ENVIRONMENTAL ASSESSMENT

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO THE CHANGE IN EXPIRATION DATES OF

FACILITY OPERATING LICENSE NOS. DPR-53 AND DPR-69

BALTIMORE GAS AND ELECTRIC COMPANY

CALVERT CLIFFS NUCLEAR POWER PLANT UNIT NOS. 1 AND 2

DOCKET NOS. 50-317 and 50-318

Date: April 3, 1985

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1.0 INTRODUCTION

The currently licensed term for Calvert Cliffs Units 1 and 2 is 40 years commencing with issuance of the construction permit (July 7, 1969). Accounting for the time that was required for plant construction, this represents an effective operating license term of 35 years for Unit 1 and 33 years for Unit 2. The licensee's application dated June 15, 1984 requests a 40-year operating license term for Calvert Cliffs Units 1 and 2.

2.0 THE NEED FOR THE PROPOSED ACTION

The granting of the proposed license amendments would allow the licensee to operate Calvert Cliffs Units 1 and 2 for an additional 5 and 7 years, respectively, beyond the currently approved dates.

3.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

In April 1973, the Atomic Energy Commission issued the "Final Environmental Statement Related to Operation of Calvert Cliffs Nuclear Power Plant Units 1 and 2" (FES). This document provides an evaluation of the environmental impact associated with operation of Calvert Cliffs Units 1 and 2. The NRC staff has reviewed this document to determine if any significant environmental impacts, other than those previously considered, would be associated with the proposed license extensions.

3.1 Radiological Impacts

The NRC staff has considered the radiological impacts as a result of a hypothetical, design basis, accident at Calvert Cliffs, including the impact of revised population estimates.

In 1972 and 1973 (Safety Evaluation Report, Calvert Cliffs Nuclear Power Plants Units 1 and 2, August 1972; and Final Environmental Statement, Calvert Cliffs Nuclear Power Plant Units 1 and 2, April 1973) the staff evaluated the regional demography and found it to be acceptable with respect to 10 CFR Part 100 guidelines. At that time the region in the vicinity of the Plant site was primarily rural with a number of small communities located within a 10-mile radius. This has not changed significantly. A new community, Chesapeake Ranch Estates, 6 miles south-southeast of the site, and with intervening park land lying in the 2 to 4 mile interval, had been estimated to attract 28,000 people. To date, significant development of this community has not materialized. The 1980 census data estimates 19,972 individuals reside within 10 miles of the plant. Projections based upon Bureau of Economic Analysis regional forecasts indicate a population fo 25,190 in the year 2020.

The outer boundary of the low population zone (LPZ) is at a radius of two miles from the plant. The 1970 LPZ population was estimated by the licensee to be 577. On the basis of the 1980 census data, the NRC staff has estimated the 1980 LPZ population to be 241 (the licensee's Emergency Plan estimated 215) and the projected population for the year 2020 will be approximately 300. The nearest population center with more than 25,000 people is Washington, D.C., approximately 45 miles from the site.

The staff has concluded that, based upon these population estimates, the current Exclusion Area Boundary, Low Population Zone and nearest population center distances would likely be unchanged from those used for licensing the units. Therefore, the conclusion reached in the staff's Safety Evaluation in 1972 that Calvert Cliffs meets the requirements of 10 CFR Part 100, remains unchanged.

In addition, the staff concludes that the higher projected population would not change the overall conclusions of the Final Environmental Statement concerning radiological consequences following accidents.

Finally, the staff has assessed the public risks from reactor accidents per year of operation at other reactors of comparable design and power level (and larger). In all cases, the estimated reactor accident risks of early and latent cancer fatality per year of operation have been small compared to the background accident and cancer fatality risks to which the public is exposed, and did not increase with longer periods of operation. If similar risks were estimated for Calvert Cliffs, Units 1 and 2, we would expect a similar comparison. Therefore, we conclude that the proposed additional years of operation would not increase the annual public risk from reactor accidents.

