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CROSS-EXAMINATION
EXHIBIT NO. 17

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R-843271

DATE: MARCH 30, 1995

PA PUBLIC UTILITY COMMISSION
vs.
PENNSYLVANIA POWER & LIGHT COMPANY
DOCKET NO: R-00943271

T. S. LaGuardia

**Pennsylvania Power & Light Company
Response to Interrogatories
of the Office of Trial Staff
Dated February 1, 1995
Docket No. R-00943271**

Q.OTS-RB-39. For each decommissioning alternative, supply a table of total contingency costs claimed for Susquehanna Unit 1 and Unit 2.

A.OTS-RB-39. The total contingency costs from the 1993 decommissioning estimate for the following alternatives are:

	<u>Unit 1</u>	<u>Unit 2</u>	<u>Totals</u>
DECON	\$54,395,000	\$68,409,000	\$122,804,000
SAFSTOR	\$62,109,000	\$92,087,000	\$154,196,000

No detailed estimates were done, prepared or shown in the Decommissioning Study for ENTOMB; therefore, no contingency can be calculated.

R. J. Bernini

**Pennsylvania Power & Light Company
Response to Interrogatories of the
Office of Trial Staff
Dated February 1, 1995
Docket No. R-00943271**

- Q. OTS-RB-40. Calculate the nuclear decommissioning expense annuities without the contingency factor for each of the three decommissioning alternatives.
- A. OTS-RB-40. The calculation of the nuclear decommissioning expense annuities without the contingency factor for DECON and SAFSTOR is set forth on Attachments 1 and 2, respectively.

PENNSYLVANIA POWER & LIGHT COMPANY

Adjustment to Annual Accrual for Decommissioning Expense
Year Ended September 30, 1995
(Thousands of Dollars)

This adjustment provides for an annual accrual of decommissioning expense associated with the Susquehanna Steam Electric Station (SSES), based upon the total estimated cost of immediate dismantlement of the facility.

Line No.	Description	Amount		
		Unit 1	Unit 2	Total
1	Cost of decommissioning in 1993 dollars *	\$ 296,129 \$350,524	\$ 585,326 \$453,735	\$ 681,455 \$804,259
2	PP&L share (90%)	\$ 266,516 \$ 315,474	\$ 346,793 \$ -408,361	613,309 \$ -723,832
3	Rate of inflation	4%	4%	
	<u>Years to Retirement</u>			
4	Unit 1 (1994-2022)	29		
5	Unit 2 (1994-2024)		31	
	<u>Cost of Decommissioning</u>			
6	Unit 1 (line 2 x 3.118651 (a))	\$ 831,170 \$983,844	\$ 1,169,779	\$2,000,949
7	Unit 2 (line 2 x 3.373133 (b))		\$1,377,456	\$2,361,300
8	Value of trust @ 9/30/95	\$56,548	\$41,717	\$98,265
9	Earnings on trust (c)	5.50%	5.50%	
	<u>Value of Trust</u>			
10	@ 2022 (line 8 x 4.244401 (d))	\$240,012		
11	@ 2024 (line 8 x 4.724124 (e))		\$197,076	\$437,088
	<u>Net Cost of Decommissioning</u>			
12	Unit 1 (line 6 - line 10)	\$ 591,158 \$743,832	\$ 972,703	\$1,563,861
13	Unit 2 (line 7 - line 11)		\$1,180,380	\$1,924,212
	<u>Annuity Amount</u>			
14	Unit 1 (line 12 x .016952 (f))	\$10,021 \$12,609	\$ 14,366	\$24,387
15	Unit 2 (line 13 x .014769 (g))		\$17,435	\$36,042
16	Less: Amount per budget	3,818	3,308	7,126
17	Increase in expense	\$8,791	\$14,125	\$22,916
		\$ 6,203	\$ 11,058	\$ 17,261

- a) Future value of \$1 with compound interest @ 4% for 29 years.
b) Future value of \$1 with compound interest @ 4% for 31 years.
c) Reflects an after tax rate of return of 1.5% above the assumed rate of inflation.
d) Future value of \$1 with compound interest @ 5.5% for 27 years.
e) Future value of \$1 with compound interest @ 5.5% for 29 years.
f) Periodic deposit that will grow to \$1 in 27 years with interest compounded @ 5.5%.
g) Periodic deposit that will grow to \$1 in 29 years with interest compounded @ 5.5%.

* EXCLUDING CONTINGENCY

PENNSYLVANIA POWER & LIGHT COMPANY

Adjustment to Annual Accrual for Decommissioning Expense
Year Ended September 30, 1995
(Thousands of Dollars)

This adjustment provides for an annual accrual of decommissioning expense associated with the Susquehanna Steam Electric Station (SSES), based upon the total estimated cost of ~~immediate~~ SAFESTOR dismantlement of the facility.

