GULF STATES UTILITIES COMPANY

RIVER BEND STATION POST OFFICE BOX 220 ST. FRANCISVILLE, LOUISIANA 70775

AREA CODE 504 635-6094 346-8651

June 17, 1993
RBG-38,647
File No. G1.11.2

Mr. J. Dale Givens, Assistant Secretary
Office of Water Resources
Louisiana Department of Environmental Quality
Post Office Box 82215
Baton Rouge, LA 70884-2215

Attention: Ms. Cheryl Lejeune

Dear Mr. Givens:

La. Water Discharge Permit No. WP0409
River Bend Station - Unit 1

This letter is a follow-up to the letter dated January 27, 1992 which accompanied the permit renewal application and modifications for water discharge permit no. WP0409.

As stated in the above mentioned letter, GSU wishes to advise LDEQ of the completion of the described plant system modifications. The station water flow diagram, Form 2C, Item IIA, Sheet 2 of 2, which was previously submitted, reflects our current water flow configuration. Please find enclosed the updated Form 2C, Item IIB, Attachment i, which provides further description of outfalls and GSU's completed Environmental Impact Questionnaire. Should you require any more information, contact Mr. Michael Harrington at (504) 381-4780.

I certify under penalty of law that this document and all attachments were prepared under the direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations.

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Sincerely

J. E. Booker

J. E. Booker
Manager - Safety Assessment
and Quality Verification
River Bend Nuclear Group

MAH/PWC/re

Enclosure

xc: Ms. Jane Fontenot, Chief
Water Management Division
Permits Issuance Section (6W-PS)
U.S. Environmental Protection Agency, Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

GULF STATES UTILITIES COMPANY

RIVER BEND STATION POST OFFICE BOX 220 ST. FRANCISVILLE, LOUISIANA 70775

AREA CODE 504 635-6094 346-8651

June 17, 1993
RBG-38,646
File No. G1.11.7

Ms. Jane Fontenot, Chief
Water Management Division
U.S. Environmental Protection Agency, Region VI
1445 Ross Avenue
Dallas, TX 75202-2733

Attention: Mr. Ken Holley

Dear Ms. Fontenot:

NPDES Permit No. LA0042731
River Bend Station - Unit 1

This letter is a follow-up to the letter dated January 27, 1992 which accompanied the permit renewal application and modifications for Louisiana Water Discharge Permit No. WP0409 and updated EPA Forms 1 and 2C for permit No. LA0042731.

As stated in the above mentioned letter, GSU wishes to advise EPA of the completion of the described plant system modifications. The station water flow diagram, Form 2C, Item IIA, Sheet 2 of 2, which was previously submitted, reflects our current water flow configuration. Please find enclosed the updated Form 2C, Item IIB, Attachment 1, which provides further description of outfalls and GSU's completed Environmental Impact Questionnaire. Should you require any more information, contact Mr. Michael Harrington at (504) 381-4780.

Sincerely

J. E. Booker

J. E. Booker
Manager - Safety Assessment
and Quality Verification
River Bend Nuclear Group

MAH/PWC/re

Enclosure

xc: Ms. Cheryl Lejeune, Environmental Quality Specialist
Office of Water Resources
Louisiana Dept. of Environmental Quality
Post Office Box 82215
Baton Rouge, LA 70884-2215

Gulf States Utilities Company
River Bend Nuclear Power Station
NPDES Permit No. LA0042731
Permit Renewal Application

FORM 2C, ITEM IIB, ATTACHMENT 1:
FURTHER DESCRIPTION OF OUTFALLS

OUTFALL 001

This outfall is the plant water discharge to the Mississippi River. It consists of cooling tower blowdown and other previously monitored outfalls. These other outfalls include the metal cleaning waste discharge (outfall 102) and the plant low-volume chemical wastewater discharge (outfall 002). GSU redirected the sanitary wastewater treatment discharge (outfall 004) from Grants Bayou to this outfall during the last refueling outage. This change to the water flow diagram is depicted on Form 2C, Item IIA, sheet 2 of 2.

Cooled water from circulating water cooling towers is pumped through the turbine condenser; cooled water from the service water cooling tower is pumped through the service water heat exchangers. The heated waters are returned to their respective cooling towers. Four eight-cell induced draft cooling towers reject heat from the turbine condenser, and one five-cell induced draft cooling tower rejects heat from the service water heat exchangers. Water losses from drift and evaporation are replenished with clarified river water. Cooling tower blowdown is accomplished by directing a portion of the cooled water pump discharge to a common discharge header leading to outfall 001. This diversion of pumpage is normally valved to provide a minimum of 2200 gpm (3.17 MGD) blowdown rate to accommodate discharge of treated low volume waste containing treated low-level-radioactive wastewater. During full power, hot weather operation of River Bend Station, cooling water blowdown occurs at approximately 3500 gpm (5.04 MGD), but may occur at rates up to 7000 gpm (10 MGD).

Cooling tower blowdown, metal cleaning wastes (described for outfall 102), low-volume wastes (described for outfall 002) and sanitary wastewater treatment effluent (described for outfall 004) merge into a common discharge header for the 2.6 mile conveyance to the Mississippi River via buried pipeline. The discharge volume of outfall 002 constitutes approximately 10% of the flow from outfall 001 for about three hours per day and less than 2% of the flow for the remainder of the day during full power operation. The discharge volume of outfall 004 constitutes less than 2% of the flow through outfall 001. Chlorine residual is neutralized with continuous ammonium (or sodium) bisulfite injection into cooling water blowdown downstream of the common discharge header. Compliance monitoring for flow, pH, temperature, oil and grease, free available chlorine and total zinc is performed. Acute/chronic toxicity testing has been performed (quarterly, for one year per the NPDES permit) at the exposed vacuum-break chamber of the 30-inch diameter buried pipeline approximately 300 meters before the pipeline enters the floodplain. This pipeline emerges on the east bank of the river in the discharge control structure, approximately at river mile 262. The 30-inch diameter submerged discharge is located 610 feet downstream of the plant's river water intake structure. Figures 1, 2, and 3 of Attachment 3 are plan and elevation views of the configuration of river water intake and station water discharge pipes.

Gulf States Utilities Company
River Bend Nuclear Power Station
NPDES Permit No. LA0042731
Permit Renewal Application

FORM 2C, ITEM IIB, ATTACHMENT 1:
FURTHER DESCRIPTION OF OUTFALLS

OUTFALL 002

This outfall is the plant low-volume chemical wastewater discharge to the common discharge header leading to the Mississippi River. It consists of the treated wastewater from the following sources:

ion-exchange resin backwash, regeneration and reject from demineralized water production;

reverse osmosis waste and filter backwash from service water polishing;

previously monitored (as outfall 102) metal cleaning waste discharge;

floor, equipment, decontamination, and plant laboratory drains, as well as solid radioactive waste dewatering (note - this treated wastewater is discharged when recycling to condensate storage is not available);

and, blowdown from rental boilers used during refueling outages and plant start-up.

In one system, non-radioactively-contaminated wastewater is pumped to one of two 30,000 gallon capacity treatment tanks for neutralization before discharge. A process monitor controls the discharge from these tanks, recirculating the tank contents until its pH is within preset limits, then allowing the station to divert the treated water through disposable filter cartridges to the common discharge header. If the process monitor senses an unacceptable shift in pH during discharge, the wastewater is diverted back to the tanks for retreatment. Solids removed during wastewater treatment are sent for approved offsite disposal.

In a separate treatment system, radioactive wastewater from condensate system, reactor water cleanup system and fuel pool system demineralizers' backwash, as well as solid radioactive waste dewatering, floor and lab drains, equipment washing/draining and personnel decontamination is collected in one of nine 25,000 gallon holding tanks for filtration and/or demineralization. Treated water collects in one of four 19,500 gallon recovery tanks for monitoring of boiler water quality and radioactivity. The station recycles this water whenever demineralization achieves boiler water quality and sufficient tankage exists, or meters the treated wastewater to the common discharge header at a rate ensuring compliance with 10CFR20 and 10CFR50-Appendix I standards. The ion-exchange resins used in these processes are replaced instead of regenerated. The station disposes of these resins and other solids removed during the treatment of these low-volume wastes in accordance with NRC, EPA, DOT and applicable state requirements.

Compliance monitoring is performed on both effluent streams before release to the common discharge header to the river. The results of each are combined (flow-weighted) for reporting as outfall 002.

FORM 2C, ITEM IIB, ATTACHMENT 1:
FURTHER DESCRIPTION OF OUTFALLS

OUTFALL 102

This outfall is the treated metal cleaning wastewater discharge. The cleaning and passivation stages use specialized chemicals designed to remove scale and corrosion products from iron, copper, zinc, and nickel surfaces. The wash and rinse water from chemical cleaning of the service water system is collected in three 1.2-million gallon storage tanks. Treatment typically consists of biological or chemical precipitation of dissolved metals, filtration and neutralization, performed by a contractor. If the quality of the treated water is suitable, it will be chlorinated and recycled to the cooling tower makeup water system. Compliance monitoring for iron, copper, and flow is performed before the wastewater is recycled or discharged. If recycling is not available, compliance monitoring for pH, total suspended solids, and oil and grease (per outfall 002) is performed. Then the treated water will be conveyed to the low-volume waste treatment system (described for outfall 002) for further treatment if necessary, or pumped to the common discharge header to the river. This batch treatment may yield up to 100,000 gallons of treated water per day, discharged at no more than 400 gpm.

OUTFALL 003

This outfall is the plant non-radioactive floor drain wastewater discharge and transformer yard wastewater discharge. Four oil/water separators previously discharged through the storm drain system to Grants Bayou. Two of the oil/water separators receive wastewater from fire suppression and storm runoff from the plant electric power distribution transformers. The other oil/water separators receive wastewater consisting of well water, fire suppression water, and deminimus quantities of chemically treated cooling water from sampling, equipment and instrument drain lines discharging to non-radiologically-contaminated power plant floor drains .