The NRC staff has also evaluated the radiological environmental effects associated with normal operation of the facility. This evaluation was conducted to assure that the licensee's "as low as is reasonably achievable" (ALARA) measures and dose projections are applicable for the additional years of plant service and are in accordance with 10 CFR Part 20 and 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).

3.1.1 Environmental Impacts - General Public

The NRC staff calculated dose commitments to the human population residing around nuclear power reactors to assess the impact on people from radioactive material released from these reactors during normal operation. The annual dose commitment is calculated to be the dose that would be received over a 50-year period following the intake of radioactivity for one year under the conditions that would exist 15 years after the plant began operation.

The 15 year period is chosen as representing the midpoint of plant operation and is incorporated into the dose models by allowing for buildup of long life radionuclides in the soil. It affects the estimated doses only for radionuclides, that have half-lives greater than a few years, ingested by humans. For a plant licensed for 40 years, increasing the buildup period from 15 to 20 years would increase the dose from long life radionuclides via the ingestion pathways by less than one-third. It would have much less effect on dose from shorter life radionuclides. Table V-5 of the FES indicates that the estimated doses via the ingestion pathways are well below the regulatory design objectives. For example, the ingestion dose to the thyroid from Units 1 and 2 is 3 mrem/yr

compared to an Appendix I design objective of 15 mrem/yr. Thus, an increase of even as much as one-third in these pathways would remain well below the Appendix I to 10 CFR Part 50 guidelines and would not be significant.

On February 25, 1985 by license amendments 100 and 82, the NRC staff approved the licensee's proposed radiological effluent Technical Specifications and found that they are in compliance with NRC requirements regarding ALARA.

3.1.2. Environmental Impacts-Occupational Exposures

The Staff has audited the licensee's dose assessment for the years 2009 to 2016 (the additional years during which Unit 1 and/or Unit 2 would operate) against the criteria in Standard Review Plan (NUREG-0800) 12.3 "Radiation Protection Design Features," July 1981. The licensee has based his estimate on operating experience, engineering judgement and on personnel exposure at Calvert Cliffs Units 1 and 2 for the years 1979 to 1983. The projected dose for the years 2009 to 2016 is based on an adjusted year-end totals from 1979 to 1983, and yielded 420 and 720 person-rem for one and two outage years respectively. Currently operating PWRs average more than 700 person-rems per unit annually, with particular plants experiencing an average lifetime annual dose as high as 1300 person-rems. These dose averages are based on widely varying yearly doses at PWRs.

BG&E provided tables specifying person-rem exposures at Calvert Cliffs Units 1 and 2 by plant system independent of when these exposures were obtained (e.g., during normal operations, maintenance, repair, or refueling activities) and by whom (e.g., plant operations personnel, plant maintenance personnel, or contractor/vendor personnel).

The licensee estimated nine additional refueling outages for the years 2009 to 2016. Barring major modification, total dose is predicted to be 3600 person-rems. The licensee expects that the dose allowance for corrosion product build-up will be offset by dose savings from an improved ALARA program. State-of-the-art technologies will be in use, including some robotics. BG&E expects no steam generator replacements due to the quality of the volatile primary chemistry control program. The licensee also expects to rely less on contracted work force and more on company personnel.

The staff concludes that the licensee's dose assessment is acceptable and their radiation protection program is adequate to ensure that occupational radiation exposures will be maintained ALARA and in compliance with 10 CFR Part 20 requirements.

3.1.3. Environmental Impacts-Uranium Fuel Cycle

The impacts of the uranium fuel cycle are based on 30 years of operation of a model light water reactor (LWR). The fuel requirements for the model LWR were assumed to be one initial core load and 29 annual refuelings (approximately 1/3 core). The annual fuel requirement for the model LWR averaged out over a 40-year operating life (one initial core and 39 refuelings of approximately 1/3 core) would be reduced slightly as compared to the annual fuel requirement averaged for a 30-year operating life. This results from the initial core being average over 40 rather than 30 years.

