

U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
SPENT FUEL PROJECT OFFICE

ENVIRONMENTAL ASSESSMENT  
RELATED TO THE RENEWAL  
OF THE LICENSE FOR THE  
SURRY INDEPENDENT SPENT FUEL STORAGE INSTALLATION

DOCKET 72-2  
VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)

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ENVIRONMENTAL ASSESSMENT  
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1. INTRODUCTION

1.1 Description of the Proposed Action

The U. S. Nuclear Regulatory Commission (NRC) is considering renewing Virginia Electric and Power Company's (Dominion's) License No. SNM-2501 for the Surry Independent Spent Fuel Storage Installation (ISFSI) located in Surry County, Virginia. By letter dated April 29, 2002, Dominion submitted an application for the renewal of the Surry ISFSI license. The current license expires on July 31, 2006.

As part of the application, Dominion requested an exemption from 10 CFR 72.42(a) which specifies a 20 year license term. The exemption, if granted, would authorize a 40 year license renewal term.

This environmental assessment (EA) is being prepared in accordance with NRC requirements in 10 CFR Part 51 and associated guidance in NRC NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs."

1.2 Previous Environmental Assessments and Supporting Documents

Documents evaluated in the preparation of this EA include: "Environmental Assessment Related to the Construction and Operation of the Surry Dry Cask Independent Spent Fuel Storage Installation", April 1985; "Virginia Electric and Power Company Surry ISFSI Request for Additional Information License Renewal Application," October 6, 2003; "Surry ISFSI License Renewal Application, RAI Response Meeting," September 4, 2003; "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, Supplement 6, Regarding Surry Power Station, Units 1 and 2 ( NUREG-1437), Final Report," November 2002; and "Virginia Electric and Power Company, Surry Independent Spent Fuel Storage Installation, License Renewal Application, Safety Analysis Report and Environmental Report," April 2002.

A complete set of references is listed in Section 9.0 of this EA.

1.3 Need for the Proposed Action

The Surry ISFSI is needed to provide continued spent fuel storage capacity so that the Surry Power Station can continue to generate electricity. The current license will expire July 31, 2006. This renewal is needed to provide an option that allows for interim spent fuel storage and, indirectly, power generation capability, beyond the term of the current ISFSI license to meet future system generating needs. The renewed ISFSI license would permit 20 additional years of storage beyond the current license period. An exemption would allow 20 years of storage beyond the renewal period.

## 2.0 THE PROPOSED ACTION

The proposed action is renewal of the Surry ISFSI license for 20 years. The current expiration date is July 31, 2006. The proposed renewed license expiration date is July 31, 2046.

### 2.1 Description of the ISFSI

The Surry ISFSI is located in Surry County, Virginia, on the south side of the James River, approximately 25 miles upstream of the point where the river enters the Chesapeake Bay (see Figure 2.1). The Surry site consists of approximately 840 acres on Gravel Neck Peninsula. In addition to the ISFSI, the site includes two nuclear reactors and their turbine building, intake and discharge canals, auxiliary buildings, the Gravel Neck Combustion Turbines Stations, and a switchyard.

The Gravel Neck Peninsula is at the approximate upstream limit of saltwater incursion to the James River; upstream of Gravel Neck is a tidal river and downstream is an estuary. The 840-acre site extends as a band across the peninsula. Steep bluffs drop to the river on either side and to the tip of the peninsula, which is low and marshy. Hog Island Wildlife Management Area, a Commonwealth wildlife management area, is located on the tip of the peninsula.

The site is 7 miles south of colonial Williamsburg and 8 miles east-northeast of the town of Surry. Jamestown Island, part of the Colonial National Historic Park, is to the northwest on the northern shore of the James River. The area within 10 miles of the site includes parts of Surry, Isle of Wight, York, and James City Counties, and parts of the cities of Newport News and Williamsburg. The counties surrounding the site are predominantly rural, characterized by farmland, woods, and marshy wetlands. East and south of the site, at distances between 10 and 30 miles, are the urban areas of Hampton, Newport News, Norfolk, and Portsmouth, Virginia, and others, collectively known as Hampton Roads. Figure 2.2 is the Surry Power Station Site vicinity.

The Surry ISFSI is approximately 800 by 800 feet. It is fenced, with an entrance on the south side. The restricted area and the controlled area boundary for the ISFSI is the Surry site boundary. The minimum distance from the ISFSI to the controlled area boundary is approximately 1,500 feet northwest of the ISFSI. The nearest residence is located approximately 1.5 miles from the ISFSI. Figure 2.3 is the Surry Site Plan.

Currently, the facility is licensed to store spent fuel storage casks on three reinforced concrete pads that are 230 feet long, 32 feet wide, and approximately 3.0 feet thick. Two of the three storage pads have been built. Each pad is designed to accommodate 28 casks.

