMENT) MILESTONE SCHEDULE (IN MONTHS) FOR A TYPE IV STATE

YEAR	MONTH	Federal Lead Agency	U.S. Army Corps of Engineers[1]	Environmental Protection Agency[2]	State Dept. of Highways	Public Service Commission	Utility Schedule					MONTH	YEAR
		Construction and Operation	Permit for Construction in Nav. Waters (River Crossings)	NPDES Permit for Construction	Permit for Roadwork (Access Roads)	Certificate of Public Convenience & Necessity	Design, Engineering and Construction						
YEAR 1	1					● Applic. Submitted	● Determine Load & Terminal Points					1	YEAR 1
	2											2	
	3											3	
	4						● Begin ROW Selection					4	
	5					● Public Hearings						5	
	6											6	
	7											7	
	8							● Env. Measurements & Monitoring Program				8	
	9											9	
	10					● Certificate Granted						10	
	11											11	
	12											12	
YEAR 2	1			● Applic. Submitted								1	YEAR 2
	2	● Applic. Submitted					● Begin ROW Procurement		● Engineering & Design			2	
	3			● Notice of Intent								3	
	4			● Comment Period								4	
	5	● DEIS Pub. for Rev.										5	
	6											6	
	7			● Public Hearings								7	
	8	● Public Hearings		● Permit Issued								8	
	9											9	
	10	● EPA Review/Appeal Period			● Applic. Submitted		● Purchase Steel					10	
	11											11	
	12	● Permit Issued			● Permit Issued							12	
YEAR 3	1		● Applic. Submitted				● Start ROW Clearing					1	YEAR 3
	2		● Comment Period				● Purchase Cable					2	
	3						● Purchase Insulation & Hardware					3	
	4											4	
	5											5	
	6											6	
	7		● Permit Issued									7	
	8						● Begin Foundation Installation					8	
	9											9	
	10											10	
	11											11	
	12						● Begin Tower Erection					12	
YEAR 4	1											1	YEAR 4
	2						● Begin Wire Installation					2	
	3											3	
	4											4	
	5											5	
	6											6	
	7											7	
	8											8	
	9											9	
	10											10	
	11											11	
	12											12	
YEAR 5	1											1	YEAR 5
	2											2	
	3						● Commercial Operation					3	
	4											4	
	5											5	
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	9											9	
	10											10	
	11											11	
	12											12	



DEIS - Draft Environmental Impact Statement
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ROW - Right-of-way
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* For facilities with no Federal involvement, schedule is shortened four months since ROW clearing can begin as soon as the state certificate is granted.

(1) An application for construction must be filed with the COE for each structure; a single permit is shown for simplification.

(2) Where the state has NPDES granting authority, these permits are issued by the state agency; the schedule is not altered.

CHAPTER 4 POTENTIAL IMPACTS OF DECISIONS ON FISH AND WILDLIFE RESOURCES

Almost every decision made by the utility industry has a potential impact of varying magnitude on fish and wildlife resources, either directly or indirectly. Some major decisions which have an impact are indicated on the Preconstruction Licensing Schedules included in Chapter 2. Roman numerals on those figures key the areas and timing for decision making. These major decisions are comprised of a number of detailed considerations as indicated in the discussions of the potential impacts of each type of generating facility. The impact of transmission lines on fish and wildlife resource is also considered.

Not all detailed considerations for design and construction which impact fish and wildlife resources are made by the utility industry. For example, a utility may contract with an engineering firm to design the circulating water system. The final design may include details of the intake, screens, pumps, water boxes, and condensers. Many design features may individually have an aquatic impact. In this case, the decision made by the utility may not be reflected in the details of the design as performed by the contractor or engineering firm.

Consequences or secondary effects of design features may have an impact. For example, design of the intake, circulating water system, and discharge system will determine the transit time of species entrained in the water.

Location of the intake and discharge will determine in part the amount of heated water recirculated. Construction of a hydroelectric facility will cause changes in physiochemical parameters. In each of these cases, the secondary effects of decisions made by the initial utility decision will also have an effect on the aquatic biota. These consequences may not have been considered or anticipated.

Almost all decisions are reversible. However, in many cases the cost is high and in some cases prohibitive. For example, in the case of the circulating water system, biologists may be consulted with respect to the design. They may suggest changes in intake velocity, screen type, and fish bypass systems. Their suggestions are usually based on present regulatory requirements, guidelines, or experience from other sites. In some cases the intake structure may have been constructed but under initial operation found to impact aquatic organisms. In these cases, biologists or regulatory personnel may request modifications in some of the design features. The intake location at this point is relatively fixed (cost might make changes prohibitive) but other design features might be modified at a more reasonable cost.

Major decisions which impact aquatic systems include site selection, type of generation, circulating water and cooling systems, and intake and discharge systems. Those with the greatest impact on terrestrial systems involve site selection and transmission Rights-of-Way.

The time frame for the planning and construction of many generating stations is so long that many decisions are made and changed a number of times before the plant goes into operation. These changes are often in response to new regulatory decisions or guidelines. They may also be made after more detailed ecological data have been gathered and analyzed.

IMPACTS OF PRE- PUBLIC/AGENCY NOTIFICATION DECISIONS

Site selection will determine which populations will be impacted and which life stages of important organisms* will be affected. The presence of threatened and endangered species may preclude a site from consideration. Areas which are unique biologically (have unique habitats or communities) or which have concentrations of important species or various life stages of these species may also preclude a site. If the above factors are discovered after site selection, they may make it necessary to examine alternate sites or to make modifications in plant design. Sites in areas which are not ecologically sensitive or unique will result in minimal impact of other design features.

No site is ideal. Thus, aspects of the circulating water system and intake and discharge systems will have an impact on fish and wildlife resources and this impact may be large or small depending on various design features. Ecological data at the site are necessary for an evaluation of the proper design of these systems. The trend in decision making within the utility industry has been to involve the biologist at an early stage in planning.

Nuclear and Fossil-Fueled Electric Generating Stations

In the selection of a site for a nuclear or fossil-fueled electric generating station, preliminary physical, biological, and social studies are prepared. The outcome of these studies will ultimately determine the adequacy of a site. Following is a list of those major categories that are considered in the site selection process. These are presented in their typical order of importance, however, it must be noted that any one item may be of sufficient impact so as to render the particular site under investigation inadequate.

GEOLOGY AND SOILS

General Seismic and Geological Characteristics
Soil Stability and Topography
Subsidence
Seismically Induced Floods and Water Waves

ATMOSPHERIC FACTORS

Air Pollution Standards

* Important organisms refer to those of sport, commercial, or ecological importance.

