CASE NUMBER 8794

IN THE MATTER OF
BALTIMORE GAS AND ELECTRIC COMPANY'S PROPOSED
STRANDED COST QUANTIFICATION MECHANISM
PRICE PROTECTION MECHANISM
AND UNBUNDLED RATES

CASE NUMBER 8804

IN THE MATTER OF
THE PETITION OF THE OFFICE OF PEOPLE'S COUNSEL
FOR A REDUCTION IN
THE RATES AND CHARGES OF THE
BALTIMORE GAS AND ELECTRIC COMPANY

BEFORE THE MARYLAND PUBLIC SERVICE COMMISSION

TESTIMONY OF DAVID A. SCHLISSEL
ON BEHALF OF THE
MARYLAND OFFICE OF PEOPLE'S COUNSEL

DECEMBER 22, 1998

I. PURPOSE AND SCOPE OF TESTIMONY

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is David A. Schlissel. My business address is Schlissel Technical Consulting, Inc., 45 Horace Road, Belmont, Massachusetts 02178.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A. I am testifying on behalf of the Office of People's Counsel.

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND RECENT WORK EXPERIENCE.

A. I graduated from the Massachusetts Institute of Technology in 1968 with a Bachelor of Science Degree in Engineering. In 1969, I received a Master of Science Degree in Engineering from Stanford University. In 1973, I received a Law Degree from Stanford University. In addition, I studied nuclear engineering at the Massachusetts Institute of Technology during the years 1983-1986. Since 1983 I have been retained by governmental bodies, publicly-owned utilities, and private organizations in 25 states to prepare expert testimony and analyses on engineering and economic issues

related to electric utilities. My clients have included the Staff of the California Public Utilities Commission, the Staff of the Arizona Corporation Commission, the Staff of the Kansas State Corporation Commission, the General Staff of the Arkansas Public Service Commission, municipal utility systems in Massachusetts, New York, North Carolina and Texas, state attorney generals in five states, the majority owners of the Great Bay Power Company, and state consumer counsels or public advocates in twelve states.

I have testified before state regulatory commissions in Arizona, New Jersey, Connecticut, Kansas, Texas, New Mexico, New York, Vermont, North Carolina, South Carolina, Maine, Illinois, Indiana, Ohio, Massachusetts, Missouri, and Wisconsin and before an Atomic Safety & Licensing Board of the U.S. Nuclear Regulatory Commission.

A copy of my current resume is attached as Exhibit___STC-1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS DOCKET?

A. Schlissel Technical Consulting, Inc., ("STC") was retained by the Office of People's Counsel ("OPC") to analyze issues related to

BGE's proposed replacement of the steam generators at the Calvert Cliffs Nuclear Station. OPC also asked STC to evaluate the likely future operating performance of the nuclear units in the PJM system. This testimony presents the results of my investigation of these engineering and economic issues.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. Section II will report on the results to date of my investigation into the Company's plan to replace the steam generators at Calvert Cliffs. Section III then will discuss the nuclear unit capacity factors which I recommended that OPC witness Biewald use in his energy market price analyses.

II. STEAM GENERATOR ISSUES

Q. WHAT IS A STEAM GENERATOR?

A. A steam generator is essentially a large cylindrically shaped heat exchanger. Primary reactor coolant, which is heated in the reactor, flows inside the main body of the steam generator inside thousands of small diameter tubes. The secondary system coolant flows around the outside of these tubes.

The function of the steam generator is to transfer heat from the primary system coolant to the secondary system coolant. Once the secondary system coolant has been transformed into steam, it is used to drive the plant's turbine-generator to produce electricity. Exhibit___STC-2 is an illustration of a Combustion Engineering-designed steam generator like those at Calvert Cliffs. There are a number of different steam generator designs. However, all steam generators have the same general function – to use the primary system coolant to produce steam to generate electricity.