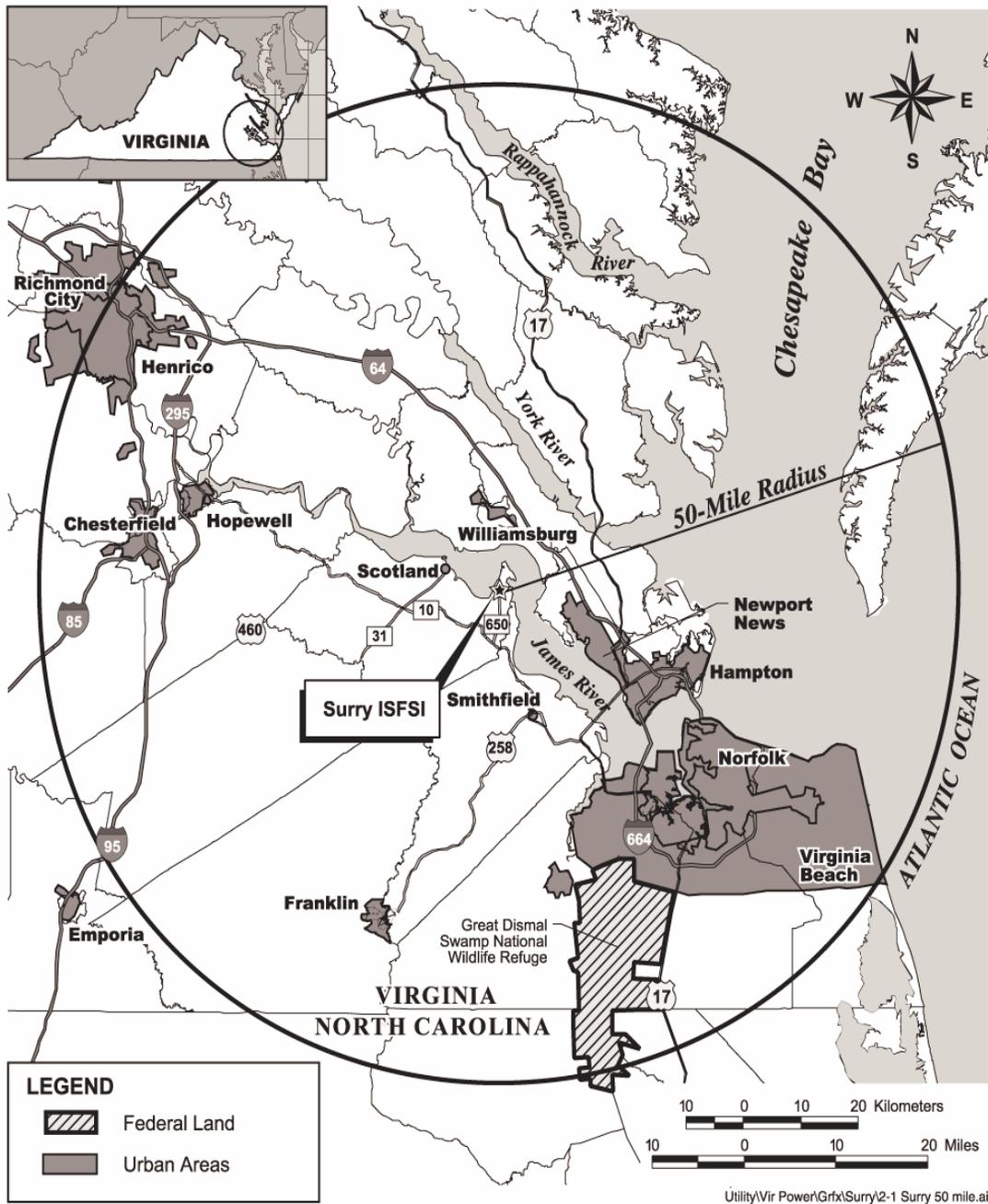


Figure 2.1. 50 Mile Surry Vicinity Map

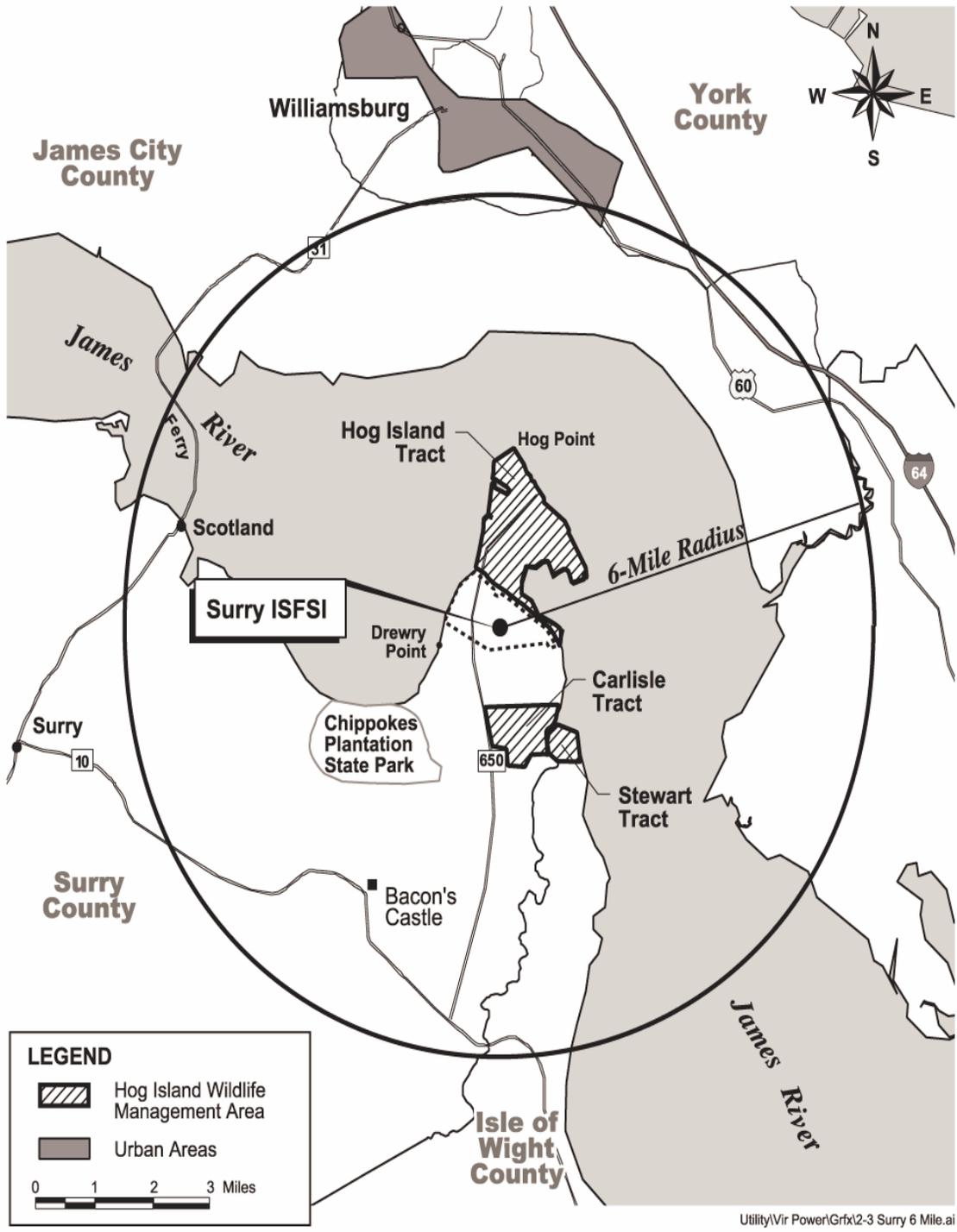


Figure 2.2. Surry Power Station Site Vicinity Map

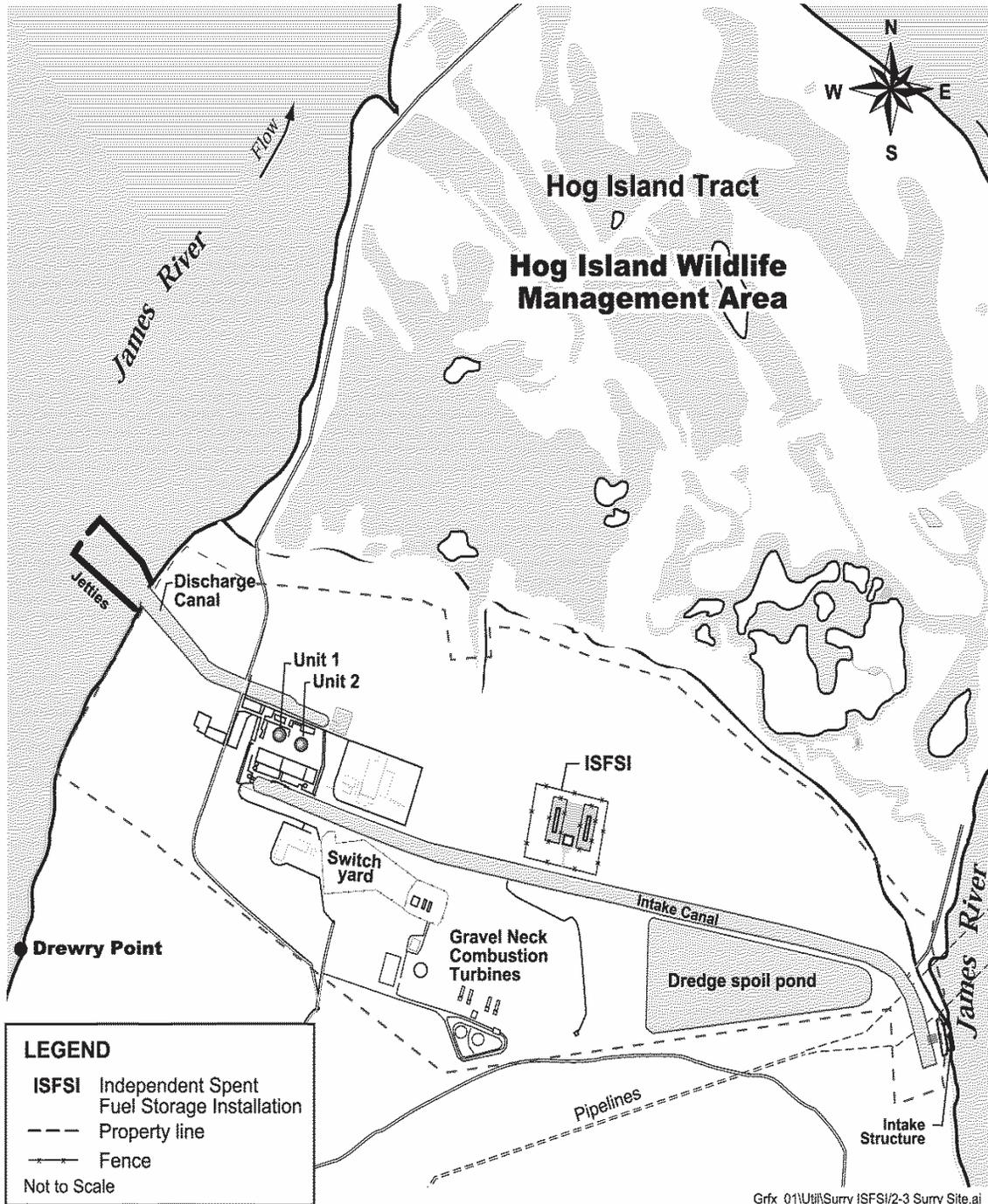


Figure 2.3. Map of Surry ISFSI Site Plan

Compacted areas around the storage pads allow positioning of the handling equipment. These compacted areas are connected via an access road to the ISFSI entrance. The areas surrounding an additional slab would be compacted to properly support the haul vehicle and transport needed for handling the casks.

A low-level waste storage building is located within the ISFSI perimeter, near the entrance and between Pads 1 and 2. Standard metal shipping containers also are stored in the area between the pads, and north of the low-level waste storage building. These containers and the low-level waste storage building are not part of the ISFSI operations and are not part of the license renewal application.

## 2.2 Cask Descriptions

There are five different cask systems licensed for the Surry ISFSI. They are the General Nuclear Systems, Inc., (GNSI) CASTOR V/21 and CASTOR X/33, the Westinghouse MC-10, the NAC INTACT 28 S/T and the Transnuclear, Inc., TN-32. The TN-32 cask is the reference cask specified in the Final Safety Analysis Report (FSAR) (see Figure 2.4).

### CASTOR V/21 CASK

The GNSI CASTOR V/21 cask is a thick-walled nodular cast iron cylinder that is approximately 4.9 m high (192.4 in.), 2.40 m (94.5 in.) in diameter with fins. The side wall thickness without fins is about 379 mm (14.9 in.). The cask is sealed with two lids installed one on top of the other. Both lids are sealed with multiple seals consisting of metal seals and elastomer o-rings. The primary and secondary lids are constructed of stainless steel. The lids are fastened to the body with bolts.

