VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

December 5, 1986

W. L. STEWART
VICE PRESIDENT
NUCLEAR OPERATIONS

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
Attn: Mr. Lester S. Rubenstein, Director
PWR Project Directorate No. 2
Division of PWR Licensing-A
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Serial No. 86-496A
NO/JDH
Docket Nos. 50-280
50-281
License Nos. DPR-32
DPR-37

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
ADDITIONAL INFORMATION REGARDING 40 YEAR OPERATING LICENSES

On November 24, 1986, we met with you and members of your staff to discuss our proposed license amendments regarding extending the operating licenses for the North Anna and Surry Power Stations to 40 years. As a result of that meeting, several areas were identified where additional information was necessary to supplement the statements in our August 22, 1986 submittal (Serial No. 86-496) for Surry.

Additional information on Pressurized Thermal Shock (PTS) was submitted separately on November 26, 1986 (Serial No. 86-781). This additional information on PTS demonstrated the acceptability of continued operation for both units for approximately 60 calendar years. The additional information you requested regarding radiological impacts, environmental impacts, non-radiological impacts and alternative actions is attached.

We appreciate your support in evaluating this proposed amendment on a priority basis. If you have any questions or require additional information, please contact us immediately.

Very truly yours,

W. L. Stewart

W. L. Stewart

Attachment

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cc: Dr. J. Nelson Grace
Regional Administrator
NRC Region II

Mr. W. E. Holland
NRC Senior Resident Inspector
Surry Power Station

Mr. Charles Price
Department of Health
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Mr. Chandu P. Patel
NRC Surry Project Manager
PWR Project Directorate No. 2
Division of PWR Licensing-A

Attachment

ADDITIONAL INFORMATION

FOR

SURRY POWER STATION

REGARDING

FORTY YEAR OPERATING LICENSES

GENERAL INFORMATION (Review Methodology)

In assessing the acceptability of extending the operating licenses for Surry Power Station, we conducted thorough reviews of the following principle licensing documents to identify instances where evaluations were based on other than 40 years:

- Surry Updated Final Safety Analysis Report (Revision 4, June 1986)
- Surry Unit 1 Final Environmental Statement (May 1972)
- Surry Unit 2 Final Environmental Statement (June 1972)
- Surry Units 3 and 4 Final Environmental Statement (May 1974)
- Surry Safety Evaluation Report (February 1972)
- Surry License Nos. DPR-32 and DPR-37 (including Technical Specifications)

In general, where the evaluations did not cover a 40 year span, they were found to be on an annual or a 30 year basis, or no specific period was stated. Evaluations conducted on a per year basis were examined to determine whether any adverse cumulative effects resulted from the period of additional operation (4 years for Surry 1; 4 1/2 years for Surry 2).

Evaluations conducted on a 30 year basis were found primarily to be cost or fuel cycle evaluations. When the basis was unclear, a 30 year period was assumed and the concern was evaluated for the additional period. In a few cases, the previous evaluations assumed the current operating life of roughly 36 years. The impact of the additional 4 or 4 1/2 years was also considered in these instances.

In brief, no concerns were identified which would preclude 40 years of operation.

RADIOLOGICAL IMPACTS

Additional information regarding the radiological impacts on the Exclusion Area, the Emergency Planning Zone, and the nearest population centers is provided below.

Exclusion Area

The Exclusion Area consists of the Company-owned property in approximately a 1650 ft. radius of the station. There is currently no expectation that the boundary would be affected as a result of Company initatives during the additional years of operation.

Emergency Planning Zone

The Emergency Planning Zone (EPZ) consists of the area within a 10 mile radius of the station for which there is reasonable probability that appropriate protective measures could be taken on behalf of the population in the event of a serious accident. Based on 1980 census data, the permanent 1980 population in the EPZ was 86,617 (278 persons per square mile). This actual population figure is 35.4% lower than the NRC projected 1980 10-mile population of 134,000 presented in Table 5.9 of the Surry 3 and 4 FES. Based on the general population trends discussed below, we would expect little change in the EPZ population during the additional years of operation.

Major Population Centers

In the 1972 Final Environmental Statements for Surry Power Station Units 1 and 2, NRC noted that the rural character of the land around the station is evident in all directions from the Surry site, especially south of the James River where the population density remains low for at least 20 miles. Based on a review of 1980 population data and population projections until the year 2000 provided by the Commonwealth of Virginia's Department of Planning and Budget (October 1986), this characterization should remain valid through the additional years of operation.

