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April 26, 1984

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Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Gustave A. Linenberger
Administrative Judge
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Richard F. Cole
Administrative Judge
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

In the Matter of
Gulf States Utilities Company
(River Bend Station, Units 1 and 2)
Docket Nos. 50-458 and 50-459

Dear Gentlemen:

In light of the interest of other Atomic Safety and Licensing Boards in similar matters, I am forwarding a copy of Applicants' application for a license to permit the receipt, possession, inspection and storage of unirradiated nuclear fuel bundles.

Sincerely,

Mark J. Wetterhahn

Mark J. Wetterhahn
Counsel for Gulf States Utilities Company

MJW/lad
cc: Service List

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April 16, 1984
RBG- 17,593
File Nos. G9.5, G9.34.3

John G. Davis, Director
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Davis:

River Bend Station - Unit 1
Docket No. 50-458
Special Nuclear Material License (Fuel)

Gulf States Utilities Company for itself and on behalf of Cajun Electric Power Cooperative, pursuant to Title 10, Code of Federal Regulations Part 70, is filing herewith eight (8) copies of an application for a license to permit the receipt, possession, inspection and storage of special nuclear material in the form of unirradiated nuclear fuel bundles, and for packaging of such fuel bundles for delivery to a carrier. Also, attached for your convenience are current appropriate FSAR sections that are referenced in the application.

It is requested that the term of this license begin December 1, 1984 and remain in effect until such time as it may be supplanted by a permanent operating license.

The Physical Security Plan for receipt and storage of special nuclear material and proof of financial protection as referenced herein will be forwarded to you at a later date under separate cover.

Your prompt consideration of this application is appreciated. Should you have any questions or require additional information, please contact Mr. Mark W. Henkel of my staff at (409) 838-6631, Ext. 2282.

Sincerely,

J. E. Booker

J. E. Booker
Manager-Engineering
Nuclear Fuels & Licensing
River Bend Nuclear Group

Attachments

RIVER BEND STATION UNIT 1

Application for License

For

Storage Only of

Unirradiated Nuclear Fuel

Gulf States Utilities Company (GSU) for itself and on behalf of Cajun Electric Power Cooperative (Cajun), pursuant to Title 10, Code of Federal Regulations Part 70, hereby applies for a license to permit the receipt, possession, inspection and storage of special nuclear material in the form of unirradiated nuclear fuel bundles, and for the packaging of such fuel bundles for delivery to a carrier. The term of the license is requested to begin December 1, 1984. It is requested that the license remain in effect until such time as it may be supplanted by a permanent operating license.

GENERAL INFORMATION

a. Name of Applicant and Co-owner

For Unit 1, the Applicant is Gulf States Utilities Company, for itself, as owner of an undivided 70% interest in the facility, and as agent for Cajun Electric Power Cooperative, Inc. which will own an undivided 30% interest in the facility.

b. Address of Applicant and Co-owner

Gulf States Utilities Co.
P. O. Box 2951
Beaumont, TX 77704

Cajun Electric Power Cooperative, Inc.
10719 Airline Highway
P. O. Box 15540
Baton Rouge, LA 70895

c. Directors and Principal Officers

The names, addresses, and citizenship of the principal officers for both GSU and Cajun are included with the application for an operating license (General Information) submitted to the Commission on August 25, 1981 (See letter RBG-11,029; Draper to Eisenhut).

d. Absence of Foreign Control

Neither GSU nor Cajun are owned, controlled, or dominated by an alien, a foreign corporation or foreign government.

1.1 REACTOR AND FUEL

1.1.1 Identification of Reactor, Geographic Location, Docket and Construction Permit Numbers.

The application for Special Nuclear Materials (SNM) License is submitted for River Bend Station Unit 1. This General Electric BWR-6 unit has a minimum inner vessel diameter of 218 inches and a rated core thermal power of 2894 MW_t.

River Bend Station Unit 1 is located in West Feliciana Parish, Louisiana, 3 km (2 mi) east of the Mississippi River and approximately 38 km (24 mi) north-northwest of Baton Rouge, Louisiana.

The Construction Permit Application was docketed in September, 1973 with docket number 50-458. On March 23, 1977, Construction Permit Number 145 was issued to Gulf States Utilities for River Bend Station Unit 1.

In 1980, the Nuclear Regulatory Commission (NRC) granted Gulf States Utilities a construction permit allowing Cajun Electric Power Cooperative (CEPCO) to become a thirty percent co-owner in River Bend Station Unit 1. Gulf States Utilities Company is acting project manager and is responsible for the design, construction, and operation of River Bend Station. GSU submits this application for Special Nuclear Materials License on behalf of itself and Cajun in order to adhere to the regulatory requirements stated in 10CFR Part 70.

The Reporting Identification Symbol (RIS) for River Bend Station Unit 1 is XIP.

1.1.2 Fuel Assemblies

Each fuel assembly consists of a square channel enclosing an 8x8 array (bundle) of Zircaloy rods. The fuel bundle may or may not be channeled while in storage. Each bundle consists of sixty-two fuel rods and two water rods for a total of sixty-four rods per bundle. The rods are supported by an upper and lower tie plate cast from Type 304 stainless steel. Eight of the fuel rods on the bundle periphery are tie rods. Both threaded ends of these rods pass through the tie plates and are bolted to support and maintain bundle geometry. Finger springs are located between the lower tie plate and the channel for controlling bypass flow. Each bundle contains two centrally located water rods, one of which is a spacer capture rod designed to provide axial support for seven Zircaloy-4 fuel rod spacers. The spacers contain Alloy X-750 springs. The fuel rod spacers laterally support the bundle rods, maintain rod spacing and geometry, as well as dampen any flow induced vibrations.

The fuel rods contain one-hundred and fifty inches of uranium dioxide fuel pellets, with the top ten inches of the rod serving as a fission gas plenum. The top and bottom six inches of the fuel zone contain natural uranium (0.711 weight percent of U-235) fuel pellets, which serves as a reflector. Some of the fuel rods contain small amounts of gadolinium, a burnable poison. The concentration of gadolinium within selected fuel rods may vary between rods, as well as axially within each rod. The distributed gadolinium serves to flatten the axial and radial power distributions. For the initial core loading, gadolinium-bearing fuel rods are located near the center of the bundle.