For neutron shielding, two concentric rows of axial holes in the wall of the cask body are filled with polyethylene rods. The bottom and the secondary cover each have a slab of the same material inserted for the same purpose. The cast iron wall of the cask provides gamma radiation shielding.

### CASTOR X/33 CASK

The GNSI CASTOR X/33 cask is a thick-walled ductile cast iron cylinder that is approximately 5.3 m (189.6 in.) high, 2.6 m (93.6 in.) in diameter. The cask is sealed with two stainless steel lids installed one on top of the other and bolted to the cask body. The primary lid is secured to the cask body with 44 bolts. The secondary lid is secured to the cask body with 70 bolts. Both lids are sealed with multiple seals consisting of metal seals and elastomer o-rings.

For improved neutron shielding, one row of axial holes in the wall of the cask body are filled with polyethylene rods. The cast iron wall of the cask provides gamma radiation shielding.

## WESTINGHOUSE MC-10 CASK

The Westinghouse MC-10 cask is a low alloy steel shielded container which is approximately 4.78 m (188 in.) high and 2.24 m (88 in.) in diameter. Three covers are provided to seal the top end of the cask cylinder. A low alloy steel cover with a metallic o-ring provides the initial seal and gamma shielding following fuel loading. A carbon steel cover, with a dual-seal elastomer o-ring and metallic ring, provide the primary containment seal.

The forged steel walls and bottom provide radiation (gamma) shielding and structural integrity.

## NAC INTACT 28 S/T CASK

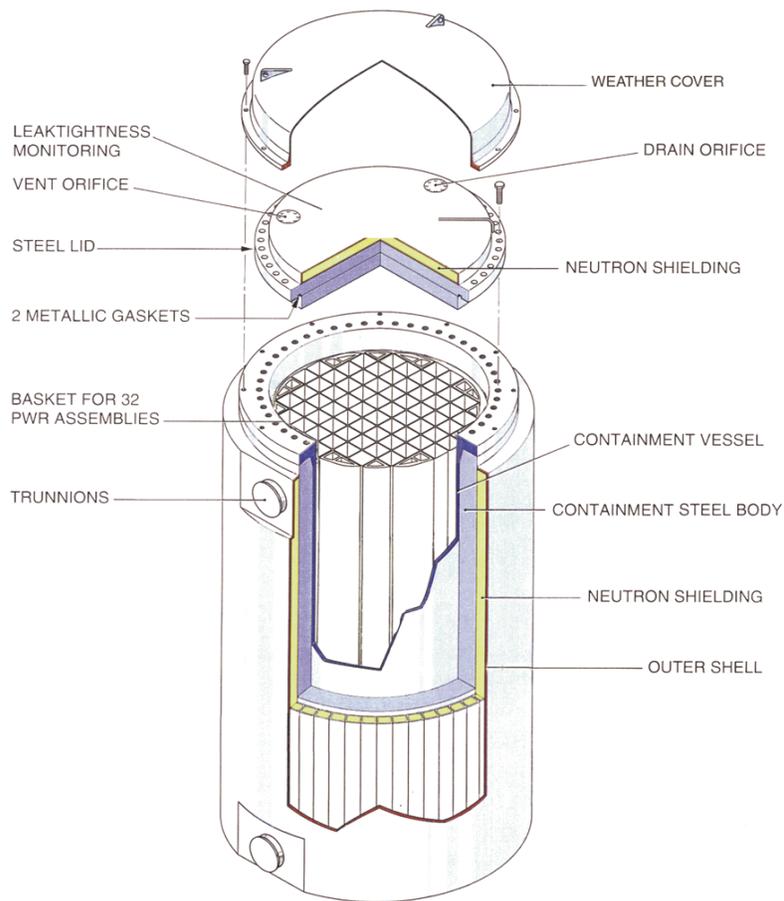
The NAC INTACT 28 S/T cask is a smooth right circular cylinder which is approximately 4.56 m (181 in.) high and 2.39 m (94 in.) in diameter. The upper end of the cask is sealed by an austenitic stainless steel bolted closure lid and has an inner and outer closure plate. The closure lid utilizes a double barrier seal system with two metallic o-rings forming the seals. The lower end of the cask is austenitic stainless steel with an outer closure plate.