Each of the Calvert Cliffs Units has two steam generators. Each steam generator is approximately 13.5 feet wide and 62 feet high. There are 8,519 ¾ inch diameter tubes within each steam generator.

Q. PLEASE EXPLAIN HOW YOU HAVE CONDUCTED YOUR INVESTIGATION OF BGE'S PROPOSED REPLACEMENT OF THE STEAM GENERATORS AT CALVERT CLIFFS?

A. I have completed the following activities as part of this investigation:

- I have submitted more than 100 detailed interrogatories to BGE and reviewed the documents that the Company provided in response to these interrogatories. These documents included:
  - the findings of steam generator tube inspections at Calvert Cliffs;

- assessments of the root causes of steam generator tube cracking and corrosion;

- assessments of the likely future progress of steam generator tube degradation;

- materials related to BGE's efforts to address steam generator tube degradation at Calvert Cliffs;

- BGE's analyses of the economics of replacing the steam generators versus early retirement of the Calvert Cliffs units; and

- materials related to BGE's participation in steam generator-related industry groups.

- I made a site visit to Calvert Cliffs to review those Data Request responses that BGE asserted were voluminous

- I have reviewed the correspondence between the U.S. Nuclear Regulatory Commission ("NRC") and BGE concerning steam generator related corrosion issues and the results of periodic NRC inspections and evaluations of Calvert Cliffs.

- I have reviewed the nuclear industry experience concerning steam generator tube corrosion and the replacement of the steam generators at both domestic U.S. and foreign nuclear power plants.

Q. DID THE COMPANY PROVIDE EVIDENCE IN ITS PRE-FILED TESTIMONY SUPPORTING THE DECISION TO REPLACE THE CALVERT CLIFFS' STEAM GENERATORS?

A. No. The planned replacement of the steam generators at Calvert Cliffs is only briefly mentioned in the testimony of BGE witness Bourquin.[1] BGE did not provide any supporting evidence or analyses to support its decision to spend $305 million on replacing the Calvert Cliffs' steam generators. Nor did the Company present any evidence to support its claim that Calvert Cliffs could not operate beyond the 2004-2006 timeframe if the steam generators are not replaced.[2]

Q. HAVE YOU EVALUATED THE REPLACEMENT OF THE STEAM GENERATORS AT OTHER OPERATING NUCLEAR POWER PLANTS?

A. Yes. I have evaluated the engineering and economic reasonableness of the proposed replacement of the steam generators at the Trojan, Indian Point Unit No. 2, Point Beach Unit No. 2, and Arkansas Unit No. 2 nuclear power plants. I also have evaluated the reasonableness of Northeast Utilities' planning for and management of the replacement of the steam generators at the Millstone Unit No. 2 nuclear plant.

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[1] Prepared Direct Testimony of Ralph H. Bourquin, Jr., at page 14, lines 13 through 15, at page 16, lines 18 through 22, and at page 17, lines 1 through 3.

In addition, I have examined steam generator-related design and materials issues in a number of other investigations of nuclear power plant construction projects and operating facilities.

Q. WHAT WERE THE ROOT CAUSES OF THE STEAM GENERATOR TUBE PROBLEMS THAT HAVE BEEN EXPERIENCED AT CALVERT CLIFFS?

A. The root cause of the tube degradation experienced at Calvert Cliffs was the susceptibility of the materials used in the existing steam generators to corrosion when exposed to the operating environment in the steam generators. In particular, the Alloy 600 material used for the steam generator tubes has been shown to be extremely susceptible to a variety of degradation mechanisms including denting, stress corrosion cracking, and intergranular attack.

Q. WERE THE MATERIALS USED IN THE ORIGINAL CALVERT CLIFFS STEAM GENERATORS TYPICAL OF

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[2] Prepared Direct Testimony of Ralph H. Bourquin, Jr., at page 16, lines 18 through 22,

THE TYPES OF MATERIALS USED IN STEAM GENERATORS BUILT IN THE 1970'S?