The fuel channels are fabricated from Zircaloy-4. The channels prevent cross-flow between bundles, guide and provide a bearing

surface for control rods, and provide rigid lateral support for the fuel bundles. The channel is open at the bottom and makes a sliding seal fit on the lower tie plate surface. At the top of the channel, two diagonally opposite corners have welded tabs, one of which supports the weight of the channel from a raised post on the upper tie plate. The post has a threaded hole to which is attached a channel fastener assembly.

Other pertinent data are as follows:

Fuel pellet diameter, in.	0.410
Cladding inside diameter, in.	0.419
Cladding outside diameter, in.	0.483
Cladding thickness, in.	0.032
Rod pitch, in.	0.636
Water rod inside diameter, in.	0.531
Water rod outside diameter, in.	0.591
Water rod thickness, in.	0.030

Additional information is contained River Bend Station FSAR subsections 4.2.2.1 through 4.2.2.3.6 including all tables and figures referenced therein.

1.1.3 Enrichment

There are five bundle types in the initial core loading of River Bend Station Unit 1. The number of bundles and nominal concentrations are shown below.

Number of Bundles	Bundle Average Enrichment (w/o U-235)	Highest Pin Enrichment (w/o U-235)	Uranium per Bundle (Kg)	U-235 per Bundle (Kg)	Natural Uranium per Bundle (Kg)
76	0.711	0.71	182.985	1.310	184.266
108	0.936	1.20	182.985	1.725	99.504
120	1.633	2.00	182.656	3.004	25.679
280	2.477	3.80	182.403	4.550	14.741
40	2.775	3.60	182.660	5.104	17.475

The fuel bundles contain no U-233, plutonium, depleted uranium, or thorium. The weight of a fuel assembly is approximately 700 pounds (317 Kg). The weight of a fuel bundle is approximately 600 pounds (272 Kg).

1.1.4 Total Nuclear Fuel Material

The license is requested for a maximum of 634 fuel bundles with a total U-235 content not to exceed 2176 Kg, and a natural uranium content not to exceed 32,834 Kg. The total uranium content is not to exceed 116,605 Kg. No licensing request is submitted for U-233, plutonium, depleted uranium, or thorium.

The totals represent an initial core loading of 624 fuel bundles and an allowance for 10 spare fuel bundles with maximum pin enrichments not to exceed 3.80 w/o U-235. For calculation of maximum content, the spare bundles are assumed to have an average enrichment of 2.775 w/o U-235.

1.2 STORAGE CONDITIONS

1.2.1 Storage Locations

There are three principal locations where the fuel bundles or assemblies may be stored. These include (1) New Fuel Storage Vault - Fuel Building, (2) Spent Fuel Pool - Fuel Building, and (3) Fuel Pool - Containment Building. Appropriate descriptions and drawings of these areas are provided in RBS FSAR as referenced in section 1.2.3 below. The relative location of these storage areas are shown in Figures 1 and 2.

Circumstances may arise which could interrupt off-loading and receipt of fuel in the fuel handling area. For example, maintenance or malfunction of the fuel handling crane or construction activities which conflict with fuel receipt could disrupt fuel receiving activities. As a contingency for such a disruption, a temporary storage area outside the fuel building will be provided where fuel may be stored in its original shipping container. This area will be a secure, limited access area controlled in accordance with an Interim Security Plan (see Section 1.2.5) which can be implemented if required at GSU's option.

In addition to the outside temporary storage, fuel may be temporarily stored in the New Fuel Receiving area and fuel handling area during receipt, off-loading, inspection and fuel channeling activities. If equipment malfunctions or other delays occur, one loaded trailer could be parked in the New Fuel Receiving Area. In addition, there exists the possibility of unloading other containers into this area concurrent with the loaded trailer.

Both the Fuel Building and the Containment Building are secure, limited access areas controlled with the Interim Security Plan.

1.2.2 <u>Adjacent Area Activities</u>

Consistent with the administrative controls and restrictions provided in the paragraphs below, no operations other than fuel and component inspection, handling, and storage will be performed in the fuel storage areas. Crane operations will be restricted such that no more than one channeled fuel assembly or equivalent weight per crane will be allowed over storage areas containing fuel. Loaded fuel shipping containers or properly designed overload test weights may be handled in these areas provided that they are at no time suspended over the fuel arrays in storage. Any non-fuel related activities which must be conducted in the fuel handling area will be reviewed and approved by the Shift Supervisor, or his designee.

Any non-fuel activities in the fuel handling area on elevation 113'-0" of the Fuel Building will be restricted as follows during fuel handling:

a) No painting, grinding, sandblasting, or similar activities are allowed.
b) No overhead work is allowed
c) No crane operations other than those required for fuel handling and inspection are allowed.
d) No construction or test activities which may adversely affect fire protection in the fuel handling area are allowed.

When fuel handling activities are not in progress, selected activities such as those above may be performed provided the fuel is protected and the activities are reviewed and approved by the Shift Supervisor or Maintenance Supervisor or their designee.

Activities in other areas of the Fuel Building and Containment Building need not be restricted during any of these periods.

If fuel is stored in the containment fuel storage racks, the above restrictions will also apply to the 186'-3" operating deck in the Containment Building.

1.2.3 Fuel Storage and Handling

1.2.3.1 New Fuel Storage Vault

The new fuel storage vault contains storage space for a maximum of 220 fuel assemblies. The vault contains twenty-two (22) sets of castings, each of which may contain up to ten (10) fuel assemblies. Each set of castings is made up of three tiers which are portioned by fixed box beams (see Figure 3). This arrangement maintains the fuel assemblies in a vertical position supported at the lower and upper tie plates with added lateral support at the center of gravity of the fuel assembly.

The new fuel storage racks are made from aluminum. Materials used for construction are specified in accordance with the applicable ASTM specifications. The material choice is based on a consideration of the susceptibility of various metal combinations to electrochemical reaction. When considering the susceptibility of metals to galvanic corrosion, aluminum and stainless steel are relatively close together insofar as their coupled potential is concerned. The use of stainless steel fasteners in aluminum to avoid detrimental galvanic corrosion is a recommended practice and has been used successfully for many years by the aluminum industry.