The cask has an inner and outer shell of austenitic stainless steel separated by lead gamma shielding. The top end closure plates are separated by two inches of lead gamma shielding. The bottom end closure plates are separated by lead gamma shielding. Neutron emissions from the stored fuel are attenuated by an integral neutron shield located outside the outer shell. Neutron emissions from the top of the cask are attenuated during storage by a neutron shield cap encased in stainless steel.

## TN-32 CASK

The TN-32 cask is a smooth right circular cylinder of multi-wall construction that is approximately 5.6 m (201.6 in.) high and 2.7 m (97.2 in.) in diameter. The cask inner shell and containment vessel is a welded, carbon steel cylinder and has a sprayed metallic aluminum coating for corrosion protection. The cask is sealed with one carbon steel lid bolted to the top flange of the containment vessel. The lid is secured to the cask body with 48 bolts. The lid and lid penetration covers are sealed with metallic o-ring seals.

Surrounding the outside of the containment vessel wall is a steel gamma shield with a wall thickness of 20.3 cm (8.0 in.).



**Figure 2.4. TN-32 Reference Cask**

### 3.0 ALTERNATIVES TO THE PROPOSED ACTION

Possible alternatives to the final action have been considered. Dominion evaluated, and NRC reviewed, a no-action alternative and eleven other alternatives to the Surry ISFSI.

#### 3.1 The No-Action Alternative

Dominion considered the no-action alternative relative to the licensee's request for approval of the Surry ISFSI renewal. Under the no-action alternative, NRC would not renew the Surry ISFSI license. Dominion would not be lawfully allowed to store spent fuel at the ISFSI after July 31, 2006, and would have to remove all spent fuel that is currently stored there. If Dominion could find no other place to store newly generated spent fuel, Dominion would have to cease

operating the Surry Power Station. Shutdown of the Surry Power Station could negatively impact the local economy and infrastructure of the area. For these reasons, the “no action” alternative is not considered a practical alternative.

### 3.2 Other Alternatives

The first alternative was to ship the spent fuel to a permanent federal repository. This is the preferred alternative, but a repository is not likely to be ready to receive spent fuel in time to meet the Surry Power Station spent fuel storage needs. The second alternative was to ship spent fuel to North Anna Power Station. However, this alternative would only provide a short-term solution and could not meet Dominion’s extended spent fuel storage needs.

A third alternative was to increase the storage capacity of the existing spent fuel pool. Dominion has already increased the original capacity of the Surry Power Station spent fuel pool and, prior to applying for Surry ISFSI construction approval, had determined that it could not store more spent fuel in the pool. This determination remains valid; increasing pool capacity is not a reasonable alternative to license renewal.

A fourth option was to construct a new spent fuel storage pool at the Surry Site. Expansion of the pool would necessitate constructing additional fuel and decontamination buildings and pool space and transferring assemblies from existing Surry ISFSI storage casks into the pool. Dominion would later have to remove these assemblies from the pool for packaging into casks for shipment to a federal repository and would have to decontaminate the expanded pool space. Given the increased environmental impacts from construction, increased worker dose, necessary modifications to plant systems, and increased facility maintenance requirements with no identifiable reduction in significant environmental impact, the staff concludes that constructing a new pool at the Surry site offers no environmental advantage over ISFSI license renewal.

The fifth alternative was to ship the spent fuel to a reprocessing facility; however, there is no commercial reprocessing facility in the United States, thus this is not a reasonable alternative. The sixth alternative was to ship spent fuel to a federal interim storage facility, however, as in the fifth alternative, there are no federal interim storage facilities. The seventh alternative was to improve fuel usage and Dominion was participating in a program to extend fuel burnup. However, such operational changes may alter the amount of fuel to be stored, but they do not eliminate the need for storage.

The eighth alternative was to operate Surry at reduced power, however this alternative does not address the need to store spent fuel already generated. The ninth alternative was to ship spent fuel to other utility companies’ reactors for storage, but this is not reasonable because there is no available plant to ship the fuel to. The tenth alternative was construction of an ISFSI at a site away from the Surry Power Station. Dominion proposed to construct an additional ISFSI at North Anna or expand its current ISFSI to contain Surry spent fuel. Given the construction environmental impacts, increased worker dose, and transportation costs, with no significant reduction in operational environmental impacts, Dominion concluded that transfer of the spent fuel to North Anna for storage in an ISFSI does not offer net environmental benefits. As a second part of the tenth alternative, the NRC evaluated the environmental impacts of construction and operating a private ISFSI at the Skull Valley Goshutes Indian Reservation and

concluded that the proposed ISFSI would not reduce the already small environmental effects of spent fuel storage at reactor sites.

The eleventh alternative was to research other technologies for interim disposal of spent nuclear fuel. There are numerous dry storage technologies being evaluated by the NRC. They include different cask designs and storage concepts. This alternative would, however, add additional doses associated with repackaging and is not feasible at this time.

#### 4.0 AFFECTED ENVIRONMENT

A detailed description of the affected environment is found in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 6, Regarding Surry Power Station, Units 1 and 2 (NUREG-1437) dated November 2002, Section 2.2. The following paragraphs summarize the affected environment.

##### 4.1 Land Use

The Surry ISFSI is located in Surry County, Virginia, on the south side of the James River, approximately 25 miles upstream of the point where the river enters the Chesapeake Bay. The Surry site consists of approximately 840 acres on Gravel Neck Peninsula. In addition to the ISFSI, the site includes two nuclear reactors and their turbine building, intake and discharge canals, auxiliary buildings, the Gravel Neck Combustion Turbines Stations, and a switchyard.

The Commonwealth of Virginia mandates that cities and counties have comprehensive land use plans. Surry County, along with the counties south of the James River, have experienced isolation and very slow, even at times negative, population growth over many decades. Surry and surrounding counties south of the James River are predominantly agricultural and rural and characterized by gently rolling hills and some swamp areas. The elevation of Surry County varies from about 30 to 37m (100 to 120ft) above sea level. The County has 720 square km (278 square mi) of land area and 67 square km (26 square mi) of inland waterways. An estimated 75 percent of the county drains through the Blackwater River to the Chowan River and Albermarle Sound on the coast of North Carolina. Streams in the county are very slow running and generally have swampy bottoms.

A Surry County Zoning District Map, published in 1980, shows that the vast majority of the land area of the county is zoned A-R, or Agricultural-Rural Residence District. The remainder is designated other zones, such as R-2 (Vacation Residence District), H-P (Historic Preservation), R-1 (Urban Residence District), B-1 (local Business District), B-2 (General Business District), M-1 (Light Industrial District), and M-2 (General Industrial District). The Surry Power Station is the only M-2 zone in the county.

There are several parks and preserves in Surry County, primarily along the south bank of the James River. Immediately adjacent to Surry Power Station is the Hog Island tract of Hog Island Wildlife Management Area (HIWMA) (zoned A-R), at the north end of the peninsula on which Surry Power Station is located. In addition, south of Surry Power Station are the Carlisle and Stewart tracts of HIWMA. West of Surry Power Station, bordering the James River, is Chippokes Plantation State Park, and further west are Swanns Point and Pipsico Reservations.