A. Yes. The materials used in the Calvert Cliffs steam generators, including the Alloy 600 material used for the steam generator tubes, were typical of the materials used in nuclear power plants of Calvert Cliffs' vintage.

Q. WHO DESIGNED THE ORIGINAL CALVERT CLIFFS STEAM GENERATORS?

A. The original steam generators were included in Calvert Cliffs' Nuclear Steam Supply System ("NSSS") which was designed and supplied to the Company by Combustion Engineering.

Q. WHICH OPERATING POWER PLANTS IN THE U.S. HAVE HAD STEAM GENERATORS DESIGNED BY COMBUSTION ENGINEERING?

A. The following nuclear plants have had steam generators that were originally supplied as part of NSSS systems from Combustion Engineering - ANO-2, Calvert Cliffs Units 1 and 2, Fort Calhoun, Maine Yankee, Millstone Unit 2, Palisades, Palo Verde Units 1, 2,

and 3, San Onofre Units 2 and 3, St. Lucie Units 1 and 2 and Waterford Unit 3.

Q. HAVE THE SPECIFIC STEAM GENERATOR TUBE CORROSION MECHANISMS THAT HAVE BEEN EXPERIENCED AT CALVERT CLIFFS BEEN TYPICAL OF THE MECHANISMS THAT HAVE AFFECTED THE OTHER NUCLEAR PLANTS WITH COMBUSTION ENGINEERING DESIGNED STEAM GENERATORS?

A. Yes. Essentially all of the operating pressurized water reactor nuclear power plants in the U.S. have experienced some degree of steam generator tube degradation. However, the specific degradation mechanisms experienced and the number of tubes affected have varied significantly from plant to plant.

The corrosion mechanisms that have been experienced at Calvert Cliffs are typical of the mechanisms that have degraded the steam generator tubes at other plants with Combustion Engineering designed steam generators. For example, the outer diameter stress corrosion cracking/intergranular attack at the top of the tube sheet and the tube support plates degradation mechanism that has affected

Calvert Cliffs has been reported as a problem at ANO-2, St. Lucie Unit 1, Maine Yankee, and Fort Calhoun.

However, stress corrosion cracking and intergranular attack have not been reported as significant problems at San Onofre Unit 3 and Waterford Unit 3, which also have Combustion Engineering-designed steam generators.

Q. HAVE ANY UTILITIES SUED COMBUSTION ENGINEERING OVER PROBLEMS EXPERIENCED BY STEAM GENERATORS?

A. Yes. Florida Power & Light Corporation sued Combustion Engineering in 1995, saying that the steam generators at the St. Lucie Unit 1 nuclear plant had lasted only one-half as long as Combustion Engineering had promised. The two parties reached a confidential settlement in March, 1997.

In addition, Entergy has reached a confidential settlement with Combustion Engineering in lieu of litigation over the steam generators at the ANO-2 nuclear plant.

Q. HAS BGE SUED COMBUSTION ENGINEERING OVER THE PROBLEMS EXPERIENCED BY THE CALVERT CLIFFS STEAM GENERATORS?

A. No. BGE has a Tolling Agreement in place to maintain the option of commencing a lawsuit against Combustion Engineering concerning the Calvert Cliffs steam generators.[3]

Q. SHOULD THE COMPANY BE ENTITLED TO KEEP ANY COMPENSATION IT MAY RECEIVE FROM COMBUSTION ENGINEERING AS A RESULT OF A LAWSUIT OVER THE CALVERT CLIFFS STEAM GENERATORS OR A SETTLEMENT IN LIEU OF LITIGATION?

A. No. Any compensation that the Company receives from Combustion Engineering should be flowed through to ratepayers.

Q. HAS TUBE CORROSION LED TO THE REPLACEMENT OF THE STEAM GENERATORS AT OPERATING NUCLEAR POWER PLANTS IN THE U.S.?

A. Yes. Steam generator tube corrosion has led to the replacement of the steam generators at twenty-two nuclear power plants in the U.S. and at many foreign plants.

