ENVIRONMENTAL IMPACT APPRAISAL BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NOS. 45 AND 45 TO

FACILITY LICENSE NOS. DPR-32 AND DPR-37

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION UNITS 1 AND 2

DOCKET NOS. 50-280 AND 50-281

Description of Proposed Action

By letter dated May 16, 1977, as supplemented February 6, April 17, May 18, and August 18, 1978, Virginia Electric and Power Company (the licensee) requested amendments to Section 4.13 of non-radiological environmental technical specifications, Appendix A, for Surry Power Station, Units 1 and 2. The licensee proposes to delete the biological monitoring program and reduce temperature and salinity monitoring and impingement sampling. We propose to modify the licensee's proposal by maintaining a low-level fish sampling program in the estuary to complement the impingement monitoring. The licensee has agreed to this modification.

This appraisal reviews the impact of and provides a basis for deleting Specification 4.13B (except for a low-intensity fish sampling program to complement the impingement monitoring) and reducing the sampling required by Specification 4.13A and 4.13E.

Environmental Impact of Proposed Action

Our Final Environmental Statement (FES) for Surry Power Station, Unit 2, recommended that several monitoring programs be required as part of that operating license. The licensee was required to determine:

1. The relationship between the thermal discharge and the physical and chemical characteristics of the water mass within a 10-mile segment of the James River.

2. The planktonic, nektonic, and benthic characteristics of this segment.

3. The effects of the operation of the Surry Power Station on the physical, chemical and biological variables in the James River Estuary.

This monitoring program was to continue for three years after Unit 2 was licensed to operate or, if significant impact were demonstrated, as long as required to interpret the impact. Based on data collected for more than five years under this program combined with the pre-operational data which have documented cyclic, short-term natural variations in the estuary, we conclude that combined operation of Surry Power Station Units 1 and 2, is not causing a significant adverse impact on any segment of the biota as described below.

4.13A

Specification 4.13A requires intensive monitoring of temperature and salinity to determine the relationship between the thermal discharge and the physical-chemical characteristics of the water mass within a 10-mile tidal segment of the James River. The licensee proposes to delete requirements to monitor and record salinity continuously at the intake and to monitor and record temperature continuously at monitoring stations along the 10-mile segment of the estuary near Surry. A less stringent monitoring program is proposed which would eliminate all of the permanent temperature and salinity monitoring stations in the James River, but would maintain the monthly temperature and salinity boat cruises presently being conducted, as well as the continuous temperature measurements taken at the intake and discharge.

We have reviewed the results of the present monitoring program and have concluded that further monitoring is not required. The FES stated that operation of Surry would probably result in destruction of the density stratification upstream from the intake point. This would cause this portion of the river to behave like a well-mixed estuary. Because of the importance of density stratification and density flow to estuarine species, the staff was concerned that any alteration of the natural salt transport and salinity stratification scheme in the estuary could result in a significant impact on the biota in the James River. Although stratification may have been altered, no changes in community structure have been observed in the river that could be attributed to the salinity changes resulting from station operation (see following discussion).

The thermal plume predictions in the FES were based on the preoperational mathematical and physical model studies. The predictions were more severe than those actually measured in the field. The thermal plume was predicted to extend over the entire width of the river in some cases. In the field, however, increases in temperature were rarely measurable beyond a point halfway across the river. The thermal discharge is quickly mixed in the James River and beyond 1,000 yards from the discharge, water temperatures were not found to be higher than those which occur naturally. The hydro-thermal studies were designed to support the biological monitoring program which examines the environmental effects of the heated discharge. To date,

no significant adverse impacts on any segment of the biota have been documented (see following discussion). In spite of some short-comings in the hydro-thermal studies at Surry, there is a valuable and substantial data base from which to adequately draw conclusions concerning the plant's hydro-thermal effects. We conclude that the licensee's proposal for relief from the specified thermal and salinity ETS is acceptable because the reduced program will adequately monitor impacts.