Also in the vicinity of Surry Power Station and across the James River are two national parks, northwest is the Jamestown Colonial National Historical Park, and 14 km east-northwest is the Yorktown Colonial National Historical Park. Both of these parks have adjacent attractions that are not part of the national park system. Other major tourist attractions also across the James River include Busch Gardens, Colonial Williamsburg, the college of William and Mary and Water Country. Continued operation of the Surry ISFSI and construction of an additional pad will not cause any adverse impacts to these parks due to natural features and administrative controls employed by the applicant.

#### 4.2 Transportation

There are 49 counties and independent cities within an 80-km (50 mile) radius of Surry Power Station, 44 in Virginia and 5 in North Carolina. In two of the latter counties, the 80-km (50 mile) ring just overlaps a 5-km (3 mile) triangular corner. The area around Surry Power Station is served by several major freeways including Interstate 64, which together with U. S. Highway 60 connects the Newport News, Portsmouth, and Norfolk area with Richmond, and Interstate 95, which runs in a north-south direction west of Surry County through the region and connects Richmond to Washington, D.C. to the north and North Carolina to the south.

The area is traversed by several other Commonwealth and Federal highways, including U. S. Highway 58, running southwest from Newport News. U. S. Highway 460 connects the Suffolk, Portsmouth, and Norfolk areas with Interstate 95 at Petersburg. U. S. Highway 13 runs approximately north-south and connects the eastern shore of Maryland and Virginia to eastern North Carolina, passing through Norfolk and Portsmouth, Virginia.

The most direct vehicular access to Surry Power Station from the more populous cities and counties on the north bank of the James River is via State Highway 31 and the James River Ferry service, operated by the Virginia Department of Transportation 24 hours a day at no cost to motorists. The major northwest-southeast route is State Highway 10 through Prince Georges, Surry, and Isle of Wight counties. This is a main route between the towns of Surry and Smith. Access from the southwest is via State Highways 40 and 31 from Sussex, Southampton, and the surrounding counties.

#### 4.3 Geology, Soils, Groundwater and Seismology

The Surry Power Station site is in the Coastal Plain physiographic province. In the vicinity of the site, the upper 20 to 35 feet of earth consists of layers of sand, silty sand, and organic and inorganic silts and clays. A survey of the site prior to its selection for the ISFSI indicated that subsidence was not a problem. Elevation at the Surry Power Station ranges from 25 to 35 feet above sea level and the water table at the site is 1 to 2 feet above sea level. The site grade for the ISFSI concrete slabs is 35 feet. Surface drainage is from the ISFSI to the James River toward the north. No earthquake within the last 200 years has been large enough to cause structural damage at the site.

#### 4.4 Water Resources

Water is not required at the Surry ISFSI. Potable water is not required because the ISFSI is manned only infrequently, during cask handling operations and inspections. Fire suppression water is not required. No fires other than small electrical fires are considered credible at the

Surry ISFSI. Therefore, the Surry ISFSI does not have a fire protection system other than portable fire extinguishers that are available within the ISFSI. The fire fighting equipment and personnel at the Surry Power Station would be available if needed.

## 4.5 Ecology

### 4.5.1 Aquatic Resources

Approximately 80 fish species are known to inhabit the brackish portion of the river downstream of the Surry Power Station and approximately 40 species have been recorded from the freshwater portion of the river upstream. This diverse mixture of fish is typical for upper estuarine habitat due to the seasonal changes in salinity that occur. In addition to finfish, numerous aquatic invertebrate species are found in the vicinity of Surry Power Station.

In a letter dated November 12, 2003, by the U. S. Fish and Wildlife Service, no Federally listed aquatic species is known to occur in the lower James River. Twenty fish species are listed as threatened or endangered by the Commonwealth of Virginia, but only one of these is reported to occur in Surry County. This species is the blackbanded sunfish (*Enneacanthus chaetodon*). However, this sunfish primarily inhabits thickly vegetated ponds, swamps, and pools and is not reported to occur in the James River drainage.

### 4.5.2 Terrestrial Resources

The terrestrial ecosystem of the Surry Power Station and vicinity contains communities similar to those of the majority of the Virginia and North Carolina coastal plain. Of minor importance in the vicinity of the Surry Power Station are marshy forests with swamp communities dominated by black gum (*Nyssa sylvatica*) and bald cypress (*Taxodium distichum*), with ash (*Fraxinus* spp.), elm (*Ulmus* spp.), and red cedar (*Juniperus virginiana*) as common associates.

The most recreational important species on the Surry Power Station site is the white-tailed deer (*Odocoileus virginianus*). Small mammals, especially rodents, occupy more open habitats, as do birds of prey (e.g., hawks and owls). A total of 37 mammals, 194 birds (the majority of which are associated with forest for forest-edge communities), 43 reptiles, and 34 amphibians species have been identified as present on, or whose range might include, the Surry Power Station site.

No areas designated by the U. S. Fish and Wildlife Service as “critical habitat” for endangered species exist at the site. The only terrestrial community at the site consist of remnants of mixed pine-hardwood forest that were used for timber production prior to the site’s acquisition by Dominion.

Endangered or threatened animal and plant species that could occur (based on habitat and known geographic range) in the vicinity of the ISFSI are the federally-listed threatened bald eagle (*Haliaeetus leucocephalus*) and threatened sensitive joint-vetch (*Aeschynomene virginica*), and the state-listed threatened barking treefrog (*Hyla gratiosa*).

## 4.6 Meteorology, climatology, and air quality

The site is in a climatological transition region between the maritime climate of Norfolk and the continental climate of Richmond. Daily maximum temperatures range from a low of about 8 °C

(46°F) in January to a high of about 31°C (86°F) in July, and daily minimum temperature range from about -2 °C (28 °F) in January to a high of about 20 °C (69 °F) in July. Precipitation is rather uniformly distributed throughout the year, with an annual average of about 111 cm (44 in.). Thunderstorms are occasional in the site region, with a normal occurrence of about 37 per year. Most of these storms occur during the months of May through September.

#### 4.7 Noise and Aesthetics

The Surry Power Station and ISFSI is clearly an industrial site. However, its structures are not visually obtrusive from any vantage point, even from across the James River because the forest is a buffer zone. There is no noise other than from minimal onsite traffic and materials-handling and construction equipment, when in use.

#### 4.8 Historical and Cultural Resources

The Environmental Assessment for the ISFSI construction acknowledged that although the station was located in a historic region, no historical resources have been identified within the boundaries of the site. However, there are numerous historic sites located and recorded in Surry County near the Surry Power Station. Within Surry County, 16 sites are currently listed on the National Register of Historic Places. During the nuclear station license renewal process, Dominion commissioned a cultural resource survey of the property. The survey identified one previously recorded archaeological site on the west side of the property and classified the remainder of the property into one of three categories, based on the potential for archaeological resources. The ISFSI, because it rests on previously disturbed land, was classified as having no potential for cultural resources. The wooded area on the east, south and east sides of the ISFSI were classified as moderate to high potential because they are less disturbed.

#### 4.9 Socioeconomic

The NRC staff reviewed Dominion's Environmental Report for a description of the affected environment for social, economic, and community resources from the ISFSI. Approximately 426,000 people live within 20 miles of Surry, a population density of approximately 350 persons per square mile. Approximately 2,100,000 people live within 50 miles of the Surry ISFSI, a population density of approximately 320 person per square mile. Dominion pays annual property taxes to Surry County for the Surry Power Station, which includes the ISFSI.

