OCA EXHIBIT NO. 82

DOCKET NO. R-850152

8H 12-17-85
N69

PENNSYLVANIA PUBLIC SERVICE COMMISSION

R.I.D. 438

In the matter of the petition by Philadelphia Electric Company for an increase in its electric rates.

Supplementary Testimony of

JOHN K. STUTZ, Ph.D.

&

RICHARD A. ROSEN, Ph.D.

May, 1978

Since our original testimony was submitted in this hearing, the firm of A.D.Little, Inc. has revised some of the building load estimates that they developed for use in the D.O.E. M.O.P.P.S. study. Their final set of values appear in revisions of Exhibit___(S&R-5),pages 1 and 2 attached. Further, recently available computer runs done at Brookhaven National Laboratory for the M.O.P.P.S. study have provided us with more accurate projections of the total penetrations of each of the ADL conservation groups in the commercial sector by the year 1985.(We have assumed these levels are achieved by 1986). The BNL results were produced using a linear programming optimization model (BECOM) which contains the same ADL coefficients used by ESRG in its revised commercial sector forecast. BECOM estimates cost-effective levels of conservation, assuming the fuel prices projected by the Presidents National Energy Plan. Table 1, attached, gives the new penetration levels for the three conservation technology groups. Note that they do not differ greatly from the estimates used in our original forecast for the commercial sector. Since only one basic set of penetration levels result from a range of energy price inputs into BECOM, we will present a single set of results from our commercial sector electric forecasting model for our probable case, and will eliminate high and low cases for this sector only.

The new values for the resulting peak forecasts by ESRG can be found in the new Exhibit___(S&R-9) attached. The changes in the sectoral Total Energy, Base Energy, and Air-Conditioning connected loads can be found in revised Tables 9, and 10 attached. The new estimates for total commercial square-footage consistent with 1976 demand for electricity is 3.36×10^8 ft^2. The new base year result for air-conditioning compressor energy from the model is 1.276×10^9 kwh., with $.426 \times 10^9$kwh contributed

YEAR	INITIAL PECO FORECAST	REVISED PECO FORECAST		ESRG FORECAST		
		BASE	HIGH	LOW	BASE	HIGH
1977*	5560	5560	5560	5560	5560	5560
1978	6300	5700	6010	5712	5781	5848
1979	6600	5850	6230	5773	5879	5984
1980	6900	6050	6520	5835	5980	6125
1981	7200	6250	6810	5877	6069	6261
1982	7500	6480	7130	5925	6166	6407
1983	7800	6710	7460	5973	6267	6560
1984	8100	6940	7800	6012	6362	6712
1985	8400	7150	8130	6052	6462	6872
1986	8700	7350	8440	6084	6559	7034
1987	8950	7550	8740	6125	6662	7215

.18 X Base Energy + .463 X A/C Connected Load = Peak

* Actual Weather-corrected Peak

OCA EXHIBIT NO. 53

DOCKET NO. R-850152

BY 12-17-85
NBG

Q. IR-OCA-15-15. Please provide copies of all agreements between PECo and the Atomic Energy Commission or, where appropriate, the Nuclear Regulatory Commission or Department of Energy, regarding the construction and operation of Peach Bottom 1 as a joint venture.

A. IR-OCA-15-15. Copies of agreements between PECo and the Atomic Energy Commission are provided as follows:

1. Attachment IR-OCA-15-15(a) is the transmittal letter dated November 21, 1958 PECo proposal to AEC.

2. Attachment IR-OCA-15-15(b) is the PECo - AEC letter of intent dated February 16, 1959.

3. Attachment IR-OCA-15-15(c) is the AEC contract No. AT(40-1)2586.

Responsible Witness: V.S. Boyer, Vice President - Nuclear Power

3 PAGES

PHILADELPHIA ELECTRIC COMPANY

1000 CHESTNUT STREET

PHILADELPHIA 5, PA.

R. G. RINCLIFFE
PRESIDENT

November 21, 1958

Director, Division of Reactor Development
U. S. Atomic Energy Commission
Washington 25, D. C.