Q. HAVE STEAM GENERATORS DESIGNED BY COMBUSTION ENGINEERING BEEN REPLACED AT ANY POWER PLANTS?

A. Yes. The steam generators have been replaced at the Palisades, Millstone Unit 2 and St. Lucie Unit 1 nuclear plants, all of which had Combustion Engineering designed steam generators. Replacement steam generators also have been ordered for the ANO-2 and Palo Verde plants.

Q. HAVE STEAM GENERATOR RELATED PROBLEMS LED TO THE RETIREMENTS OF ANY OPERATING NUCLEAR POWER PLANTS?

A. Yes. The cost of addressing steam generator corrosion issues was a major factor in the decisions to retire the Maine Yankee, San Onofre Unit 1, and Trojan nuclear plants.

Q. HAVE YOU BEEN ABLE TO DETERMINE WHETHER BGE RESPONDED APPROPRIATELY TO STEAM GENERATOR ISSUES AT CALVERT CLIFFS?

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[3] Exhibit___STC-3.

A. No. The Company's extremely slow and incomplete responses to OPC Data Requests have made it impossible for me to determine, at this time, whether the Company responded appropriately to steam generator issues or whether the steam generator tube degradation that has been experienced at Calvert Cliffs was made more severe due to BGE's operational practices.

For example:

* OPC Data Requests submitted in July and August, were not answered until late October and November.

* Copies of documents identified during my November 4th site visit to Calvert Cliffs were not provided until late November and December. Some documents still have not been provided.

* The Company has not provided complete copies of important documents. Instead, BGE has sent me bits and pieces of draft reports and studies.

* BGE has provided very few documents from 1995 and earlier years. Consequently, there is almost no evidence regarding the Company's efforts to monitor and manage steam generator performance during the first twenty years of operations at Calvert Cliffs.

Q. HAVE YOU BEEN UNABLE, FOR THESE SAME REASONS, TO DETERMINE, AT THIS TIME, WHETHER THE COMPANY USED A REASONABLE DECISION-MAKING PROCESS TO REACH THE CONCLUSION THAT THE

CALVERT CLIFFS STEAM GENERATORS SHOULD BE REPLACED?

A. Yes.

Q. WHAT HAS BEEN THE HISTORY OF STEAM GENERATOR TUBE DEGRADATION AT CALVERT CLIFFS?

A. Calvert Cliffs experienced relatively minor steam generator tube degradation through the 1996 outage. Significant tube corrosion was discovered during this outage due, in large part, to the use of more sensitive detection equipment. The use of this more sensitive equipment during the 1996, called a Plus Point Probe, was consistent with industry practice at the time.

Q. HOW MANY STEAM GENERATOR TUBES ARE CURRENTLY PLUGGED IN EACH CALVERT CLIFFS UNIT?

A. There are currently 604 tubes plugged in Steam Generator No. 11 and 776 tubes plugged in Steam Generator No. 12 in Calvert Cliffs Unit 1. This represents 7.1% of the 8,519 tubes in Steam Generator No. 11 and 9.1 percent of the 8,519 tubes in Steam Generator No. 12.

There are also 704 tubes plugged in Steam Generator No. 21 and 443 tubes plugged in Steam Generator No. 22 in Calvert Cliffs Unit 2. This represents 8.3% of the 8,519 tubes in Steam Generator No. 21 and 5.2 percent of the 8,519 tubes in Steam Generator No. 22.[4] The most significant tube degradation at Calvert Cliffs has occurred in (1) the region immediately above the 21.5 inch thick tube sheet where corrosion products form sludge-like deposits and (2) in free standing areas in the upper tube bundles.[5]

Q. HAS THE NRC ESTABLISHED SAFETY LIMITS ON THE NUMBER OF STEAM GENERATOR TUBES THAT CAN BE PLUGGED IN EACH UNIT AT CALVERT CLIFFS?