Certain evaluations in the FES were conducted based on population within a 50 mile radius of the station. Rigorous comparisons between the FES evaluations and current data are difficult because 1) some of the assumptions used in the FES data are not known, and 2) current population information is only available on a city/county basis. However, population trends within this area can be seen by reviewing the populations of major population centers and counties within the area. To be comprehensive, cities or counties of which only a portion was inside the 50 mile radius were also considered. In general, from 1970 to 1980, the population of these cities and counties increased 4.5% (an annual rate of less than 1/2 percent). The Commonwealth of Virginia projects an increase by the year 2000 of 21.5% (an annual rate of less than 1%).

Specifically, the nearest major population centers within 50 miles of the station are the cities of Newport News and Hampton which are southeast of the station. The combined population of these cities increased approximately 3.3%, from 258,956 in 1970 to 267,520 in 1980. During the same period, the populations of Richmond, Norfolk and Portsmouth actually decreased 77,575 while the city of Virginia Beach had the largest increase, from 172,106 to 262,199. The table below shows the actual and projected populations for the major population centers near Surry.

Major Population Centers
Near Surry Power Station

	Historical		Projected
	1970	1980	2000
Newport News	138,177	144,903	176,600
Hampton	120,779	122,617	132,500
Norfolk	307,951	266,979	280,000
Portsmouth	110,963	104,577	117,100
Chesapeake	89,580	114,486	163,000
Virginia Beach	172,106	262,199	426,200
Richmond	249,431	219,214	212,700
Totals	1,188,987	1,234,975	1,508,100

From the table, it is clear that the total population in these cities increased approximately 3.9% from 1970 through 1980 (an annual increase of less than 0.4%) and is expected to increase approximately 22% by the year 2000 (an annual projected increase of about 1%). Based on the actual and projected increases, we have determined that the conclusions in the FES concerning population-based evaluations remain valid for the additional years of operation. We have further determined that the conclusions in the NRC Safety Evaluation Report that Surry meets the requirements of 10CFR100 would remain unchanged for the additional years of operation.

Postulated Accidents

The magnitude of accident releases and doses to individuals would not change as a result of an increase in the years of plant operation. The total integrated dose to the public would change if the total population around the site continued to grow during the period covered by the license extension.

However, Table 6.2 of the Surry 1 and 2 FES shows that the estimated integrated exposure of the population within 50 miles of the plant from each postulated accident would be orders of magnitude smaller than that from naturally occurring radioactivity, which corresponds to approximately 190,000 man-rem per year, based on a natural background of 100 mrem per year. As discussed previously, the population is increasing roughly 1% annually in the 50 mile radius of Surry. This growth, if continued through the additional years of plant operation requested, would still be a small fraction of the orders of magnitude change necessary to significantly affect the previously postulated radiological consequences. We conclude that there is no change to the environmental impact of postulated accidents on the general population as discussed in Section VI of the FES and that the higher projected population in the year 2013 would not change the overall conclusions of the FES concerning radiological consequences following accidents.

ENVIRONMENTAL IMPACT (General Public)

The Final Environmental Statements (FES) for Surry Units 1 and 2 provided NRC estimates for annual releases and yearly doses resulting from the operation of the station. The estimated annual releases remain unchanged regardless of the life time of the facility, and as shown in the table below, the actual releases have remained small fractions of the Part 50, Appendix I requirements.

The dose estimates provided in the FES (Section V.E) were reviewed for the impact of a 40 year operating life. The FES does not state the number of years of generation assumed in these analyses. However, increasing the operating life to 40 years would increase the actual yearly dose contributed from long lived radionuclides via ingestion pathways. Increases in the actual yearly dose contributed from long-lived radionuclides via other exposure pathways would be substantially less. We conservatively estimate that this increase would be 12% at most. The affect of shorter lived isotopes would be much less. A 12% increase is minor considering 1) doses are well within the guidelines of 10CFR50, Appendix I, 2) the cost benefits of continued station operation and 3) the station was originally approved for 4 unit operation rather than 2.

We are not aware of any significant land use changes within a 50 mile radius of Surry Power Station that have affected offsite dose calculations. One onsite land use change which did not significantly affect offsite dose calculations, however, was the establishment of a dry cask storage installation at the Surry site. The radiological and environmental impacts of this facility were reviewed and found to be acceptable by the NRC prior to issuance of Special Nuclear Materials License Number SNM-2501 for the Surry Independent Spent Fuel Storage Installation on July 2, 1986.