NOTE:

During the refueling outage which began in March, 1992, the plant's cooling water system was modified to isolate the service water system from the condenser cooling system. This isolated service water system contains a more effective biocide as part of its chemical treatment. To prevent service water from entering the storm drain system, these non-radiologically-contaminated floor drains were isolated from the yard drain system. These floor drains have been rerouted to the sanitary waste treatment system, and the effluent from the sanitary waste treatment system has been rerouted to the Mississippi River via the cooling tower blowdown common header. Refer to Form 2C, Item IIA, Sheet 1 of 2 for the previous water use diagram, and refer to Form 2C, Item IIA, Sheet 2 of 2 for the water use diagram that reflects our current water flow configuration.

Gulf States Utilities Company
River Bend Nuclear Power Station
NPDES Permit No. LA0042731
Permit Renewal Application

FORM 2C, ITEM IIB, ATTACHMENT 1:
FURTHER DESCRIPTION OF OUTFALLS

OUTFALL 004

This outfall is the plant sanitary wastewater treatment discharge. Treatment consists of flow and nutrient equalization followed by extended aeration of activated sludge. Undesirable microbial activity is controlled with hydrogen peroxide. Excess sludge is further treated by aerobic digestion before removal. A sand filter and ultraviolet light provide final treatment before discharge. Treated effluent from the sand filter (or from the clarification chambers during sand filter maintenance/repair) is pumped to the common discharge header and discharged to the Mississippi River. Solids removed by sedimentation and tertiary filtration are sent for approved disposal.

NOTE:

During the refueling outage which began in March, 1992, the plant's cooling water system was modified to isolate the service water system from the condenser cooling system. This isolated service water system contains a more potent biocide as part of its chemical treatment. To prevent this chemically treated service water from ente ng the storm drain system, these non-radiologically-contaminated floor drains were isolated from the yard drain system. These floor drains were rerouted to the sanitary waste treatment system, and the effluent from the sanitary waste treatment system was rerouted to the Mississippi River via the cooling tower blowdown common header. Refer to Form 2C, Item IIA, Sheet 1 of 2 for the previous water use diagram, and refer to Form 2C, Item IIA, Sheet 2 of 2 for the water use diagram that reflects our current water flow configuration.

OUTFALL 005

This outfall is stormwater runoff from approximately 5 acres of industrial materials storage area, discharging to Grants Bayou. Assuming the 10-year, 24-hour rainfall event of 8.2 inches, this watershed is calculated to yield 0.56 million gallons of non-contaminated stormwater runoff to Grants Bayou.

OUTFALL 006

This outfall is the discharge of the drainage conveyances from the east side of the plant to Grants Bayou. It consists of stormwater from the east side of the plant, and previously monitored outfalls 003 and 008. The station building roof drain and yard drain systems direct drainage to a ditch called East Creek. East Creek receives stormwater runoff from approximately 43 acres of the plant site, approximately 29 acres of which is considered to contribute sheet runoff. Assuming the 10-year, 24-hour rainfall event of 8.2 inches, this watershed is calculated to yield 9.6 million gallons of stormwater runoff to Grants Bayou.

FORM 2C, ITEM IIB, ATTACHMENT 1:
FURTHER DESCRIPTION OF OUTFALLS

OUTFALL 007

This outfall is the discharge of the drainage conveyances from the west side of the plant to Grants Bayou. It consists of stormwater from the west side of the plant and previously monitored outfall 008. A network of small ditches from office areas, warehouse areas, materials storage areas, equipment and vehicle maintenance areas all connect to a drainage ditch called West Creek. West Creek receives stormwater runoff from approximately 47 acres of the plant site, all considered to be sheet runoff. Assuming the 10-year, 24-hour rainfall event of 8.2 inches, this watershed is calculated to yield 10.4 million gallons of stormwater runoff to Grants Bayou.

OUTFALL 008

This outfall is the plant testing and flushing water discharge. This discharge results from the hydrostatic testing and flushing of piping systems and vessels, including periodic required flushing and testing of the Fire Protection Water Supply System and the Automatic Sprinkler System. Wastewater from hydrostatic testing and flushing activities is usually conveyed from the plant and support areas by hoses or temporary piping to yard drains or ditches for discharge to Grants Bayou. Some of these activities may direct wastewater to the sanitary waste treatment system via non-radiologically-contaminated plant floor drains for discharge to the river. Flushing and hydrostatic testing is usually performed with well water. Occasionally, demineralized water may be used, which, upon standing in storage tankage, absorbs carbon dioxide resulting in pH levels sometimes as low as 5.6 standard units.

(Proposed new) OUTFALL 009

This outfall is a proposed new outfall for La-WP0409, and is already included in the NPDES permit LA0042731 for River Bend Station. This outfall is the stormwater discharge from part of the cooling tower yard. Stormwater runoff and deminimus quantities of cooling tower drift/mist drains by gravity from approximately 13 acres of the plant site east of the cooling tower area. Assuming the 10-year, 24-hour rainfall event of 8.2 inches, this watershed is calculated to yield 2.21 million gallons of stormwater runoff to Grants Bayou.

Gulf States Utilities Company
River Bend Nuclear Power Station
NPDES Permit No. LA0042731
Permit Renewal Application

FORM 2C, ITEM IIB, ATTACHMENT 2:
CHEMICAL TREATMENT OF WATER

The cooling water treatment program to minimize scaling, biofouling, and corrosion of plant metallurgy consists of the following:

Cooling Tower Water -

The following are added to the river water intake pumps/piping and clarifiers providing cooling tower makeup for condenser cooling and service water cooling:

Cationic coagulant, occasionally supplemented with anionic flocculent during periods of low river water turbidity, are added to river water clarifiers for silt and colloid removal.

Clarifier clearwells are periodically shock chlorinated with sodium hypochlorite/ sodium bromide, for algae control.

Clarifier sludge is diluted with untreated river water to approximately 4% solids and returned to the Mississippi River.

Sodium hypochlorite/sodium bromide is injected into the river water intake at the river to prevent infestation of the intake pipeline by the Zebra Mussel, *Dreissena polymorpha*, which is now present in the intake water for River Bend Station.

The following are added to the cooling towers/flumes:

Zinc salts, and/or phosphate salts, blended with anionic copolymer and/or terpolymers are added for mild steel corrosion control.

Tolyltriazole salts are added for copper and brass corrosion control.

Polyacrylate polymer/hydroxyethylidene diphosphonate (HEDP) blend is added for scaling control.

Sodium hypochlorite and a sodium bromide/surfactant blend is added for biofouling control.

Sulfuric acid is added for pH control.

The cooling tower system operation normally results in 4 to 6 cycles of concentration. The cooling tower blowdown is dechlorinated with ammonium (or sodium) bisulfite before discharge to the river.

Gulf States Utilities Company
River Bend Nuclear Power Station
NPDES Permit No. LA0042731
Permit Renewal Application

FORM 2C, ITEM IIB, ATTACHMENT 2:
CHEMICAL TREATMENT OF WATER

Isolated Service and Standby Cooling Water -

The isolated service water is made up with demineralized water to which is added molybdate, nitrite, and tolyltriazole sodium salts for corrosion control, polyacrylate dispersant for scaling control, sodium hydroxide for pH control, and a broad spectrum biocide such as isothiazoline, gluteraldehyde, or dibromonitrilopropionamide. This isolated service water system does not discharge to the environment.

The standby cooling water is a reservoir of 6.5 million gallons made up from fresh well water and a multicell induced draft cooling tower to which is added isothiazoline and/or glutaraldehyde for biological control. This system provides backup emergency cooling of nuclear safety related systems in the event that normal cooling becomes unavailable. During refueling outages, at 18 month intervals, this standby cooling tower is operated for several weeks with the isolated service water while the normal systems undergo maintenance. The water treatment chemicals listed above for the isolated service water system are added to the reservoir to maintain the corrosion and biological control attributes of the isolated service water. There is no blowdown from this cooling tower during operation. When this tower is returned to standby status, suspended solids are removed by side stream filtration and dissolved solids are removed by reverse osmosis or other de-ionization process. The waste streams from filtration and de-ionization will be directed to the low volume waste treatment system for discharge through outfall 002.

Auxiliary Boiler Water -

The following may be used for auxiliary boiler makeup: zeolite softeners for demineralization, sodium sulfite for oxygen removal, phosphate salts for scaling control, and sodium hydroxide for pH control.

Fire Suppression Water -

The following may be used for protection of the fire suppression water system: sodium hypochlorite/sodium bromide or a biocide for biofouling control, sodium hydroxide for pH control, and phosphate or molybdate/nitrite salts for corrosion control.

With the exception of the previously noted zinc, no chemicals which contain any of the priority pollutants listed in 40 CFR 423, Appendix A, are used for treatment of cooling water that is discharged to the environment.

ENVIRONMENTAL IMPACT QUESTIONNAIRE

Name of Applicant: Gulf States Utilities Company
(firm, partnership, corporation, etc.)

Mailing Address: Post Office Box 220
5485 U.S. Highway 61
St. Francisville, LA 70775

Facility Name: River Bend Station

Telephone: (504) 346-8651

Facility Location: Approx. 3 Mi South of St. Francisville, LA

Parish: West Feliciana

Check One: New facility ____ Existing facility X Facility Expansion ____

Type of Facility: Nuclear Electric Power Generating Station
(cannery, oil refinery, dairy, etc.)