The rack is designed to withstand a impact load which could be generated by the vertical free fall of a fuel assembly from the height of 3 feet while maintaining the safety design basis.

The storage rack is designed to withstand the pull-up force of 4,000 lb. and a horizontal force of 1,000 lb. The racks are designed with lead outs to prevent sticking. However, in the event of a stuck fuel assembly, the maximum lifting force of the fuel handling platform grapple (assumes limit switch fail) is 3,000 lb.

The storage rack is designed to withstand horizontal combined loads up to 3 g.

The fuel storage rack is designed to handle non-irradiated, low emission radioactive fuel assemblies. The expected radiation levels are well below the design levels.

The fuel storage rack is designed using non-combustible materials. Plant procedures and inspections assure that combustible materials are restricted from this area. Fire prevention by elimination of combustible materials and fluids is regarded as the prudent approach rather than accommodation and the need for fire suppressant materials which could inhibit or negate criticality control assurances. Therefore, fire accommodation is not considered a problem.

The new fuel storage vault is provided with removable overlapping metal covers to ensure a watertight facility. When not receiving or discharging new fuel, the metal covers will be secured.

The racks are constructed in accordance with the quality assurance requirements of 10CFR50, Appendix B.

The racks are categorized as Safety Class 2 and Seismic Category I.

A complete description of the New Fuel Storage Vault including design criteria is contained in Subsection 9.1.1 of the River Bend FSAR.

1.2.3.2 Spent Fuel Pool Storage - Fuel Building

The spent fuel storage racks in the fuel building contain a storage space sufficient for 3172 fuel assemblies and are designed to withstand all credible static and dynamic loadings to prevent damage to the structure of the racks, and therefore the contained fuel, and to minimize distortion of the racks arrangement. The fuel storage racks in the fuel building use a neutron absorber to maintain subcriticality in a close packed geometric array.

A sufficient quantity of racks will be installed prior to receipt of new fuel on site so that the initial core load can be stored.

The racks are designed to protect the fuel assemblies from excessive physical damage under normal or abnormal conditions.

The racks are constructed in accordance with the Quality Assurance Requirements of 10CFR50, Appendix B.

The rack design precludes the possibility of placing fuel elements within the array other than in the storage spaces provided.

The spent fuel storage racks are categorized as Safety Class 2 and Seismic Category I.

The spent fuel storage facilities are housed within Seismic Category I Structures which are tornado, missile, and flood protected, and are designed to Regulatory Guides 1.13 and 1.29. The spent fuel storage facility is designed in accordance with General Design Criteria 2, 3, 4, 5, 61, 62, and 63.

The spent fuel pool contains two sizes of rack modules: 12 x 13 and 13 x 13 storage cells (Figure 4 and 5). A maximum of 3,172 fuel assemblies may be stored.

The center-to-center spacing for the fuel assemblies within a rack module is 6.28 inches and 8.5 inches between adjacent rows in adjacent rack modules.

Each rack module utilizes individually fabricated cells. The cells are assembled and welded to a grid base. All cells are welded together at the top through an upper grid to form an integral structure (see Figure 6). All structural components of racks are made from type 304 stainless steel. The optimum storage density is provided by the incorporation of neutron-absorbing material between adjacent cells. The neutron poison material is supported along the full length via stainless steel sheets, which additionally form the inside surface of the fuel storage cells.

The storage rack structure is designed to withstand the impact resulting from a falling object possessing 3,800 ft-lb of kinetic energy, which represents the maximum credible fuel drop accident.

The storage rack structure is designed to withstand the uplifting force of 1,100 lb due to fuel handling equipment jamming or maloperation. The racks are designed with lead outs to prevent sticking.

One modified storage rack has the capability of storing fuel assemblies and 9 defective fuel containers.

The spent fuel racks are designed to handle irradiated or unirradiated fuel assemblies. The expected radiation levels are well below the design levels.

If the spent fuel storage pool is not flooded a fire retardant covering will be placed over fuel stored in the racks to prevent the entry of debris or fire suppressant materials.

A complete description of the fuel storage racks in the fuel building is contained in subsection 9.1.2 of the River Bend FSAR.

1.2.3.3 Containment Fuel Storage

The containment fuel storage racks contain storage space sufficient for 30 percent of one full core of fuel assemblies (200 fuel assemblies) and are designed to withstand all credible static and dynamic loadings to prevent damage to the structure of the racks, and therefore the contained fuel, and to minimize distortion of the racks arrangement. The containment fuel storage racks contain twenty (20) sets of castings, each of which may contain up to ten (10) fuel assemblies. Each set of castings is made up of tiers which are portioned by fixed box beams (See Figure 7).

The racks are designed to protect the fuel assemblies from excessive physical damage under normal or abnormal conditions.

The racks are constructed in accordance with the Quality Assurance Requirements of 10CFR50, Appendix B.

The rack arrangement is designed to prevent accidental insertion of the fuel bundles between adjacent racks. The storage rack structure is designed so that the upper tie plate casting cannot be lowered below the top of the upper rack. This prevents any tendency of the fuel bundle jamming on insertion or removal from the rack.

The containment fuel storage racks are categorized as Safety Class 2 and Seismic Category I.

The containment fuel storage facilities are housed within Seismic Category I structures which are tornado, missile, and flood protected, and are designed to Regulatory Guide 1.13 and 1.29. The containment fuel storage facility is designed in accordance with General Design Criteria 2, 3, 4, 5, 61, 62, and 63.

There are three tiers of castings which are positioned by fixed-box beams and cruciforms (see Figure 7). The lower casting supports the weight of the fuel assembly and restricts the lateral movement; the center and top casting restricts lateral movement only of the fuel assembly.