The net result would be approximately 1.5% reduction in the annual fuel requirement for the model LWR. This small reduction in annual fuel requirements would not lead to significant changes in the impacts of the uranium fuel cycle. If anything, the impacts of the uranium fuel cycle become more conservative when a 40-year period of operation is considered.

3.2 Non-Radiological Impacts

Re-examination of the staff's FES of April 1973 reveals that the assessments of non-radiological impacts were based on several considerations depending on the type of impact being addressed. For some types of impact, the assessments were based on a fixed life-of-plant; for other types, the assessments were based on plant design features, on relative loss of renewable resources or on relative loss or degradation of available habitat.

Economic assumptions made in the cost evaluation of alternative actions includes 30 years as the useful life of the plant (FES, Table XI-6). Land use of 100 acres for electrical energy production was anticipated to be a 30 to 40 year resource commitment (FES p. VIII-1). Entrainment and impingement impacts were assessed as small losses, relative to the standing crop of food base organisms and on the basis of low concentrations of susceptible life forms of economically valuable fish and shellfish expected in the plant vicinity (FES pp. V-10 through V-12 and p. VII-1). Thermal and chemical discharges (including eutrophic conditions of the discharge) were assessed on a spatial basis; i.e., as an acceptable mixing zone or degraded habitat relative to the available suitable habitat in the plant vicinity (FES, pp. V-12 through V-23).

The design and location of the intake structure were considered by the staff as a possible intrusion on the migratory pathway of blue crabs resulting in impingement losses (FES, p. V-9). Also, the intake design with its curtain wall was expected to entrap some fish. The use of chlorination was considered as a possibility for biofoulant control in the FES assessment although the licensee planned to apply for permission to use chlorine only if their mechanical cleaning (Amertap) system was found inadequate for control of biofoulants.

Impact on a local oyster bar was attributed primarily to construction dredging activities (FES p. IV-2 and p. V-9); however, compensation of $200,000 paid by the licensee to the State of Maryland appears to have been calculated as the product of an annual average loss of $6,600 for the Flag Pond oyster harvest and a 30 year anticipated life-of-plant (FES p. VII-1). An additional contingency fund of $200,000 was established by the licensee to provide for compensation to the State if it were determined after three years of operation that marine life had been damaged and additional mitigation measures were needed (FES, p. IV-2 and p. XI-18).

In the FES of 1973, oyster production on the Flag Pond Bar was estimated at 600 bushels annually. This may be compared to the reported 1979 and 1983 Flag Pond oyster populations of 7080 bushels and 54,400 bushels, respectively (Abbe, 1984). The Maryland Department of Natural Resources planted shells on portions of the Flag Pond Bar in 1980 and 1981 and oyster spat sets on the shell

cultch were above average in 1981; i.e., 1060 spat per bushel on the planted shell cultch compared to 140 spat per bushel on natural bottom in the area (as described by Abbe, George R. 1984, "Oyster population density on Flag Pond Bar near the Calvert Cliffs Nuclear Power Plant in central Chesapeake Bay 1983," Report No. 84-3, Benedict Estuarine Research Laboratory, Academy of Natural Sciences, Philadelphia, PA, March 1984). No studies have been made to document the survival rates of spat to sublegal and legal size oysters; however, it appears from the recent data that the local habitat continues to support a large oyster population even though the majority of original population was relocated to the Patuxent River during construction of the Calvert Cliffs power plant (FES, p. i).

The staff's conclusion in the FES as to the potential for environmental impact on aquatic biological resources was that the Plant, as originally proposed and evaluated, was not expected to impair the productivity of the Bay, given that:

> (1) intake velocity is low, (2) chlorine will not be used, (3) larvae of economically important species are not in the vicinity, (4) fish escape slots are provided in the intake curtain wall structure, and (5) exposure time to elevated temperature is limited (FES, p. XI-19).