Products: Electric Power

Representative preparing questionnaire response:

Name: Michael A. Harrington
Supervisor - Environmental Services

Mailing Address: Post Office Box 220
St. Francisville, LA 70775

Telephone: (504) 381-4780

There is no requirement that the information furnished in response to this questionnaire be certified by a professional engineer or other expert. However, a measured response should be given for each question posed, taking into consideration appropriate factors such as: the environmental sensitivity of the area, both for the proposed site and alternative sites; impacts on the economy of the area, both favorable and unfavorable; availability of raw materials, fuels and transportation and the impact of potential sites on their availability and economics; relationship of the facility to other facilities, either within or independent of the company, and the effects of location on these relationships; and other factors which may be appropriate on a case-by-case basis.

ENVIRONMENTAL IMPACT QUESTIONNAIRE
GULF STATES UTILITIES COMPANY
RIVER BEND STATION - UNIT 1
APPLICATION TO RENEW LA PERMIT WP0409

Gulf States Utilities (GSU) Company's River Bend Station Project was reviewed under the requirements of the National Environmental Policy Act of 1969 by various Federal and State agencies before GSU was allowed to begin construction of River Bend Station. GSU submitted an Environmental Report - Construction Permit Stage in 1973 to the United States Atomic Energy Commission (USAEC) as part of the requirements to secure a permit to construct River Bend Station. This 4-volume Environmental Report detailed the alternative projects that GSU evaluated before selecting this one, the alternative sites that GSU evaluated before selecting this one, the mitigative measures taken to protect the environment, and an analysis of social and economic benefits balanced against the environmental costs. The USAEC issued a Final Environmental Statement - Construction Permit Stage, concerning the proposed construction project which identified the potential and real adverse environmental effects of construction and proposed operation of this facility, as well as the mitigative measures they felt would protect the environment to the maximum extent possible.

The River Bend Station Project was reviewed again under the requirements of the National Environmental Policy Act of 1969 by various Federal and State agencies before GSU was allowed to begin operation of River Bend Station. Gulf States Utilities submitted another environmental report to the United States Nuclear Regulatory Commission (USNRC) in 1981 as part of the requirements to secure a license to operate River Bend Station. This 4-volume report addressed environmental protection issues more specifically related to operation of River Bend Station. Changes to the proposed project that had occurred from the original evaluation (such as the cancellation of Unit 2) were addressed in this report. The USNRC issued a Final Environmental Statement related to the Operation of River Bend Station, which identified the potential and real adverse environmental effects of operation of this facility, as well as the mitigative measures they felt would protect the environment to the maximum extent possible.

The five questions in this questionnaire are answered in detail within the 8 volumes of the Environmental Report prepared by GSU and in the 2 Final Environmental Statements published by the USNRC. We endeavor to summarize these details for your convenience in the following responses to this questionnaire:

Question 1

Have the potential and real adverse environmental effects of the proposed facility been avoided to the maximum extent possible?

Response to Question 1

Gulf States Utilities (GSU) submitted an **Environmental Report - Construction Permit Stage** and a **Preliminary Safety Analysis Report** to the United States Atomic Energy Commission (USAEC) on July 8, 1973, as part of the application to construct River Bend Station. The USAEC's Licensing staff reviewed the proposed River Bend Project pursuant to the requirements of the National Environmental Policy Act of 1969. The USAEC staff was required to evaluate the environmental and economic impacts of the proposed project balanced against the environmental and economic impacts of alternative projects. The principal alternatives to the proposed River Bend Project that were evaluated by the USAEC staff included alternative sites (see the response to question 4), alternative energy sources (see the response to question 3), purchase of power (see the response to question 2), alternative heat dissipation methods and alternative transmission line corridors (see the response to question 5). The USAEC's preliminary evaluation was published in June of 1974, as the *Draft* **Environmental Statement Related to the Construction of River Bend Station,** and was made available to the public, to the Council on Environmental Quality, and to Federal, State, and local agencies for review and comment. The USAEC received comments on the *Draft* Environmental Statement from the following:

Federal Agencies

Advisory Council on Historic Preservation
Department of Agriculture, Forest Service
Department of Agriculture, Research Service
Department of the Army, Corps of Engineers
Department of Commerce
Department of Health, Education and Welfare
Department of the Interior
Environmental Protection Agency
Federal Power Commission

State and Local Agencies

Louisiana Department of Conservation
Louisiana Stream Control Commission
Louisiana Soil and Water Conservation Committee

as well as from Gulf States Utilities. During their review process, USAEC required GSU to provide responses to many of these comments, consisting of clarifications and, where applicable, commitments by Gulf States Utilities to undertake additional measures to enhance the protection of the environment. After reviewing the impacts that would occur during construction and operation, the USAEC issued the *Final* **Environmental Statement - Construction Permit Stage** in September, 1974. The following is a summary of environmental impact and adverse effects cataloged in this **Environmental Impact Statement**:

> The 3292 acre site is about 80% forest, with most of the remaining acreage in pasture. Construction-related activities on the site would disturb about 700 acres. The portion of this land not to be used for the plant facilities, parking lots, roads, etc., will be restored by seeding and landscaping. The temporary removal of vegetation will tend to promote erosion. Increased siltation and turbidity can be expected in the bayous during construction.

A maximum of 60 cubic feet per second (cfs) of cooling water will be withdrawn from the Mississippi River of which 12 cfs will be returned to the river via pipeline with the dissolved solids concentration increased by a factor of about 5. About 48 cfs will be evaporated to the atmosphere by the cooling towers.

During the construction period, the terrace aquifer will be dewatered for about 16 months at a rate of 20,000 gallons per minute (gpm) in order to lower the water table by 45 feet at the building site. It is expected that the water table will not be lowered by more than 30 feet at a radius of 2000 feet from the construction site. The dewatering discharge will be sent to Grants Bayou, transforming it from a lentic to a lotic habitat for the duration of the dewatering. The water temperature will be cooler and water quality altered in Grants Bayou because of the influence of the discharged groundwater. The dewatering will cause a loss of wildlife in the moist or temporary pond habitats affected.

A small amount of aquatic organisms entrained in the makeup water for the plant's cooling towers will be killed due to thermal and mechanical shock. This loss is expected to have an insignificant effect upon the river ecosystem.

The volume of thermal discharge (14 cfs) is very small compared with the river flow (annual mean is over 400,000 cfs) and the effect on the river ecosystem is not expected to be significant.

Chemical discharges from the plant, including chlorine, will be diluted to concentrations below those which might adversely affect aquatic biota.

The risk associated with accidental radiation exposure will be very low.

Approximately 87 miles of transmission lines will be constructed, requiring about 2200 acres of land for the rights-of-way, only about one-fourth of which will be through woodland or scenic areas.

Plant construction will involve some community impacts. Farming, hunting, and fishing on the site will be suspended. Traffic on local roads will increase substantially due to construction and commuting activities. Influx of workers' families (2200 peak work force) is expected to cause no major housing or school problems, because most of the work force is expected to commute from the Baton Rouge area.

No significant environmental impacts are anticipated from normal operational releases of radioactive materials. The calculated dose to the estimated 1980 population which will live within a radius of 50 miles from the plant is 16 man-rems/year. This value is less than the natural fluctuations in the approximately 70,000 man-rems/year dose this population would receive from background radiation.

Fogging and icing caused by evaporation and drift from the cooling towers are expected to increase slightly over their natural occurrence.

A new access road from Highway 61 to the site requires about 9.6 acres of land.

The *Final* **Environmental Statement - Construction Permit Stage** went on to conclude that after weighing the environmental, economic, technical, and other benefits of the proposed River Bend Station against environmental and other costs, and considering available alternatives, the action called for under the National Environmental Policy Act of 1969 and Appendix D to 10CFR50 was the issuance of construction permits for the proposed facility.

Along with the permission to construct the facility, the USAEC listed their additional requirements and endorsed some additional measures that Gulf States Utilities committed to undertake for the protection of the environment. These included:

USAEC REQUIREMENTS

The applicant shall install state-of-the-art radioactive gaseous waste treatment equipment capable of reducing thyroid dose to less than 15 millirems/year in order to meet the "as low as practicable" guidelines of Regulatory Guide 1.42 and the requirements of 10CFR50.54a.

In addition to the program described in Section 6.1 of the **Environmental Report - Construction Permit Stage**, soil and crop sampling will be included in the preoperational monitoring program.

A control program shall be established by the applicant to provide for a periodic review of all construction activities to assure that those activities conform to the environmental conditions set forth in the construction permit.

Before engaging in a construction activity which may result in a significant adverse environmental impact that was not evaluated or that is significantly greater than that evaluated in this *Final* **Environmental Statement Related to the Construction of River Bend Station**, the applicant shall provide written notification to the USAEC, Director of Licensing.

If unexpected harmful effects or evidence of irreversible damage are detected during facility construction, the applicant shall provide to the staff an acceptable analysis of the problem and a plan of action to eliminate or significantly reduce the harmful effects or damage.

Dewatering operations shall be controlled to assure that there are no deleterious effects on neighboring wells.

GSU COMMITMENTS

Gulf States Utilities shall take the necessary mitigating actions during construction of the station and associated transmission lines to avoid unnecessary adverse environmental impacts from construction activities:

A new access road will be constructed from U.S. Highway 61 to the northeast corner of the site to minimize the traffic and associated noise in the residential area along Route 965 and on the continuation of the existing parish road.

The cooling tower makeup water line, the cooling tower blowdown line, and electrical power and control cables will be routed along a haul road from the river to the site for economy and minimal environmental disturbance.

Spoil deposit areas will be selected to minimize adverse environmental effect, and all bare soil will be seeded for erosion control and restoration.

To lessen truck traffic on Highway 61, the purchased coarse fill will be trucked in over an extended period of time and stockpiled.

Sprays or other measures will be used to prevent dust blowing from the coarse fill stockpile.