A. Yes. The NRC has recently issued a license amendment that allows the Company to plug approximately 30 percent of the tubes in each steam generator. When the Company reaches this plugging limit, the steam generator will have to be replaced or the unit must be permanently retired.

Q. COMPANY WITNESS BOURQUIN HAS TESTIFIED THAT BGE CURRENTLY BELIEVES THAT CALVERT CLIFFS

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[4] Exhibit___STC-4.

[5] See Exhibit___STC-2.

[CONTAINS CONFIDENTIAL INFORMATION]

In addition, there were a number of mitigating steam generator life extension options that the Company could have implemented in recent years, and could still implement, to slow the rate of tube corrosion and, thereby, delay the ultimate replacement of the existing steam generators. These life extension options included:

* preventive sleeving of steam generator tubes

* reduction of the plant's primary system operating temperature

* chemical cleaning of the steam generators

[CONTAINS CONFIDENTIAL INFORMATION]

[CONTAINS CONFIDENTIAL INFORMATION]

Q. **HAVE YOU SEEN ANY EVIDENCE THAT IT HAD BEEN RECOMMENDED THAT BGE IMPLEMENT ANY OF THESE MITIGATING ACTIONS?**

A. Yes. For example, the chemical cleaning of the Calvert Cliffs steam generators has been recommended to BGE. In fact, as early as 1993, Babcock & Wilcox Nuclear Service Company had recommended to BGE that steam generator tube degradation could be reduced by controlling the tube environment. This could be accomplished by "maintaining proper chemistry, sludge lancing, chemical cleaning, etc.."[10]

In October, 1996, a consultant, Dominion Engineering, Inc., prepared a "Chemical Cleaning Discussion" for BGE. The documents from this discussion reveal that Dominion Engineering told BGE that significant tube degradation had been found in the upper tube bundle regions of the steam generators at a number of

Combustion Engineering-design plants, including Calvert Cliffs Unit 1.[11] The consultant also told the Company that the damage mechanism that caused this degradation was associated with the presence of "heavy" upper bundle deposits. Moreover, the removal of these upper bundle deposits, in combination with other remedial actions, might mitigate future tube degradation in these regions.[12] In addition, Dominion Engineering reported to BGE that chemical cleaning was "recognized as the most effective method for the removal of [these] deposits" and was considered "the action most likely to mitigate this degradation mechanism."[13]

The documents from the October 1997 "Chemical Cleaning Discussion" further reveal that a panel of industry experts had, previously, "strongly recommended" that chemical cleaning be performed at the San Onofre Nuclear Plant "as soon as practical to address under deposit and crevice corrosion in the upper tube bundle."[14]

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10 Exhibit___STC-9, at page D-15.
11 Exhibit___STC-10, at page 3.
12 Exhibit___STC-10, at page 3.
13 Exhibit___STC-10, at page 3.
14 Exhibit___STC-10, at page 20.

The documents from a subsequent Calvert Cliffs Unit 1 Planning Discussions conducted in July 1997 reveal that Framatome Technologies, Inc., a consultant to BGE on steam generator issues, had specifically recommended that BGE chemically clean the steam generators at Calvert Cliffs:

* Damage mechanisms that are killing CCNPP steam generators are caused by deposits at sludge pile and upper bundle

* If CCNPP steam generators are to last as long as possible, Framatome recommends sludge lancing and/or chemical cleaning to slow growth rate and reduce required repair scope.[15]

This same document reported that chemical cleaning of the steam generators had slowed the steam generator tube degradation growth rate at the Palo Verde Nuclear Generating Station in Arizona, which also has steam generators designed by Combustion Engineering.