4.13B

Specification 4.13B requires that a biological monitoring program be conducted in conjunction with the physical and chemical monitoring programs. Sampling is required for plankton, the attached benthic community, epibenthos, nekton and planktonic organisms. The purpose of this sampling program is to determine the planktonic, nektonic and benthic characteristics of the tidal segment centered at Hog Island and to determine biological changes that occur as a result of the operation of the Surry Power Station.

Phytoplankton

Since 1973 phytoplankton samples have been collected at a minimum of six stations in the river as well as at stations in the intake and discharge canals. The samples are analyzed to determine both the dominant genera of the community and the chlorphyll "a" content. Measurements of primary productivity have been made at three stations between May 1971 and April 1972 and from 1975 to the present. Preoperational studies showed that the oligohaline or transition zone of the James River near Hog Island is one of low productivity. High turbidity, which limits light penetration, confines photosynthesis to the surface, while respiration occurs at all depths. Also, population levels are naturally low in the transition zone (the interface between fresh and salt water) because fluctuating salinity concentration makes it a relatively hostile environment for all but the hardiest of species.

Community structure in the James River has been generally similar in all years of the study. Dominant genera include four diatoms and one cryptophyte. The lowest densities occur in January and the highest in June and August each year. As might be expected, periodic within-community dominance shifts occur which are related to salinity fluctuations in the transition zone. Extreme, but natural variability within species is the rule rather than the exception.

With such extreme natural variability, no effect on community structure could be identified as attributable to the thermal effluent. The Staff in the FES predicted that exposure of phytoplankton to elevated temperatures during

condenser passage and entrainment in the thermal plume might change the composition of the phytoplankton community toward more heat-tolerant forms, particularly the blue-green algae. While the presence of blue-green algae species was noted both before and during plant operation, no evidence collected suggests that a shift toward nuisance species of phytoplankton have occurred or are likely to occur.

All studies to date have not detected any significant adverse effects on phytoplankton density, productivity or community structure as a result of plant operation and none are expected in the future. Thus, we conclude that the phytoplankton sampling program may be deleted.

Zooplankton

Surface zooplankton samples have been collected by tows at a minimum of seven stations since 1972. Throughout the study there was a scarcity of zooplankton, a finding that is not unexpected since it is typical of most turbid estuarine transition zones where only the most tolerant fresh and salt water species can coexist. The James River zooplankton community is composed of two groups: the true zooplankton (holoplankton) and the meroplankton. Meroplankton are those forms having a temporary planktonic stage (eggs, larvae, etc.) in their life cycle. Included are temporary planktonic stages of true benthic organisms and invertebrates such as the blue crab, as well as fish eggs and larvae. Few eggs are found in the vicinity of Surry Power Station because of the true estuarine forms generally spawn downriver where salinities are higher than 5 ppt, while the freshwater and anadromous forms spawn upriver from the 0.5 ppt isohaline. Freshwater inflow and tidal action, however, result in limited numbers of eggs of both estuarine and freshwater forms present in the transition zone. Larval stages of several species, transported by tidal action, are found in the transition zone.

The holoplankton present in the transition zone are usually dominated by cyclopoid and calanoid copepod nauplii. Rotifers and cladocerans are present in small numbers during the whole year but are most abundant during periods of low salinity. Seasonal pulses of meroplankton larvae of gastropods, polychaetes and pelecypods occurred during normal reproductive seasons from spring through late fall. The only apparent effect of the Surry discharge was an addition of barnacle nauplii to the river in August and September (however, this is not considered to be a nuisance species and therefore not an adverse impact).

Statistical analyses performed by the licensee indicate that considerable variability in abundance was found within and between stations both in and out of the thermal plume. Variation also occurred over depth, tide and time of day as well as over months and seasons. From such analysis, it is

concluded that operation of the Surry Power Station is not having a detectable adverse environmental impact on the zooplankton of the oligohaline zone of the James River. Therefore, we conclude that the zooplankton monitoring program may be terminated.