Water sprinkler trucks and other sprinkling methods will be used as necessary for dust control throughout the construction period.

Use of explosives, if required, will be limited to daylight hours and will conform to local, State, and Federal regulations.

Methods and chemicals used for rodent and insect control will be carefully applied to ensure that desirable species will not be unduly harmed.

Erosion will be controlled by using gentle slopes, seeding, netting, and straw, and by special structures where needed.

Fire protection systems will be installed as soon as excavation and backfill operations permit and will be maintained for use during the remainder of the construction period.

After cessation of construction activities and removal of construction facilities, the site will undergo final grading and landscaping.

Construction of dikes across a natural drainage area to create a wildlife management lake will provide an additional use of excavation material and establish wildlife habitat.

The excavated embayment on the river bank, for intake and discharge structures, will be designed and constructed to reduce erosion of the river bank.

Roadside slopes will be seeded, and elevated highways will be provided with culverts.

Precautions will be taken to assure that construction chemicals such as paint and thinner, fuel oil, diesel fuel, and gasoline will not be released to the environment.

Sanitary waste will be transported offsite by closed tank truck for disposal.

Based on a review of the anticipated construction activities and the expected environmental effects of these construction activities, the USAEC staff concluded that the measures and controls instituted by the applicant, as summarized above, would be *adequate to ensure that adverse environmental effects will be at the minimum practicable level.* **A Limited Work Authorization** was issued to Gulf States Utilities to begin the excavation and backfill activities, and the permission to begin construction was issued to Gulf States on March 25, 1977.

Gulf States Utilities submitted an **Environmental Report - Operating License Stage** on April 24, 1981, and a **Final Safety Analysis Report** on August 25, 1981, to the United States Nuclear Regulatory Commission (USNRC), as part of the application to operate River Bend Station. The USNRC staff performed a second assessment of the environmental impacts pursuant to the regulations set forth in 10CFR51, which implements the requirements of the National Environmental Policy Act of 1969. The USNRC assessed the physical, social, biological, and economic impacts that could be attributed to the operation of the River Bend Station. The following individuals performed these assessments:

AGENCY	POSITION AND AREA OF EXPERTISE
E. J. Weinkam III, NRC	**Licensing Project Manager**; M.S. Mechanical Engineering 1984; Mechanical/Nuclear Engineering; 10 years experience.
S. Acharya, NRC	**Senior Radiological Engineer**; Ph.D. Physics, 1971; Nuclear Engineering; 15 years experience.
L. Bell, NRC	**Nuclear Engineer**; M.S. Physics, 1967; Nuclear Engineering; 12 years experience.
C. Billups, NRC	**Aquatic Scientist**; Ph.D. Marine Science, 1974; Aquatic/Fishery Resources, Aquatic Ecology; 14 years experience.
E. Brannigan, NRC	**Health Physicist**; Ph.D. Nuclear and Radiochemistry, 1971; Health Physics; 12 years experience.
J. Swift, NRC	**Health Physicist**; Ph.D. Nuclear Engineering, 1971; 18 years experience.
L. Bykoski, NRC	**Regional Environmental Economist**; Ph.D. Economics, 1965; 19 years experience.
C. Ferrell, NRC	**Site Analyst**; B.S. Physics, 1950; Radiological Physics; 32 years experience.
E.N. Fields, NRC	**Cost-Benefit Economist, Electrical Engineer**; B.S. Electrical Engineering, 1969; 15 years experience.
C.R. Hickey, Jr., NRC	**Senior Fishery Biologist**; M.S. Marine Science, 1971; Marine/Fisheries Science; 14 years experience; AFS Certified Fisheries Scientist.
G. LaRoche, NRC	**Senior Land Use Analyst**; Ph.D. Botany, Ecology, 1969; Land Use and Terrestrial Ecology; 28 years experience.
J.C. Lehr, NRC	**Senior Environmental Engineer**; M.S. Environmental Engineering, 1972; Water Quality; 12 years experience.
J. Levine, NRC	**Meteorologist**; M.S. Meteorology, 1967; Meteorology; 22 years experience.
R. Wescott, NRC	**Hydraulic Engineer**; M.S. Engineering Science, 1974; Hydraulic Engineering; 10 years experience.
A.J. Policastro, Argonne National Laboratory	**Noise Analyst**; Ph.D. Civil Engineering, 1970; Applied Mathematics; 13 years experience.

AGENCY	POSITION AND AREA OF EXPERTISE
C.T. Hunsaker, Oak Ridge National Laboratory	**Environmental Scientist**; Ph.D. Environmental Science and Engineering, 1980; Aquatic Resources; 5 years experience.
R.L. Kroodsma, Oak Ridge National Laboratory	**Terrestrial Ecologist**; Ph.D. Zoology, 1970; Land Use and Terrestrial Ecology; 14 years experience.
R.B. McLean, Oak Ridge National Laboratory	**Aquatic Ecologist**; Ph.D. Marine Biology, 1974; Fishery Harvest Estimates; 10 years experience.

The USNRC's preliminary evaluation was published in July 1984, as the *Draft* **Environmental Statement Related to the Operation of River Bend Station**, and was made available to Federal, State, and local agencies for review and comment. The USNRC received comments on the *Draft* Environmental Statement from the Department of the Army's Corps of Engineers and the Environmental Protection Agency's Region VI, as well as from GSU. No State or Local agencies responded with comments to the Draft Environmental Statement. The USNRC staff reviewed the activities associated with the proposed operation of River Bend Station and the potential impacts, both beneficial and adverse. The USNRC issued the *Final* **Environmental Statement - Related to the Operation of River Bend Station** in January, 1985, listing the following conclusions:

> The River Bend Station will provide approximately 4.5 billion kWh of electrical energy annually (assuming that the unit will operate at an annual average capacity factor of 55%). The addition of the station will add 936 MW of operating capacity to the GSU system, resulting in increased system and regional reliability.
>
> Alteration of about 753.2 acres of land and associated wildlife habitats has been necessary, including 457.3 acres that will be devoted to permanent plant facilities. Losses of prime farmland and farmland of statewide importance total 378 acres. Although construction has had adverse effects on land and wildlife, these effects have not been particularly significant. Vacant areas on the site, including 711 acres of bottom-land hardwood forest, will be preserved and devoted to conservation uses.
>
> A maximum of about 33.8 ft^3/sec of cooling water will be withdrawn from the Mississippi River, of which 5.4 ft^3/sec will be returned to the river via a pipeline as blowdown, with the concentration of dissolved solids increased over that in the river by a factor of about 6. About 25.4 ft^3/sec will be evaporated to the atmosphere by the cooling towers.
>
> Two 500-kv and four 230-kv transmission lines totaling 105 circuit miles will connect the River Bend Station with the existing power system. Route lengths total 56.5 miles for the 500-kv lines and 23.8 miles for the 230-kv lines.
>
> Cooling tower salt drift will not adversely affect native vegetation or agricultural crops in the vicinity of the plant.
>
> Evidence found to date by the staff indicates that operation of the River Bend transmission lines will have no effect on the health of humans, animals, and plants.

Losses of aquatic organisms by impingement on the intake structure and entrainment in the makeup water withdrawn from the Mississippi River will be small in magnitude and will have negligible impacts on riverine populations.

The thermal discharge from the plant during operation is expected to result in a plume of heated water extending across less than one-fifth of the river width, remaining attached to the near shore of the river and extending more than 1 mile downstream. However, no tributary stream mouths would be blocked by this plume.

Thermal and chemical discharge effects will be small in magnitude and result in negligible impacts on riverine populations.

There are no endangered species of aquatic organisms in the vicinity of the site. The American alligator, Federally listed as threatened in Louisiana, appears to be a permanent resident on the site. Because most of the alligator's primary habitat (wetlands in bottom-land forest) will be preserved on the site, the site should continue to provide a suitable habitat for this threatened species. No other terrestrial species with Federal or State-listed endangered or threatened status occur regularly or breed on the site.

Noise levels off the site during plant operation are predicted by the staff to be above ambient levels. Examination of the predicted broad-band noise and the potential for annoyance as a result of audibility of tones indicates that adverse community reaction would be expected from noise of operation of the plant. A monitoring program to identify the extent of impacts and the mitigation actions necessary, if any, will be required.

The operation and maintenance of the River Bend Station will have no impact on archeological resources or historic sites.

Socioeconomic impacts of the project are anticipated to be minimal.

The risk to the public health and safety from exposure to radioactive effluents and from transportation of fuel and wastes during normal operations will be very small.

An assessment of the environmental impacts of accidents indicates the impacts could be severe, but the likelihood of their occurrence is judged to be small. The overall assessment of the environmental risks of accidents, assuming protective actions, shows that they are on the same order as the risks from normal operation, although accidents have a potential for early fatalities and economic costs that cannot arise from normal operation. The risks of early fatality from potential accidents are small in comparison with the risks of accidental deaths from other human activity.

This statement assesses various impacts associated with the operation of the facility in terms of annual impacts, and balances these impacts against the anticipated annual energy production benefits. Thus, the overall assessment and conclusion would not be dependent on specific operating life. Where appropriate, however, a specific operating life of 40 years was assumed.

On the basis of the analyses and evaluations set forth in this statement, and after weighing the environmental, economic, technical, and other benefits against environmental and economic costs at the operating license stage, the USNRC staff concludes that the action called for under the National Environmental Policy Act and 10CFR51 is the issuance of operating licenses for River Bend Station, subject to the following conditions for the protection of the environment:

> Before engaging in additional construction or operational activities that may result in a significant adverse impact that was not evaluated or that is significantly greater than that evaluated in this statement, the applicant shall provide written notification of such activities to the Director of the Office of Nuclear Reactor Regulation and shall receive written approval from that office before proceeding with such activities.
>
> The applicant shall carry out the environmental monitoring programs...as modified and approved by the USNRC staff, and implemented in the Environmental Protection Plan and Technical Specifications that will be incorporated in the operating license for River Bend Station. Monitoring of the aquatic environment shall be as specified in the National Pollutant Discharge Elimination System (NPDES) permit.
>
> If adverse environmental effects or evidence of irreversible environmental damage develops during the operating life of the plant, the applicant shall provide the USNRC staff an analysis of the problem and a proposed course of action to alleviate it.