Attention: Chief, Civilian Power Reactor Branch

Dear Sir:

Philadelphia Electric Company is pleased to submit the attached proposal, pursuant to the invitation of the Commission of September 22, 1958, for the development, design, construction and operation of a gas-cooled, graphite-moderated nuclear power plant.

The arrangement in brief under which Philadelphia Electric Company proposes this undertaking is as follows:

1. Philadelphia Electric Company and a group of more than thirty-five investor-owned utility companies have made binding commitments to finance the construction of a 40 net electrical MW gas-cooled, graphite-moderated nuclear power plant pursuant to this proposal.

2. Philadelphia Electric Company will own this plant which will be located on its system and will contract to operate it for five years and pay all operating costs.

3. Bechtel Corporation, an experienced engineer-constructor, has agreed to design and construct the plant on a firm price, turnkey basis.

4. General Atomic Division of General Dynamics Corporation, a leading organization in research, development and production in the nuclear field, has agreed to design and furnish to Bechtel Corporation the nuclear steam supply system on a fixed price basis.

5. General Dynamics also proposes to perform the necessary research and development with a ceiling price of $14.5 million on a reimbursable cost basis under a direct contract with AEC.

6. Philadelphia Electric Company requests a waiver of source and special nuclear material use charges for five years of operation to an estimated maximum value of $2 million and General Dynamics is requesting a waiver of use charges for research and development under its contract at a maximum value of $500,000. Philadelphia Electric Company also requests that AEC undertake to reprocess irradiated fuel from the reactor on the basis of charges made in accordance with the Commission's policy at the time the spent fuel is received by the Commission.

7. Philadelphia Electric Company and all parties agree to make technical and economic information resulting from the over-all project available to AEC for public use.

The reactor system to be incorporated in the proposed plant will have a gas outlet temperature in excess of 1000°F and will produce steam at high temperature and pressure for use in modern turbo-generator equipment. Further, the prototype will be a significant and substantial step toward the achievement of economic nuclear power.

The proposed type of reactor embodies the following characteristics:

1. Simplicity, compactness and use of low cost construction materials.

2. Low fuel cycle costs, arising from high burnup, and

3. Low fuel fabrication costs, and

4. Good neutron economy.

5. An extraordinary degree of inherent safety.

This type of reactor in large scale plants will result in low capital costs, high efficiencies and thus low power cost. A study and preliminary estimate, based on present day cost levels, of a 325 net electrical MW nuclear unit indicates an over-all power cost, under conventional utility financing, of approximately 7 mills per kwh.

We are convinced that this reactor type will prove to be one of the most promising for economic use in this country and we believe its development presents an additional opportunity for the United States to maintain its world leadership in the reactor field.

The plan of action described in the proposal is evidence of the willingness of a large nation-wide group of investor-owned utility companies and competent firms engaged in nuclear development, engineering and construction work to accept a high degree of responsibility. More than thirty-five utility companies have organized a non-profit corporation, High Temperature Reactor Development Associates, Inc. (HTRDA) and have committed $16.5 million toward the research and development associated with the design and construction of the proposed prototype plant as a development project. Philadelphia Electric Company, in addition to making a contribution to HTRDA, has committed to invest $8 million in the plant making a total of $24.5 million, the amount of the fixed price contract for the plant.

Philadelphia Electric Company and the companies associated with it in HTRDA have endeavored to prepare the proposal so that it is fully responsive to the invitation of the Commission. We are prepared to discuss the details of the attached proposal with the appropriate officials and to supply such additional information as may be deemed pertinent.

The proposal submitted provides for a construction date not later than June 30, 1963 and is predicated on the Commission accepting this proposal as a basis for a cooperative arrangement and on its being submitted to the Joint Committee by January 10, 1959, and with the appropriate contracts being consummated not later than March 1, 1959. However, it is possible to establish a construction completion date of December 31, 1962 provided:

1. All parties concerned including the AEC make a determined effort to bring this about.

2. More favorable delivery of components can be obtained.

3. Installation and construction times can be compressed.

4. Earlier delivery of fuel elements is made possible by the AEC's assigning high priority to irradiation and testing programs such as making a suitable existing gas-cooled loop available at an early date.