Line No.	Description	Amount		
		Unit 1	Unit 2	Total
1	Cost of decommissioning in 1993 dollars *	\$346,452	\$540,309	\$886,761
		\$350,524	\$453,735	\$804,259
2	PP&L share (90%)	\$311,807	\$486,278	\$798,085
		\$315,471	\$408,361	\$723,832
3	Rate of inflation	4%	4%	
	<u>Years to Retirement</u>			
4	Unit 1 (1994-2022)	29		
5	Unit 2 (1994-2024)		31	
	<u>Cost of Decommissioning</u>	\$972,417		
6	Unit 1 (line 2 x 3.118651 (a))	\$985,844	\$1,649,280	\$2,612,697
7	Unit 2 (line 2 x 3.373133 (b))		\$1,377,456	\$2,361,300
8	Value of trust @ 9/30/95	\$56,548	\$41,717	\$98,265
9	Earnings on trust (c)	5.50%	5.50%	
	<u>Value of Trust</u>			
10	@ 2022 (line 8 x 4.244401 (d))	\$240,012		
11	@ 2024 (line 8 x 4.724124 (e))		\$197,076	\$437,088
	<u>Net Cost of Decommissioning</u>	\$732,405		
12	Unit 1 (line 6 - line 10)	\$743,832	\$1,443,204	\$2,175,609
13	Unit 2 (line 7 - line 11)		\$1,180,380	\$1,924,512
	<u>Annuity Amount</u>	\$12,416		
14	Unit 1 (line 12 x .016952 (f))	\$12,609	\$21,315	\$33,731
15	Unit 2 (line 13 x .014769 (g))		\$17,433	\$30,042
16	Less: Amount per budget	3.818	3.308	7.126
17	Increase in expense	\$8,791	\$14,125	\$22,916
		\$8,598	\$18,007	\$26,605

- a) Future value of \$1 with compound interest @ 4% for 29 years.
b) Future value of \$1 with compound interest @ 4% for 31 years.
c) Reflects an after tax rate of return of 1.5% above the assumed rate of inflation.
d) Future value of \$1 with compound interest @ 5.5% for 27 years.
e) Future value of \$1 with compound interest @ 5.5% for 29 years.
f) Periodic deposit that will grow to \$1 in 27 years with interest compounded @ 5.5%.
g) Periodic deposit that will grow to \$1 in 29 years with interest compounded @ 5.5%.

* SAFESTOR WITHOUT CONTINGENCIES

PA PUBLIC UTILITY COMMISSION
V. PENNSYLVANIA POWER & LIGHT
COMPANY
DOCKET NO. R-00943271

OCA CROSS EXAMINATION EXH. NO. 15

DATE ENTERED: 3-30-95

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Pennsylvania Power & Light Company
Response to Interrogatories
of the Office of Consumer Advocate, Set I
Dated January 30, 1995
Docket No. R-00943271

- Q.3. Please discuss in detail all nuclear plant life extension programs, if any, which are presently being conducted by or for PP&L. Identify any expenditures for these programs in each of the years 1990-1995 by major FERC account.
- A.3. PP&L has a program to preserve the option for Susquehanna plant license renewal and plant life extension. PP&L has made no commitment to plant life extension. However, the Company believes that by maintaining the plant in a high quality and reliable condition throughout its initial 40-year license period, it will have demonstrated that the plant is qualified to continue operating beyond this period.

PP&L program consists of:

1. Development of long-term maintenance efforts for Susquehanna Units 1 and 2 to assure safe and reliable plant operation for the current 40-year license period. These efforts also are intended to preserve the option for license renewal, and life extension, by maintaining the quality and reliability of major components which are economically significant to the decision to extend the operating licenses of the two Susquehanna units.
2. Participation in the development of industry life cycle management programs which will improve the management of aging of large Susquehanna components.
3. Participation in the BWR Owner's Group to support the development of a workable, economic License Renewal Rule.

Expenditures to date have been to improve our long-term maintenance efforts for major plant components needed to get to 40 years. These long-term maintenance efforts also will preserve the option for plant license renewal and life extension. No expenditures have been made specifically for plant life extension programs.

J. M. Kleha
G. T. Jones

**Pennsylvania Power & Light Company
Response to Interrogatories of
the Office of Consumer Advocate, Set I
Dated January 30, 1995
Docket No. R-00943271**

- Q.27. Regarding Questions 26 and 27, please provide a detailed explanation by Unit that describes with specificity the reasons, and associated costs, for the increases or decreases in Susquehanna-related O&M expenditures between the last rate case and the current request.
- A.27. Attachment 1 provides the amount of specifically-identifiable Susquehanna-related production O&M expenses included in the Company's allowed PUC jurisdictional revenue requirements at Docket No. R-842651 and its claimed PUC jurisdictional revenue requirements for the 12 months ended September 30, 1995. Data is provided by major cost allocation category for the Susquehanna station; comparable data by specific FERC Account or by unit is not available.

Reasons for the associated expense variances are as follows:

1. Nuclear fuel consumed - Increase is due primarily to increased output at Susquehanna resulting, in part, from a re-rating of Unit No. 2.
2. Spent fuel disposal - Increase is due primarily to higher DOE fees resulting from the increased output at Susquehanna and a revised DOE fee structure.
3. Energy trust financing - Decrease is due primarily to lower trust financing costs.
4. Decommissioning - Increase is due primarily to a recent site-specific study of the cost (stated in 1994 \$) to decommission Susquehanna.
5. All other production O&M - Increase is due primarily to the difference between an initial estimate of the 2-unit operation of Susquehanna and the budgeted expense to operate a 10-year old nuclear facility, including a normalized level of refueling outage costs.