The U.S. NRC incorporated into the requirements for operation those mitigative measures it felt would protect the environment to the maximum extent. Compliance with these requirements is documented in several reports compiled each year, including:

> The Annual Environmental Operating Report, which addresses the aquatic and terrestrial environmental aspects of plant operations (e.g., cooling tower salt drift, noise, etc.);
>
> the Annual Radiological Environmental Operating Report, which reports specifically on the radiological environmental impacts of station operation;
>
> the semi-annual Radioactive Effluent Release Reports, which reports all radiological effluents released during a calendar year of plant operation;
>
> and the Discharge Monitoring Reports, which relate specifically to the non-radiological impacts on the aquatic environment.

GSU ensures that the potential and real adverse environmental effects of station operation are avoided to the maximum extent possible by compliance with these conditions of its operating license.

Question 2

Does a cost benefit analysis of the environmental impact costs balanced against the social and economic benefits of the proposed facility demonstrate that the latter outweighs the former?

Response to Question 2

The U.S. Nuclear Regulatory Commission assessed the physical, social, biological, and economic impacts that can be attributed to the operation of the River Bend Station. The participants in this assessment are listed in the response to Question 1; they described the economic, environmental, and socioeconomic benefits and costs associated with the operation of River Bend Station in the *Final* **Environmental Statement - Related to the Operation of River Bend Station** (NUREG-1073), published in January of 1985. A subjective measure of cost and benefit impacts was assigned by the reviewers, where quantification was not possible:

> "Small" refers to impacts that in the reviewers' judgements, are of such minor nature, based on available information, that they do not warrant detailed investigations or considerations of mitigative actions;
>
> "Moderate" refers to impacts that in the reviewers' judgements, are likely to be clearly evident (mitigative alternatives are usually considered for moderate impacts);
>
> "Large" refers to impacts that in the reviewers' judgements, represent either a severe penalty or a major benefit - acceptance requires that large negative impacts should be more than offset by other overriding project considerations.

These identified costs and benefits were based on the information at hand in 1985:

Costs:

Category	Impacts	Discussion
ECONOMIC		
Fuel	Small	11.1 mills/kWh (1986 dollars)
Operation and Maintenance	Moderate	
Total	Small	$92 million/year (1986 dollars)
Decommissioning	Small to Moderate	$56-94 million (1984 dollars)
ADVERSE SOCIOECONOMIC EFFECTS		
Loss of historic or archaeologic resources	None	The NRC and State Historic Preservation Office agree that the operation and maintenance of the plant will have no effect on any sites or properties listed on, or eligible for, the National Register of Historic Places.

Category	Impacts	Discussion
ADVERSE SOCIOECONOMIC EFFECTS		
Increased demands on public and private facilities and services.	Small	About 4% of the plant's workers are expected to reside in Point Coupee, 4% in East Feliciana, 20% in West Feliciana and the remainder in East Baton Rouge parishes. Scheduled station outages, 1 to 3 months long, occurring every 12 to 18 months will normally involve about 400 craft workers and 100 temporary vendor workers, the distribution of whose residences is expected to be similar to that of the plant's workers.
ADVERSE NONRADIOLOGICAL HEALTH EFFECTS		
Air quality changes	Small	Principal emissions to the atmosphere will result from the operation of the plant's mechanical draft cooling towers. The principal effect is expected to be a visible plume of water vapor, whose intensity and extent will depend on ambient meteorological conditions. During the winter, in addition to the visible plume, icing on nearby surfaces would be a possibility. However icing is not expected to be a major impact because temperatures fall below freezing on the average of only 14 hours a year. The effects of cooling tower drift with dissolved salts also are expected to be minimal, and any deposition of dissolved salts should occur primarily near the cooling towers.
Water Quality Changes	None	The River Bend Station will be discharging cooling tower blowdown, water treatment wastes, (sanitary wastes - after 1992) and sludge to the Mississippi River, and sanitary (before 1993) and other wastes to Grants Bayou. Effluent limitations and monitoring requirements for the station are specified in NPDES permit LA0042731 (and Louisiana Water Discharge Permit WP0409).
ADVERSE RADIOLOGICAL HEALTH EFFECTS		
Routine operation, Postulated accidents, & Uranium fuel cycle	Small	During normal operations of the River Bend Station, small quantities of radioactivity (fission, corrosion, and activation products) will be released to the environment. The amounts of radioactivity released through vents and discharge points to areas outside the plant boundaries are to be recorded and published semiannually in the Radioactive Effluent Release Reports for the facility. Airborne effluents will diffuse in the atmosphere in a fashion determined by the meteorological conditions existing at the time of release and are generally dispersed and diluted by the time they reach unrestricted areas that are open to the public. Waterborne effluents will be diluted with plant wastewater and then further diluted as they mix with the Mississippi River beyond the plant boundaries. Site-specific values for various parameters involved in each dose pathway are used in calculations of dose to the "maximally exposed" individual for each of the many potential exposure pathways specific to the environment around the facility. These calculations include values for the <u>amounts of radioisotopes released</u> in the gaseous and liquid effluents (calculated or observed), <u>meteorological information</u> (e.g., wind speed and direction) specific to the site topography and effluent release points, and <u>hydrological information</u> pertaining to dilution of the liquid effluents as they are discharged.

Category	Impacts	Discussion
ADVERSE RADIOLOGICAL HEALTH EFFECTS		
Routine operation, Postulated accidents, & Uranium fuel cycle	Small	An annual land use census will identify changes in the use of the unrestricted areas to allow for modifications in the programs for monitoring/evaluating doses to individuals from principal pathways of exposure. An extensive radiological environmental monitoring program, designed specifically for the environs of the River Bend Station, provides measurements of radiation and radioactive contamination levels that exist outside of the facility boundaries both before and after operations begin. The results for all radiological environmental samples measured during a calendar year of operation, as well as the results of the annual land use census, are recorded and published in the Annual Radiological Environmental Monitoring Report for the facility.
ENVIRONMENTAL		
Damages suffered by other water users:		
Surface water consumption	Small	The cooling towers will evaporate water at an average rate of 11,400 gallons per minute. This represents approximately 0.008% of the Mississippi River's average flow rate and 0.03% of its minimum daily flow rate. This consumptive use of river water is not expected to adversely affect any other uses of this river water.
Surface water contamination	Small	Under winter operating conditions, the greatest temperature difference, 24 C, exists between river water at 3.9 C and the blowdown discharge. The 1 C isotherm at the surface was estimated to be 7.2 feet wide during the winter and would not reach the river surface in the summer when the temperatures are the highest (29.4 C). The NPDES permit for the River Bend Station specifies limitations for the regular and standby cooling tower blowdown, treated chemical waste, and low-level radioactive waste discharges to the Mississippi River. Chlorine will be controlled to less than 0.1 ppm free residual in the blowdown discharge. Chemicals in the station's blowdown will not impair designated water quality uses.
Groundwater consumption	Small	Two 130 gpm wells approximately 1800 feet deep will supply an average of 69.3 gpm to the plant for domestic water supply. For 40 years of continuous pumping, drawdown of the piezometric surface in this Tertiary Zone 3 Aquifer is estimated to be less than 13 feet at a distance of 100 feet and less than 7 feet at a distance of 10,000 feet. The fire protection storage tanks will be resupplied by a 800 gpm well approximately 150 feet deep. Drawdown of the piezometric surface in this Upland Terrace Aquifer during operation (a maximum of 12.5 hours to replenish the storage tanks) is estimated to be less than 15 feet, and less than 0.2 feet at a distance of 1000 feet, and negligible beyond a distance of 1300 feet.

Category	Impacts	Discussion
ENVIRONMENTAL Damages suffered by other water users:		
Groundwater contamination	Small	Approximately 136,900 lb/yr of salt are emitted from the cooling towers. It is assumed that all the emitted salt is deposited within a 7,500 foot radius of the towers and that the salt is completely dissolved by the annual average rainfall of 54.0 inches. The resulting annual average increase of salt concentration in storm runoff and, therefore, in groundwater at the surface is less than 3 ppm. This increase in dissolved salt concentration would be reduced after mixing with ambient groundwater, and is not expected to adversely affect groundwater quality.
Damage to aquatic resources:		
Impingement and entrainment	Small	[illegible]cake structures are designed with low approach [illegible]ities during normal operation of 0.24 feet/sec, and the average velocity in front of the wedge-wire screen face is estimated to be 0.48 feet/sec. Impingement of organisms is not likely to be a problem because of low intake velocities. Because phytoplankton densities are greater on the western side of the river, less than 0.01% of the total phytoplankton population at the site will be entrained in the cooling water system.
Thermal effects	Small	The thermal discharge should not adversely affect aquatic organisms in the Mississippi River. The Louisiana State Water Quality Criteria for thermal discharge will be met, even under worst case conditions when the River Bend Station thermal plume will allow more than a 75% area and flow as a free zone of passage for organisms. There will be no blockage of tributary streams, and the thermal discharge is not expected to adversely impact adult fish, fish spawning, or plankton.
Chemical discharges	Small	The normal and standby cooling tower blowdown, auxiliary boiler blowdown, neutralized chemical waste (and now, sanitary waste) are combined and discharged to the Mississippi River. Clarifier blowdown enters the river through a separate pipeline adjacent to the plant blowdown. Discharge of clarifier sludge to the Mississippi River will not adversely affect aquatic organisms because of the naturally high levels of suspended solids in this river and rapid dilution. The State of Louisiana has designated the river reach adjacent to the site for propagation of fish and wildlife and has set appropriate criteria to ensure protection of this use. River Bend Station must comply with the discharge limitations assigned by NPDES Permit LA0042731 (and Louisiana Water Discharge Permit WP0[illegible]9).
Damage to terrestrial resources:		
Station operations	Small	Most of the threatened or endangered species potentially occurring in the region do not occur regularly at the site. Potential impacts on these species are, therefore, not significant. The threatened American alligator is a permanent resident of wetlands on the site. The use of the site as proposed for the River Bend Station is likely to enhance the status of the alligator in the area, because virtually all of the bottomland habitat on the