The containment spent fuel storage racks are made from aluminum. Materials used for construction are specified in accordance with the latest issue of applicable ASTM specifications. The material choice is based on a consideration of the susceptibility of various metal combinations to electrochemical reaction. When considering the susceptibility of metals to galvanic corrosion, aluminum and stainless steel are relatively close together insofar as their coupled potential is concerned. The use of stainless steel fasteners in aluminum to avoid detrimental galvanic corrosion is recommended practice and has been used successfully for many years by the aluminum industry.

The center-to-center spacing for the fuel assembly between rows is 12.25 inches. The center-to-center spacing within rows is 7.00 inches. Fuel assembly placement between rows is not possible.

Lead-in and lead-out guides at the top of the racks provide guidance of the fuel assembly during insertion or withdrawal.

The rack is designed to withstand a fuel bundle drop of 4 ft.

The containment spent fuel storage rack is designed to withstand the pullup force of 4,000 lb. and a horizontal force of 1,000 lb. There are no readily

available forces in excess of 1,000 lb. The racks are designed with lead-outs to prevent sticking. However, in the event of a stuck fuel assembly, the maximum lifting force of the refueling platform grapple (assumes limit switches fail) is 3,000 lb.

The storage rack is designed to withstand horizontal combined loads up to 3 g's, well in excess of expected loads.

The fuel storage racks are designed to handle irradiated fuel assemblies. The expected radiation levels are well below the design levels.

If the containment building fuel pool is not flooded, a fire retardant cover will be placed over fuel stored in the racks to prevent the entry of debris or fire suppressant materials whenever fuel handling is not underway.

A complete description of the fuel storage racks in containment is contained in subsection 9.1.2 of the River Bend FSAR.

1.2.3.4 Temporary Storage

As discussed in Section 1.2.1, a temporary outdoor storage area is provided in case unforseen events briefly interrupt fuel receipt and offloading. This area is located North of the Diesel Generator Building (see Figure 8) outside the protected area fence and inside the barrier fence. This temporary storage area will be a secure, limited access area which will be guarded continually when fuel is present in accordance with the Interim Security Plan. As soon as fuel receiving can be resumed, the fuel will be removed from temporary storage and moved to the Fuel Building.

1.2.3.5 Fuel Handling System - Fuel and Containment Buildings

All required fuel handling equipment will be preoperationally tested for safe operation prior to its use for fuel handling activities. The fuel handling equipment and fuel bundles and assemblies are specifically designed for all fuel handling activities described in this application.

A complete description of the Fuel Handling System is contained in subsection 9.1.4 of the River Bend FSAR.

1.2.3.6 Fuel Handling Activities

Upon arrival of a shipment of fuel the following will normally take place:

1. Radiation Protection will perform a preliminary survey on the truck. Reactor Engineering will be notified of any unsatisfactory results identified by the survey.

2. The shipment is then directed from the gate to the New Fuel Receiving Area entrance door located on the North face of the Fuel Building under escort of Radiation Protection personnel.

3. Maintenance will locate the truck and direct the removal of tarps and chains.

4. Radiation Protection will survey the wooden crates.

5. The shipment and shipping containers will be verified to comply with shipping papers presented by the carrier. Reactor Engineering is responsible for evaluation and resolution of discrepancies.

6. Upon proper acceptance of shipping papers and radiation surveys, the truck may be unloaded. If the shipping papers are incorrect, the truck may be unloaded, provided the containers are properly tagged and treated as nonconforming material.

7. Either part or all the shipping containers may be off-loaded outside the fuel building. Those remaining on the trailer will be directed into the New Fuel Receiving Area within the Fuel Building. Transfer of shipping containers off-loaded outside the fuel building to the New Fuel Receiving Area will be made as soon as possible.

During removal of the metal shipping containers from the wooden shipping crates, Radiation Protection will

survey the metal containers. The containers will be hoisted to the Fuel Container Upending Area, 113' elevation, of the Fuel Building using the fuel bridge crane. The fuel may now be readied for inspection, channeling, and storage or inspection and storage. All personnel involved in the inspection operation will be familiar with and adhere to all criticality rules. Inspection, channeling, and storage will proceed in accordance with written procedures as follows:

1. Unpack fuel bundles from the metal shipping containers. Remove the polyethylene sleeves from the fuel bundles prior to inspection. After the polyethylene sleeve is removed, Radiation Protection will perform a survey to ensure no external contamination is present. The sleeves will then be permanently discarded.

2. Move one bundle to the new fuel inspection stand and secure in place on the inspection stand. Move second bundle from the shipping container and secure in place on the inspection stand. Two bundles may be secured on the inspection stand concurrently. Bundle movements will generally be made using the new fuel bridge crane.

3. The inspection will encompass the following categories:
   a. Visual examination
   b. Removal of packing spacers
   c. Dimensional check
   d. Pin enrichment and location check (also gadolinia fuel pins)
   e. Clean all outside surfaces and verify cleanliness of all visible surfaces.

4. The inspected bundles may now be channeled and transported to the new fuel vault or the spent fuel storage pool. The inspected bundles may also be transported to the new fuel vault for storage prior to being channeled.

5. In addition to the fuel handling platform operator, an independent observer will verify the coordinates of the stored fuel in the new fuel vault, the spent fuel storage pool, or in the upper containment pool.

6. The stored fuel in the new fuel vault when the permanent covers are not in place, the spent fuel storage pool when not flooded, or the upper containment pool when not flooded will be covered by a fire retardant material to prevent possible inundation by low density fire extinguisher foam or water mist whenever fuel handing is not underway.

Should a defective new fuel bundle be found, the bundle will be clearly marked and segregated from all non-defective fuel bundles in the new fuel vault or the spent fuel storage pool.

Should a condition arise that would preclude the inspection and subsequent storage of new fuel in the new fuel vault or the spent fuel storage pool, the crated fuel may be diverted, as allowed in 1.2.1, "Storage Locations," to the temporary storage area located within the site boundary. Such temporary storage area will be a secure (fenced), limited access area with security supervision and protection against theft, vandalism and fire hazard (see Figure 8). This temporary storage area will be used, in accordance with the Interim Security Plan, as a surge area in unforseeable events such as the following:

a) Unavailability of the new fuel bridge crane.

b) Necessary construction or test activities affecting fuel handling operations.