Dispersion Climatology
Atmospheric Dispersion - Valley and Canyon Sites
Atmospheric Dispersion - Shoreline Sites
Vortex Phenomena and Extreme Winds
Fogging and Icing

Hydrology

Water Use Policies
Adequate Water Supply (Quantity)
Groundwater
Inadvertent Loss of Water
Water Quality
Icing and Sedimentation
Mixing Zones
Stratified Waterbodies
Impoundments

ECOLOGY

Temperature Sensitive Aquatic Species
Breeding Habitats
Species Migration
Terrestrial Vegetation
Rare or Endangered Species

PUBLIC EXPOSURE TO RADIATION

LAND USE

Land-Use Compatibility
Land-Use Planning
Watershed Planning
Transmission Line Corridors

HUMAN INTEREST FACTORS

Unique Natural Resource Areas
Historical Areas
Archaeological Sites
Fossil and Rock Deposits

ESTHETICS

View of Transmission Facilities
View of Power Plant Site

OTHER CONSIDERATIONS

Transportation Provisions
Construction Impacts

Most thermal plants are located near rivers, lakes, or the seashore because of the need for an adequate supply of cooling water to condense the steam leaving the turbines. The amount of cooling water required depends upon the size of the plant, its thermal efficiency, and the permissible temperature rise of the cooling water passing through the condensers. Typically, for a 1,000-megawatt generating station, a flow of 1,500 cubic feet (42 cubic meters) per second is required, and the minimum river flow would have to be about 4,000 cubic feet (110 cubic meters) per second to limit the temperature rise of the river water to approximately 7°F (4°C).

With a decreasing availability of water for steam electric power plant cooling, two principal ways can be used to remedy this situation: 1) recirculating the cooling water in reservoirs or ponds and 2) by the use of cooling towers, both evaporative (wet and wet/dry towers) and nonevaporative (dry towers). Each one of these methods requires a certain supply of makeup water to replace water evaporated and otherwise lost. For a 1,000-megawatt generating station, the water requirement for a cooling pond would be 10 to 20 cubic feet (0.3 to 0.6 cubic meters) per second; for an evaporative cooling tower system, 20 cubic feet (0.6 cubic meters) per second; and for a nonevaporative cooling tower system, about two cubic feet (0.006 cubic meters) per second.

Where cooling waters are in good supply, the once-through circulation method for condenser cooling is usually the most economical; the recirculation system involving reservoirs and ponds ranks next in economy. The cooling tower system is relatively expensive, especially the nonevaporative, or dry, cooling tower system. This is due to the penalties involved in efficiency bases; power supply for pumping water through the tower and fan motors.

Air pollution regulations also pose severe limitations in locating large plants. Special studies must be made of atmospheric conditions in the area, the sulfur and ash content of the fuel burned, and the degree to which the area is developed. Even with modern boiler design, dust collectors, and proper plant layout and stack height, the station size may sometimes be limited by the permissible atmospheric pollution level in the specific region (see Clean Air Act Amendments, Appendix A).

Air pollutants of major concern at fossil-fueled power plants include fly ash and polycyclic hydrocarbons in the particulate group, and the oxides of sulfur and nitrogen in the gases. Modern power plants are normally equipped with electrostatic precipitators to provide a substantial degree of control over particulates and fly ash. The sulfur-derivative gases are generally the most troublesome pollutants from fossil-fueled plants, sulfur being present in almost all fossil fuels. Most of the sulfur appears in the stack gases as sulfur dioxide in a concentration that is a function of the sulfur content of the fuel and the amount of excess air in the stack emission.

Removal of sulfur dioxide from combustion gases by known techniques (flue gas desulfurization equipment) is difficult and expensive, and experimental work is underway for better methods. As a means of control, utilities have constructed very high stacks at thermal power stations, in some instances as high as 825 feet (250 meters) or more, to allow the wind to dilute the stack gases. This method of air pollution control is no longer permitted by EPA.

Supply of fuel of low sulfur content is limited. Instead of extracting sulfur dioxide from stack gas, techniques for extracting sulfur directly from oil are being developed with promising results, but the cost is uncertain. Similar experiments are being conducted on coal.

Hydroelectric Site Selection

The possibility of specific hydroelectric development depends on weather conditions and geographical features. Mountainous regions subject to heavy rainfall close to industrial regions are the most favorable for hydroelectric development.

Water must be collected and stored at a high elevation and led through tunnels or pipelines to a station at a much lower elevation, or dams may be erected across a river to raise the level of the water. The power developable by a volume of water is directly proportional to the working head, that being the difference in elevation between two points in a body of fluid. A high-head installation requires a smaller volume of water than a low-head installation to produce an equal amount of power.

Transmission Line Design and Construction

After a power plant site has been selected, surveys are made to determine the best routes for the transmission lines. Before construction, studies determine the voltage, conductor spacing, number and type of insulators, conductor size and material, pole or tower design, and the protective features to guard the line against damage from lightning or other hazards. On large systems it is necessary to check normal and abnormal operating conditions and extensive studies on network analyzers are often necessary.

High voltage transmission facilities, whether overhead or underground, by necessity interact with the environment since these facilities transverse the land. When evaluating the environmental compatibility of an electric transmission line and its associated right-of-way, consideration must be given to: exposure to society; compatibility with existing and proposed land use; existing ecological conditions; extent of the environmental benefits which may be realized through underground installation, as compared to overhead; and whether any such benefits can be economically justified.

Economic Considerations

In most cases, large electric generating units result in economies of scale for all types of capacity additions (peak, middle, base), thus making it more advantageous for a utility to satisfy a certain demand with a single large unit rather than with two units half the size. The maximum upper bound for unit capacity is limited by required spinning reserves for forced outages. Spinning reserves are that margin of power left for utilization in an emergency.

IMPACTS OF PRECONSTRUCTION LICENSING SCHEDULES

The following discussion is keyed to the various flow charts (Figures 5-8) of utility decision making processes which have an effect on fish and wildlife resources. As pointed out elsewhere in the text, not all of these decisions are made directly by a utility but may be made indirectly through an architectural-engineering firm or may be accepted as part of a more generalized design package. The following discussion briefly describes why each major decision has some impact on fish and wildlife resources. These impacts may be negligible or large and may be either positive or negative.

Nuclear and Fossil-Fueled Plants (Figures 5 and 6)

Site Selection (I). The *location of the site* will determine which populations and habitats, both terrestrial and aquatic, will be affected by the generating station. The proposed *area of the site* will actually determine how much land will be taken out of use by the public and how much will be unavailable to wildlife. Changes will occur in land and ground water characteristics in the plant vicinity. Changes of the land will include the clearing of vegetation, fencing off sizable areas, and recontouring the land. The ground water may be affected by receiving the direct discharge of wastes or by the lowering of the water table. The volume of water to be withdrawn for cooling will have an impact depending upon the size of the water body involved. For example, the same volume of water withdrawn from a river will have a different effect on the biota than water drawn from an ocean or an estuary.