Q. **HAVE YOU SEEN ANY EVIDENCE AS TO WHY BGE HAS NOT IMPLEMENTED ANY OF THESE MITIGATING ACTIONS AT CALVERT CLIFFS IN RECENT YEARS?**

A. It appears that once it decided to replace the steam generators in 2002 and 2003, BGE decided not to implement any of these steam generator life extension options.

Q. ARE THERE ANY COSTS OR RISKS ASSOCIATED WITH THE IMPLEMENTATION OF THESE STEAM GENERATOR LIFE EXTENSION OPTIONS?

A. Yes. It is expensive to implement steam generator life extension options such as preventive sleeving and chemical cleaning, e.g., approximately $10 million each time the steam generators are chemically cleaned. However, these options can benefit both the utility and its ratepayers if it enables the utility to delay an expensive steam generator replacement.

There are additional potential costs associated with continuing to operate a nuclear power plant with a large number of plugged or sleeved tubes:

* extended periods of operation at reduced power

* extended refueling outages to perform steam generator inspections

* mid-cycle inspection outages

* the threat of a tube leak

[15] Exhibit___STC-11, at the seventh unnumbered page.

These potential costs must be considered in any analysis of whether to implement life extension options in order to delay or defer the replacement of a nuclear plant's steam generators.

Q. HAS THE COMPANY EXAMINED WHETHER THE REPLACEMENT OF THE STEAM GENERATORS WOULD PRODUCE BENEFITS FOR RATEPAYERS IF THE NRC DOES NOT APPROVE THE RENEWAL OF THE OPERATING LICENSES FOR CALVERT CLIFF?

A. **[CONTAINS CONFIDENTIAL INFORMATION]**

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Q. IS IT THEN YOUR TESTIMONY THAT THE COMPANY'S DECISION TO REPLACE THE STEAM GENERATORS IN 2002 AND 2003 WAS IMPRUDENT?

A. No. BGE's slow and incomplete responses to OPC Data Requests have made it impossible for me to reach any decision, at this time, regarding the prudence of the Company's decision to replace the steam generators at Calvert Cliffs in the years 2002 and 2003.

Q. WHAT IMPACT WOULD THE REPLACEMENT OF THE STEAM GENERATORS HAVE ON THE POSSIBILITY OF

EXTENDING THE OPERATING LIVES OF THE UNITS AT CALVERT CLIFFS?

A. The installation of the replacement steam generators would enhance the Company's ability to extend the operating lives of both Units at Calvert Cliffs beyond their currently scheduled retirements in 2014 and 2016.

Q. WHAT INFORMATION HAS BGE PROVIDED TO YOU REGARDING THE PROJECTED SERVICE LIFE FOR THE REPLACEMENT STEAM GENERATORS?

A. BGE has been unable to provide any studies, analyses, assessments, or evaluations of the projected service lives for the replacement steam generators.[20] The Company also was unable to provide any correspondence with the vendor for the replacement steam generators which discussed or addressed the projected service lives for the equipment.

Q. DOES IT NEVERTHELESS APPEAR THAT THE MATERIALS AND DESIGN FEATURES OF THE REPLACEMENT STEAM GENERATORS ADDRESS THE

[20] Exhibit___STC-15.

DEGRADATION MECHANISMS THAT HAVE AFFECTED THE ORIGINAL CALVERT CLIFFS STEAM GENERATORS?

A. Yes. It appears that many design and materials improvements have been incorporated in the replacement steam generators at Calvert Cliffs to minimize their susceptibility to the corrosion mechanisms that have degraded the original steam generators. Most significantly, the replacement steam generators will use tubes fabricated from a material called Alloy 690 which offers superior resistance to corrosion in steam generator operating environments.

Replacement steam generators will Alloy 690 tubes have been in service at other nuclear power plants since March 1989. During this 9.5 year period, there have been no reports of any Alloy 690 tubes that have been plugged due to in-service degradation. The only defects in tubes fabricated from Alloy 690 have been caused by damage during maintenance activities.