Pennsylvania Power & Light Company
Susquehanna-Related Production O&M Expenses
Included in PUC Jurisdictional Revenue Requirements
(\$000)

<u>Description</u>	<u>Amount</u>		<u>Variance</u>
	<u>12 Months</u> <u>Ended March 31, 1985¹</u>	<u>12 Months</u> <u>Ended September 30, 1995²</u>	
Nuclear Fuel Consumed	\$46,898	\$48,076	\$1,178
Spent Fuel Disposal	8,085	10,448	2,363
Energy Trust Financing	6,536	5,395	(1,141)
Decommissioning	4,687	23,569	18,882
All Other Production O&M	78,870	120,125	42,025

¹ Source: Either Exhibit AJB3 or the PUC's Final Order at Docket No. R-842651.

² Source: Exhibit JMK2 at Docket No. R-00943271.

J. M. Kleha
G. T. Jones

**Pennsylvania Power & Light Company
Response to Interrogatories of
the Office of Consumer Advocate, Set I
Dated January 30, 1995
Docket No. R-00943271**

- Q.30. Regarding Questions 29 and 30, please provide a detailed explanation by Unit that describes with specificity the reasons and associated costs for the increases or decreases in Susquehanna-related A&G expenditures between the last rate case and the current request.
- A.30. Attachment 1 provides the amount of specifically-identifiable Susquehanna-related A&G expenses included in the Company's allowed PUC jurisdictional revenue requirements at Docket No. R-842651 and its claimed PUC jurisdictional revenue requirements for the 12 months ended September 30, 1995. Data is provided by major cost allocation category for the Susquehanna station; comparable data by specific FERC Account or by unit is not available.

Reasons for the associated expense variances is as follows:

1. Property Insurance - Decrease is due primarily to lower insurance premiums.
2. Employee Benefits - Increase is due primarily to changes in corporate benefit options over the past 10 years and higher benefit amounts related to current payroll levels.

Pennsylvania Power & Light Company
Susquehanna-Related A&G Expenses
Included in PUC Jurisdictional Revenue Requirements
 (\$000)

<u>Description</u>	<u>Amount</u>		<u>Variance</u>
	<u>12 Months Ended</u> <u>March 31, 1985</u> ¹	<u>12 Months Ended</u> <u>September 30, 1995</u> ²	
Property Insurance	\$5,241	\$4,572	\$(669)
Employee Benefits	6,570	14,092	7,522

¹ Source: Either Exhibit AJB3 or the PUC's Final Order at Docket No. R-842651.

² Source: Exhibit JMK2 at Docket No. R-00943271.

J. M. Kleha
G. T. Jones

**Pennsylvania Power & Light Company
Response to Interrogatories of
the Office of Consumer Advocate, Set I
Dated January 30, 1995
Docket No. R-00943271**

- Q.33. Regarding Questions 32 and 33, please provide a detailed explanation by Unit that describes with specificity the reasons and associated costs for the increases or decreases in Susquehanna-related capital costs in rate base between the last rate case and the current request.
- A.33. Attachment 1 provides the amount of specifically-identifiable Susquehanna-related capital-related investment included in the Company's allowed PUC jurisdictional revenue requirements at Docket No. R-842651 and its claimed PUC jurisdictional revenue requirements for the 12 months ended September 30, 1995. Data is provided by major cost allocation category for the Susquehanna station; comparable data by specific FERC Account or by unit is not available.

Reasons for the associated variances are as follows:

1. Electric Plant in Service - Increase is due to a number of individual projects. See the response to Questions 34 and 35 of Interrogatories of the Office of Consumer Advocate Dated January 30, 1995.
2. Accumulated Depreciation Reserve - Increase is due primarily to the accrual of annual depreciation expense using the "modified sinking fund" depreciation method.
3. Accumulated Deferred Income Taxes - Increase is due primarily to accrued deferred income taxes resulting from the difference between book and tax depreciation.

Pennsylvania Power & Light Company
Susquehanna-Related Rate Base Items
Included in PUC Jurisdictional Revenue Requirements
 (\$000)

<u>Description</u>	<u>Amount</u>		<u>Variance</u>
	<u>12 Months Ended</u> <u>March 31, 1985</u> ¹	<u>12 Months Ended</u> <u>September 30, 1995</u> ²	
Electric Plant In Service	\$2,879,036	\$3,191,830	\$312,794
Accumulated Depreciation Reserve	27,520	643,438	615,918
Accumulated Deferred Income Taxes			
Test Power - SSES	(20,327)	(13,222)	(7,105)
ACRS - Nuclear	230,711	663,167	432,456
Energy Trust	1,265	---	(1,265)

¹ Source: Either Exhibit AJB3 or the PUC's Final Order at Docket No. R-842651.

² Source: Exhibit JMK2 at Docket No. R-00943271.

**PENNSYLVANIA POWER & LIGHT COMPANY
RESPONSE TO INTERROGATORIES
OF THE OFFICE OF CONSUMER ADVOCATE, SET II
DATED JANUARY 30, 1995**

DOCKET NO. R-00943271

- Q.2.** How often will PP&L be adjusting its nuclear plant or fossil plant decommissioning cost estimates? Please provide any state regulatory requirements or guidance, if they exist.
- A.2.** PP&L will review the Susquehanna Decommissioning Cost Estimate at two-year intervals, or more frequently, if there are material changes to the applicable estimation information, to assure that the estimate is kept current throughout the life of the plant.