Development of a Plot Plan (II). The exact orientation and location of specific features of the plant will be important in determining its impact on the biota. The *position of the intakes*, for example, is important in determining the number of organisms that may become impinged on the traveling screens. Those intakes that have been located flush with the shoreline in areas of relatively strong currents have impinged relatively few aquatic organisms. Those that are set back from the river or the edge of a body of water, and particularly those that have a long intake canal, have usually had problems with large numbers of aquatic organisms becoming impinged upon the intake screens.

The *location of the discharge structure*, particularly in relationship to the location of the intake, may have an impact. The recirculation of warm water will attract fishes, particularly in winter, and make them more vulnerable to impingement. The *methods of discharging* are also important. Long discharge canals often have a slow dissipation of heat and may become areas where organisms will congregate and potentially be subject to either heat or cold shock due to the operation of the plant. Entrainment time for organisms will also be longer in a long discharge canal.

Food and cover on the plant site will be removed from use by wildlife. *Removal of vegetation* may cause increased erosion and subsequently increased silt deposition in the adjacent water body. Fences will act as barriers to the migrations of some mammals. Tall structures on the site may cause mortalities to migrating birds. Access roads, railroads, and/or location of staging areas may also affect the biota.

Circulating Water Cooling System (III). The *volume of water* pumped through the plant has a direct impact on the numbers of organisms that will be impinged upon the traveling screens and those that will be entrained. The *design and efficiency of pumps* and, in general, the entire circulating water system may determine the extent of mechanical damage and stress on entrained organisms. The *type of condenser tubes* may be important. If copper nickel tubes are used, copper ions released to the water may be toxic to some organisms and may be assimilated by shellfish in the receiving water body. The *temperature differential* through the condensers will be important in determining the amount of heat shock experienced by entrained organisms. Different cooling systems (towers, spray canals, etc.) will require differing amounts of water. The *method of cooling* and the *type of treatment of the water* will have some impact on entrained organisms. The accumulated salts and minerals in the blowdown from cooling towers will alter the local water chemistry. In addition, the *height and dimensions of the tower* will affect the drift characteristics of the plume and the increase in relative humidity and chemical deposition (particularly salts) downwind from the cooling towers may affect both plants and animals.

Intake System (IV). Utilities are now required to demonstrate that the existent or proposed intake system represents the best available technology for minimizing adverse environmental impact. The *design of an intake* affects the numbers of organisms which will be impinged. The presence of *curtain walls*, *ice walls*, and *oil booms* may create turbulence in front of the screens and may form a barrier which will cause fishes to become entrapped in front of the intakes and subsequently impinged. As *intake velocity* increases an increased number of organisms will be unable to swim against the current and will become impinged. *Trash racks* in front of the *intake screens* will collect larger organisms (usually greater than 3 inch diameter). The *mesh size of screens* will determine which organisms will become impinged and which will go through the plant. Most plants use some type of traveling screen and the frequency of rotation of the screens will determine how long an organism is

subjected to the stress of impingement. Generally, with fixed screens all impinged organisms are killed. The design and use of *fish diversion systems* such as horizontal louvers, vertical louvers, and other alternatives may be decided upon to move fishes and other organisms away from the area of the intakes. Other factors to consider include the frequency of trash collection and the method and location of disposal; the spray system for cleaning screens and a deicing system; inclusion of a *fish return system* that removes impinged fish from the intake structure and returns them to the discharge site of the water system; the type, size, and location of these sluiceways; and the effect of *intake area lighting*, either attracting or repelling organisms.

Discharge System (V). *Design of the discharge system* will determine the size and configuration of the plume. It will also determine the *velocity* and *temperature* profiles in the area of the discharge. These items will affect the concentration of organisms in the heated plume or the avoidance of high temperature areas by motile organisms. Mortalities of fishes may result due to cold shock during an unscheduled plant shutdown during winter and heat shock in summer if organisms become trapped in the discharge.

Waste Treatment Systems: Chemical (VI), Biocide (VII), Sanitary (VIII), Liquid Radwaste (IX), Gaseous Radwaste (X). These systems may have some impact on the biota but their discharges are well regulated and must conform to government regulated standards. Each plant produces a unique discharge, depending upon such factors as intake water quality and the amounts and types of chemicals required to produce suitable process and cooling water. The concentration of the chemical component of the discharge and the volume of waste are important factors affecting a *chemical waste treatment system.*

The *biocide treatment system* to control biofouling of the condensers may affect entrained organisms and those in the discharge particularly where chemicals such as chlorine are used. Chlorine is toxic to aquatic organisms and some of the chlorinated compounds which are formed may be more persistent and may cause delayed mortalities of aquatic organisms in the area of the discharge. The amount of chlorine or other chemical used, the frequency of treatment and its duration, and any residual left in the discharge will determine the magnitude of the impact.

Important factors affecting *sanitary waste treatment* include method of treatment, concentration of discharge components, and the bypass system and/or backup system for the chlorine used in this method.

The *liquid radwaste* and *gaseous radwaste* systems are found in nuclear power plants, only. The method of control and disposal of these wastes, as well as the concentration of the components of the discharges, will determine any environmental effects.

Air Quality Control Method (Fossil) (XI). To meet the best available control technology concerning emission levels promulgated by EPA, as mandated by the Clean Air Act Amendments of 1977, most utilities are presently including in their design for fossil-fueled power plants the required emission control equipment. The *type of control equipment* selected will determine the quality of the discharge through the stack and the amount and quality of sludge and other solid wastes which must be disposed of at or near the plant. For instance, the resultant throw-away sludge from SO_2 scrubbers (which is the most popular method of emission control) must be disposed of in an environmentally acceptable manner. This precludes the possibility of secondary impacts as a result of leaching heavy metals and dissolved solids into ground and surface waters.

Although the use of higher stacks for greater atmospheric dispersion and dilution of stack emissions has been prohibited as a sole control philosophy, *stack height* must still be engineered to provide for adequate *dispersion and dilution of effluents* following cleaning by other means.

Transmission Facilities on Plant Site (XII). Depending on the transmission voltage outside the site bounds and on the number and capacity of the transmission lines leaving the site, there may be one, two, or more transmission *switchyards*. The land area occupied by transmission facilities on-site and the fact that higher voltage switchyards require larger areas makes the decision as to the number and voltage capacity of switchyards environmentally sensitive. The location of the switchyards and their *access roads* must also be considered as decisions affecting wildlife resources.

Selection of Construction Schedule (XIII). The aquatic environment near a power plant under construction may be more susceptible to disturbances during some *periods of the year* than at other times. Hatching and migration may be some of the activities disrupted for a few months each year by construction activities such as: intake and discharge construction, removal of vegetation resulting in runoff to a water body or exposure to direct sunlight of sensitive areas, dewatering of excavation, and others. The terrestrial environment may be likewise affected.