Q. ARE THE COMPANY'S PROJECTED DURATIONS FOR THE REPLACEMENT OF THE CALVERT CLIFFS STEAM GENERATORS CONSISTENT WITH THE DURATIONS OF

STEAM GENERATOR REPLACEMENTS AT OTHER NUCLEAR POWER PLANTS?

A. Yes. BGE's projected [ ] durations for the replacement of the steam generators at Calvert Cliffs is consistent with the durations of recent steam generators at the North Anna, Ginna, St. Lucie and McGuire nuclear plants.

Q. IS BGE'S ESTIMATED COST FOR THE PURCHASE AND INSTALLATION OF THE REPLACEMENT STEAM GENERATORS CONSISTENT WITH THE COST OF STEAM GENERATOR REPLACEMENTS AT OTHER NUCLEAR POWER PLANTS?

A. The Company's projected $305 million cost for the replacement of the Calvert Cliffs steam generators is at the low end of the range of the costs of recent steam generator replacements.

Q. WHAT IS YOUR CONCLUSION CONCERNING THE COMPANY'S PLANS FOR REPLACING THE STEAM GENERATORS AT CALVERT CLIFFS?

A. As a result of BGE's slow and incomplete responses to OPC Data Requests I have been unable to determine whether the Company's

decision to replace the steam generators at Calvert Cliffs in the years 2002 and 2003 was prudent. I also have been unable to determine whether the Company responded appropriately over the years to steam generator issues or whether the steam generator tube degradation that has been experienced at Calvert Cliffs was made more severe due to BGE's operational practices.

Consequently, it is my recommendation that the Commission examine steam generator issues in a second phase to this proceeding or in a separate evidentiary proceeding.

III. NUCLEAR UNIT CAPACITY FACTORS

Q. PLEASE EXPLAIN THE BASIS FOR THE NUCLEAR UNIT CAPACITY FACTORS THAT YOU RECOMMENDED THAT OPC WITNESS BIEWALD USE IN HIS ANALYSES.

A. Except for Salem Units 1 and 2, I recommended that Mr. Biewald use the capacity factors achieved by the nuclear units in PJM during the five most recent calendar years. I believe that it is reasonable to anticipate that each nuclear unit's performance during the foreseeable future will be similar to its performance over the past five years.

For Salem Units 1 and 2, I recommended that Mr. Biewald use the 82.1 percent median capacity factor achieved during the years 1993 to 1997 by Salem's peer nuclear units.

Q. WHY DID YOU RECOMMEND THAT MR. BIEWALD NOT USE THE ACTUAL CAPACITY FACTORS ACHIEVED BY SALEM UNITS 1 AND 2 DURING THE YEARS 1993 TO 1997?

A. The two Salem Units were shut down for multi-year long outages starting in May and July of 1995. As a result, the Salem Units achieved very poor capacity factors during the five year period 1993-1997. I don't think it is reasonable to assume that Salem will experience such extended outages again in the foreseeable future. Therefore, I think it is prudent to assume that, in the future, Salem will operate at the median operating performance that its peer nuclear plants achieved during the period 1993-1997.

Q. WHAT PLANTS DO YOU CONSIDER TO BE THE PEER UNITS FOR SALEM UNITS 1 AND 2?

A. The nuclear units with designs and vintages must similar to the Salem Units are those plants with Westinghouse designed nuclear steam supply systems that have 3 or 4 steam generators. The units

in this peer group include Beaver Valley Unit 1, D.C. Cook Units 1 and 2, Farley Units 1 and 2, Indian Point Unit 2, Indian Point Unit 3, North Anna Units 1 and 2, Robinson Unit 2, Surry Units 1 and 2, Turkey Point Units 3 and 4, and Zion Units 1 and 2.

Q. DOES THIS CONCLUDE YOUR TESTIMONY AT THIS TIME?

A. Yes.