#### 4.10 Auxiliary Systems

The only utility provided to the Surry ISFSI is electric power for lighting, general utility, and instrumentation purposes. Annunciator lamps are located on the local ISFSI annunciator. Ventilation, off gas systems, and steam are not required for the Surry ISFSI.

No chemical operations are required for the Surry ISFSI. No chemical storage, handling, processing, or other activity involving chemical reactions is licensed. Major maintenance operations are not licensed. Cask design features minimize or eliminate maintenance. The Surry ISFSI does not include active components such as remotely operated equipment or hot cells. There are no fuel handling facilities exclusively dedicated to the Surry ISFSI. Handling of the fuel and cask loading and decontamination is conducted in the Surry Power Station fuel building.

## 5.0 ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

### 5.1 Radiological Impacts

The staff evaluated radiological impacts from operations to ensure that the radiation dose to both workers and the public is as low as reasonably achievable (ALARA). The Surry Power Station ALARA program, including ISFSI operations, complies with 10 CFR 20.1101, Radiation Protection Programs, and is consistent with Regulatory Guide 8.8, Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Reasonably Achievable.

#### 5.1.1 Sources of Radiation

Neutron and gamma radiation emanating from the shielded casks is the primary source of radiation exposure. The original environmental report analysis assumed a CASTOR V/21 reference storage cask loaded with 21 fuel assemblies with an initial enrichment of 3.5 weight percent U-235, a burn-up of 45,000 megawatt days per metric ton uranium, and a cooling time of 5 years. The current reference cask used in the FSAR for purposes of this analysis is a TN-32 cask loaded with fuel assemblies with an initial enrichment of 3.5 weight percent U-235, a burn-up of 45,000 megawatt days per metric ton uranium, and a cooling time of 7 years.

#### 5.1.2 Occupational Doses

Surry Power Station personnel involved in ISFSI operations will incur the highest occupational doses from the ISFSI because of their proximity to the casks. The collective dose to workers involved in the loading, transport, and emplacement of a single cask was estimated to be 2.65 person-rem, assuming a reference TN-32 cask. The annual collective dose for surveillance and maintenance activities was estimated to be 1.4 persons-rem. The annual dose to Low Level Waste Storage Facility workers from the ISFSI was estimated to be 1.3 person-rem, assuming all three pads were full.

To evaluate the additional annual dose to station personnel from ISFSI operations, the FSAR assumed 84 TN-32 casks in the ISFSI. All workers at the Surry Power Station are assumed to be in offices, non-shielded buildings, or in the plant yard. As a bounding estimate, the total number of workers assumed in the FSAR was 600 spending a total of 1,248,000 man-hours per year in the Surry yard area and in offices. The shortest distance between the Surry Units 1 and 2 perimeter fence and the nearest cask is approximately 2,100 feet. The dose rate from the ISFSI to a yard location 2,100 feet away is 0.001 mrem/hr. The exposure for station workers due to the ISFSI is estimated to be 1.3 person-rem per year. The total annual occupational dose of 11.9 person-rem per year is based on the transfer of three reference casks per year with an ISFSI with 84 reference casks. All estimates indicate that dose rates remain well within the 10 CFR Part 20 and Part 72 limits.

#### 5.1.3 Doses to the Public from Normal Operations

The only doses to members of the public during normal operations will result from gamma and neutron radiation that is emitted from the cask surfaces. The dose rate decreases rapidly as a function of distance from the ISFSI. There are several parks and preserves in Surry County,

primarily along the south bank of the James River. Immediately adjacent to Surry Power Station is the Hog Island tract of Hog Island Wildlife Management Area (HIWMA) (zoned A-R), at the north end of the peninsula on which Surry Power Station is located. In addition, south of Surry Power Station are the Carlisle and Stewart tracts of HIWMA. The west, bordering the James River, is Chippokes Plantation State Park, and further west are Swanns Point and Pipsico Reservations.

The ISFSI licensing basis for the annual dose to the nearest permanent resident, located 1.5 miles from the ISFSI, was based on 84 CASTOR V/21 reference casks. The annual dose calculated for that case was  $6.0 \times 10^{-5}$  mrem, well below the 10 CFR 72.104 limit of 25 mrem per year. The revised calculations based on 84 TN-32 reference casks results in a dose of  $5.6 \times 10^{-5}$  mrem per year, which is less than the original licensing basis. The staff reviewed the calculations and assumptions provided by Surry. Based on these results, normal ISFSI operations will not have a significant offsite radiological impact and will remain well within the 10 CFR 20.1101 and 72.104 limits.

The collective dose to the public from normal operations was conservatively estimated by assuming that all residents within a 2-mile radius of the plant were at the same distance from the ISFSI as the nearest permanent resident. The annual collective dose from 84 TN-32 reference casks to 48 residents within a two-mile radius of the ISFSI is calculated to be  $2.7 \times 10^{-6}$  person-rem, which is several orders of magnitude less than the collective dose from natural background radiation. Typical average individual exposure from background radiation is 360 mrem/yr.

#### 5.1.4 Impacts from Design Events

In its application for renewal, Dominion addresses four categories of design events as defined in ANSI/ANS-57.9, which include normal, off-normal, and accident events. Design Event I represents an event associated with normal operations, such as the normal ambient temperature range; the impacts from such events are similar to impacts due to normal operations at the ISFSI. Category II design events are defined as events which can be expected to occur with moderate frequency. Category III design events are defined as serious occurrences which are expected to happen on an extremely infrequent basis, if ever, during the lifetime of the facility. Category IV design events are defined as maximum hypothetical accidents which are considered not credible. Design Events II through IV are addressed in Dominion's ISFSI FSAR. Dominion's calculated dose to an individual at the nearest site boundary is 84 mrem which is well within the 5 rem criteria in 10 CFR 72.68, which has since been changed to 10 CFR 72.106.

##### Design Event II

The Final Safety Analysis Report (FSAR) defines one off-normal scenario: a total loss of power to the ISFSI. The event could be initiated as a result of natural phenomena, such as lightning or extreme wind, or as a result of undefined disturbances in the non-safety-related portion of the electric power system of the Surry Power Station.

This event would have no safety or radiological consequences, because none of the systems whose failure could be caused by this event are necessary to the safety function of the ISFSI.

### Design Event III

Nine categories of events were analyzed in the Surry Environmental Review. They were earthquakes, extreme winds, flooding, gas cloud explosion, fire, inadvertent loading of a newly discharged fuel assembly, loss of neutron shield, cask seal leakage and cask drops. Each event was reviewed by the NRC and determined to be not credible or have no off-site radiological consequences.

### Design Event IV

The Surry Environmental Review postulated a loss of confinement barrier scenario for a Design Event IV. This event was analyzed, and although not credible, was found to be within regulatory limits.

#### 5.1.5 Doses from Construction Activities

The exposure analysis in the original environmental report estimated that construction of a third pad would result in a collective dose of 78 person-rem to 20 workers. This estimate was based on an average dose rate of 11 millirem per hour and a construction time of 7,090 man-hours. A radiological survey conducted on July 2, 2001, with the second pad approximately 50 percent full, reported a dose rate of 0.33 millirem per hour along the east side of the security fence surrounding Pad 1. This is the closest point at which Pad 3 construction workers would be exposed. The dose rate measured at the east perimeter fence of the ISFSI was 0.122 millirem per hour, which would be the dose rate to workers involved in extending that side of the perimeter fence. Based on these measurements, the collective dose from Pad 3 construction is likely to be 20-30 times lower than the original estimate.