Areas with high potential for environmental damage, such as permafrost ground, bogs and swamps, etc., should be carefully studied so as to establish a *time/season schedule* for construction where possible. It must be noted that this time scheduling is not always possible, due to the requirements of some construction activities. In those cases, appropriate mitigative measures should be implemented within the context of the cost-benefit analysis.

Determination of Site Dewatering Requirements and Yard Drainage System (XIV). The site dewatering requirements are generally determined by the building (foundation) *elevations* and their *locations* within the

site perimeter. The yard drainage system is a result of site rainfall characteristics and landscaping.

During excavation below the groundwater level, dewatering will be required. Because the pumping of water from the excavation will also carry away dissolved and suspended solids, decisions must be made as to whether the *spoils area* will allow percolation back to the groundwater body or whether settling ponds will be used to clarify and purify the effluent prior to discharge into a surface water body.

The *quality of runoff* water will vary throughout construction and operation due to clearing and grading operations. Thus, the yard drainage system should be planned to accommodate these variations and the appropriate treatment of effluents should be anticipated (within reasonable bounds).

The final *location of the coal pile or the oil storage tanks* will result in impacts to wildlife resources if appropriate measures cannot be taken to prevent uncontrolled acid runoff or accidental spillage during oil deliveries or oil tank rupture. These impacts can be quite severe since they could occur suddenly or problems such as a slow leak go unnoticed for a period of time.

Solid Waste Storage Study (XV). All the plant *solid wastes* may potentially affect wildlife resources as a result of poorly selected storage locations which may cause the direct or indirect destruction of habitats. These storage areas may disrupt local wildlife activities during construction or through uncontrolled ground percolation runoff, fugitive dust, noise, and human activity. Factors to consider include: location of solid waste storage, area and volume of the coal pile, area and volume of ash disposal, area and volume of sludge disposal.

Coal Handling Alternatives (XVI). The selection of on-site rail transport, slurry pipeline, conveyor belts or truck *transport from the coal pile* to the plant, and the particle size being transported will potentially affect wildlife resources in different manners. The best type of transportation system should be selected taking into consideration that, in general, rail and truck transport is large in terms of area usage; conveyor belts present fugitive dust problems; and slurry pipelines have a high water consumption rate and consequently a water disposal problem. The transportation systems should be tailored to the availability and nature of resources at the site. Where a tradeoff becomes necessary, mitigative measures should be implemented to the extent possible. Preventive measures for spills or fugitive dust must be explored.

Water Treatment Facilities (XVII). The manner in which the *solid and liquid effluents* from water treatment facilities are disposed of must be considered. These effluents are generally minor when compared to total site effluents, nevertheless, neutralization and/or removal of harmful chemicals and suspended and dissolved solids must be accomplished in a manner which will not result in impacts to wildlife resources.

Selection of Unit Capacity (XVIII). Power plant heat conversion efficiency has reached a plateau between 33 and 38 percent. In other words, for every unit of heat extracted from the fuel which is converted to electrical energy, two units of heat must be ultimately discharged to the atmosphere directly through smoke stacks or cooling towers or indirectly by way of a water body. The *unit capacity* determines the extent of resources impacted (although larger units have slightly higher efficiencies), due to the use of larger amounts of land, water, and air resources.

The point should be made here that following the period of construction, the environmental impact of the facility on fish and wildlife resources through utilization of air and water for cooling is not determined by unit size but by *usage*. The higher the demand for electric power from a particular facility, the higher the impact of that facility will be. The only objection to the installation of facilities larger than necessary is that utilities may be put in the position of encouraging usage of power rather than conservation in an effort to cover fixed costs.

Hydroelectric Facilities (Figure 7)

Site Selection (I). As in the case of the nuclear and fossil-fueled power stations, site selection will have an impact on fish and wildlife resources. The development of hydroelectric power affects water quality, particularly temperature, oxygen, and flow regimes. A dam creates dramatic changes in the character of a river. Some unique habitat for fishes may be lost with *impoundment*, depending on the size of the project. The populations influenced will vary according to the percentage change of habitat from running to still water and the amount of sedimentation and siltation associated with the location. The latter is particularly dependent on whether the dam is built on the headwaters or mainstem of a river. A dam itself creates a barrier to migrating fish and the reservoirs behind them flood spawning areas and affect fishes and fish food organisms.

Land requirements for hydroelectric facilities are greater than for fossil or nuclear power plants. The possibility of inundating wildlife concentration areas (particularly recreationally or economically valuable species), endangered species habitat, riparian forests and wetlands (areas of major concern in ecological environmental impact analysis) is thus increased. Reservoir construction is often assumed to be beneficial to waterfowl and this benefit usually is said to at least partially mitigate the loss of terrestrial wildlife. It has been shown that large water-management reservoirs (especially those with some sort of waterfowl management program) are valuable to migrating and wintering waterfowl. However, large water-management reservoirs are not conducive to waterfowl production. In addition, migrating waterfowl use of the proposed site may in certain cases be greater than in the proposed reservoir.

A narrow latitude exists in the selection of alternate sites in the case of hydroelectric dams. Most suitable sites have been developed. The site selection in the case of the pumped storage station may be restricted depending upon whether the utility decides to build a combination (nonreversible) or reversible type. The former requires two dams and two reservoirs on a river large enough to provide water flows that can be used by turbines for generation. The latter type can be built on an existing impondment or lake. Consequently, the populations affected by the two types of stations can be quite different (e.g., impoundment vs. lake populations). In any event, the populations found in the lower body of water will also develop in the upper impoundment through exchange of large amounts of water.

Since one of the stipulations in the FERC requirements for a pumped storage project provides for a *recreation* facility, the creation of such a facility will have some impact on the fish and wildlife of the area under development.

Development of Plot Plan (II). The *orientation and location of the power station* will have an impact on fishes, particularly those that are migratory. In general, a hydroelectric dam is placed in the main channel of a stream or river. After the decision for the particular orientation of a station has been made the location of the *spillway* and generating facilities will become fixed. The location, depth, and size of the *intake system* may have an impact on the biota. Water can be withdrawn from a depth that will protect the fisheries below a dam, or enhance another. The intake could be located in an oxygen deficient and/or cold water strata which would influence the biota downstream. The location of the intake will also be important in protecting the safe passage of downstream migrants and adults of anadromous or catadromous fishes. *Trash collection facilities* (trash racks) may have an impact in that the downstream migrants may become impinged. The location of the discharge will also affect migration. Fish will sometimes have to be spilled over the dam to ensure proper migratory patterns. Fish ladders must be positioned properly or the fish will not be attracted to them.

Engineering Design Systems (III). One of the most important factors that affect fish directly as a result of hydroelectric and pumped storage projects is the *fluctuation in water levels*, particularly during the spawning period. The nests or eggs may become exposed which will result in their destruction. However, extensive drawdown may not take place in a multi-purpose reservoir because a conservation pool has to be maintained. The *flood control method* is also important.