Attached Benthic Community

A series of fouling plate stations was established in the James River around Surry in January 1969. Two vertical and two horizontal plates were suspended at each station. One of each pair was removed and replaced at quarterly intervals; the other of each pair was left in place for one year before being removed and replaced. Throughout the seven years that this community has been under study the fouling plates have been colonized mainly by barnacles, ectoprocts, hydroids and one species of amphipod. Other forms have been present in low numbers.

With the exception of 1972 following Hurricane Agnes, the largest numbers of species and individuals within species have been collected in August through October of each year. Two species (a barnacle and an amphipod) were dominant during the entire study period and these have shown no changes in population density or structure attributable to the operation of Surry. Barnacles exhibited similar temporal patterns during all years of the study except 1972 when Hurricane Agnes resulted in reduced salinity levels in the area.

Comparison of fouling plate data with plankton data (which sample barnacle nauplii) and benthic data (which sample adults on a monthly or quarterly basis) shows the superiority of fouling plates for sampling these organisms. While plates yield samples integrated over time, plankton sampling can miss periods of nauplii abundance. Neither method, however, indicated that station operation is adversely impacting this organism.

Amphipods, while not considered a fouling organism, were opportunistic in seeking suitable habitat and consequently comprised the other dominant species collected during this study. Population densities for this species were highest in late summer or early fall at all stations in the seven years studied.

Fouling organism populations have exhibited seasonal variation patterns that change from year to year in response to natural factors (mainly temperature and salinity). We conclude that no evidence has been found of any significant adverse impacts on this community as a result of station operation, and this study may be terminated.

Epibenthos

Replicate quantitative benthic grab samples have been collected at sixteen stations since 1969. Collections have been made of bottom dwelling organisms (benthos) on a quarterly basis starting in 1973 except during June, July and August when monthly samples are collected.

Because the James River near Surry is of low but highly variable salinity (i.e., oligohaline) and is characterized by high turbidity and sedimentation rate, it presents an inhospitable environment for all but a few of the most tolerant benthic species. Those surviving either maintain viable, reproducing populations, or are temporary invaders from both the upstream freshwater zone and the downstream saline zone which are found when suitable environmental conditions exist. As is typical of most zones of this type, a few species (classified as "estuarine endemic" and characteristic of the meso- and oligohaline zones of the estuarine system of Chesapeake Bay) which are well adapted to the varying environmental conditions are overwhelmingly dominant. Thus, the diversity of benthic taxa is minimal in the transition zone, increasing maximally toward seawater and moderately upriver to freshwater.

In the James River at Surry, the non-commercial brackish water clam (Rangia cuneata) is found in abundance, and comprises more than 90% of the total invertebrate biomass. The American oyster (Crassostrea virginica) is not found in the olihohaline zone of the James River, this species being more mesohaline in habitat. The blue crab (Callinectes sapidus) is only a sporadic visitor to the Surry area. Commercial quantities of penaeid shrimp are not present within the Chesapeake Bay.

Rangia cuneata showed no obvious increases or declines in abundance at either plume or non-plume sampling stations that could be attributed to plant operation. Rather Rangia revealed an apparent preference for silty-clay substrate whether within the thermal plume area or not.

Other benthic species have shown changes during operation with some decreasing in abundance while others increased. These changes occured at both plume and non-plume stations and appeared to be related to natural perturbations (such as Hurricane Agnes and its attendant low salinity levels).

Results of this study show that the benthic macroinvertebrate community is not being seriously impacted by the operation of Surry Power Station and we conclude that studies of this community may be terminated.

Nekton

A sampling program for nekton (fish), consisting of seine hauls at seven stations and otter trawls at six stations, has been conducted monthly since 1970. The ETS also specified eight fishes in the area as species of interest which were to receive special emphasis in the study.

This program (in conjunction with the impingement sampling program discussed later) has recorded the presence of about 90 species of fish in the vicinity of Surry. This diverse assemblage includes over 30 freshwater species, over 30 species living in both the Atlantic Ocean and freshwater and about 20 species normally inhabiting only the Atlantic Ocean.