Category	Impacts	Discussion
Damage to terrestrial resources:		
Station operations	Small	site will be preserved. In addition, the applicant proposes to create a 34 acre lake adjacent to the bottomland area, which might further enhance the alligator population.
Transmission line maintenance	Small	The power line rights-of-way will be managed by periodic removal of tall-growing trees within the right-of-way and removal or trimming of such trees at the edge of the right-of-way. During power line right-of-way maintenance, the primary potential problem is excessive erosion along maintenance roads. The staff will require the applicant, in using existing maintenance roads or construction of new roads, to practice appropriate erosion control techniques, such as following contours and constructing appropriately spaced trench drains or water bars to divert water to and off the side of the road.
Cooling tower operation	Small	At the nearest site boundary, the level of deposition predicted by the staff for the more toxic component of the drift, NaCl, is well below the levels of NaCl that cause leaf damage to sensitive plant species (107 lb/acre/yr). About 20% of the drift solids will consist of NaCl, the remainder will consist of the less toxic ions of sulfate, calcium, bicarbonate, and others. No serious impact to vegetation off the site is anticipated. Relative humidity is predicted to increase by a maximum of 7% on any one day, and by an annual average of up to 0.14%. These changes in humidity are much smaller than the natural variation and should have no effects on terrestrial biota. Wildlife should quickly become accustomed to the constant low level of noise (41 to 59 dBA at the site boundary), and their population levels should not be adversely affected.

Benefits:

A major economic benefit to be derived from the operation of the River Bend Station is the approximately 4.5 billion kilowatt-hours (kWh) of baseload electrical energy that will be produced annually. This projection assumed that the unit would operate at an annual average capacity factor of 55%. The addition of the unit would also improve GSU's ability to supply system load requirements by contributing 940 megawatts (MW) of capacity to the Cajun and Gulf States systems - 282 MW to the Cajun system and 658 MW to the GSU system. The USNRC staff estimated that production costs incurred on 4.5 billion kWh of GSU's existing fossil units would be reduced by approximately 36.2 mills per kWh, resulting in a total cost reduction per year on existing generation of $163 million (1986 dollars).

Another major economic benefit to be derived from the operation of the River Bend Station is the revenue that will be injected into the regional economy. The annual payroll for the plant's workers was projected to be $23 million (1985 dollars), and for temporary contract workers in a refueling outage to be $3.2 million (1985 dollars). Local purchases of materials and supplies relating to station operation was expected to total about $1 million annually (1985 dollars). Local purchases were expected to be made within a 50 mile radius of the station. Property and sales tax revenues resulting from the operation of the station are tabulated:

Estimated real estate and personal property taxes[1] to be paid to West Feliciana Parish

Year	Total estimated River Bend Station Property taxes	Total estimated parish property tax revenue[2]	Percent of tax revenue attributable to River Bend Station
1986	$32,000[3]	$1,232,000	3%
1987	35,000	1,235,000	3%
1988	38,000	1,238,000	3%
1989	41,000	1,241,000	3%
1990	44,000	1,244,000	4%
1996[4]	$11,968,000[5]	$13,048,000	92%
1997	10,230,000	11,190,000	91%
1998	9,429,500	10,349,000	91%
1999	8,279,000	9,119,000	91%
2000	7,204,000	7,964,000	90%

[1]Dollars are valued in year of expenditure.
[2]The assessed valuation of parish taxable property other than River Bend was assumed to be $30 million for 1986-1990 and $40 million for 1996-2000.
[3]Taxes are for land and nuclear fuel.
[4]River Bend Station has qualified for an exemption from ad valorem taxes for a 10-yr period after the plant is placed in service.
[5]Estimated plant cost is $2.9 billion; CEPCO financing costs are unknown.

Estimated sales taxes[1] to be paid during the first 5 years of operation of River Bend Station[1,2]

Year	State (3%)	School Board (1%)	Parish (1%)	Total (5%)
1986	$489,600	$156,550	$156,550	$ 782,[illegible]
1987	507,200	169,050	169,050	845,300
1988	547,800	182,600	182,600	913,000
1989	591,600	197,200	197,200	986,000
1990	638,900	212,950	212,500	1,064,800
Total	$2,755,100	$918,350	$918,350	$4,591,800

[1]Dollars are valued in year of expenditure.
[2]Dollars reflect 100% of sales tax. Amounts could be reduced by 30% if CEPCO is granted tax exempt status.

The major environmental benefits to be derived from the operation of the River Bend Station will be the avoidance of adverse impacts on air quality and the conservation of wildlife habitat on non-power producing areas of the site. River Bend Station will derive its power from the energy released by nuclear fission rather that the energy released from combustion of coal, oil, or gas. The combustion of fossil fuels would result in emissions of acid anhydrides (SO_x, NO_x) from which acid precipitation

develops, as well as the emission of CO and CO_2 which contribute to global warming. These adverse impacts are thereby avoided by the operation of River Bend Station. A total of 711 acres of bottomland hardwood forest will be preserved and devoted to conservation uses. This bottomland forest is occupied by a threatened species, the American alligator.

As a result of its analysis and review of potential environmental, technical, and social impacts, the USNRC staff concluded that River Bend Station can be operated with minimal environmental impact.

Question 3

Are there alternative projects which would offer more protection to the environment than the proposed facility without unduly curtailing nonenvironmental benefits?

Response to Question 3

GSU's Baton Rouge service area showed the need for an additional 1900 MW capacity to supply the projected load increases for the 1980's and maintain the 15% reserve capacity required by GSU's membership in the Southwest Power Pool. The following, prepared in 1975, tabulates the GSU system power requirements beginning in 1967 and projects them through 1985:

SYSTEM DEMAND AND RESOURCE CAPABILITY COMPARISON: 1967-1985
Total Capability Resources and Load Responsibility

Year (Summer)	Load Responsibility (MW)	Total Capability, Resources with River Bend Station (MW)	Total Capability, Resources without River Bend Station (MW)
1963	1,531	1,961	1,961
1964	1,712	2,181	2,181
1965	1,832	2,181	2,181
1966	1,914	2,233	2,233
1967	2,200	2,527	2,527
1968	2,259	2,527	2,527
1969	2,686	3,143	3,143
1970	2,886	3,723	3,723
1971	3,139	4,041	4,041
1972	3,348	4,246	4,246
1973	3,546	4,732	4,732
1974	3,678	4,707	4,707
1975	3,866	5,254	5,254
1976	4,076	5,833	5,833
1977	4,361	5,757	5,757
1978	4,681	5,618	5,618
1979	4,981	6,098	6,098
1980	5,281	6,433	6,433
1981	5,631	6,433	6,433
1982	5,981	7,097	6,256
1983	6,331	7,097	6,256
1984	6,681	7,716	6,034
1985	7,031	8,056	6,374

SYSTEM DEMAND AND RESOURCE CAPABILITY COMPARISON: 1967-1985

Total Generating Capacity Resources and Peak Demand

Year (Summer)	Peak Demand (MW)	Generating Capacity (MW) with River Bend Station	Generating Capacity (MW) without River Bend Station
1963	1,531	1,961	1,961
1964	1,712	2,181	2,181
1965	1,832	2,095	2,095
1966	2,049	2,095	2,095
1967	2,300	2,475	2,475
1968	2,554	2,475	2,475
1969	2,851	3,145	3,045
1970	2,039	3,625	3,625
1971	3,285	3,943	3,943
1972	3,603	4,042	4,042
1973	3,790	4,564	4,564
1974	3,896	4,564	4,564
1975	4,096	5,132	5,132
1976	4,296	5,593	5,593
1977	4,596	5,529	5,529
1978	4,896	5,520	5,520
1979	5,196	6,000	6,000
1980	5,496	6,335	6,335
1981	5,846	6,335	6,335
1982	6,196	7,098	6,158
1983	6,546	7,098	6,158
1984	6,896	7,816	5,936
1985	7,246	8,156	6,276

Reserve Margin: 1967-1985

Year (Summer)	Total Capability Resources (MW)	Load Responsibility (MW)	Percent Reserve Margin
1967	2,527	2,200	14.9
1968	2,527	2,529	11.9
1969	3,143	2,686	17.0
1970	3,723	2,886	29.0
1971	4,041	3,139	28.7
1972	4,246	3,348	26.8
1973	4,732	3,546	33.4
1974	4,707	3,678	28.0
1975	5,254	3,866	35.9
1976	5,833	4,076	43.1

Year (Summer)	Total Capability Resources (MW)	Load Responsibility (MW)	Percent Reserve Margin
1977	5,757	4,381	31.4
1978	5,618	4,681	20.0
1979	6,098	4,981	22.4
1980	6,433	5,281	21.8
1981	6,433	5,631	14.2
1982	7,097	5,981	18.7
[w/out River Bend]	[6,256]		[4.6]
1983	7,097	6,331	12.1
[w/out River Bend]	[6,256]		[-1.2]
1984	7,716	6,681	15.5
[w/out River Bend]	[6,034]		[-9.7]
1985	8,056	7,031	14.6
[w/out River Bend]	[6,374]		[-9.3]

Several energy types and sources were considered for the feasibility of producing 1900 MW of electricity. The River Bend Power Plant project was selected from among the alternatives reviewed, optimizing the protection of the environment while fulfilling the requirement for new generating capacity. The energy source alternatives which were reviewed and rejected included:

Fuel Cells

This energy source would require costly fuel reforming and purification processes and expensive metal catalysts; this was not considered feasible until hydrogen would become generally available and/or until efficient high temperature units using impure, low-cost fuels would be developed.