**PENNSYLVANIA POWER & LIGHT COMPANY
RESPONSE TO INTERROGATORIES
OF THE OFFICE OF CONSUMER ADVOCATE, SET II
DATED JANUARY 30, 1995**

DOCKET NO. R-00943271

- Q.14. Please identify the low-level waste compact that Pennsylvania belongs to and describe the status of the Compact's development of a low-level waste facility.**
- A.14. Pennsylvania belongs to the Appalachian States Compact. The compact is in the site identification phase.**

**PENNSYLVANIA POWER & LIGHT COMPANY
RESPONSE TO INTERROGATORIES
OF THE OFFICE OF CONSUMER ADVOCATE, SET II
DATED JANUARY 30, 1995**

DOCKET NO. R-00943271

Q.30. Please provide a comparison of the 1993 Decommissioning cost estimate with the previous Susquehanna cost estimate. Please include:

- a. LLRW Burial Costs
- b. ISFSI Costs Energy Costs
- c. Non-radiological Decommissioning Costs
- d. Insurance Costs
- e. Staffing Costs
- f. Remaining Costs

A.30. The following is a comparison of the December, 1993 Decommissioning Cost Estimate with the previous Susquehanna Decommissioning Cost estimate of January, 1985. Costs are unescalated and include contingencies:

ITEM	JANUARY 1985	DECEMBER 1993	AVERAGE* ANNUAL INCREASE	TOTAL INCREASE
a. LLRW Disposal	\$121,810,000.	\$224,562,000	\$11,508,000	\$102,752,000
b. ISFSI	0	0	0	0
c. Non-Radiological Decommissioning	**	\$127,386,000	\$14,267,000	\$127,386,000
d. Insurance	\$10,001,000	\$4,432,000***	(-\$624,000)	\$(-5,569,000)
e. Staffing	\$75,754,000	\$231,698,000	\$17,466,000	\$155,944,000
f. Remaining	\$59,239,000	\$216,181,000	\$17,578,000	\$156,942,000
TOTALS	\$266,804,000	\$804,259,000	\$60,195,000	\$537,455,000

*Average annual cost was obtained by multiplying the Total Increase by $12/107 = 0.112$.

**Non-Radiological Decommissioning Costs were not included in the January, 1985 Estimate.

***Undistributed insurance costs.

**Pennsylvania Power & Light Company
Response to Interrogatories
of the Office of Consumer Advocate, Set VIII
Dated February 23, 1995
Docket No. R-00943271**

Q.1. Referring to Response 2 of OCA Interrogatory Set II, is the two-year review of estimates a regulatory commitment? Are there any procedures in place to determine whether there are "material changes to the applicable estimation information?" If so, please provide. In the absence of any formal procedures, please explain in detail how PP&L will make this determination.

A.1. In its response to a 1994 PUC management audit finding, PP&L has agreed to prepare a Susquehanna Decommissioning Key Indicator Report. The report will be an internal document prepared at two-year intervals beginning in 1995.

PP&L does not have a formal procedure in place to determine whether there are material changes to the applicable estimation information. During the normal course of business, an assigned PP&L employee will monitor industry developments which could materially affect the 1993 Decommissioning Cost Estimate. An update will be initiated when necessary to reflect significant changes in the key parameters.

**Pennsylvania Power & Light Company
Response to Interrogatories
of the Office of Consumer Advocate, Set VIII
Dated February 23, 1995
Docket No. R-00943271**

- Q.3. Referring to Response 3 of OCA Interrogatory Set II, please provide all notes and correspondence relating to number 5 of page 5 of Attachment 1. Provide all estimated costs for radwaste disposal provided by PP&L. Provide all suggestions made by TLG Engineering.**
- A.3. The original draft of TLG's 1993 decommissioning report did not have sufficient description of the costs of disposal of the various classes of radioactive waste used in the estimate. PP&L discussed this in a telephone conversation with TLG, Inc., and requested additional clarification. This clarification was provided in the final report.**

TLG, Inc. also clarified that the costs used in the final estimate were Barnwell, S.C. disposal costs for Susquehanna decommissioning waste. This location was used because of the uncertainty of any other disposal alternative. Future updates will consider the viability of an Appalachian States Compact disposal site.

**PENNSYLVANIA POWER & LIGHT COMPANY
RESPONSE TO INTERROGATORIES
OF THE OFFICE OF TRIAL STAFF
DATED FEBRUARY 1, 1995**

DOCKET NO. R-00943271

- Q.OTS-RB-37. Has the Company done any studies or testing concerning the possibility of extending the operating license of either Susquehanna unit. Explain why or why not.**
- A.OTS-RB-37. PP&L has not performed any studies or testing regarding the extension of the operating license for the Susquehanna plant. The Company's current programs are designed to preserve the option for license renewal by maintaining the reliability and quality of the plant for the remainder of its current license period. PP&L has not performed any studies because of the current uncertainty regarding the NRC License Renewal Rule, which is under revision.**

PA PUBLIC UTILITY COMMISSION
V. PENNSYLVANIA POWER & LIGHT
COMPANY
DOCKET NO. R-00943271

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**GUIDELINES FOR PRODUCING COMMERCIAL NUCLEAR
POWER PLANT DECOMMISSIONING COST ESTIMATES**

Volume 1

Prepared for the
National Environmental Studies Project
of the
Atomic Industrial Forum, Inc.

by

TLG ENGINEERING, INC.