We have also conducted a general comparison of the radiological impacts on man as assessed in the FES with those actually experienced during plant operations. The following table gives a summary of liquid and gaseous effluent dose information during the period from January 1, 1985 through December 31, 1985 in comparison with 10 CFR Part 50, Appendix I limits.

Surry	1985	10CFR50, App. I (2 unit)
A. Gaseous Releases		
1. Max. Site Boundary Gamma Air Dose (mrad)	1.11	20
2. Max. Site Boundary Beta Air Dose (mrad)	3.02	40
3. Total max. offsite dose to any organ (mrem)	0.23	30
4. Total max. offsite whole body dose (mrem)	0.939	10
B. Liquid Releases		
1. Total max. offsite whole body dose (mrem)	0.00305	6
2. Total max. offsite organ dose (mrem)	0.203	20

The liquid and gaseous effluent doses reported in 1985 are significantly less than the 10 CFR 50, Appendix I limits. Furthermore, the 1985 whole body doses are consistent with the projected doses reported in Table 5.7 of the FES. Both the total maximum offsite whole body dose due to gaseous effluents projected in the FES and the actual doses reported in 1985 are less than 1.0 mrem which is a very small value compared to the 500 mrem annual whole body dose rate limit. The 1985 whole body dose due to liquid effluents is actually less than the FES projected value. Both of these dose values are also a small fraction of the annual whole body dose rate limit.

Based on the continued operation of Surry using existing liquid and gaseous radwaste treatment systems coupled with the current radiological monitoring program, the anticipated liquid and gaseous effluent doses during the period covered by the requested amendment will remain a fraction of 10 CFR Part 50, Appendix I limits, and will not adversely impact upon the environment.

ENVIRONMENTAL IMPACTS (Uranium Fuel Cycle)

The impact of the uranium fuel cycle was considered in the Final Environmental Statement for Unit 1 (May 1972) and Unit 2 (June 1973). In Section IX of the Unit 1 and the Unit 2 FES, each unit was estimated to operate for 30 years. Enrichments of approximately 3.1% and annual refuelings were assumed for both units. The environmental impact on the uranium fuel cycle was found to be acceptable.

Since that time, two license amendments (Amendment Nos. 66/65 on February 25, 1981 and Amendment Nos. 73/74 on January 19, 1982) allowed an increase in the limiting reload enrichments specified in Technical Specification 5.A.3 from an original maximum reload enrichment of 3.6% to the current limit of 4.1% thus allowing longer operating cycles in lieu of the 12 month cycles assumed in the FES. In each case, the environmental considerations were assessed and the NRC staff concluded that the amendments would not result in any significant environmental impact.

In assessing the impact on the uranium fuel cycle for the additional four years operation for Unit 1 and 4 1/2 years operation for Unit 2 (approximately 8 1/2 reactor-years additional operation), we have considered the following factors:

1. The additional years of reactor operation would almost proportionally increase the total fissile uranium required. This impact is justified in light of the continued benefit received from station operation.

2. The units are expected to consume 8,809 kg of fissile uranium for Unit 1 and 8,813 kg of fissile uranium for Unit 2 over the current licensed periods. This is expected to increase to 9,873 kg for Unit 1 and 10,082 kg for Unit 2 consumed over the extended 40 year period. Therefore a 2 unit total of 17,622 kg for the current licensed period and 19,955 kg for the extended period are expected to be consumed. These values were calculated based on the actual uranium loadings for past and current cycles and projected loadings for future cycles, and were converted to the amount of uranium loaded which is actually consumed. The one unit value of 15,900 kg of consumed fissile uranium stated in the Surry 1 and Surry 2 FES's bound the 40 year values given above.

Based on our review of the previous NRC findings supporting two license amendments regarding increases in enrichments, the lack of adverse impact on the fuel cycle due to increased enrichments, and the previous FES assessment for the units, we have determined that the FES values for consumed fissile uranium remain bounding for the additional operating period.

OCCUPATIONAL EXPOSURES

Occupational exposure information for Surry Power Station for the years 1981 through 1985 with projected data for 1986-1987 is provided below.