#### 5.1.6 Doses from Decommissioning Activities

Decommissioning the Surry ISFSI could require the removal of the spent fuel from the ISFSI cask and shipment in a licensed shipping container to a suitable fuel repository. Any contamination on the interior of the storage cask would be from crud (Co-60) on the outside of the fuel pins and from crud in the spent fuel pool water. The contamination on the interior of the cask could be removed with a high pressure water spray wash. Consequently, radiation levels from activation products would be negligible. Decommissioning activities would also include surveying the area to determine the levels, if any, of residual radioactive material.

Radiological decommissioning of the ISFSI would be complete when the last cask is removed from the site. Small occupational exposures to workers could occur during decontamination activities, but these exposures would be much less than those associated with cask loading and transfer operations. Due to the design of the sealed surface storage casks, no residual contamination is expected to be left behind on the concrete base pad. The base pad, fence, and peripheral utility structures are defacto decommissioned when the last cask is removed.

The occupational exposure is not significantly increased and offsite dose rates remain well within the 10 CFR Part 20 limits. Therefore, the proposed action now under consideration would not change the potential environmental effects.

## 5.2 Non-radiological Impacts

### 5.2.1 Impacts from Construction

The Surry ISFSI will require one additional storage pad during the license renewal term. The pad would be built on previously disturbed ground adjacent to the existing pads. Best management practices during construction would prevent erosion and sedimentation of surface water. Storm water runoff is diverted to a percolation basin. The ISFSI is approximately 35 feet above the mean sea level at Hampton Roads, Virginia. The pads are approximately 3 feet thick. The Surry Power Station site is 25 to 35 feet above sea level and groundwater is approximately 1 to 2 feet above sea level. Construction of one pad at the ISFSI would not adversely affect the geology, soils, groundwater or surface water of the area.

There could be minor increased noise and dust from the construction of the third pad, but this will be short and will not impact off-site populations.

The perimeter fence might need to be moved about 75 feet into the surrounding woodland. If this occurred an additional two acres would be incorporated into the facility. The woods surrounding the facility are mixed pine/hardwood forest that has been timbered in the past. No threatened or endangered species occur in the immediate vicinity of the ISFSI. Land immediately west of the facility slopes toward a northerly drainage into the wetland of the Hog Island Wildlife Management Area. Surveys for cultural resources have not identified any sites in the potentially affected area, and indicated that there would be no potential for cultural or archaeological resources at the ISFSI.

All Dominion land-disturbing activities are done according to the requirements of permits issued by Surry County. In addition, Dominion has procedures in place for sediment and erosion control best management practices, and for identifying and preserving previously unknown cultural artifacts. All land-disturbing activities at the ISFSI would be conducted using these procedures. For these reasons, any impacts from construction would be small and would not warrant mitigation.

### 5.2.2 Impacts from Operations

There are no liquid discharges from the ISFSI; therefore, no geologic or water resources or aquatic resources would be affected. All storm water runoff is diverted to a percolation basin. There are no air emissions from the ISFSI so air quality would not be affected. All operations, maintenance, and surveillance activities at the ISFSI would be performed by Surry Power Station employees as part of their job. No additional employees would be required to operate the ISFSI.

The presence of the Surry Power Station has had little impact on land use in Surry County. The continued operation of the ISFSI would not affect land use patterns in the county. Federally threatened bald eagles are present at the Surry Power Station site, and nest at the Hog Island Wildlife Management Area immediately north of the ISFSI. NRC is aware of no activities related to continued ISFSI operations during the license renewal term that would adversely affect this species. The ISFSI is located on land that has no potential for unknown cultural resources. Continued operations for the 40 year license renewal would have no adverse effect on historic or cultural resources.

### 5.2.3 Impacts from Decommissioning

The decommissioning plan was included in the license application. Cask decommissioning could be accomplished in two ways: (1) the ISFSI cask, including the spent fuel stored inside, could be shipped to an offsite facility for temporary or permanent storage or, (2) the spent fuel could be removed from the ISFSI cask and shipped in a licensed shipping container to a suitable fuel repository. Nevertheless, minor impacts from noise and dust could also result from dismantling the pad and structures, but they would be much less than similar construction impacts.

### 5.3. Cumulative Impacts

The NRC has evaluated whether cumulative environmental impacts could result from the incremental impacts to the proposed action when added to other past, present, or reasonable foreseeable future actions in the area. The NRC approval of the proposed license renewal, when combined with known effects on notable resources areas at the site, is not anticipated to result in any cumulative impacts.

### 5.4 Monitoring

The NRC has reviewed the Surry Environmental Report for mitigation measures and has determined that impacts are small and might not require mitigation. Current operations include mitigation activities that would continue during the term of the license renewal. Dominion performs routine mitigation and associated monitoring activities to ensure the safety of workers, the public, and the environment. These activities include the radiological environmental monitoring program conducted for Surry Power Station and the Surry ISFSI, periodic monitoring of the casks and preventative maintenance as necessary, monitoring and maintenance of the perimeter and security fences, and maintenance of the grounds on which the ISFSI is located.

## 6.0 AGENCIES AND PERSONS CONSULTED

In accordance with NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," the NRC staff consulted with several other agencies regarding the proposed action. These consultations were intended to afford the designated agency the opportunity to comment on the proposed action.

- 6.1 Arthur S. Warren, Chief, Radiological Planning, Virginia Department of Emergency Services, 10501 Trade Court Richmond, VA 23236-3713, Phone (804)897-6500 ext 6587 Fax (804)897-6526.

On October 16, 2003, the NRC staff discussed its preliminary findings with Mr. Arthur S. Warren of Virginia Department of Emergency Services and requested him to provide comments on behalf of the State of Virginia. A follow-up letter was sent on October 26, 2003. Mr. Warren provided a letter dated January 23, 2004 which advised that the Commonwealth of Virginia concurs with the NRC findings regarding the environmental assessment in accordance with the requirements of the National Environmental Policy Act, as specified in 10 CFR 51.10.

- 6.2 Ethel Eaton, Manager of Review and Compliance, Department of Historic Resources, 2801 Kensington Avenue, Richmond, VA 23221, Phone: 804-367-2323, Fax: 804-367-2391.

On October 16, 2003, the NRC staff discussed the preliminary findings of this EA with Ms. Ethel Eaton of the Virginia State Department of Historic Resources and received verbal concurrence. The staff determined that there are historical properties present in the vicinity of the facility; however, the staff concluded that the proposed action will not adversely affect these historic properties.

- 6.3 Eric Davis, Virginia Field Office, U.S. Fish and Wildlife Service (FWS), 6669 Short Lane Gloucester, VA 23061, Phone: 804-693-6694, Fax: 804-693-9032, E-mail: [FW5ES\\_VAFO@fws.gov](mailto:FW5ES_VAFO@fws.gov)

On October 17, 2003, the NRC staff requested that the FWS provide an official species list for the Surry Site and vicinity. A follow-up letter was sent regarding this request on October 29, 2003. On November 12, 2003, the FWS transmitted that official species list. The NRC staff has determined that Section 7 consultation is not required because the proposed action will not affect listed species or critical habitat.