Brookfield, Connecticut

Thomas S. LaGuardia

John F. Risley

Francis W. Seymore

William A. Cloutier

Emile G. Smith

Joseph J. Adler

Kathleen M. Hubbard

May 1986

5.4.6 Equipment and Materials

The general description of the equipment and materials needed to perform the operations of the activity are identified in this section. This section forms the basis for estimating equipment and materials costs. For these unit factors, typical dollar costs and the references used to estimate these costs are provided. A provision is included to add subcontractors overhead and profit on materials, as applicable (typically 10%). As in the labor component, materials and equipment would be divided by the unit of productivity (e.g., cubic yard, inch of cut, etc.).

5.4.7 Unit Factor Summary

This section should sum the labor, material and equipment cost to show the total unit cost factor for the activity.

5.5 ADJUSTMENT FACTORS FOR WORK DURATIONS

Work on activated or contaminated systems necessarily requires additional time for crews to provide for personnel protection and to work in a radioactive environment. Time estimates of worker productivity should recognize the inefficiencies associated with working in restrictive clothing and rubber gloves, breathing through filtered respirators, standing on ladders or scaffolding, or crawling into inaccessible areas of the plant. In keeping with the ALARA principle, crews need to be briefed prior to entering a radioactive area as to the high radiation sources, exposure time limitations, shielding requirements and the assigned dismantling duties. The routine requirements of obtaining radiation work permits (RWP) and work authorizations on an entry-by-entry basis consume a significant but necessary amount of worker productive time. In addition, organized labor agreements or company policy for paid breaks must be accounted for in a job duration.

Work on nonradioactive piping, components and structures is not as restrictive. However, there remains the difficulty of working on ladders and scaffolding, crawling into inaccessible areas, and to a lesser extent, daily instructions on assigned dismantling duties. Allowances should be made for paid work breaks and the time expended in transit to and from the locations.

The adjustment factors identified herein should be included in the unit factor development for all repetitive activities but only where applicable. The adjustment factors for work on radioactive equipment will necessarily

be more extensive than for nonradioactive equipment. Nonrepetitive activities such as equipment setup or scaffolding erection will be considered separately but will include the same or similar adjustment factors.

There are five types of adjustment factors identified herein that cover the range of difficulty expected in any dismantling project. While additional detailed breakdowns of these factors are possible, the added complexity and degree of accuracy achievable do not warrant the effort. The five types of adjustment factors are:

1. Height
2. Respiratory Protection
3. Radiation/ALARA
4. Protective Clothing
5. Work break.

Each of these factors represent a loss in productivity. It may be necessitated by physical access limitation, mandated by radiation protection guidelines (ALARA), and/or imposed by worker (union) management agreements. These factors should be included for work involving activities in a radiation environment. They represent actual working conditions and restrictions that prevail at essentially all nuclear power plants. The estimator, of course, has the option to modify these estimates to account for site-specific differences; however some allowance should generally be made for each of these factors, as appropriate. As described herein, some of these factors are additive to the critical duration time required to perform the work activity, while others are applied against the "adjusted duration" as extended from the critical duration by the adjustment factors. The basis for each of these factors is described in the following factor definitions.

5.5.1 Height Factor

This factor adversely affects worker productivity due to the need to work typically 10 to 20 feet above the floor on temporary scaffolding to perform dismantling activities for the majority of plant systems. A 10% to 20% increase in the critical duration is estimated.

This factor allows time for the crew to climb up to the working platform of the scaffold, lift or pass tools and equipment up to the platform, and to reverse the steps upon completion of the activity. In addition, it allows for the difficulty of reaching beyond the scaffold to perform the required work. This factor increases the difficulty of the activity and should be applied against the critical duration.

5.5.2 Respiratory Protection Factor

This factor adversely affects worker productivity due to the use of canister filter masks (as a minimum) to protect the worker from airborne contamination from dismantling activities. This mask, while providing radiological protection, restricts peripheral vision, free breathing and rapid coordinated motion. This factor will increase theoretical performance durations by 25% to 50%; it increases the difficulty of work and should be applied against the critical duration.

5.5.3 Radiation/ALARA Factor

This factor addresses the administrative controls and requirements to work in radiation areas. It accounts for the increased time consumed by preparation and implementation of Radiation Work Permits (RWPs), and the necessity for the training, prework briefings and possible debriefings. The "Radiation/ALARA" factor also accounts for installation and removal of temporary shielding and possible replanning of work to reduce subsequent personnel exposure. This factor increases the difficulty of work and should be applied against the critical duration, extending activity durations by approximately 10% to 40%. For removal of high dose components such as steam generators, pressurizers, reactor coolant or recirculation pumps, etc., or for work in areas with poor access and high congestion ALARA training may include repeated mock runs, briefings and debriefings. These preparations would favor the higher percentage factor. Repetitive, lower dose activities such as removing pipe would favor the lower percentage.