Surry Power Station
Occupational Exposures
Historical Data With Nearterm Projection

Year	Person-Rem	3 Year Avg. Centered on Yr. in Question
1981	4244	3144
1982	1351	2818
1983	2859	2082
1984	2035	2179
1985	1641	2021*
1986	2387*	1582**
1987	719**	

* Based on Actual Data through 11-18-86
** Based On Projections

NOTE: Surry performed two refueling outages during 1986. Approximately 400 person-rem were expended performing ALARA improvement items.

Occupational exposures at Surry have historically been above the industry average. Factors which have contributed to the higher than anticipated exposures include the degradation and subsequent removal and replacement of the steam generators in 1979-1981 coupled with the fuel failure problems experienced in the early 1980's.

In the recent five year period covering 1981-1985, Surry has realized a downward trend in occupational radiation exposure. (See attached figures showing annual and 3 year trends and coolant activity). Factors influencing this trend include a fuel sipping program for identification and removal of defective fuel and strict primary chemistry controls. This downward trend is expected to continue with aggressive ALARA efforts.

ALARA modifications performed during the two refueling outages in 1986 include installation of permanent reactor head shield in Unit 1 (Unit 2 head shield installed during the 1985 refueling), permanent removal of non-essential large bore snubbers, the safety injection leakage monitoring system modification which reduces testing time, installation of a remote testing connection for the transfer canal tube type "C" test, installation of bottom mounted thermocouples which facilitates head removal and the computerized photo documentation of the plant for ALARA preplanning.

Other ALARA improvements performed during 1986 include the chemical decontamination of a portion of the boron recovery system, and the spent resin catch tank modification and boric acid transfer pump replacement project to substantially reduce maintenance efforts. In addition, fuel is being switched from fuel with inconel grids to fuel with zircaloy grids to reduce out-of-core source terms.

The use of B-10 enriched boron and chemical decontamination of other radioactive systems are other potential improvements being investigated which may further reduce occupational exposure.

The Company has committed to INPO to reduce Surry's annual occupational exposure to the estimated industry average (currently estimated at 600 person-rem in 1990 for a 2 unit site). Based on the current downward trend and the Company's aggressive ALARA program, we believe this goal is attainable. Based on that goal, the occupational dose during the years 2008-2013 would be 1200 person-rem for Unit 1 and 1350 person-rem for Unit 2. This is based on 3 additional refuelings per unit and no major unanticipated maintenance.

The Company's aggressive ALARA program, dose-saving plant modifications and management commitment should ensure that the occupational dose received during the additional years of operation is maintained as low as reasonably achievable and would be consistent with industry performance. We conclude that the ALARA measures and dose projections for the additional years of plant operation are in accordance with 10 CFR Part 20 and the guidance of Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable" (Revision 3).