Transfer of new fuel stored in the temporary storage or to the new fuel receiving area at elevation 95' will be made as soon as possible. Every effort will be made to minimize the time of storage of new fuel in the temporary storage area.

1.2.3.7 Administrative Controls

The Plant Manager has overall responsibility for special nuclear materials on the River Bend site. The Assistant Plant Manager-Services is responsible for establishing the onsite fuel management program and ensuring that proper controls are applied to all SNM. Individual section supervisors and superintendents will ensure that written procedures are developed and approved for all fuel handling

activities for which they are responsible. Further, they are charged to ensure the activities are performed in accordance with those procedures.

Safety related procedures and instructions that have been determined to possibly constitute an unreviewed safety question are also reviewed by the Facility Review Committee (FRC). The permanent FRC members are:

a. Assistant Plant Manager-Operations
b. Operations Supervisor
c. Assistant Plant Manager-Services
d. General Maintenance Supervisor
e. Rad/Chem Section Supervisor
f. Reactor Engineering Supervisor
g. (Non-voting) Supervisor, Site Engineering
h. (Non-voting) Operations Quality Assurance Supervisor
i. (Non-voting) Nuclear Licensing Representative

Specific approval and authorization responsibilities will be given by one of the following personnel or their designated alternates:

1. Approve fuel movement plans

   Reactor Engineering Supervisor
   Shift Supervisor
   Assistant Plant Manager-Services

2. Authorize and/or direct unloading, movement, storage, and shipping of Fuel

   Reactor Engineering Supervisor
   Shift Supervisor
   Maintenance Supervisor
   Operations Supervisor

3. Approve radiation survey results

   Radiation Protection Supervisor

4. Direct and authorize use of fuel handling equipment

   Maintenance Supervisor
   Shift Supervisor

5. Authorize entry into limited access areas

   Plant Manager
   Assistant Plant Manager - Services
   Assistant Plant Manager - Operations
   Operations Supervisor
   Reactor Engineering Supervisor
   Radiation Protection Supervisor
   Shift Supervisor
   Plant Security Supervisor

6. Approve fuel inspection results

   Maintenance Supervisor
   Reactor Engineering Supervisor

7. SNM accountability

   Reactor Engineering Supervisor

1.2.4 Fire Protection System

1.2.4.1 General Description - Fuel and Containment Buildings

The materials used in construction of the fuel storage area are concrete and steel. The fuel assemblies and fuel racks are also constructed of non-flammable materials. Fire suppression equipment consists of manual water type hose stations and portable fire extinguishers. All ventilation ducts penetrating fire barriers are provided with three (3) hour rated fire dampers with 160°F fusible links.

The fuel building is provided with a zoned detection system arranged to alarm locally, panels 1FPM-PNL15 and 16, and in both control rooms. Automatic sprinklers are provided for the new fuel receiving area, elevation 95', and in general areas of elevation 70' and 113'. Automatic dry pipe sprinklers are installed in the railroad bay. Charcoal filters have individual water spray systems manually actuated by the opening of local valves. Thermistor wire in the charcoal filters provides alarms locally and in both control rooms. Water flow is alarmed locally and in both control rooms by means of local fire detection panels. The containment building is also provided with a zoned detection system which alarms locally, panels 1FPM-PNL4 and 5,

and in both control rooms. Portable extinguishers and water hose stations are provided throughout the containment.

Ventilation systems, including smoke and heat removal systems, are discussed in detail in section 9.4 of the River Bend Station FSAR. Appendix 9A contains the fire hazard's analysis and reference drawings showing the relative location of all fire protection apparatus (i.e. hose stations, extinguishers, etc.) on the refueling floor in containment and in the fuel handling areas in the fuel building.

Construction of the Fire Protection System serving the fuel building and storage areas will be completed prior to the receipt of unirradiated fuel. The Fire Protection System in these areas will also have successfully completed preoperational testing.

1.2.4.2 Fire Protection-Temporary Storage

The following protection and precautions will be taken for storage in the Temporary Storage area:

1. Non-flammable or fire retardent materials will be utilized where possible.
2. Portable fire extinguishers will be located near the stored fuel.
3. There will be a security guard stationed in the area of the fuel with communications to the security access station. Note, this is 24 hour security.
4. The crated fuel will be inspected for fire hazard once every eight hour shift.
5. For fire prevention, a 25 foot space, clear of all vegetation, will be provided around the storage area.
6. If needed, outside fire hydrants with sufficient amount of extra hose are available for fire suppression.

1.2.5 Control of Access to Areas Where Special Nuclear Material is Stored

A description of the controls for prevention of unauthorized access to the fuel storage areas is contained in the Interim Security Plan and is considered security confidential. This plan is submitted under separate cover.

Control of access to temporary storage areas, as discussed in Section 1.2.3.4, is also covered under this plan.

1.3 PHYSICAL PROTECTION

The quantity of U-235 (contained in uranium enriched to 20% or more in the U-235 isotope), or plutonium to be possessed under this license is less than the quantity specified in 10CFR73.1(b) of 10CFR73. Therefore, the physical protection requirements specified therein do not apply. Physical protection is, however, addressed in the Interim Security Plan (submitted under separate cover) for protection of the received, unirradiated fuel bundles.

1.4 TRANSFER OF SPECIAL NUCLEAR MATERIALS

1.4.1 Special Nuclear Material Transport

General Electric Company will be responsible for shipment of fuel from their facility to River Bend Station Unit 1. The fuel will be shipped in approved shipping containers.

1.4.2 Special Nuclear Material Packaging for Transport

General Electric Company will be responsible for proper packaging of fuel for transport from their facility to River Bend Station Unit 1. In the event fuel must be returned to the GE facility, GSU will be responsible for proper packaging of fuel for return shipment. All packaging of fuel by GSU for transport will be done in accordance with 10CFR Part 71.

1.4.3 Special Nuclear Material Control and Accounting Practices

Special nuclear material control and accounting practices implemented by GSU for unirradiated fuel at River Bend Station Unit 1 shall be in accordance with ANSI N15.8, Nuclear Material Control Systems for Nuclear Power Plants.