The reservoir behind a dam may become stratified and the hypolimnion may be inhabited by cold water species. Releases of water for downstream use may cause large water surface temperature variations and affect the local fishery. The elevation differential (amount of head) between upper and lower ponds is especially important for pumped storage systems.

When an upper impoundment is located where the underlying ground is subject to *seepage*, the bottom is often lined by impervious materials to prevent seepage. This may eliminate the benthic fauna. The seepage from the upper impoundment could raise the water level of existing lakes in the vicinity and may affect the fish, wildlife, and vegetation associated with those lakes.

The *number and capacity of the pump turbines* will determine the numbers of organisms affected. With more pumps larger numbers of organisms will be entrained and a larger number of fish may be damaged. The daily pumping and generating modes of the pumped storage plants may affect anadromous fishes. For example, when discharge from the upper reservoir occurs the velocity may block (at least temporarily) further upstream migration. Currents created during pumping might attract downstream migrants which might subsequently be drawn through the pumps. In addition, the depth and size of the intake structure, *trash collection facilities*, and the *type of pumps* utilized (in pumped storage), will have important effects.

The location of the *discharge system* is fixed relative to the intake structure. The *depth* (surface or bottom) can influence the migratory pattern of fishes and concentration of dissolved gases (super saturation) in the water below a dam. The super saturation of gases, particularly nitrogen, has been known to cause gas bubble disease in fishes. It is related to spilling characteristics of dams. Means of controlling nitrogen gas levels through adjustment of spillway flows or control of major upstream storage releases can be employed. The depth of the discharge can influence water temperature which in turn can affect the biota below the dam.

The discharge may cause significant stream-flow alteration and affect food production, success of migration, spawning, and survival of aquatic organisms in downstream areas. Some utilities may be required to maintain a *minimum flow* (discharge) to enhance the survival and migration of fishes, and maintain the stream resource.

Regulation of stream flow by upstream reservoirs may improve fishing. Passage of anadromous fishes is related to *volume of flow* and *size of an impoundment*. Delays in migration of fishes at dams and reservoirs can prolong the exposure of fishes to high concentrations of nitrogen gas, predation, and competition with other species. Additional factors involved in the effects of the discharge system include: design of the *pen stock* (the area near intake and generators in pumped storage), and the design of *spillways*, including capacity, flow characteristics, and type of gate.

The *method of sanitary waste treatment*, the concentration of discharge components, and the bypass system and/or backup system for chlorine will affect, in some way, the biota.

Fish Protection Studies (IV). Because of the recent passage of the Anadromous Fish Act of 1969, utilities are required to build either *fish passage facilities* or other means to replenish (preserve) the fish stocks. However, the mitigating devices employed will vary according to the fishes of interest and characteristics of the site, including the height of the dam. If the innundation results in total elimination of the habitat of a species the utility might build a hatchery to raise the species for transplant. In general, the resource agencies prefer *fish ladders* if the technology for the target species is well understood and known. *Fish locks* are generally considered inefficient for passage of significant numbers of migrants of many species. Relatively few *fish lifts* (or elevators) have been constructed and then primarily at dams where restoration efforts are underway. Other facilities for downstream migration are also considered.

Transmission Facilities (V). The *location of towers* and substations, as well as *access roads* and the *tower design* itself, will have a number of environmental consequences. The factors are discussed in more detail in tne next section, Transmission Lines and Facilities.

Recreational Facilities (VI). One of the benefits accrued from hydroelectrical power generation is the creation of a recreational facility from the water impoundment. The *type of facility*, a beach, etc., will have an effect on various habitats. Some habitats will be changed; some lost; some added. The *amount of area to be dedicated* to this use will also be of importance.

Selection of Construction Schedule (VII). Time of filling of the reservoir will have an impact on fish and wildlife resources. If an impoundment is filled in winter, it will be relatively stable during spawning periods of fishes. If filling is done in summer, it may be too late for those fish which usually spawn in early spring. Similarly, if the clearing of vegetation is done during the time of nesting, breeding, and migration of wildlife it may have an adverse impact.

Selection of Unit Capacity (VIII). Following the period of construction, the environmental impact of the facility on fish and wildlife resources may be influenced by *usage*. The higher the demand for electric power from a particular facility, the higher the impact of that facility.

Transmission Lines and Facilities (Figure 8)

Transmission lines generally affect terrestrial vegetation and wildlife. Their impact on aquatic habitats may be either indirect (removal of shade, runoff) or direct (location of towers or access roads through aquatic habitats). The extent of the impact of rights-of-way (ROW) depends a great deal on their location. Thus, the previous discussions on *site selection* apply here as well.

Right-of-Way Selection (I). Since the point of origin for a transmission system is fixed at a generating station or an existing substation,

CHAPTER 5 FUTURE TRENDS

ACTIVITIES AT THE FEDERAL LEVEL

Two major events occurred during 1977 which are having a significant impact on the utility industry. These are the creation of the Department of Energy and the passage of the Clean Air Act Amendments of 1977. Even though all the responsibilities of the Department of Energy are not fully understood at present, the fact that this Department has regulatory authority over fuels and power utilization, including such measures as time-of-day usage rate, conservation measures, etc., will create a shift in the planning factors presently used by utilities. These new factors, once incorporated into the generation planning, will better indicate and forecast the future demand of electricity and the necessary construction of new generating capacity.

The impact of the Clean Air Act Amendments are beginning to be felt by the utilities. With the shift to coal for power generation, much closer attention to the atmospheric discharges generated will be required. Scrubbers are mandatory in that a 90% reduction in uncontrolled emissions is required. In addition, EPA must determine whether some of the toxic substances found in coal will become suspect as air pollutants and will require close monitoring. Depending upon the findings of these studies, emission limitations may be prepared.

The licenses of a great majority of existing hydroelectric projects have expired, or will expire, in the near future. Since these permits were for a period of 50 years, these facilities must now consider a much more involved licensing requirement and guideline document. Close consideration must be given to general reservoir improvement, recreational areas provided or to be developed, considerations of rejuvenation of the dams for increase in power output, better management of the water resources, and consideration of the possibility of multi-purpose impoundment of waters which in the past were considered too small for generation of a significant amount of power.

The present contribution from each source of power generation to the total energy contribution in the U.S. is as follows: petroleum = 15.6%; natural gas = 14.4%; coal = 46.3%; Nuclear = 9.3%; hydro = 13.8%; others 0.19%, with a total of 2.036×10^9 kWhr. However, in some cities and states such as Chicago, Boston, Connecticut, and Wisconsin, nuclear power amounts to 40 or 50% of the supply. Judging from the number of energy related bills introduced during the 95th Congress, our legislators are keenly aware of the importance of their decisions in relation to energy development.