Radioactive Waste

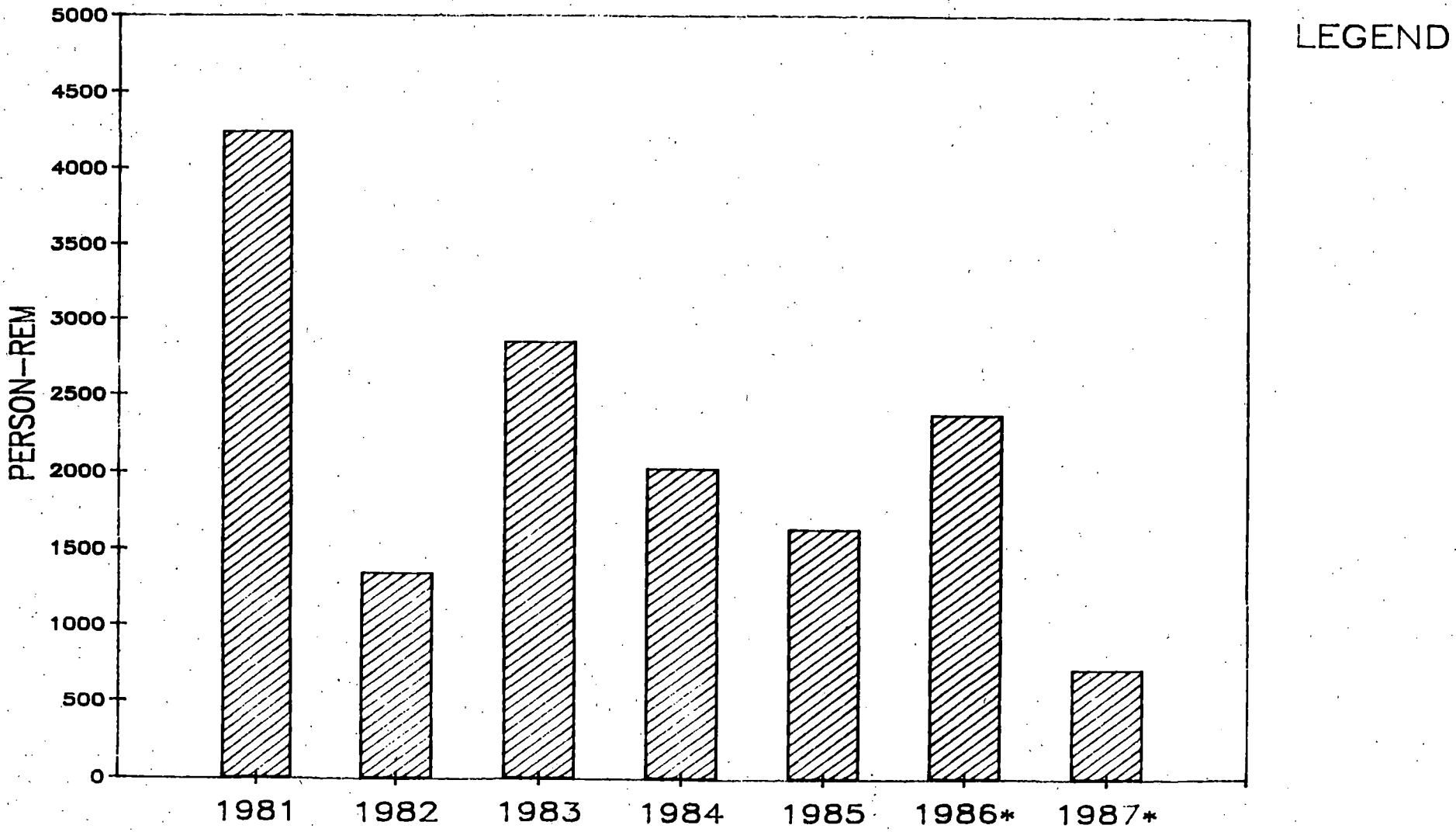
At the present time, 90% of Surry Power Station's radioactive waste is dry active waste (DAW). Over the next several years, DAW generation is expected to decrease by approximately 50% due to volume reduction efforts such as supercompaction and a sorting/segregation program. Liquid waste is also expected to decline due to improvements in radwaste processing.

Surry Power Station currently makes approximately 40 radioactive waste shipments per year. Historically, shipments have been from 30 to 50 per year. Section V of the Unit 1 FES estimates 60 shipments per year for 2 operating units. Based on the radwaste reduction efforts described above, it is anticipated that radwaste shipments would continue to remain below the FES estimates during the additional years of plant operation.