The foregoing three factors for height, respiratory protection and ALARA, as applicable, are summed to form the "actual work duration." On an 8-hour day basis, these factors represent about 60-180 minutes per day for such daily repetitive activities.

5.5.4 Protective Clothing Factor

This factor accounts for the use of protective clothing, the associated procedural "suit-up," controlled disposal of the clothing, and the required exit frisking. This factor is applied against the "actual work duration" and produces a 15% to 30% increase in total activity durations. The variability will depend on the exit delays and how many workers suit up or frisk out at the same time. This factor is applied to the "actual work duration" because the actual activity will require the critical duration to perform the activity, plus all adjustments.

The estimate is based on the productive time lost during eight protective clothing (PC) changes per day as follows:

Start of workday	Suit-up in PCs	10-20 minutes
Morning break	Remove PCs and frisk out	10-15 minutes
Break return	Suit-up in PCs	10-20 minutes
Lunch break	Remove PCs and frisk out	10-15 minutes
Post-lunch return	Suit-up in PCs	10-20 minutes
Afternoon break	Remove PCs and frisk out	10-15 minutes
Break return	Suit-up in PCs	10-20 minutes
End of workday	Remove PCs and frisk out	10-15 minutes

Total Time Lost: 80 to 140 minutes
% lost in 8-hr day: 80 to 140/480 minutes = 15% to 30%

Note that the actual break time is not included here. It is listed below in the work break factor.

5.5.5 Work Break Factor

This factor is for paid nonproductive time, necessitated by agreement with labor for scheduled work breaks at predetermined intervals. This is an overall additive factor applied against all activity time, extending the total work duration by approximately 8.33%. The factor is applied to the total of all adjusted durations because that sum represents all the work to be performed for the activity. The estimate is based on the productive time lost while walking to and from the crew's work area as follows:

Start of workday	Walk to work area, pick up tools, etc.	2.5 minutes
Morning break		10.0 minutes
Transit time (Morning break)	Walk to and from break area, wash up, etc.	5.0 minutes
Transit time (lunch break)	Walk to and from break area, wash up, etc.	5.0 minutes

Afternoon break		10.0 minutes
Transit time	Walk to and from break	5.0 minutes
	(Afternoon break) area, wash up, etc.	
End of workday	Walk to lockers, wash up	2.5 minutes
Total Time Lost:		40.0 minutes

% lost per 8-hr day = $40/480$ minutes = 8.33%

5.5.6 Application of Work Adjustment Factors

An example of the application of additive work difficulty factors is shown in Table 5.2. This table also shows the format for typical routine unit factors. See Figure 3.1 of Volume 2 for an explanation of notations shown within the unit factor development format.

5.6 APPLICATION OF UNIT FACTORS

The unit factors were developed to provide a rapid and simple method to estimate removal of piping, components and structures for decommissioning. The factors were prepared on a unit of productivity basis; i.e., labor hours per cubic yard of concrete, per shipment for vessel, or labor hours per ton for steam generator and pressurizer removal. The estimator need only calculate the quantity of material or number of shipments for the component and multiply the quantity by the unit factor. As noted earlier, equipment and material costs are provided in each unit factor as needed, assuming this cost information is not normally within the "routine" estimating data bank.

The application of unit factors for work on specific, more highly radioactive components should be evaluated as to the appropriate crew size or number of crews required to keep exposures to workers within the limits of 10CFR20. This evaluation may be performed in conjunction with an overall assessment of occupational exposure. The estimator should determine if it is feasible to reassign personnel who have reached their exposure limit to later work in nonradioactive areas.

The following sections describe the material quantity calculations required to apply the unit factors.

5.6.1 Piping, Valves and Pipe Supports

The credibility of any estimate is dependent on the accuracy and completeness of the inventory of plant equipment used. The estimator must rely on up-to-date drawings and/or construction records to develop the list of piping and valves. The piping sizes and system

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- Q.15. Do the assumptions in the decommissioning cost estimates regarding waste burial costs include surcharges for waste that were generated by facilities in states not belonging to a compact? If yes, what was the percentage of the surcharge to the total burial cost?**
- A.15. The assumptions did not include surcharges for wastes that were generated by facilities in states not belonging to a compact.**

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Q.16. Please describe the assumptions and rates that were used to estimate radioactive waste burial costs for the Susquehanna. Please describe in detail the procedure that is used to estimate the quantity of low-level waste.

A.16. It was assumed that low-level wastes would be shipped to a facility within the Appalachian States Compact. Because the facility is not in operation, no direct estimate could be used. The burial costs for radioactive materials generated in the decommissioning process were then equated to current costs of low-level waste operations at the Barnwell, South Carolina facility. A rate of \$279/cubic foot was used for calculating the disposal cost, and was comprised of a \$59/cubic foot disposal charge and a \$220/cubic foot out-of-compact surcharge component.

In addition to the base charge of \$279, surcharges were included for the special handling and isolation of highly activated reactor vessel components. Surcharges were applied consistent with the practices of, and at the levels imposed by, the Barnwell facility for comparable waste forms. Curie and weight surcharges were included within the disposal cost for the Nuclear Steam Supply System components as well as any other large contaminated equipment.