Federal regulatory agencies have, over the past year, given serious consideration to streamlining the licensing process for energy producing facilities. However, as of present, none of these agencies have come up with a precise plan that indeed streamlines present regulatory activities. The Executive Office has been working with a plan of its own for streamlining the licensing process.

There appears to be a greater cooperation among the many regulatory agencies (such as NRC, EPA, DOI, DOE and the Corps of Engineers) in the preparation and review of environmental impact statements, based on the various memorandums of understanding that have been proposed or signed by these agencies. However, these have not been helpful in reducing the complexities or length of time as they relate to power plant licensing.

ACTIVITIES AT THE STATE LEVEL

As it has been shown in Table 1 of this document, the number of states having highly regulated power plant siting has been increasing toward a Type 1 state; this being one having a Siting Authority, one- or two-stop siting, and requiring an EIS. In an attempt to expedite the licensing process of power generating facilities further, states have now undertaken joint hearings relating to site acceptability with Federal regulatory agency hearings.

The number of states receiving National Pollution Discharge Elimination System Permits (NPDES) granting authority has also increased. These states are beginning to experience the many difficulties and complexities in the granting of these permits, and delays and slippages of schedules have occurred.

States Having Approved Programs[a]
for the National Pollutant Discharge Elimination System (NPDES)

California	Montana
Colorado	Nebraska
Connecticut	Nevada
Delaware	New York
Georgia	North Carolina
Hawaii	North Dakota
Illinois	Ohio
Indiana	Oregon
Kansas	South Carolina
Maryland	Vermont
Michigan	Virgin Islands
Minnesota	Virginia
Mississippi	Washington
Missouri	Wisconsin
	Wyoming

[a]As of October 23, 1977

ACTIVITIES AT THE POWER GENERATION INDUSTRY LEVEL

The power generation industry, keeping a careful watch on all the regulatory activities occurring at the Federal and State levels, is slowly shifting toward highly sophisticated site selection processes, as well as energy forecasting methods. It is anticipated that all new power generating facilities located away from the oceans or Great Lakes will seriously consider utilizing some method of closed-cycle cooling system for condenser cooling water. Those utilities mandated to convert to coal are, for the most part, complying with the coal conversion requirement. The majority of the future power generating facilities as well as transmission lines are moving toward larger unit capacities and higher transmission voltages, as well as consideration of "Standard Plant Designs" (package plants) which have already received preliminary approval in a general way by the cognizant regulatory agencies.

The impacts that these plants and transmission lines may have on the environment are also receiving close attention, not only by regulatory agencies but by industry as well. With the shift to coal, stack scrubbers are beginning to be installed. Future facilities involving scrubbers will require, as part of the site selection process, consideration of large disposal areas for scrubber sludge and fly ash so as to contain these materials over the life of the plant in an environmentally compatible fashion.

It can generally be concluded that sincere attempts are being made at the Federal, State, and utility levels to provide the necessary electric power that the country requires in an environmentally acceptable fashion. However, at this time, there does not appear to exist a streamlined set of procedures through which the three major parties can quickly reach the common objective of expeditious and cost-effective steam electric power plant construction.

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APPENDIX A

LAWS AND REGULATIONS

In the United States, the construction of an electric power generating facility must comply with an ever increasing number of requirements implicit in Federal, State, and local laws and regulations. Some individual states (see Table 1) have progressed in the direction of creating a single agency for handling the various siting requirements. But, in general, the institutional mechanisms for assuring the public that power generating facilities are best adapted environmentally and economically to meet society's needs are still evolving with a duplication of various agency efforts and the resulting time delays.

Laws and regulations that govern the planning and construction of power plants are based on the need to protect our environment for future generations and the availability of present and future resources. Following are the primary regulations that equitably make resources available and seek to furnish protection for our environment.

UNITED STATES WATER LAWS, REGULATIONS, AND TREATIES

Water Supply

Present day society has placed a great deal of emphasis on the availability and protection of our oceans, lakes, rivers, and streams. The principal components in the regulation and protection of these supplies are:

International Treaties. Major streams flowing across or along the boundaries of the United States are the subject of international treaties or agreements.

Interstate Compacts. Numerous interstate compacts, approved by Congress, apportion the waters of interstate among affected states, particularly in the West.

Federal Interstate Compacts. The Delaware and Susquehanna River Basin Compacts are unique in that the Federal Government is a signatory party. These Compacts established Federal-State commissions with authority to regulate use of the waters of the basins.

Federal Water Rights. Under the Reservation Doctrine, it has been maintained that when the United States reserved or withdrew public land of the United States from entry, it also withdrew from appropriation by others the waters originating on or flowing across such reserved or withdrawn lands. These include national forests, national parks, power site withdrawals, and reclamation withdrawals.

Indian Water Rights. Approved by Acts of Congress and/or formalized by Executive Orders, Indian water rights are based on treaties and agreements between Indian tribes and the United States.

State Water Laws. Most of the States have enacted statutes and have provided the organizational structure to implement some measure of state control over water use.

Water Quality Protection

The aforementioned treaties, compacts, laws and rights govern the availability of water. The following Federal statutes were legislated to protect the quality of that water:

Rivers and Harbor Act of 1899 (33 U.S.C. 401-413). The Act provides that the Army Corps of Engineers must approve plans for construction, excavation, filling, or removal of structures in navigable waterways of the United States. It further prohibits the deposit of refuse in navigable waters generally and was thus referred to commonly as the Refuse Act of 1899. The Act forms the base for all other environmentally related legislation in the U.S.

Fish and Wildlife Coordination Act of 1958 (P.L. 85-624; U.S.C. 661-666). The provisions of the Act govern the measures to be taken for the protection and propagation of fish and wildlife in connection with Federal or federally permitted activities. The provisions of the Act apply to the control or modification of the waters of any stream or other body of water by an agency or department of the United States, or by any public or private agency acting under a Federal permit or license.

Wild and Scenic Rivers Act of 1968 (P.L. 90-542 as amended by P.L. 92-560, October 25, 1972; P.L. 93-279, May 10, 1974; P.L. 93-621, January 3, 1975; P.L. 94-199, December 31, 1975, P.L. 94-486, October 12, 1976). This Act provides for the inclusion of certain river segments in a National Wild and Scenic Rivers System in order that they may be maintained in a free-flowing state. Certain river reaches have been included in the system and others are being considered for inclusion. There is a substantial hydroelectric power potential which cannot be developed in those river reaches included in the system.

National Environmental Policy Act of 1969 (P.L. 91-190, 83 Stat. 852). Under the provisions of this statute, the short- and long-term environmental consequences of a proposed Federal action affecting the environment must be evaluated and set forth in an Environmental Impact Statement. Alternatives to the proposed action must have been fully considered and evaluated. These provisions also apply to recommendations or reports on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment.

Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500, 86 Stat. 816). This comprehensive Act covers the disposal of pollutants from any man-made or man-induced source or cause, including those from Federal installations to navigable waters which are defined for the purposes of the Act as being all waters. The Act directly controls the development and utilization of new water for energy production and the disposal of waste products, including heat. The Act provides for the Environmental Protection Agency to establish effluent limitations on point source discharges and to administer a system of permits for pollutant discharges. Intakes, as well as point identifiable and non-point unidentifiable sources of discharges, are regulated under different sections of the Act. Such Federal permits may not be required in states which have received authority from EPA to issue and enforce permits meeting the requirements of the Act. EPA, however, retains the power to intercede.

Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-532, 86 Stat. 1052). Ocean dumping is allowed only in accordance with permits issued by the Environmental Protection Agency or the U.S. Army Corps of Engineers for dredged materials. Permits will be issued where it has been determined that the dumping will not unreasonably degrade or endanger human health, welfare or amenities, or the marine environment, ecological systems, or economic potentialities.

Coastal Zone Management Act of 1972 (P.L. 92-583, 86 Stat. 1280). Under this Act, the Secretary of Commerce is directed to cooperate with coastal and Great Lakes states in the development and implementation of plans and programs for management of the land and water resources of coastal zones.

Guidelines for Preparation of Environmental Impact Statements (40 CFR, Part 1500). (Latest revisions issued by the Council on Environmental Quality, August 1, 1973). These Guidelines attempt to clarify those actions for which a statement should be prepared and the content of each statement in general. Specifically, the Guidelines require that the impact on ecological systems be thoroughly evaluated. They also require that sufficient analysis of alternatives and their cost impact on the environment be included in the statement in order to allow a decision as to the possibility of options which might have less detrimental effect. Emphasis appears to be on a thorough evaluation of all alternatives to the proposed action. In addition, the Guidelines list those Federal agencies which have jurisdiction by law or special expertise that may wish to comment on the various types of environmental impact. Attached to the Guidelines is a listing of the appropriate persons within each agency that should be contacted.

Endangered Species Act of 1973 (P.L. 93-205; Amended by P.L. 94-32, June 30, 1976; P.L. 94-359, July 12, 1976) The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, and to provide a program for the conservation of such endangered species and threatened species.

Energy Supply and Environmental Coordination Act of 1974 (P.L. 93-319, 88 Stat. 246). Recognizing the conflict between the need for energy and the desire to protect the environment, Congress enacted the Energy Supply and Environmental Coordination Act of 1974, P.L. 93-319, 88 Stat. 246, on June 22, 1974. One major function of the Act is to expedite conversion to coal as a major source of energy. The Act empowers the FEA Administrator to prohibit power plants or other "major fuel burning installations" from burning natural gas or petroleum as energy source. The Act also gave the FEA Administrator power to suspend for temporary periods the requirements of the Clean Air Act. In addition, the Act extended the 1975 deadline to 1977 for emissions standards for automobiles. The Act mandated a report on implementation of the Act, an energy conservation study, fuel economy study, and gave power to the Administrator to collect energy information necessary to obtain a reliable energy data base.

UNITED STATES AIR LAWS AND REGULATIONS

Air Quality
Air Quality Act of 1967 (P.L. 90-148)
Clean Air Act Amendments of 1970 (P.L. 91-604)
Clean Air Act Amendments of 1977 (P.L. 95-95)

Concern for our air quality is of major importance in maintaining and improving our environmental standards. Of major significance in controlling the quality of our atmosphere are the Clean Air Act Amendments of 1970 and 1977. A brief explanation of the major parts to ensure compliance with the Act are:

State Implementation Plans (SIP). Each state was required to submit an enforceable State Implementation Plan for approval to the EPA Administrator to provide for attainment and maintenance of primary (to protect public health) and secondary (to protect public welfare) National Ambient Air Quality Standards (NAAQS) within the country's 247 Air Quality Control Regions. By 1980, and every five years thereafter, the EPA must review the NAAQS and develop new or revised standards when the need is demonstrated.

The Clean Air Act Amendments require the EPA to study and determine whether radioactive pollutants, cadmium, arsenic, and polycyclic organic matter in the air can endanger public health. Determination on radioactive pollutants will be made within two years, and on the others within one year, and an affirmative finding will result in NAAQS for these pollutants.

Radioactivity has been defined as an air pollutant subject to EPA and State control.

As a result of the 1977 Amendments, each state plan must include a control strategy to attain and maintain air standards in each control region primarily through the application of emission limitations. Further, each state now has the authority to subdivide regions as to nonattainment status if monitoring and modeling indicating a subdivision is warranted. This will limit nonattainment areas to those portions of an Air Quality Control Region (AQCR) actually showing the standards not to be exceeded.

All of the provisions of the 1977 Amendments must be implemented by each state by July of 1979. Many of the changes in the 1977 Amendments do not go into effect until adopted into the state's implementation plan.

New Source Review Procedures. To ensure attainment and maintenance of NAAQS, the Act requires the states to evaluate the impact on ambient air quality of projected emissions from new or modified sources, including power plants of all air pollutants for which NAAQS have been promulgated. Where ambient air standards are already exceeded or will be exceeded due to emissions from a new plant, in the region in which the source proposes to locate, no permit to construct may be issued except in limited circumstances where emission trade-offs can be made.

New fossil fuel-fired steam generators (greater than 250 million Btu/hr heat input) are required to meet New Source Performance Standards (NSPS), but no preconstruction review procedure is required by the Federal government to determine the capability of the new power plant to comply with these standards. Some states, however, have voluntarily incorporated such evaluations in their procedures.

Air Quality Maintenance Areas. The maintenance regulations will be applied, on a case-by-case basis, to some new power plants proposed in areas where air standards are exceeded or are projected to be exceeded within the next ten years due to increase in the number of emitters. These regulations do not mandate specific requirements but constitute general planning requirements for the states to make reasoned judgements about growth in poor air quality areas by devising Air Quality Maintenance (AQM) Plans.

Although areas requiring such plans have been designated, the earliest date the plans are expected to be submitted to EPA by the States is August, 1978. Potentially, AQM plans could contain requirements which would preclude a new power plant from being sited in certain areas, or could require application of a more stringent emission limitation to a new power plant to ensure maintenance of air standards and possibly to allow room for additional growth if the state so desires. AQM plans should affect new power plants only through an extension of new source review requirements.

The 1977 Amendments require each state to develop further an inventory of Air Quality Control Regions (AQCR) and provide available data to characterize the region according to its attainment of standards status.

For each region attaining the standard for a pollutant, Prevention of Significant Deterioration regulations for that pollutant must be implemented. For each region or sub-region exceeding the standard for a pollutant, nonattainment regulations must be implemented.

Each new state has the authority to subdivide regions as to nonattainment status if monitoring and modeling indicates a subdivision is warranted. This will limit nonattainment areas to those portions of an AQCR actually showing the standards to be exceeded.