Because the oligohaline zone of an estuary is inhabited by freshwater, estuarine and marine fishes for varying lengths of time at different life stages, the fish population structure is very different from the low species/high biomass benthos. The variability and instability of the transition zone, is reflected in the dynamic nature of the fish community where few long-term trends continue without interruption. Natural changes in temperature and salinity are compounded by natural catastrophies such as floods, hurricanes and drought, which cause even wider fluctuations in species composition and sizes and numbers of individuals within species. Periodic fish kills due to man-made occurrences such as excess chlorination at sewage treatment plants, and spills and contamination of other toxic materials such as kepone, have been recorded almost yearly in the lower James River since 1962.

The results of this monitoring program indicates that despite numerous natural environmental perturbations and man-made insults occurring in almost every year of the studies, the fish populations in the transition zone of the James River have remained diverse and viable.

The bay anchovy (Anchoa mitchilli) is the most abundant fish in the area, followed by Atlantic menhaden (Brevoortia tyrannus) and then spot (Leiostomus xanthurus). Silversides (Menidia sp), spottail shiner (Notropis hudsonius), hogchoker (Trinectes maculatus), channel catfish (Ictalurus punctatus) and Atlantic croaker (Micropogon undulatus) have also been present in substantial numbers since operation began. Declines of white perch (Morone americana) and striped bass (Morone saxitalis) are attributed partially to fish kills occurring in 1971, 1973 and 1974. Marine spawners whose larvae and young use the river as a nursery have generally shown increases in relative abundance since preoperational times. Young of the year Atlantic menhaden, spot and Atlantic croaker, three of the dominants at Surry, that were spawned in the riverine environment have shown increases in recent years. Declines in relative abundance of some anadromous species such as alewife (Alosa pseudoharengus) and blueback herring (Alosa aestivalis) have been attributed to natural fluctuations in year-class strength and offshore catches by foreign fishing fleets. Some indigenous estuarine species such as the bay anchovy and silversides have shown no change at all or have increased slightly. Some upper estuarine species such as channel catfish have experienced significant population increases.

The results of these studies emphasizes what is already known about fish populations in the transition zone of an estuarine environment: the transition zone serves as a nursery for some species; there is considerable immigration and emigration through the zone; and constant changes occur

within the zone as well as without. Over an extended time period, natural and man-made insults generally appear to result in only relatively short-term changes and fishes within the zone apparently thrive.

Operation of the Surry Power Station has not resulted in significant adverse impacts on fish populations in the area. No "cold shock" fish kills have occurred, the plant discharge does not act as a thermal barrier to fish migration, and changes in the fish population in the area are within the range of natural variations. We conclude that the fish sampling program may be significantly reduced. Only a low-intensity fish sampling program of seining and trawling in the vicinity of the intake structure to complement the impingement program need be retained.

Planktonic Organisms

Sampling of entrained planktonic organisms, such as fish eggs and larvae (ichthyoplankton) and zooplankton (including holoplankton and meroplankton) has been conducted at least monthly since 1973. Sampling was conducted more frequently during the spawning season (spring through fall). Samples were taken in the intake and discharge canals, in the thermal plume, and at control stations.

Far-field sampling of zooplankton has revealed no adverse impacts on the zooplankton community as a result of station operation (see previous discussion of zooplankton). The zooplankton fauna is dominated by two species of copepods and joined by rotifers and cladocerans under low salinity conditions and by larvae of sessile forms such as gastropods, pelecypods and barnacles as well as benthic polychaetes during their reproductive seasons. These organisms are collected in the entrainment samples in much the same proportions and numbers as in the far-field collections.

A pump entrainment study investigating zooplankton mortality indicated a high survival of entrained zooplankton through much of the year. Although delayed mortality of organisms after plant passage was not measured in this study and would increase impact, none of the species examined are centered at the plant's location (the juncture between a freshwater and upper estuarine fauna) and no significant effect of even high mortality is likely. Because the zooplankton entrainment program has demonstrated that losses of these organisms due to plant operation are smaller than the Staff predicted in the FES might occur and are not significant, we conclude that this portion of the entrainment program may be deleted.