The Greater-Than-Class C (GTCC) material generated in the disposition of the most highly radioactive reactor vessel internal components (i.e., those closest to the reactor core) will most likely not be suitable for shallow land disposal. This material, (if not acceptable for disposal within the regional low-level waste facilities), will be accommodated at the Department of Energy's (DOE) geologic repository. This assumption, (that GTCC waste would be sent with the spent fuel to the geologic repository), was integral to the total waste disposal estimate for Susquehanna SES. As stated in the

report summarizing the cost estimate, the disposal cost for GTCC was estimated on a basis equivalent to that charged by the DOE for spent fuel.

In summary, the costs reported in the study for off-site burial is an aggregate of (1) the LLRW base burial rate of \$279/cubic foot, (2) the associated surcharges for handling and isolating the heavy and more highly radioactive components, and (3) a spent fuel equivalent handling/disposal cost for the GTCC waste designated for geologic placement at the future DOE facility.

Waste quantities were developed from a detailed material take-off for the two nuclear units generated with the use of plant drawings, system descriptions and other summary information.

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- Q.17.** Referring to the preceding question, provide all backup documents, such as waste burial rate sheets.
- A.17.** The "waste burial rate sheets," used in estimating disposal costs for the low-level waste generated in the decommissioning activity as well as in determining surcharges for the more highly contaminated and activated material removed in the decommissioning of Susquehanna SES, are provided in Attachment 1.



CHEM-NUCLEAR SYSTEMS, INC.

140 Stoneridge Drive • Columbia, South Carolina 29210

November 20, 1992
DNG-126-92

Dear Customer:

Enclosed is the Barnwell Low-Level Radioactive Waste Management Facility Rate Schedule which will be effective January 1, 1993. This rate schedule is being sent to all generators, processors, and brokers whom we think will dispose of waste at Barnwell over the next eighteen months.

Additionally, Chem-Nuclear is required by the Southeast Compact Commission's Import Policy to collect their access fee. We are sending contracts to Large Generators (generators who have projected a disposal volume of over 1,500 cubic feet during the period of January 1, 1993 through June 30, 1994). These contracts reflect the payment requirements for disposal access fees. Small Generators (less than 1,500 cubic feet during the disposal period) can dispose of waste at standard access fees unless they exceed a 1,500 cubic foot volume. If the 1,500 cubic foot volume is exceeded, any excess waste will be subject to a premium over the standard access fee of an additional 30 percent (30%) (total per cubic foot for waste over 1,500 cubic feet will, therefore, be 130 percent (130%)).

If you believe that you will be a Large Generator but have not so informed us or have not received a Large Generator Disposal Contract, please contact Jack Harrison at (815) 467-3000.

Chem-Nuclear is pleased to be able to provide you disposal services.

Sincerely,

Dennis N. Galligan
Vice President
Sales and Marketing

DNG/eb

Enclosure



CHEM-NUCLEAR SYSTEMS, INC.

140 Stonedge Drive • Columbia, South Carolina 29210

BARNWELL LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT FACILITY RATE SCHEDULE

All radwaste material shall be packaged in accordance with Department of Transportation and Nuclear Regulatory Commission Regulations in Title 49 and Title 10 of the Code of Federal Regulations, Chem-Nuclear's Nuclear Regulatory Commission and South Carolina Radioactive Material Licenses, Chem-Nuclear's Barnwell Site Disposal Criteria, and amendments thereto.

1. BASE DISPOSAL CHARGES: (Not including Surcharges, Barnwell County Business License Tax, and Cask Handling Fee)

A. Standard Waste	\$59.00/ft ³
B. Biological Waste	\$61.00/ft ³
C. Special Nuclear Material (SNM)	\$59.00/ft ³

Note 1: Minimum charge per shipment, excluding Surcharges and specific other charges is \$1,000.

Note 2: Base Disposal Charge includes:

Extended Care Fund	\$ 2.80/ft ³
South Carolina Low-Level Radioactive Waste Disposal Tax	\$ 6.00/ft ³
Southeast Regional Compact Fee	\$.89/ft ³

2. SURCHARGES:

A. Weight Surcharges (Crane Loads Only)

<u>Weight of Container</u>	<u>Surcharge Per Container</u>
0 - 1,000 lbs.	No Surcharge
1,001 - 5,000 lbs.	\$ 675.00
5,001 - 10,000 lbs.	\$1,200.00
10,001 - 20,000 lbs.	\$1,685.00
20,001 - 30,000 lbs.	\$2,170.00
30,001 - 40,000 lbs.	\$3,185.00
40,001 - 50,000 lbs.	\$4,185.00
greater than 50,000 lbs.	By Special Request

Effective January 1, 1993

Barnwell Rate Schedule
Page Two

Effective January 1, 1993

B. Curie Surcharges For Shielded Shipment:

<u>Curie Content Per Shipment</u>	<u>Surcharge Per Shipment</u>
0 - 5	\$ 4,150.00
> 5 - 15	\$ 4,710.00
> 15 - 25	\$ 6,235.00
> 25 - 50	\$ 9,405.00
> 50 - 75	\$11,460.00
> 75 - 100	\$15,525.00
> 100 - 150	\$18,630.00
> 150 - 250	\$24,955.00
> 250 - 500	\$31,280.00
> 500 - 1,000	\$37,375.00
> 1,000	By Special Request