Sincerely,

/S/ R. G. RINCLIFFE

R. G. Rincliffe
President

ATTACHMENT IR-OCA-15-15(9)
10 PAGES

PHILADELPHIA ELECTRIC COMPANY

1000 CHESTNUT STREET

PHILADELPHIA 5, PA.

R. G. RINCLIFFE
PRESIDENT

February 16, 1959

Dr. Frank K. Pittman, Director
Division of Reactor Development
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Sir:

As a result of extensive discussions, the AEC and the Philadelphia Electric Company have reached agreement on the significant features of a contract to be negotiated between the Atomic Energy Commission and the Philadelphia Electric Company under which the latter would be responsible for the design, fabrication, construction, and operation of a nuclear power plant to be built on the system of the Philadelphia Electric Company generally in accordance with its proposal dated November 21, 1958.

Basic Assumptions. Simultaneously with and as a condition of the execution of the proposed AEC-PE contract, the AEC will execute a contract with General Dynamics Corporation under which the latter will perform supporting research and development work for the nuclear steam supply system of the proposed nuclear power plant. The AEC-PE contract will set forth the commitment of PE to design, construct, and operate the proposed nuclear power plant and the commitments of AEC with regard to the assistance it will render PE in this project. PE and High Temperature Reactor Development Associates, Inc., have entered into a contract with Bechtel Corporation for the design and construction of the PE nuclear power plant, and Bechtel has entered into a subcontract with General Dynamics for the design, fabrication, and erection engineering services in connection with the installation of the nuclear steam supply system of such plant. General Dynamics and Philadelphia Electric have entered into a contract under which General Dynamics will supply the fuel required for five years' operation of the PE plant.

Description of the Proposed Reactor. The reactor system is a high-temperature, graphite-moderated, helium-cooled, prototype power reactor. The reactor system will be designed to be fueled with graphite-clad elements containing uranium (U-235) and thorium dispersed in graphite moderator and to produce steam at approximately 1450 psi and 1000° F. with a plant

capacity of approximately 40 MW electrical (net). The first core loading probably will consist of metal-clad elements to enable the graphite-clad elements to be introduced gradually. The plant will have a capacity of approximately 28.5 MW electrical (net) while operating with metal-clad elements.

The principal characteristics of the plant are as follows (data are approximate):

	Metal-Clad Graphite Elements	Graphite-Clad Elements
Heat output	92,000 kw	115,000 kw
Electrical output (net)	28,500 kw	40,000 kw
Fuel	U-Th carbide dispersed in graphite	(same as metal-clad)
Enriched U loading (93% U-235) Kg U-235	190	190
Thorium loading, Kg	894	1190
Cladding	Stainless steel or other suitable metal	Graphite
Moderator	Graphite	Graphite
Coolant	Helium	Helium
Reactor outlet temperature	1015° F	1382° F
Reactor pressure	300 psia	300 psia
Steam conditions (at turbine)	850 psig, 850° F 296,000 lb/hr	1450 psig, 1000° F 367,000 lb/hr

Summary of the Source and Purpose of Funds for Project:
The following table sets forth the respective financial contributions of the parties, covering capital costs, R&D costs, and fuel costs during the first five years of operation.

	AEC (Thousands)	PROPOSER (Thousands)	TOTAL (Thousands)
Pre-operation R&D [2/]	$ 12,500 [1/4/]	---	$ 12,500
Construction			
Philadelphia Electric Co.	---	$ 8,000	
HTRDA	---	16,500	
			24,500 [6/]
Estimated costs of (1) land, (2) interest during construction and (3) tie-in with existing transmission lines of PE		1,200	1,200
Fabrication costs of 1st and 2nd cores required during first 5 years operation, PE		1,510 [7/]	1,510
Post-construction R&D [2/]	$ 2,000 [4/]	---	2,000

	AEC (Thousands)	PROPOSER (Thousands)	TOTAL (Thousands)
Waiver of use charges on source and special nuclear material used as fuel during initial 5 years of operation.	2,000 5/	---	2,000
Waiver of use charges on source and special nuclear material for use in R&D program.	500 5/	---	500
TOTALS	$ 17,000	$ 27,210 3/	$ 44,210

1/ This includes $460,000 for work in AEC facilities. It does not include work done by General Dynamics and Bechtel prior to the contract period of approximately $1.4 million.