Spent Fuel

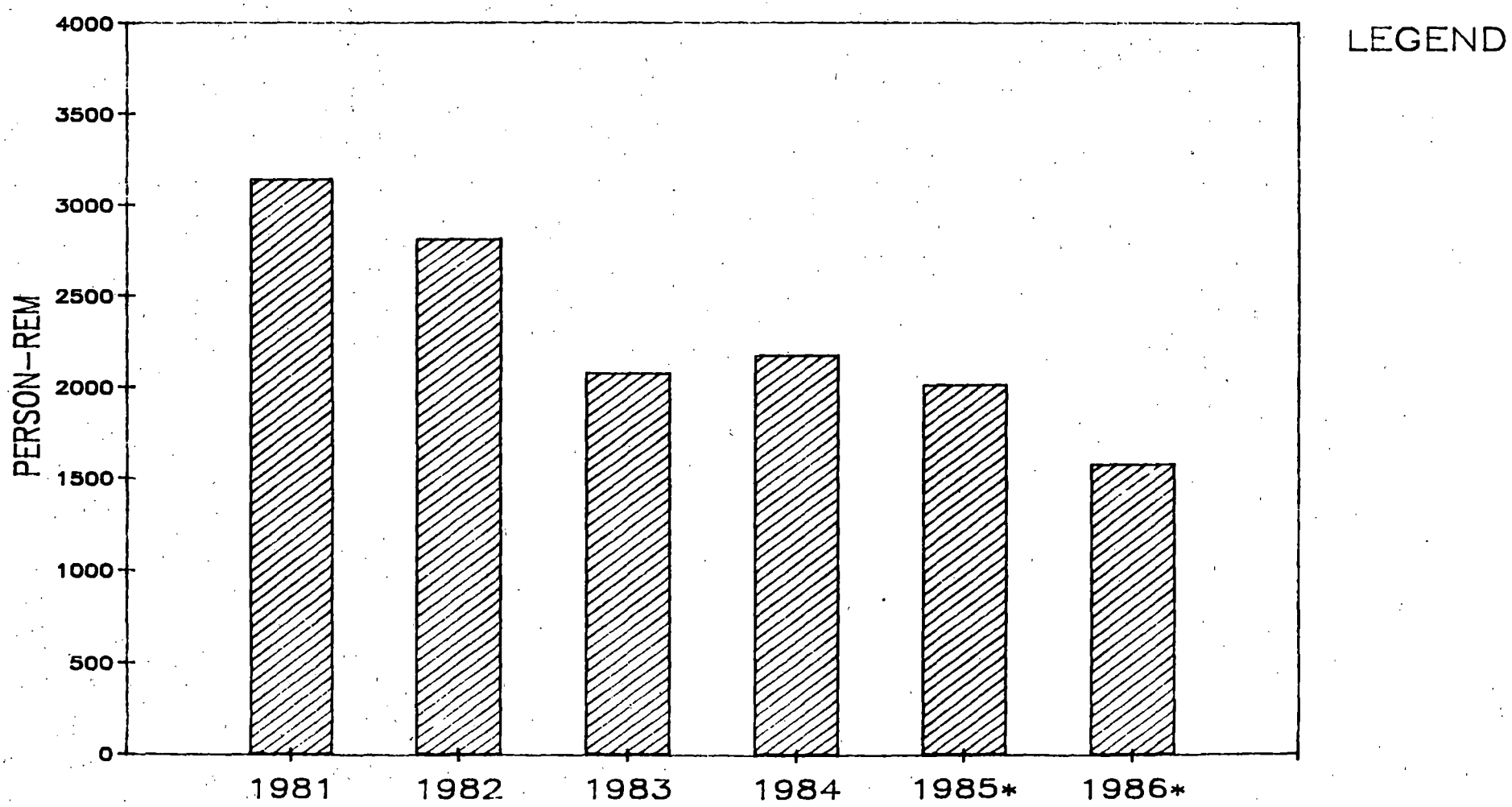
Spent Fuel will be stored in a reracked spent fuel pool and in a dry cask storage facility (both previously evaluated by the NRC staff for radiological environmental consequences) in lieu of offsite shipment as envisioned in Section V of the FES. Any further expansion of onsite spent fuel storage capacity would be evaluated by the NRC staff for radiological environmental effects.