1.5 FINANCIAL PROTECTION AND INDEMNITY

Proof of financial protection required by 10CFR140.13 will be forwarded at a later date.

HEALTH AND SAFETY

2.1 RADIATION CONTROL

2.1.1 Qualifications

The technical qualifications for personnel with Radiation Protection responsibilities are described in Section 13.1.3 of the FSAR.

2.1.2 Responsibilities

The responsibilities of key Radiation Protection personnel are described in Section 12.5.1.1 of the FSAR.

2.1.3 Training and Experience

The training and experience of Radiation Protection personnel is described in FSAR Section 13.1.3.

2.1.4 Contamination Monitoring

Radiation and contamination monitoring will be performed prior to the initial handling and storage of new fuel. All new fuel that has not been unloaded or unpacked will be handled as contaminated material with all appropriate radiological controls in effect until contamination checks are performed. New fuel will be checked for radioactive contamination by Radiation Protection personnel as part of the new fuel inspection procedure. Swipes or smears will be taken of the fuel in order to obtain a representative sample of the surface contamination of the entire assembly and will be counted for alpha and beta/gamma activity to determine the amount of contamination present. If the amount of contamination is found to exceed allowable limits, the source of contamination will be determined and appropriate decontamination steps will be

initiated as required. The Radiation Protection program outlined in FSAR Section 12.5 describes the procedures and equipment involved in radiological controls.

There should be no significant radiation hazards associated with the unirradiated fuel and the handling and storage of the fuel as outlined above should be sufficient to maintain radiation exposures ALARA.

2.1.5 Instrument Calibration

Portable survey instruments will be calibrated using either approved plant procedures and National Bureau of Standards (NBS) traceable calibration sources or by a contracted calibration service which has been evaluated and placed on the Qualified Suppliers List for safety-related services.

Multichannel analyzers and all other laboratory instrumentation will be calibrated using NBS traceable calibration sources. Functional checks will be performed daily or prior to use to ensure that the instrument is operating properly.

Additional detail on frequencies and methods of calibration of instruments is discussed in Section 12.5.2.2 of the FSAR. Tables 12.5-1 & 12.5-2 of the FSAR contain a list of equipment which will be available for use at River Bend.

2.1.6 Conformance to 10CFR20

The Radiation Protection program consists of policies, procedures, instructions, rules and practices to keep individual radiation exposure within the limits set forth in 10CFR Part 20 "Standards for Protection Against Radiation" and to maintain total radiation exposure of personnel as low as is reasonably achievable (ALARA).

The program assures that Radiation Protection training is provided, that personnel and in-plant area radiation monitoring is performed, that records of training, exposure of personnel and surveys are maintained and that proper instrumentation is available and properly calibrated. The Radiation Protection Program is discussed in Section 12.5 of the FSAR.

Administrative controls will be covered under the sections of the River Bend Station Operations Manual which govern the Radiation Protection Program.

2.1.7 Disposal of Wastes

Any radioactive waste generated in relation to material contained in the license application will be stored on site until authorized for disposal at a commercial waste disposal facility.

2.2 NUCLEAR CRITICALITY SAFETY

2.2.1 Personnel and Training

Reactor Engineering personnel are responsible for nuclear criticality safety related to fuel handling and storage operations. Safety is ensured through a combination of engineered safeguards and written procedures. Training is conducted to ensure that Reactor Engineering personnel are thoroughly familiar with design features and procedures. Qualifications of Reactor Engineering personnel are in accordance with Regulatory Guide 1.8, as described in FSAR Table 1.8-1. The Reactor Engineering Supervisor and the Training Supervisor are responsible for developing and implementing the nuclear criticality safety training program.

2.2.2 Storage of Loaded Shipping Containers

Fuel bundles may be stored in shipping containers. If they are stored in this way, the shipping containers will be stored in an array which is no more active than the array used during shipping. Containers will be stacked no more than three containers high when fuel bundles are contained within. Shipping containers will be located in limited access areas according to the Interim Security Plan submitted under separate cover.

The fuel bundles are shipped in a steel container (182 7/8" x 20 5/8" x 11 ¼") encased in a wooden shipping crate (206 3/4" x 29 3/4" x 31"). One (1) steel container is contained in each wooden shipping crate. Two (2) fuel bundles are contained in each steel container. The container and crate are described in General Electric Company drawing numbers 731E674 and 829E209, respectively.

2.2.3 Nuclear Safety of Storage Location

2.2.3.1 Criticality Control/New Fuel Vault

The calculations of k_{eff} are based upon the geometric arrangements of the fuel array and subcriticality does not depend upon the presence of neutron absorbing materials. The arrangement of fuel assemblies in the fuel storage racks results in k_{eff} below 0.95 in a dry condition or completely flooded with water which has a density of 1 g per cc. To meet the requirements of General Design Criterion 62, geometrically safe configurations of fuel stored in the new fuel array are employed to assure that k_{eff} will not exceed 0.95 if fuel is stored in the dry condition or if the abnormal condition of flooding (water with a density of 1 g/cc) occurs. In the dry condition k_{eff} is maintained equal to or less than 0.95 because of under-moderation. In the flooded condition, the geometry of the fuel storage array ensures the k_{eff} will remain equal to or less than 0.95 due to over-moderation. The floor of each vault is sloped to a low point drain thus removing any water that may be introduced. The design of the fuel racks and vault ensures that water will not be retained in or around a channeled or unchanneled fuel bundle should the vault be flooded and drained.

The new fuel storage vault is provided with 12 separate steel covers. The covers are fabricated from 1/4 inch solid steel checked plate, with one 3/4 inch steel grating attached to the underside of the solid steel checked plate. The covers are permanently attached to the fuel building floor by hinges. The doors are arranged in an overlapping fashion. Gasket material is attached to the fuel building floor providing a seal around the perimeter of the new fuel vault between the covers and the floor. Gasket material is also provided at the lap joint between adjacent doors which effects a watertight facility in conformance with the maximum k_{eff} analysis.

The new fuel storage vault will always be locked closed while new fuel is stored except during activities identified in items 1, 2, and 3 below. The key will be under the control of the Shift Supervisor.