- 6.4 The Surry Power Station ISFSI is located within the Virginia Department of Environmental Quality (VDEQ) federally approved coastal zone management program area (Tidewater, VA). The Coastal Zone Management Act requires applicants for Federal licenses conducting an activity in a coastal zone to provide the licensing agency a certification that the proposed activity complies with the State's federally approved coastal zone management plan.

On Nov 20, 2003, Dominion submitted to NRC a copy of the certification to VDEQ that the proposed action is consistent with the VA Coastal Management Plan. VDEQ concurred with staff's conclusions by letter dated December 18, 2003.

## 7.0 CONCLUSIONS

The NRC concludes that the renewal of the Surry Power Station ISFSI will not result in a significant impact to the environment. There could be minor impacts of increased noise and dust from the construction of the third pad, but this will be short and will not impact off-site populations. The extra workers needed during the construction phase would be minimal without an adverse impact on the demographics of the area.

There will be no significant environmental impacts from routine operations of the ISFSI. No liquid or gaseous effluents will be released from the storage casks. The dose rates from the spent fuel will be limited by the design of the storage cask. Occupational doses to workers may increase slightly due to work associated with construction of the third pad, loading, transferring and storing the casks, but all occupational doses must be maintained less than the limits specified in 10 CFR Part 20 and must be kept ALARA, in accordance with Surry Power Station's radiation protection program.

The environmental impacts of the proposed action have been reviewed in accordance with the requirements set forth in 10 CFR Part 51. On the basis of this Environmental Assessment, the

NRC has determined that the storage of spent nuclear fuel at the Surry Power Station will not significantly affect the quality of the human environment; therefore, an environmental impact statement is not warranted for the proposed action, and pursuant to 10 CFR 51.31 a Finding of No Significant Impact is appropriate.

Further details related to this proposed action are provided in the license application, dated April 29, 2002, and the staff's EA, dated February 2005. As of October 25, 2004, the NRC initiated an additional security review of publicly available documents to ensure that potentially sensitive information is removed from the Agencywide Documents and Management System (ADAMS) database accessible through the NRC's Web site. Interested members of the public should check the NRC's Web pages for updates on the availability of documents through the ADAMS system. Copies of the referenced documents are available for review and/or copying at the NRC Public Document Room after resumption of public access to ADAMS. The NRC Public Document Room (PDR) Reference staff can be contacted at 1-800-397-4209, 301-415-4737 or by email to [pdrc@nrc.gov](mailto:pdrc@nrc.gov).

#### 8.0 LIST OF PREPARER(S)

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Kimberly J. Hardin, Nuclear Engineer, Spent Fuel Project Office, NMSS

#### 9.0 LIST OF REFERENCES

1. Environmental Assessment by the US Nuclear Regulatory Commission for the Renewal of Surry Power Station, Letter to Arthur S. Warren, Chief, Radiological Planning, Virginia Department of Emergency Services, 10501 Trade Court Richmond, VA 23236-3713, Phone (804)897-6500 ext 6587 FX (804)897-6526 dated October 26, 2003, (Accession No. ML033030068).
2. Letter from Arthur S. Warren, Manager, Radiological Emergency Response, Commonwealth of Virginia, Department of Emergency Management, dated January 23, 2004, (Accession No. ML040300312).
3. Request for Concurrence on the Determination of Effects on Historic Properties for the renewal of Surry Power Station Independent Spent fuel Storage Installation, Letter to Ms. Kathleen Kilpatrick, Department of Historic Resources, 2801 Kensington Avenue, Richmond, VA 23221, Phone: 804-367-2323, Fax: 804-367-2391, Dated October 29, 2003, (Accession No. ML033030009).
4. Request for Information Regarding Endangered Species and Critical Habitat For The Renewal of Surry Independent Spent Fuel Storage Installation, Letter to Eric Davis, Virginia Field Office, U.S. Fish and Wildlife Service (FWS), 6669 Short Lane Gloucester, VA 23061, Phone: 804-693-6694, Fax: 804-693-9032, E-mail: [FW5ES\\_VAFO@fws.gov](mailto:FW5ES_VAFO@fws.gov), dated October 29, 2003, (Accession No. ML 033030027).
5. Letter from United States Department of the Interior, Fish and Wildlife Service, Dated November, 12, 2003 (Accession No. ML033280030).

6. Letter from Pamela F. Faggert, Vice President and Chief Environmental Officer, Virginia Department of Environmental Quality, dated December 18, 2003, (Accession No. ML040270240).
7. Letter from Dominion to Virginia Department of Environmental Quality, "Federal Consistency Certification under the Coastal Zone Management Act Virginia Coastal Resources Management Program Surry Independent Spent Fuel Storage Installation - License Renewal Application," dated November 20, 2003, (Accession No. ML040510226).
8. Virginia Electric and Power Company Surry ISFSI Request for Additional Information License Renewal Application, October 6, 2003.
9. Surry ISFSI License Renewal Application, RAI Response Meeting, September 4, 2003.
10. U. S. Nuclear Regulatory Commission, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs (NUREG-1748), Final Report, August 2003.
11. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, Supplement 6, Regarding Surry Power Station, Units 1 and 2 ( NUREG-1437), Final Report, November 2002.
12. Virginia Electric and Power Company, Surry Independent Spent Fuel Storage Installation, License Renewal Application, Safety Analysis Report, April 2002.
13. Virginia Electric and Power Company, Surry Independent Spent Fuel Storage Installation, License Renewal Application, Environmental Report, April 2002.
14. Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations (ISFSIs), March 2001.
15. Topical Safety Analysis Report for the CASTOR V/21 Cask Independent Spent Fuel Storage Installation (Dry Storage), Revision 2A, General Nuclear Systems, Inc., June 1987.
16. Topical Safety Analysis Report for the Westinghouse MC-10 Cask for an Independent Spent Fuel Storage Installation (Dry Storage), Revision 2A, Westinghouse Nuclear Energy Systems, November 1987.
17. Topical Safety Analysis Report for the NAC Storage/Transport Cask Containing 28 Intact Fuel Assemblies for Use at an Independent Spent Fuel Storage Installation, Revision 1A, Nuclear Assurance Corporation, June 1990.
18. Topical Safety Analysis Report for the CASTOR X Cask for an Independent Spent Fuel Storage Installation (Dry Storage), Revision 4, General Nuclear Systems, Inc., September 1990.
19. Environmental Assessment Related to the Construction and Operation of the Surry Dry Cask Independent Spent Fuel Storage Installation, April 1985.

20. TN-32 Dry Storage Cask Topical Safety Report, Revision 9A, Transnuclear, Inc., December 1996.
21. Code of Federal Regulations, Title 40, Protection of the Environment. Chapter V, Council on Environmental Quality.
22. Code of Federal Regulations, Title 10, Energy, Part 20, "Standards for Protection Against Radiation."
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24. Atomic Energy Act of 1954, 42 USC 2011 et seq.
25. National Environmental Policy Act of 1969, as amended, 42 USC 4321 et seq.
26. National Historic Preservation Act of 1966, as amended, 16 USC 470 et seq.
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28. U.S. EPA. Radiological Quality of the Environment in the United States, 1977. EPA 520/1-77-009.
29. National Council on Radiation Protection and Measurements. Exposure of the Population in the United States and Canada from Natural Background Radiation. NCRP Report No. 94. 1987.