2/ Excludes the cost (to be borne by GD) of work which may be required in excess of the AEC cost ceiling.

3/ Charge for UF_6 withdrawal costs and credit for reprocessed fuel, fuel reprocessing expense and estimated operating cost in excess of conventional power costs are not included.

4/ These amounts constitute separate ceilings on reimbursement by AEC, although interchanges between the two may be made by mutual agreement.

5/ These amounts constitute separate ceilings.

6/ This is based on a fixed price subcontract for design and construction of the plant.

7/ This amount represents a fixed price for the fabrication of a metal-clad core, and a maximum price for a graphite-clad core.

Undertakings of the Parties. Philadelphia Electric will:

1. Subject to the terms given below, design and construct and operate for a period of five years the nuclear power plant described above at a site to be provided by PE at Peach Bottom, York County, Pennsylvania, which site shall be subject to approval by AEC.

2. Apply for and use its best efforts to obtain all necessary licenses from AEC and such other necessary approvals from Federal, State, and local regulatory agencies as are required to permit the construction and operation of the plant and its connection to the bulk power system of PE, and take such

action as may be reasonably required to satisfy the conditions of any such licenses and approvals. In the event there should be a disagreement as to the reasonableness of the requirements such question shall not be subject to the "DISPUTES" clause of the contract. The method of deciding the question of what constitutes reasonable requirements will be a matter for negotiation in the final contract.

3. Keep available for AEC inspection and study and, in accordance with procedures approved by AEC, require subcontractors of any tier to so keep, such records of technical, economic, progress, and financial data as will enable AEC to carry out the purposes of the Power Demonstration Reactor Program. PE will require subcontractors to supply to AEC for such purposes such data as AEC may reasonably request.

4. During the period of operation of the nuclear power plant under its contract with AEC, cooperate with AEC and General Dynamics in the performance of post-construction research and development work approved in accordance with the terms of the AEC-GD contract; operate the nuclear power plant under its contract with AEC at or above the PE load factor (if the nuclear steam supply system is capable of such operation) to the extent consistent with such R&D and submit reports of said operation to the AEC for such use and dissemination as the AEC may deem desirable. PE agrees to submit to the AEC for such use and dissemination as the AEC may deem desirable, annual reports, in such form and containing such data as shall be mutually agreed upon, on the economic and technical aspects of operation of the plant after expiration of the contract, for such period as PE shall operate the plant.

The AEC will:

1. Enter into a contract for the performance by General Dynamics of research and development work necessary for the design, construction, and operation of the nuclear steam supply system of the PE nuclear power plant. The General Dynamics-AEC contract will provide for AEC financial assistance up to a maximum of $15 million ($14,500,000 funds and $500,000 waivers).

2. Subject to a maximum limitation of $2 million, waive its use charges for source and special nuclear material used by PE or by others in its behalf, during the lead time required for fuel fabrication and during the five year operation of the nuclear power plant under the PE-AEC contract.

Completion Date: Philadelphia Electric will use its best efforts to assure the completion of construction of the nuclear power plant at the earliest practicable date which is now estimated to be June 30, 1963. As soon as approval is obtained a detailed estimate of the construction schedule will be prepared and submitted to AEC.

Term of Contract. The term of the contract shall begin with the date of the contract execution and extend until the expiration

of five years after issuance by AEC of a license to operate the PE reactor for the production of power.

Organization and Financing. The financial responsibilities of PE and HTRDA to carry out their obligations under the PE-HTRDA-Bechtel contract for the nuclear power plant are backed up by contracts between PE and the 52 member companies of HTRDA and between PE and HTRDA itself, under which these companies are severally obligated to PE to contribute stated amounts to HTRDA. Copies of such contracts have been furnished to the AEC and will not be changed without approval of AEC.

Obligation of Waiver Assistance. AEC in support of its undertakings under the AEC-PE contract, will waive AEC use charges on source and special nuclear materials up to $2 million during the lead time required for fuel fabrication and during the five year operation of the nuclear power plant under such contract.