VIRGINIA POWER
SURRY POWER STATION
OCCUPATIONAL EXPOSURE



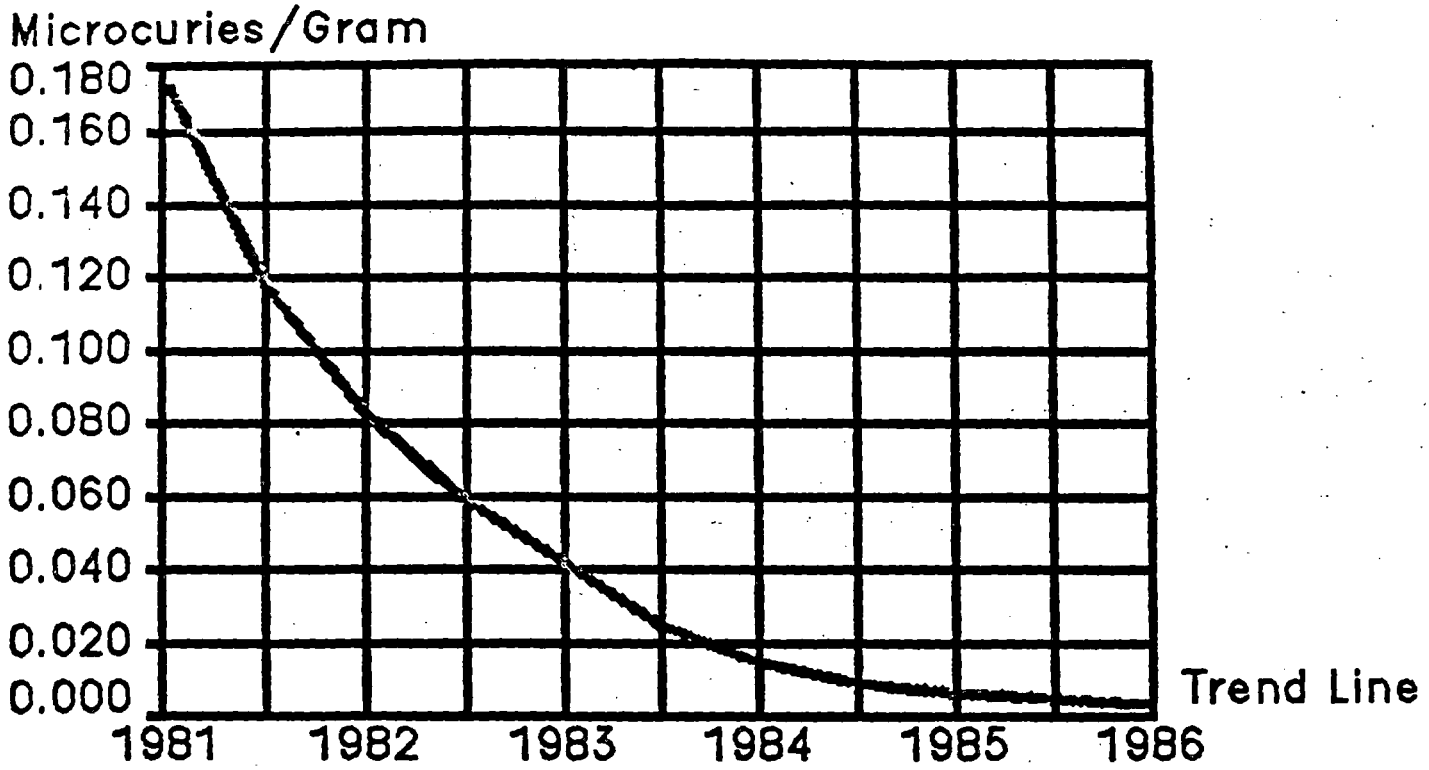
* PROJECTED. 1986 DATA INCLUDES 2 REFUELINGS

VIRGINIA POWER
SURRY POWER STATION
OCCUPATIONAL EXPOSURE
THREE YEAR AVERAGES



REACTOR COOLANT ACTIVITY

Surry Unit 1



Iodine 131 RCS Activity

PRIMARY COOLANT ACTIVITY LEVEL REDUCTION SINCE 1981

NON-RADIOLOGICAL IMPACTS

The environmental impacts of station operation are discussed in Section V of the FES. Our review of the May 1972 and June 1972 FES's for Units 1 and 2 determined that the non-radiological impacts were based on plant design features, relative loss of renewable resources, or relative loss or degradation of available habitat. In brief, no significant short or long-term damage or loss of biota of the region has occurred or is anticipated during the additional years of operation. Should an unanticipated significant detrimental effect to biotic communities or the environment occur, the monitoring programs that are presently in place are designed to detect such anomalies. Subsequent corrective measures would be taken as appropriate.

Original design features that are in place to assure no adverse environmental effect, environmental studies which have assessed actual impacts of plant operation, and the review program which assures that no changes will be made to the plant that could adversely effect the environment are further discussed below:

1. Original Design Features

The design of the structures provides for additional environmental protection with regard to intake and thermal discharge effects on aquatic organisms. These include: 1) specially designed vertical traveling screens ("Ristroph" screens) at the cooling water intake structures. These are continuously rotating vertical traveling screens which have been shown to return 94.4% of all sampled impinged fish alive to the receiving water body; 2) a discharge structure designed to facilitate mixing of cooling water and receiving water, and thereby reduce extreme thermocline formation; 3) a discharge structure constructed upstream of the intake structure in order to provide a greater distance between the cooling water discharge and downstream oyster beds, and thus allow greater thermal dissipation before the discharge water reaches the oyster beds; and 4) relatively low delta-T of 15 degrees Fahrenheit designed into the cooling water system.

For aesthetic considerations, the reactor containment foundations were constructed 50 feet below grade to lower the tops of the concrete containment domes and minimize their effect on the skyline from across the river. Also, the discharge canal was constructed at an offset angle to the river, and a buffer of trees is maintained along the shore to minimize visual impact from the river.