Prevention of Significant Deterioration (PSD). At the preconstruction stage, EPA presently reviews the impact of projected emissions in accordance with the Agency's Prevention of Significant Deterioration regulations to insure that the mandate of the Act to protect and enhance the nation's air quality is carried out. Generally, this review is calculated to prevent new sources of sulfur dioxide and total suspended particulate matter emissions from exceeding EPA established "acceptable" increments of air quality deterioration, and would result in denial of construction permits to a source whose emissions would cause the applicable increment to be exceeded.

EPA Regulations on Approval and Promulgation of Implementation Plans (40 CFR 52) incorporated the PSD regulations. Basically, the purpose of this regulation is to limit the total amount of "air quality deterioration" caused by new sources in areas where the NAAQS are being attained. The regulation established allowable increments that can occur and a permit procedure for major sources. Three classifications were defined as follows:

Class I - only small incremental increases of SO_2 and TSP allowed, severely restricts power plant development.

Class II - moderate increases allowed, compatible with large power plants.

Class III - allows the most substantial increases for particulates and SO_2.

The 1977 Amendments adopt into the Clean Air Act all the PSD provisions originally introduced by regulation: the PSD provisions must now be incorporated into each state's implementation plan. The 1977 Amendments establish lower increments than those previously in effect and establishes mandatory Class I areas for some national parks and wilderness areas. All other areas are classified Class II. Provision is made for states to designate Class III areas, but the procedure to do so is difficult. The definition of "major emitting source"[1] (those

which must apply for PSD) has been revised and covers many smaller sources by including all sources emitting over 250 tons of any pollutant. All sources required to apply for a PSD permit must demonstrate the use of Best Available Control Technology.(1)

The revised Class II increments are made effective immediately and retroactively to 1975. Plants which have received a PSD permit since January, 1975 will be reviewed against the new increments. This will make power plant siting in some areas more difficult. This may cause problems for some plants. Also, the 1977 Amendments require the EPA to develop maximum allowable increments or control strategies for PSD for nitrogen oxides, oxidants, hydrocarbons, and carbon monoxide within two years.

New Source Performance Standards (NSPS). Usually, states which have adopted NSPS impose a requirement for the source to meet the applicable standard as a condition of the permit to construct. A majority of the states do not presently have review procedures to ensure that these Federal standards will be met. However, an increasing number of states are being delegated authority to enforce Federal standards, and this will almost certainly result in more states considering Federal New Source Performance Standards at the preconstruction stage. EPA may still enforce standards independently (after startup) but the state retains primary responsibility. This is important since the regulations require new sources to meet the applicable performance standards throughout the operational life of the facility except during periods of startup, shutdown, or malfunction (either of air pollution control or process equipment) which are beyond the control of the owner or operator of the facility. Specifically, any new facility must come under the emission standard "which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving the reduction) the Administrator determined has been adequately demonstrated."

Subject facilities (including fossil fuel-fired steam generators of more than 250 million Btu/heat input per hour) are required to conduct performance tests within 60 days after achieving maximum production, but no later than 180 days after initial startup.

The 1977 Amendments require the EPA to establish a category list for sources not yet controlled. With respect to fossil fuel-fired stationary sources a "standard of performance" shall include both allowable emission limitations and a percentage reduction from the emissions that would result from fuels that are untreated before combustion. Existing NSPS applicable to such sources shall be revised within one year to reflect the degree of emission limitation and percentage reduction achievable through the application of the best technological system of continuous emission reduction which EPA determines has been adequately demonstrated. The apparent intent of the law is that after August of 1978 there will be no such thing as compliance coal for SO_2 control.

scrubbers will probably be mandatory for all new sources commencing construction after that.

An ordered, conversion to coal shall not be subject to NSPS or its revisions.

LAND USE LAWS

The use which is to be made of our limited land resources is also of great concern. Aspects of land use are important factors in many of the regulatory actions of the States and Federal government. An example being the Federal Coastal Zone Management Act which is designed to induce states to set up land use planning and management programs for coastal areas, including the Great Lakes. A land management act presently before Congress would require states to set up planning and management programs for all lands in similar manner.

OTHER SELECTED ENVIRONMENTAL AND REGULATORY LAWS AND REGULATIONS

Radiologic

Modern technology has presented us with a special concern in the area of radiological effects of nuclear power plants. The concerns involve the low probability risk of a major release of radioactivity, the very low level of radioactivity released to the air and water in the normal course of operation, and the problems of ultimate disposal of the highly radioactive wastes that remain when nuclear fuel is reprocessed at remote sites.

Under the Atomic Energy Act, as amended, the Nuclear Regulatory Commission now has the responsibility for licensing and regulating nuclear power plants in order to protect the health and safety of the public from radiation hazards. The Act makes it unlawful for any person to construct a nuclear power plant without a construction permit issued by the Commission and requires that such a power plant be operated in accordance with an operating license issued by the Commission.

Noise Control Act of 1972 (P.L. 92-574, 86 Stat. 1234)

The Environmental Protection Agency (EPA) is authorized to:

(1) Establish by regulation noise emission standards for manufactured products that are major noise sources in the following categories: construction equipment; transportation equipment; motors and engines; and electrical and electronic equipment;

(2) Issue noise emission regulations for railroad and motor carriers; and

(3) Establish criteria concerning the effects of environmental noise on public health and welfare and permissible noise levels, perform research on noise effects and noise control, and otherwise assist state and local governments in the development and enforcement of ambient noise standards.

In addition, EPA is ordered to study the adequacy of existing Federal Aviation Administration (FAA) flight and operational noise controls and propose appropriate regulations to the FAA.

Esthetics and Recreation

Finally, esthetic and recreational considerations must be of concern. Several laws have been enacted by the Congress to provide areas intended primarily for recreational uses, and to preserve certain areas in their natural conditions. These laws have the effect of limiting or precluding the location of power facilities in those areas. Included are the following:

The Wilderness Act (P.L. 88-577). Established a national wilderness preservation system. The Act authorizes the President to permit the construction of reservoirs, transmission lines, or other facilities in wilderness areas and in national forests if he deems such use to be needed in the national interests.

The National Historic Preservation Act of 1966 (P.L. 89-665). Authorized the Secretary of the Interior to maintain a national register of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture. All Federal agencies have the responsibility for taking cognizance of these properties in their programs.

The National Trails System Act (P.L. 90-543). Establishes a system of national recreation trails and national scenic trails, with connecting or side trails. The use, abandonment, or disposition of utility rights-of-way may be suitable for improving or expanding the trails system.

The National Park System. Includes national parks and national monuments administered by the National Park Service, Department of the Interior, to provide recreational opportunities.

Also, new parks and recreation areas have been, and are continually being, established by State and local entities. Therefore, in the evaluation of a potential power plant site or a transmission right-of-way, it is necessary to consider not only the current uses of the area, but also the future possible uses as well.

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environment and cultural value of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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