Termination. The contract may be terminated at any time by a written agreement of the parties. Any such termination shall be effective in the manner and upon the date specified in said termination agreement. (PE may also terminate, without further expense to the AEC, if it cannot obtain the necessary licenses or regulatory agency approvals as hereinabove required of PE, or if adequate liability insurance is not available to PE, or if the AEC-GD contract is terminated.) It is further agreed that no further payments shall be required of AEC under this contract in the event of any such termination.

AEC shall be excused from further performance of its obligations under the AEC-PE contract in the event of the failure of PE to perform its obligations under the contract, or in the event of the failure of General Dynamics to perform its obligations under the AEC-General Dynamics contract. PE shall be excused from further performance of its obligations under the AEC-PE contract in the event of the failure of AEC to perform its obligations under the AEC-PE contract or the AEC-General Dynamics contract.

Inspection and Records. AEC shall have the right to inspect the work and activities of Philadelphia Electric and its sub-contractors under the contract at such time and in such manner as the AEC may deem appropriate. The contract also will include the statutory GAO audit provision and will provide equivalent rights to AEC.

Option to Purchase. Without prejudice to any other rights AEC may have in the event of a default by Philadelphia Electric Company, AEC shall have the right and option to purchase the reactor plant and related facilities if, at any time after the initial pouring of concrete for the foundation of the reactor portion of the proposed plant, PE fails to continue with the construction or operation of the proposed reactor during the period required by the AEC-PE contract for any reason other than causes beyond the control and without the fault or negligence of PE as set forth in standard AEC clauses, including acts of God, strikes,

Governmental authority, fire or the public enemy, the inability of Philadelphia Electric Company to obtain the necessary licenses and permits, or adequate liability insurance coverage, the termination of the AEC-GD contract, or the termination of the AEC-PE contract by mutual agreement. For the purposes of this section "reactor plant and related facilities" shall not be construed to include Philadelphia Electric Company's power generating plant and equipment. Upon Philadelphia Electric Company's failure to proceed with construction or operation of the plant, AEC shall, within six months after such failure has continued for a period of three months, inform Philadelphia Electric Company in writing whether or not the AEC desires to exercise its option to purchase the reactor plant and related facilities; provided, however, that in computing such six-months' period, there shall be excluded any period during which either House of the Congress of the United States is not in session by reason of adjournment of more than three days. In the event that this purchase option is exercised by AEC, Philadelphia Electric Company will then sell to AEC the reactor plant and its related facilities, including all parts, components, and equipment in their then existing status and condition, and in addition make arrangements as may be appropriate to lease to AEC for a period sufficient to permit ten (10) years of operation of the reactor plant and related facilities, necessary real estate and related rights owned by Philadelphia Electric Company, including water rights, and rights of access, adequate for AEC's intended operation. Upon the expiration of such lease, the Government shall immediately remove all radioactive facilities, parts and materials from the leased premises and notify PE of its intention to either remove other facilities, parts and materials from the leased premises or abandon them. If the Government notifies PE of its intention to remove such other facilities, parts and materials from the leased premises, it shall remove them within a reasonable time after the termination of the lease. In any event, the Government shall leave the leased premises in a reasonably safe and orderly condition. Title to all facilities, parts and materials abandoned by the Government shall pass to PE. The property and rights to be sold and leased to AEC, and the price to be paid therefor, will be mutually agreed upon by the parties. If the parties are unable to agree, such disagreement shall be considered a dispute concerning a question of fact within the provisions of the "DISPUTES" article of the agreement, but in no event will such price exceed the original acquisition, engineering, fabrication, and construction costs, less depreciation applicable during the operating period, nor will it include research, development, or other costs incurred in anticipation of such fabrication, engineering, construction, or acquisition of tangible property.

Inventions. The contractual provisions concerning inventions will include the provisions set forth in Appendix A to this letter. PE agrees to include in its contract with GD for the supply of fuel provisions similar to paragraphs 1 through 4 of the patent provisions set forth in Appendix A of the letter of understanding from GD relating to this project. PE also agrees to direct Bechtel to incorporate such patent provisions in its subcontract with GD for the supply of the nuclear steam system.

Dr. Frank K. Pittman

Other Contractual Provisions. The contract will contain additional provisions as required by law, and, subject to mutual agreement, pertinent standard AEC articles, with minor modifications to satisfy the circumstances and needs of this contract, and such additional provisions as are reasonable under the circumstances and consistent with AEC policy.