The times at which the new fuel storage vault doors may be unlocked and opened will be administratively restricted to:

1. when new fuel is being moved in or out of the vault,
2. inspections,
3. special nuclear material accounting.

The new fuel storage racks are designed to store the fuel assemblies in an array which is sufficient to maintain a k_{eff} of 0.95 or less in the normal dry condition or abnormal completely water flooded condition. The racks are not designed to maintain a k_{eff} of 0.98 or less under optimum moderation (foam, small droplets, spray or fogging). The condition of optimum moderation is precluded since the new fuel storage vault is provided with a watertight cover consisting of twelve separate steel covers arranged in an overlapping fashion. Administrative controls will be used to preclude entry of sources of optimum moderation into the new fuel storage area during movement of fuel, thereby significantly reducing the probability of such a condition. Fire fighting foam is administratively restricted from use in the fuel building at all times. In addition, the floor of the vault is sloped to a drain to remove any water introduced into the vault. The racks themselves are designed to preclude the inadvertent placement of a fuel assembly in other than the prescribed spacing. The requirements of General Design Criteria 62, "Prevention of Criticality in Fuel Storage and Handling," are satisfied.

No limitation is placed on the size of the new fuel storage array from a criticality standpoint, since all calculations are performed on an infinite basis.

No credit is taken for burnable poisons which may be contained in any fuel bundle.

The minimum center-to-center spacing for the fuel assembly between rows is 12.25 inches. The minimum center-to-center spacing within the rows is 7 inches. Fuel assembly placement between rows is not possible.

A safety evaluation of the new fuel vault storage area is provided in subsection 9.1.1.3 of the River Bend Final Safety Analysis Report (FSAR).

2.2.3.2 Criticality Control/Spent Fuel Pool

The design of the spent fuel storage racks provides for a subcritical multiplication factor (k_{eff}) for both normal and abnormal storage conditions. For normal and abnormal conditions, k_{eff} is equal to or less than 0.95. Normal conditions exist when the fuel storage racks are located in the pool and are covered with a depth of water approximately 28 feet above the stored fuel for radiation shielding and with the maximum number of fuel assemblies or bundles in their design storage position. An abnormal condition may result from

accidental dropping of a fuel assembly or damage caused by the horizontal movement of fuel handling equipment without first disengaging the fuel from the hoisting equipment. To meet the requirements of General Design Criterion 62, geometrically safe configurations of fuel stored in the spent fuel array are employed to assure that k_{eff} does not exceed 0.95 under all normal and abnormal storage conditions.

The spent fuel storage array is such that k_{eff} is less than 0.95 due to the presence of neutron absorber sealed in the rack structure. The design of the fuel, racks, and pools ensures that water will not be retained around an assembly when the pools are flooded and then drained.

The racks are designed to maintain a minimum fuel spacing of 6.22 inches (center-to-center) within a rack module.

Neutron poison is used in the spent fuel racks. No credit is taken for burnable poisons which may be contained in any fuel bundles.

A safety evaluation of the Spent Fuel Pool is provided in subsection 9.1.2.3 of the River Bend FSAR.

Each fuel movement is required by procedure to be confirmed by an independent observer before the movement is considered complete.

2.2.3.3 Criticality Control/Containment Fuel Storage Racks

Containment fuel storage racks are designed to handle irradiated fuel assemblies and would normally be covered with approximately twenty-five feet of water above the top of the fuel to provide sufficient shielding. However, for the initial core loading, new fuel assemblies may be temporarily stored dry in the racks.

Design of the containment fuel storage racks provides for a subcritical multiplication factor (k_{eff}) for both normal and abnormal storage conditions. For normal and abnormal conditions, k_{eff} is equal to or less than 0.95. Normal conditions exist when the fuel storage racks are located in the pool and are covered by approximately twenty-five feet of water for radiation shielding and with the maximum number of fuel assemblies or bundles in their design storage position. An abnormal condition may result from accidental dropping of equipment or damage caused by the horizontal movement of fuel handling equipment. To meet the requirements of General Design

Criterion 62, geometrically safe configurations of fuel, stored in the spent fuel array, are employed to assure that k_{eff} does not exceed 0.95 under all normal and abnormal storage conditions. The geometry of the spent fuel storage array is such that k_{eff} is less than 0.95, due to overmoderation. The design of the fuel, racks, and pools ensures that water will not be retained around the assembly when the pools are flooded and then drained.

The criticality analysis was based on 1 g/cc moderator density and dry storage. Under optimum conditions of fuel geometry and moderation, there exists the possibility that a critical assembly could result from water mists from fire fogging nozzles, fire sprinklers, or from fire suppression foams. Fire fogging nozzles, sprinklers, and foams will be excluded from the fuel handling areas in the containment if fuel is stored dry in the racks.

As further protection, if the containment building fuel pool is not flooded, a fire retardant material will cover the fuel. This cover provides control over potential fuel contamination as well. The times at which the fire retardant covering may be removed will be administratively restricted to:

1. When the pool is flooded.
2. When fuel is being moved in or out of the pool.
3. Inspections.
4. Special nuclear material accounting.

The rack hold-down bolt spacing will maintain minimum spacing of adjacent racks for geometrical reactivity control. The racks are designed to maintain a minimum fuel spacing of 7 inches (center-to-center) within a rack and 12.25 inches from rack to rack.

No neutron poison is used in the upper containment fuel pool or racks. No credit is taken for burnable poisons which may be contained in any fuel bundles.

A safety evaluation of the containment fuel storage areas is provided in subsection 9.1.2.3 of the River Bend FSAR.

Each fuel movement is required by procedure to be confirmed by an independent observer before the movement is considered complete.

2.2.4 Moderation Control

Analyses of the storage areas take into account the effects of full and no moderation. Results show that flooding or lack of moderation produces no adverse effect on nuclear safety. The effects of optimum interspersed moderation and the protective actions taken considering it were discussed in Section 2.2.3.

The storage of fuel in the new fuel vault, spent fuel pool or upper containment refueling pool is such that if the array were flooded and drained, the fuel packaging would not retain water around or within the assemblies.