Section I.E of the effective National Pollutant Discharge Elimination System (NPDES) permit documents the compliance of the Calvert Cliffs once-through cooling system design under Section 316 of the Clean Water Act. The compliance finding is based on the State's review of 12 years of data (7 years preoperational and 5 years operational). Section I.E indicates that the permittee (licensee) has conducted studies to determine compliance with thermal discharge mixing zone criteria, to determine whether entrainment affects a spawning or nursery area of consequence, and to estimate impingement losses. The latter two objectives are typical studies required in a Section 316(b) demonstration. Based on these demonstrations, the plant was found to meet thermal mixing zone requirements, not to affect spawning or nursery areas of consequence, and to have a modest impingement loss.

The licensee now uses chlorination for biofouling control in the salt water cooling system. The effective NPDES permit limits the daily maximum total residual chlorine to 0.14 mg/l from the system at its discharge point into the main cooling system discharge. This usage is consistent with that evaluated and judged in the FES to be an adverse impact principally confined to those organisms within the cooling condensers being chlorinated (pp. V-22 and V-23).

With regard to intake and thermal discharge effects on aquatic organisms, other special conditions of the NPDES permit provide for additional environmental protection. These include (1) reducing the potential for cold shock by requiring the scheduling of refueling outages such that only one unit at a time is out of service during winter (Condition I.F), (2) reducing large intake impingements by

requiring monitoring for and notification of substantial events and, for each event, requiring a written report to include a discussion of precautions to be taken to avoid similar impingement events (Condition I.H), and (3) reducing potential intake embayment mortalities due to anoxic conditions, by requiring that a minimum flow or other steps be taken when the plant is out-of-service (Condition I.I).

All potential impacts have been identified, described and evaluated in previously-issued environmental impact statements and/or appraisals by the NRC and reviews by the NPDES permitting authority under the Clean Water Act. All operational non-radiological impacts on aquatic biological resources have been assessed by the staff on bases other than a life-of-plant basis; hence, the requested extensions will not alter previous staff findings and conclusions.

4.0 ALTERNATIVE TO THE PROPOSED ACTION:

The principal alternative to issuance of the proposed license extensions would be to deny the applications. In this case, Calvert Cliffs 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 Calvert Cliffs. Included in the analysis is comparison among various options for producing an equivalent electrical power capacity. Even considering significant changes in the economics of the alternatives, operation of Calvert Cliffs Unit 1 for an additional 5 years and Unit 2 for an additional 7 years would only require incremental yearly costs. These costs would be substantially less than the purchase of replacement power or the installation of new electrical generating capacity. Moreover, the overall cost per year of the facility would decrease since the large initial capital outlay would be averaged over a greater number of years. In summary, the cost/benefit advantage of Calvert Cliffs, compared to alternative electrical power generating capacity, improves with the extended plant lifetime.

5.0 ALTERNATIVE USE OF RESOURCES

This action does not involve the use of resources not previously considered in connection with the "Final Environmental Statement Relating to Operation of Calvert Cliffs Nuclear Power Plant Units 1 and 2" dated April 1973.

6.0 AGENCIES AND PERSONS CONSULTED

The NRC staff reviewed the licensee's request and did not consult other agencies or persons.

7.0 BASIS AND CONCLUSION FOR NOT PREPARING AN ENVIRONMENTAL IMPACT STATEMENT

The staff has reviewed the proposed license amendments relative to the requirements set forth in 10 CFR Part 51. Based on this assessment, the staff concludes that there are no significant radiological or non-radiological impacts associated with the proposed action and that the issuance of the proposed license

amendments will have no significant impact on the quality of the human environment. Therefore, pursuant to 10 CFR 51.31, an environmental impact statement need not be prepared for this action.

8.0 ACKNOWLEDGMENT

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