Wind

This energy source would require extensive development of the mechanical design of various structures used to support windmills to assure reliability in the presence of storms and strong winds. For GSU's service area, exploitation of this energy source would require a large number of windmill towers floating in the Gulf of Mexico, posing severe maintenance problems and interference with navigation of the waterways, or require a large number of windmill towers distributed across large areas of land with suitable meteorology, presenting a significant terrestrial environmental impact. This was not considered feasible until this technology could be demonstrated for large scale electric generation.

Solar Energy

The economies of scale relating to the size of the focusing collectors would be limited by shipment factors, manipulation logistics, and resistance to strong winds. These considerations limit the size to 6 foot

diameter focusing collectors. Each collector would then require an area of 28 square feet to produce its 200 watts of electric power. This was not considered a feasible alternative for a 1900 MW power plant since it would require over 10 square miles of land area for collector surface, presenting a significant environmental impact.

Organic Waste

This energy source would require transportation and storage of low density refuse for combustion. This was not considered feasible since the population of the city of Baton Rouge was estimated to generate a quantity of refuse expected to provide less than 3% of the heat required for a 1900 MW power plant.

Magnetohydrodynamics

Requiring high temperatures (4000°F to 5000°F), posing as yet unsolved problems for materials, construction, heat transfer, and removal of nitrogen oxides from effluent, this energy source was not feasible as an alternative energy source for the River Bend power plant.

Electrogasdynamics

This technology would require conversion of very high voltage direct current electricity to a form compatible with the existing power grid, a concept still in the early stages of development.

Controlled Thermonuclear Fusion

This energy source would enjoy a virtually unlimited fuel supply, and its utilization would not generate significant radioactive waste. However, controlled thermonuclear fusion would require very high temperatures, posing yet unsolved problems for materials, construction, and heat transfer, and is not expected to become commercially successful for several decades.

Hydro-Electric

This energy source would require inundation of vast areas of land, given the local topography. This also precluded the development of pumped storage capability.

Geothermal

This would require over 120 geopressure wells developed over a large area of the northern Gulf of Mexico basin, assuming that all forms of energy - heat, pressure, and dissolved natural gas - would be exploited

for electric power generation. Geothermal energy was not considered feasible until problems related to produced water disposal and ground subsidence could be solved.

Energy source alternatives which remained were nuclear fission and the combustion of natural gas, fuel oil, and coal. Plant site alternatives were evaluated for four regions around GSU's three major power demand areas (see the response to Question 4). This evaluation produced several potential sites for the location of this new generation capacity: Site A, located about 15 miles northwest of Baton Rouge on the east bank of the Mississippi River; Site B, located on the west floodplain of the Mississippi River just north of False River; Site D, located about 36 miles northwest of Baton Rouge on the high valley wall of the east side of the Mississippi River; Site E, located on the west floodplain of the Mississippi River opposite Profit Island; Site F, located 14 miles southeast of Baton Rouge on the Amite River; and Sites N&R, located 23 miles northwest of Baton Rouge on the east side of the Mississippi River, on the same property. Sites B, N&R, E, and F were then selected for further examination with respect to fuel and cooling system alternatives. Four site/plant alternatives were considered: a **coal fueled plant**, an **oil fueled plant**, a **gas fueled plant**, and except for Site F, a **nuclear fueled plant**, for a total of 19 site-plant combinations. These site/plant combinations were further broken down into two cooling alternatives each: once-through cooling versus cooling towers as well as cooling towers versus cooling pond for Site F. The detrimental impact on Baton Rouge ambient air quality from the combustion of coal or fuel oil at site F, the substantial effect on terrestrial ecology of the site by construction of a 3800 acre cooling pond, or the impact of cooling tower blowdown on the relatively low flow of the Amite River all eliminated Site F from further consideration. From the 16 remaining plant/site combinations, four optimum alternatives, one for each fuel, were selected for comparison: a nuclear fueled plant at Site N with cooling towers, a coal fueled plant at Site R with once-through cooling, an oil fueled plant at Site R with once-through cooling, and a gas fueled plant at Site E with once-through cooling.

From an environmental standpoint, the aquatic impacts would be identical for any of the alternatives using once-through cooling, and would be much more severe than the aquatic impacts resulting from the alternative with cooling towers. The coal and oil fueled plant alternatives would be expected to discharge between 7.4 and 11.1 tons of sulfur dioxide per hour, between 2.8 and 6.5 tons of nitrogen dioxide, and nearly a ton of particulates per hour of full power operation. Although the gas fueled plant would be relatively clean, with negligible sulfur dioxide and particulates and less than 2 tons per hour of nitrogen dioxide, the uninterrupted availability of gas fuel for power generation in the near future was doubtful. The nuclear fueled plant would be the cleanest, with almost no atmospheric impact except for cooling tower fogging and drift.

The nuclear fueled plant with cooling towers was finally selected as the project offering greater protection to the environment than the alternative projects considered without unduly curtailing non-environmental benefits.

Question 4

Are there alternative sites which would offer more protection to the environment than the proposed facility site without unduly curtailing nonenvironmental benefits?

Response to Question 4

The site upon which River Bend Station is located was selected to minimize the overall environmental impact both during construction and during operation. Seven sites were evaluated for the appropriate location of this new generation capacity. A 1900 MW nuclear plant requires approximately 3,240 cfs of water for once-through cooling, or 60 cfs of water for cooling towers, or 3800 acres for an off-stream cooling pond, while the same size fossil plant requires approximately three-fourths of these amounts. Several rivers in the GSU service area were considered, including the Trinity, Neches, Sabine, Calcasieu, Red, Atchafalaya, Mississippi, Amite and the Pearl. Based on proximity to GSU's three major power demand areas, four regions were evaluated: Region I included the area around the Sabine River between Toledo Bend Dam and Bon Weir; Region II included the area around the Calcasieu River near Lake Charles; Region III included the area around the Amite River south of Denham Springs; and Region IV included the area around the Mississippi River north of Baton Rouge.

The evaluation of favorable locations and energy sources (see response to Question 3) for this needed capacity increase proceeded in a two-part process. First, large areas, or regions, were examined in terms of their ability to support the operation of a power station and the environmental impacts which would result. Second, a number of site and fuel combinations within the most favorable regions were evaluated in detail to determine the most suitable combination. The criteria used in this selection process included the following:

Engineering Factors	Environmental Factors
Power Network Planning	Meteorology
Availability of Cooling Water	Air Quality
Topography	Hydrology
Geology	Water Quality
Seismology	Aquatic Ecology
Transportation	Terrestrial Ecology
Population Density	Land Use
Fuel Availability	

as well as the capability for a particular site to support additional units in the future, the benefit of which would be reflected in land acquisition, site development and transportation costs. Regions I and II were eliminated in terms of power network considerations, both requiring extensive construction of transmission lines to provide power to the Baton area, entailing relatively high financial and environmental costs. Regions III and IV were then scrutinized with respect to the other engineering and environmental factors. Their shared and separate attributes are summarized as follows:

Factors	Region III	Region IV
Availability of Cooling Water	The Amite River can support cooling tower(s) or a cooling pond only; future units may be supportable with a reservoir.	The Mississippi River can support once-through cooling as well as cooling towers with or without a cooling pond; future units are supportable in any combination of cooling water usage.
Transportation	Roads and rail lines are available; the Amite River is not navigable.	Roads and rail lines are available; the Mississippi River is navigable for ship and barge traffic.
Water Quality	The Amite River is soft, slightly acidic water with low total dissolved solids.	The Mississippi River is well buffered, moderately hard, slightly alkaline water with most water quality parameters varying with river discharge and/or season.
General Geology	Areas in this region are influenced by so-called growth and slump fault displacement as well as subsidence from major groundwater withdrawal.	Northern areas of this region are free from the so-called growth and slump fault structures and free from the subsidence resulting from major groundwater withdrawal.
	Both regions are part of the Gulf Coastal Plain geologic province, which is a generally flat lying to gently sloping alluvial plain of low relief except for erosional escarpments. Sediments occur as a series of generally wedge-shaped beds that thicken rapidly toward the south. The sediment beds are interrupted by east-west travelling shear planes caused by gulfward slumping and spreading of the sedimentary masses during deposition and subsequent consolidation. The failure surfaces of these slump faults are curved, being steepest near the ground surface and flattening with depth to become bedding plane slips. Movement has ceased approximately 70,000 years ago on the northernmost fault(s), but continues on the Denham Springs-Scotlandville and Baton Rouge slump faults. Groundwater withdrawal in the Baton Rouge area is causing subsidence, and fault movements may be only near-surface-related movements.	
Seismicity	Both regions are expected to respond to earthquakes in a similar manner. The ground motion resulting from the largest earthquake to have occurred in the seismotectonic or tectonic province (the October 30, 1930 earthquake at Donaldsonville) is calculated as 0.07g, which is below the 0.10g minimum value established by the U.S. Atomic Energy Commission.	
Flood Protection	Floodplain sites would be suitable for fossil fueled plants with less severe flood design criteria. A nuclear fueled plant should be located where the Mississippi River flows near upland areas to avoid extensive earthwork.	
Air Quality	Measurements in the Baton Rouge area indicate that both state and national air quality standards were not being met. Construction of a fossil fueled power plant could contribute additional sulfur dioxide and particulates to the ambient air levels.	
Climate/ Meteorology	Both regions share the same attributes with respect to climate: warm and humid summer, mild winter, early spring, frequency of thunderstorms, tornadoes, hail, and freezes. In common to both regions are monthly average precipitation and prevailing wind speeds and directions which were measured at Ryan Airport.	