These environmental protection conditions will continue to be in place for the proposed license extension and will in no way change the existing affects on aquatic organisms.

2. Environmental Studies Conducted Since Issuance of Operating Licenses

In 1977, a completed Type 1 316(a) Demonstration was submitted to the Virginia State Water Control Board. As part of this study, Company personnel and the Virginia Institute of Marine Science had performed assessments of the thermal effects of Surry Power Station on finfish, benthic organisms, fouling organisms, zooplankton, phytoplankton, and other vertibrates. The study demonstrated that no appreciable harm resulted from the thermal component of the Surry Power Station discharge to the balanced, indigenous community of shellfish, fish and wildlife in and on the James River into which the discharge was made.

In 1980, a completed 316(b) Demonstration was submitted to the Virginia State Water Control Board. As part of this study, Company personnel and the Virginia Institute of Marine Science had performed assessments of the environmental impact of the Surry Power Station Cooling Water Intake Structures (CWIS) on shelf zone fish, shore zone fish, and ichthyoplankton. Special continuously rotating vertical traveling screens (Ristroph screens) had been installed for the CWIS to promote survival of impinged organisms. Results from the study showed that the traveling screens returned alive to the James River an average of 94.4% of all sampled fishes. The study demonstrated that the CWIS had no detectable impact upon shore zone fishes, shelf zone fishes, or ichthoplankton.

These studies show that actual and anticipated impact on the environment from the operation of Surry Power Station is less than the potential impact discussed in the FES. We expect the impact to remain negligible during the additional years of operation.

3. Design Change Review

A number of plant modifications have been made since the Final Environmental Statements were issued. These modifications tend to improve plant reliability and it has been shown that the environmental impact has been minimal. The plant modifications are described in the Updated Final Safety Analysis Report which is revised annually. Components associated with the modifications that are expected to wear out during plant life are subjected to a surveillance and maintenance program so that component degradation will be identified and corrected. Extending the operating life as proposed will have no detectable environmental impact resulting from the plant modification.

Design changes with the potential for impacting the aquatic environment are reviewed by the Company. Discharges to the James River are regulated by the Virginia State Water Control Board under authority of the National Pollutant Discharge Elimination System (NPDES) and governed by the NPDES permit issued to Surry Power Station. The Board issued NPDES Permit No. VA0004090 covering the Surry Nuclear Power Station, Units 1 and 2. Any design change which may alter a discharge to the river is reviewed and evaluated by the Board at the request of the Company during the Board's periodic review of operating conditions or at the time of reapplication and reissuance (every 5 years). Such reviews in conjunction with the NPDES permit limitations ensure that the consequences of any potential environmental impact should be maintained within accepted standards.

Amendments Nos. 85 and 86 issued on March 11, 1983, deleted the water quality monitoring requirements from the Technical Specifications since these requirements would be administered by the Virginia State Water Control Board. The existing permit expires on April 26, 1990. The requested extension of the operating licenses would require one additional reissuance of the NPDES Permit.

ALTERNATIVES TO THE PROPOSED ACTION

The principle alternative to issuance of the proposed license extensions would be to deny the application. In this case, Surry Units 1 and 2 would shut down upon expiration of the present operating licenses.

In Chapter XI of the FES, a cost benefit analysis is presented for Surry. The analysis is based upon 30 years of operation and includes a comparison with various other options for producing an equivalent electrical power capacity. Even considering significant changes in economics of alternatives, the continued operation of Surry Units 1 and 2 for another 4 and 4 1/2 years, respectively, remains the most economical alternative.

Nuclear generated electricity is the least expensive power generated and sold by the Company and the overall cost of the facility will decrease with additional years of operation since the large initial capital outlay would be averaged over a larger period of time. Continued plant operation would require little capital expenditures compared to the construction of new units. We currently project a new 750Mw fossil unit to cost about $1300/kW. In comparison, the cost of Surry 1 was approximately $260/kW. A replacement nuclear unit would not be considered at this time because of extremely large and uncertain costs as well as an uncertain regulatory climate.

Purchased replacement powers costs are also higher than the costs associated with continued operation of the existing units for an additional 4-4 1/2 years.

Approval of this extension would defer 1) the need to install replacement base load capacity and 2) the associated capital expenditures. The continued operation of Surry beyond its current operating license period would also be a benefit to the tax base and the economy of the surrounding areas.

In summary, the cost benefit of Surry, compared with other alternatives, improves with extended plant life.