Analysis of the ichthyoplankton data indicate that the dominant species captured were larvae of naked goby (Gobiosoma bosci) and bay anchovy (Anchoa mitchilli) and eggs of bay anchovy. These species comprised more than 90%

of the total catch during late spring and summer months. Because the centers of abundance for these organisms are located down-river, the entrained ichthyoplankton of these two species are believed to be the upstream edge of the population and their loss should not have a significant impact on the population of these fishes.

Postlarvae and/or juveniles of Atlantic croaker (Micropogon undulatus), spot (Leiostoimus xanthurus) and blueblack herring (Alosa aestivalis) were captured seasonally in relatively low numbers.

Total catch of organisms increases through April and May, peaking in June and July, and declines from August until the annual minimum in late winter.

Losses of ichthyoplankton due to entrainment are not adversely affecting fish populations in the area, which have remained diverse and viable in the face of a combination of natural fluctuations, environmental and man-made insults and impacts of plant operation. We conclude that the licensee has demonstrated that the effects of plant operation on ichthyoplankton are not as severe as those the FES predicted, even assuming 100% mortality, and that this portion of the entrainment program may be deleted.

4.13E

Specification 4.13E requires that a program be conducted to measure, count and identify by species the fish killed on the intake travelling screens. The ETS do not specify the frequency or the duration of the sampling program. A weekly impingement program was initiated in May 1972 and continued through May 1974. Since May 1974, the licensee has collected replicate 5-minute impingement samples five times weekly in order to evaluate the efficiency of a fish return system installed at Surry.

Results of the impingement sampling program indicate that the largest number of impinged fish usually occurs during the winter months. This is due, in part, to juvenile anadromous species moving seaward and fall and winter-spawned oceanic species moving into low-salinity areas.

Of the nearly eighty species captured between 1972 and 1976, 20 species represented 99% of the total. The ten most abundant species comprised over 91% of the total fish impinged. With one exception, all ten of these species were in the 90-100 percentile groups in frequency of occurrence.

The most abundant fish in the impingement samples was the blueback herring, which comprised about 25% of the total fish taken and was present in 98% of the samples. Three species, spottail shiner, Atlantic menhaden and Atlantic croaker, occurred in each sample taken and comprised another 25% of the total number impinged. Some species appeared frequently but were always present in low numbers. The American eel (Anguilla rostrata) appeared 96% of the time but comprised only 0.5% of the total number, while white catfish

(Ictalurus catus) appeared 98% of the time and comprised only 1.9% of the total. From these data, it is evident that a large majority of the species collected on the screens are present in very low numbers. A few species account for almost all of the total numbers of fish collected.

With the use of the Ristroph travelling screens at Surry, a biologically insignificant number of fish are actually killed, as more than 95% are returned unharmed to the river. In 1976 the average annual survival was greater than 96% and average survival was greater than 97% in 1977.

The licensee proposes to take replicate 5-minute impingement samples weekly. If the survival rate drops below 75%, replicate 5-minute impingement samples will be taken daily and seining and trawling will be conducted in the vicinity of the intake structure until the survival rate once again exceeds 75%. We conclude that this proposal is acceptable, particularly since analyses will be made to determine the species responsible for the reduced survival and further analysis will be made to assess the biological significance of the incident.

Conclusion and Basis for Negative Declaration

On the basis of the foregoing analysis, we conclude that there will be no environmental impact attributable to the proposed action. The changes assessed herein are to the non-radiological environmental monitoring programs and do not involve any change in plant design or operation or involve an increase in effluent types or quantities. The impact of the overall plant has already been predicted and described in the Commission's FES for Surry Power Station, Units 1 and 2. On this basis and in accordance with 10 CFR Part 51.5, we conclude that no environmental impact statement for the proposed action need be prepared and a negative declaration to this effect is appropriate.