Selection of sites from Region III and Region IV was guided by a number of specific criteria designated as primary and secondary criteria. Primary criteria are those where certain minimum conditions must be met to permit development. These include isolation, foundation and geologic conditions, flood protection, effects on ecology, and meteorological conditions. The secondary criteria are those which would affect comparative economics. These include cost for transmission of electricity, availability and cost of gas, fuel oil, or coal at the site for a conventional fossil fueled plant; rail and highway facilities, comparative costs of circulating cooling water development, cost of site preparation and, for nuclear fueled plants, the costs of facilities and means of transportation for larger pieces of equipment. Seven sites were chosen for consideration, six along the Mississippi River and one along the Amite River:

Site A is located about 15 miles northwest of Baton Rouge on the east bank of the Mississippi River; rejected because the safety of river intake and discharge structures could not be assured given the high rate of river bank erosion.

Site B is located on the west floodplain of the Mississippi River just north of False River; rejected as a site for a nuclear fueled plant because the levee system, designed for the 200 year flood, was not designed for earthquakes.

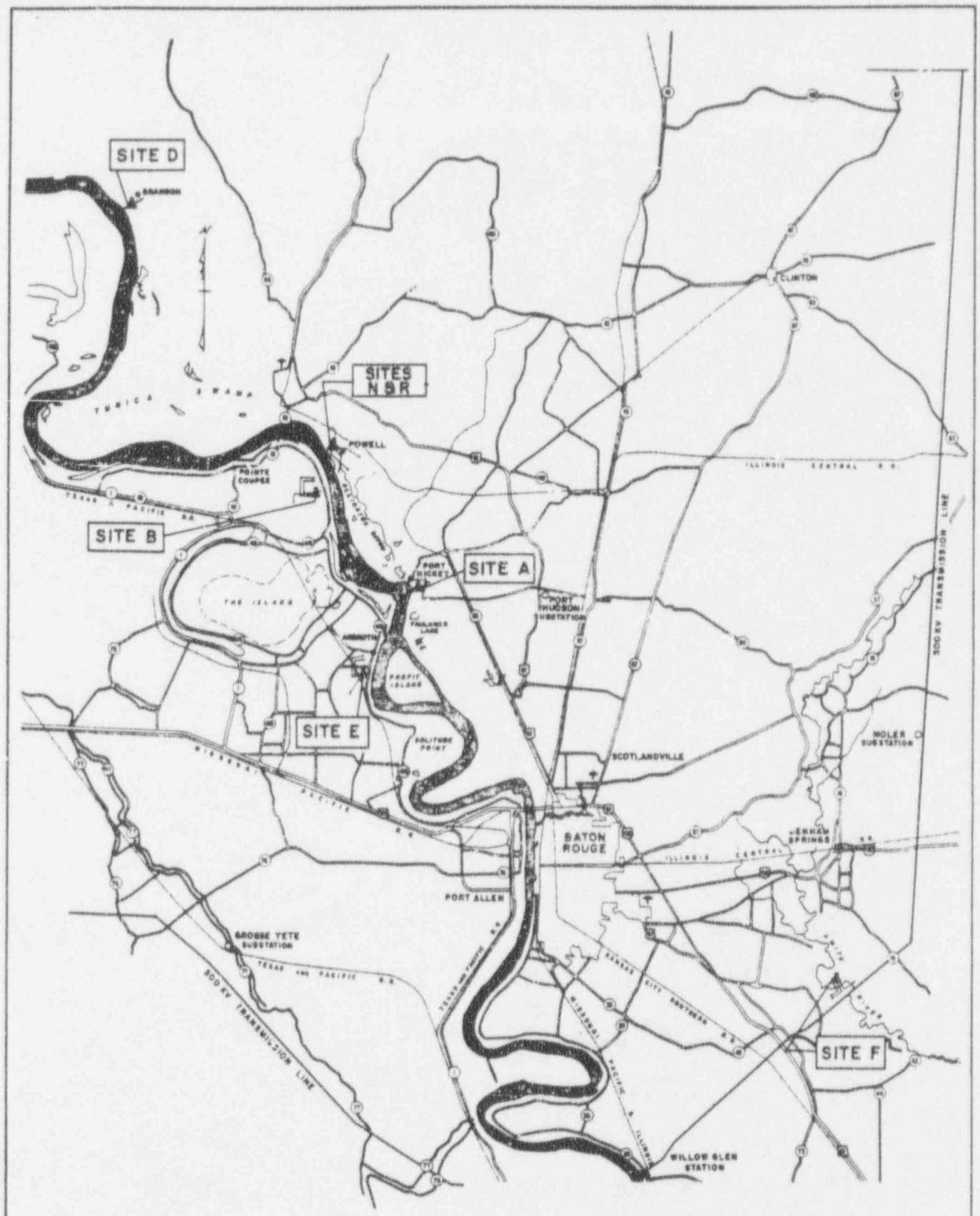
Site D is located about 36 miles northwest of Baton Rouge on the high valley wall of the east side of the Mississippi River; rejected for its proximity to the hospital and penitentiary institutions at Angola and for the extensive grading required to achieve a satisfactory elevation for site development.

Site E is located on the west floodplain of the Mississippi River opposite Profit Island; rejected because the necessary excavation and construction methods for a nuclear fueled plant would be very expensive and would endanger the levees.

Site F is located 14 miles southeast of Baton Rouge on the Amite River, is immediately adjacent to the trace of the Baton Rouge fault whose capability has not yet been established. With loadings about three times those of a fossil fueled plant, specially designed foundations would be required for a nuclear fueled plant. The ecological impact would be greater for this site because the Amite River is more productive than the Mississippi River and a greater portion of the Amite River would be involved than that of the Mississippi River.

Site N&R is located 23 miles northwest of Baton Rouge on the east side of the Mississippi River on the same property. Site R is closer to the edge of the floodplain and would require shorter intake and discharge pipelines. Both N and R would require excavation of low to medium density layers of fine clayey sands in the area under all Seismic Category I structures and backfill with controlled compact granular fill.

Site N was finally selected as the best site for a nuclear fueled plant, affording greater protection of the environment by this facility, without unduly curtailing nonenvironmental benefits.



GENERAL MAP OF SITE LOCATIONS

GULF STATES UTILITIES COMPANY
RIVER BEND STATION
UNITS 1 AND 2

SCALE - MILES

SCALE - FEET - THOUSANDS

Question 5

Are there mitigating measures which would offer more protection to the environment than the facility as proposed without unduly curtailing nonenvironmental benefits?

Response to Question 5

Most of the environmental effects of River Bend Station would be associated with the installation and operation of separately identifiable systems. The major plant systems proposed were compared to their feasible alternatives with respect to economics and the environmental costs of construction and operation. The following tables compare some of the environmental parameters related to installation and operation of the alternative systems with the annualized incramental generation costs (estimated in 1974 for anticipated 1980 costs):

Cooling System Alternatives	Habitat Acres Lost	Total Birds Displaced	Total Mammals Displaced	Incremental Generating Costs (est. for 1980)
Mechanical Draft Cooling Towers	100	3,423	1,078	BASE (proposed system)
Natural Draft Cooling Towers	71	2,560	688	$1,083,000
Round Mechanical Towers	79	2,771	799	$815,000
Spray Pond	166	5,354	1,985	$7,081,000
Dry Towers	170	5,560	2,065	$26,481,000
Once-Through Dilution	63	2,292	895	$4,068,000
Once-Through Spray	91	3,137	1,283	$4,502,000

Intake System Alternatives	Habitat Acres Lost	Total Birds Displaced	Total Mammals Displaced	Incremental Generating Costs (est. for 1980)
Recessed River Intake	30	945	136	BASE (proposed system)
River Siphon	30.2	945	136	$279,800
Thompson Creek Intake	1200	This option would require a dam 2600 feet in length, 60 feet in height, to achieve 23,000 acre-feet of storage.		

Transmission Facilities Alternatives	Miles on New 500 kv Line	Circuit Miles of 230 kv Line	Incremental Generating Costs (est. for 1980)
Proposed Route	60	79	BASE (proposed system)
Alternate - 1	53		$193,000
Alternate - 2	65		
Alternate - 3	56		

Chemical System Discharge Alternatives	Habitat Acreage Lost	Incremental Generating Costs (est. for 1980)
Discharge to the river via the cooling tower blowdown line.	0	BASE (proposed system)
Evaporator, crystallizer, centrifuge.	0.2	$145,300

Mechanical draft towers were originally proposed for River Bend Station, but the round mechanical draft (multifan) towers were finally selected - resulting in fewer animals displaced and less habitat acreage lost.

The recessed river intake originally proposed was retained, a more expensive river siphon was rejected. Also rejected was an environmentally less desirable reservoir impoundment of the Grants Bayou watershed, which was to be replenished by pumping from Thompson Creek during low flow periods to maintain the required water level.

The incorporation of the evaporator, crystallizer, and centrifuge equipment would only reduce the total dissolved solids content of the cooling tower blowdown (approximately 2000 milligrams per liter) by less than 10 milligrams per liter and was, therefore, rejected.

Similarly, the use of microstrainers and filters for cooling tower makeup water was rejected for the proven technology of clarifiers. And the expensive alternatives of evaporation, reverse osmosis, and electrodialysis for boiler water production from well water were all rejected in favor of ion exchange technology for boiler water makeup from well water.