2.2.5 Maximum Number of Fuel Assemblies Out of Authorized Locations

The maximum number of fuel bundles that will be allowed outside a normal, approved storage location or normal shipping container is three (3). Fuel bundles outside approved storage locations or shipping containers must maintain an edge-to-edge spacing of 12 inches or more from all other fuel. A fuel array of four or more bundles outside approved fuel storage locations or shipping containers is prohibited.

No more than one metal shipping container containing fuel may be opened at any one time, and this container must be closed if all fuel is not immediately removed.

Removal of wooden crates is done only in the enclosed new fuel receiving area at elevation 95'-0". The metal shipping container will be opened only in the fuel handling area (fuel container upending area) at elevation 113'-0". Fuel shipping containers will not be opened in the temporary storage area.

2.2.6 Criticality Accident Requirements - Fuel Handling and Containment Building

Emergency procedures and drills in conjunction with detectors and instrumentation for a criticality accident will be in place prior to fuel arrival on-site. Area radiation monitoring in the area of fuel movement and storage for criticality monitoring will be operable. Additionally, a criticality accident is not credible under the storage and handling conditions previously described. An exemption is requested from the requirements of 10CFR70.24(b) as provided in 70.24(c).

Area radiation monitors in the fuel storage and handling areas are provided to supplement the personnel and area radiation survey provisions of the plant health physics program described

in FSAR section 12.5 to ensure compliance with the personnel radiation protection guidelines of 10CFR20, 10CFR50, 10CFR70, and Regulatory Guides 8.2, 8.8, and 8.12.

The following design criteria are applicable to the permanently installed area radiation monitoring system:

RANGEABILITY - Five decades of range with alarms for alert and high radiation levels and channel failure alarm light. The lower range limit is selected as the lower of the following:

1. The radiation level existing with the plant shutdown (i.e., natural background)

2. One decade lower than the radiation level existing with the plant in operation (i.e., normal background).

The alarm setpoint will be in the second decade of reading or higher.

RESPONSE - Gamma sensitive to photon energies of 80 KeV to 2.5 MeV. The accuracy of all radiation detectors is within ± 20% of the signal leaving the detector over the upper 80% of its dynamic range under normal operating conditions. During accident conditions, overall detector system accuracy is ± 40% at the 95 percent confidence level over the entire operating range, with the precision being within ± 15% for any single measurement level.

RESPONSE TIME - Overall electronic detector system response time from 10 percent to 90 percent of the maximum decade reading shall be less than 3 seconds.

ENERGY DEPENDENCE - The energy response of the detectors is ± 20% over the photon energy range of 80 KeV to 2.5 MeV.

ENVIRONMENTAL DEPENDENCE - The system meets the above requirements for all variations of temperature, pressure, and relative humidity within each area monitored which includes 95 percent relative humidity and temperatures between 32°F and 120°F.

EXPOSURE LIFE - Each detector maintains its characteristics up to an integrated dose of 10^3 rads.

Airborne radioactivity monitoring will be provided in compliance with 10CFR20 and Regulatory Guides 8.2 and 8.8. The purpose of the airborne radioactivity monitoring system is to

monitor the air within an enclosure, by either direct measurement of the enclosure atmosphere or the exhaust air from this enclosure. The system indicates and records the levels of airborne radioactivity, and if abnormal levels occur, actuates alarms. Alarms are provided to alert personnel that airborne radioactivity is at or above the selected set point level to ensure that personnel are not subjected to airborne radioactivity above limits in 10CFR20. The system provides a continuous record of airborne radioactivity levels which will aid operating personnel in maintaining airborne radioactivity as low as reasonably achievable.

A complete description of the radiation protection design features is contained in subsection 12.3 of the River Bend FSAR.

2.3 ACCIDENT ANALYSIS

2.3.1 Fuel Building & Reactor Building

Detailed accident analyses of fuel handling equipment and storage areas are provided in River Bend Station FSAR Sections 9.1.1, 9.1.2, and 9.1.4. The potential for accidents affecting the safety of new fuel in the fuel ha dling and storage areas is limited to the following lifting accidents:

New Fuel Receiving Area

Dropping of a single container containing two fuel assemblies in the new fuel receiving area lifting bay while being lifted by the fuel building bridge crane.

The consequences of this accident would be limited to impact damage to the dropped container and any container impacted in the new fuel receiving area awaiting movement to the fuel container upending area. Fuel damage from this accident would be limited to the possible rupture of fuel rods in the dropped and impacted containers. Since this accident affects only new fuel the consequences would be limited to the potential release of unirradiated uranium dioxide fuel. No potential for a criticality condition exists in this accident since the maximum number of containers is enveloped by the 10CFR71 analysis for the shipping containers.

Fuel Container Upending Area

Dropping of a single container containing two fuel assemblies to the floor at the 113'-0" elevation of the fuel building or falling over of an upended and open fuel container.

The consequences of these handling accidents would be limited to impact damage to the dropped container or fuel assemblies. Fuel damage from these accidents would be limited to the possible rupture of fuel rods in the dropped containers. Since this accident affects only new fuel the consequences would be limited to the potential release of unirradiated uranium dioxide fuel. No potential for a criticality condition exists in this accident since only one container containing at most two fuel assemblies is involved.

Other Accidents

All other handling accidents involve only one fuel assembly and are discussed in FSAR Sections 9.1.1, 9.1.2, and 9.1.4. No overhead load greater than one fuel assembly will be allowed over any fuel storage array or rack which contains new fuel.

The seismic design of the reactor building and the fuel building, and of cranes, racks, and pools precludes the credibility of more severe accidents. In the unlikely event of a dropped new fuel assembly in the storage areas, the consequences affecting safety would be minimal. Due to the spacing of storage arrays, a criticality condition would not be possible under these accident conditions. The consequences of these accidents would be limited to the possible rupture of new fuel rods and subsequent release of unirradiated uranium dioxide fuel.

2.3.2 Temporary Storage Area

To preclude damage from falling objects no construction loads will be allowed over the fuel in the temporary storage area. Also, large crane movements which would allow a potentially failed boom to drop on the stored fuel will be prohibited.