C. Curie Surcharges for Non-Shielded Shipments Containing Tritium and Carbon 14:

<u>Curie Content Per Shipment</u>	<u>Surcharge Per Shipment</u>
0 - 100	No Surcharge
greater than 100	By Special Request

D. Class B/C Waste Polyethylene High Integrity Container Surcharge

<u>Curie Content Per Shipment</u>	<u>Large Liners with Maximum Dimension of 82" Diameter and 79" Height</u>	<u>Overpacks with Maximum Dimension of 33" Diameter and 79" Height</u>	<u>55-Gallon Drum size with Max. Dimension of 25.5" Diameter and 36" Height</u>
0 - 25	\$29,325	These containers will be assessed charges the same as other containers in accordance with this rate schedule plus \$2,900 per overpack and \$750 per drum	
> 25 - 50	\$30,760		
> 50 - 75	\$32,775		
> 75 - 100	\$35,300		
>100 - 150	\$38,525		
>150 - 250	\$44,965		
>250 - 500	\$52,210		
>500	Upon Request		

- NOTES:**
- Class B/C poly HICs which do not conform to the above require prior approval and pricing will be provided upon request.
 - The above Large Liner charges are inclusive of the base disposal charge (1.A.), weight surcharge, curie surcharge, cask handling surcharge, disposal overpack charge, and the Barnwell surcharge.

Barnwell Rate Schedule
Page Three

Effective January 1, 1993

- | | |
|---------------------------------------|------------------------------|
| E. Cask Handling Fee | \$1,795.00 per cask, minimum |
| F. Special Nuclear Material Surcharge | \$8.15 per gram |
| G. Barnwell Surcharge | 2.4% |

3. MISCELLANEOUS:

- A. Transport vehicles with additional shielding features may be subject to an additional handling fee which will be provided upon request.
- B. Decontamination services (if required): \$150.00 per man-hour plus supplies at current Chem-Nuclear rate.
- C. Customers may be charged for all special services as described in the Barnwell Site Disposal Criteria.
- D. Terms of payment are NET 30 DAYS upon presentation of invoices. A service charge per month of 1-1/2% shall be levied on accounts not paid within thirty (30) days.
- E. Company purchase orders or a written letter of authorization in form and substance acceptable to CNSI shall be received before receipt of radioactive waste material at the Barnwell Disposal Site and shall refer to CNSI's Radioactive Material Licenses, the Barnwell Site Disposal Criteria, and subsequent changes thereto.
- F. All shipments shall receive a CNSI allocation number and conform to the Prior Notification Plan. Additional information may be obtained at (803) 259-3577 or (803) 259-3578.
- G. This Rate Schedule is subject to change and does not constitute an offer of contract which is capable of being accepted by any party.
- H. A charge of \$12,650.00 is applicable to all shipments which require special site set-up for waste disposal.
- I. Class B/C waste received with chelating agents, which requires separation in the trench, may be subject to a surcharge if Stable Class A waste is not available for use in achieving the required separation from other wastes.

Attachment to OCA Set II
Data Request
No. 20

Additional DOE charges for receipt of 10 CFR 61 GTCC material

Fuel burnup (average)	36,000	MWD per MTU			
Initial loading of MTU per assembly	178	kilograms			
Dimensions of BWR fuel assy	Length	160.000	inches		
	Width	5.120	inches		
	Depth	5.120	inches		
U.S. Dept of Energy High-Level Waste Surcharge	0.001	per kilowatt-hour			
Generated power per assembly:	36,000	MWD/MTU x 24 hr/day x 1000 MW/KW x	178.00	kg U/MTU =	153,792,000 kWhrs (thermal)
153792000 kWhrs (thermal) x	0.330	kW (electric)/KW (thermal)	50,751,360 kWhrs (electric)		
Incurred DOE charges/assembly	50,751,360	kWhrs x	\$0.001	per kWhr =	\$50,751.38 per assy
Burial volume of assembly:	160	inches x	5.12	inches x	5.12 inches
				equals:	4,194.30 cubic in.
				equals:	2.43 cubic foot
Therefore, burial cost of GTCC waste is	\$50,751	per assy x	0.4120	assemblies per cubic foot, or	\$20,909 per cubic foot

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Q.20. Please describe the method and basis used by TLG to estimate disposal costs of greater than Class C wastes.

A.20. Segmentation and disposal of the Susquehanna SES reactor vessel internals will generate some quantity of radioactive waste which is greater than 10 CFR 61 Class C (GTCC) quantities. Currently there are no definitive guidelines for the handling and disposition of this material. The material most likely will not be acceptable for burial at the regional sites. Therefore, the most likely disposal route is via the U.S. Department of Energy and the Waste Management System for high-level waste (spent fuel), unless the NRC develops an alternative solution.

The GTCC material will be shipped to DOE in a fashion similar to the spent fuel bundles. The cost of disposal, unlike that for the spent fuel, is not covered by DOE's 1 mill/kWhr surcharge and is estimated from equivalent disposal costs for spent nuclear fuel.