Sincerely,

/s/ R. G. Rincliffe

R. G. Rincliffe
President

APPENDIX A

INVENTION RIGHTS PROVISION
FOR
PHILADELPHIA ELECTRIC COMPANY CONTRACT

Inventions.

1. Whenever any invention or discovery is made or conceived by PE or its employees in the course of, or in connection with, any work for which the Commission has provided funds under the AEC-GD contract or under this contract, or by employees of PE while assigned to another Commission contractor, to a Commission facility, or during utilization of the services of the Commission or Commission contractor personnel or whenever any invention or discovery useful in the production or utilization of special nuclear material or atomic energy as defined in the Atomic Energy Act of 1954, as amended, is made or conceived by PE or its employees in the course of, in connection with or under this contract, PE shall furnish AEC with complete information thereon; and AEC shall have the sole power to determine whether or not and where a patent application shall be filed, and to determine the disposition of the title to and the rights under any application or patent that may result; provided, however, that PE, in any event, shall retain at least a non-exclusive, irrevocable, royalty-free license, with the right to grant sublicenses to participating companies of HTRDA, under said invention, discovery, application or patent. Subject

to the license and licensing rights retained by PE, the judgment of AEC on these matters shall be accepted as final; and PE for itself and its employees, agrees that the inventor or inventors will execute all documents and do all things necessary or proper to carry out the judgment of AEC.

2. Whenever any invention or discovery is made or conceived by PE or its employees in the course of, in connection with, or under this contract, other than as provided for in Section 1 hereof, PE shall promptly furnish AEC with complete information thereon and shall specify at the time of such disclosure whether or not PE desires to file a patent application, subject to security restrictions and requirements. PE shall have the rights and title to any such invention or discovery and agrees to grant a non-exclusive, irrevocable, royalty-free license to the Government for governmental purposes under said invention, discovery, application or patent; provided, however, that if PE advises that it does not desire to file a patent application, AEC may file such application, in which event the rights under said invention, discovery, application or patent shall be determined in accordance with the first paragraph hereof.

3. No claim for pecuniary award or compensation under the provisions of the Atomic Energy Act of 1954 shall be asserted by PE or its employees with respect to any invention or discovery made or conceived in the course of, in connection with, or under the terms of this contract.

4. Except as otherwise authorized in writing by the Commission, PE

will obtain patent agreements to effectuate the purposes of paragraphs 1 and 2 of this Article from all persons who perform any part of the work under this contract, except such clerical and manual labor personnel as will not have access to technical data.

5. PE will insert in all subcontracts provisions relating to inventions and discoveries which are mutually agreed upon.

6. As respects any invention or discovery owned by the Commission or in which the Commission has the right to grant a royalty-free license, the Commission herewith grants to PE a non-exclusive, royalty-free license to make and use any such invention or discovery in the construction or operation of the nuclear or atomic energy plant constructed under this contract. However, the Commission makes no representation or warranty that the exercise of this license will not result in infringement of any patents owned by third parties, nor does the Commission assume any liability or responsibility to PE or GD for infringement of other patents owned by third parties resulting from the exercise of the foregoing license, or from the manufacture, construction, use or operation of the nuclear or atomic energy plant, or any associated equipment or apparatus, or the use of any method or process by PE or GD.

5-5-1
G.1
RFM

ATTACHMENT IR-OCA-15-15(c)
23 PAGES

UNITED STATES ATOMIC ENERGY COMMISSION

CONTRACT NO. AT(40-1) 2586

PHILADELPHIA ELECTRIC COMPANY

THIS CONTRACT, entered into and effective this 27 day of Aug, 1959, by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), acting through the UNITED STATES ATOMIC ENERGY COMMISSION (hereinafter called the "Commission"), and PHILADELPHIA ELECTRIC COMPANY, a corporation organized and existing under the laws of the Commonwealth of Pennsylvania, and having its principal office in the City of Philadelphia, Commonwealth of Pennsylvania (hereinafter called the "Contractor"),

WITNESS THAT:

WHEREAS, it is the announced policy of the Commission to encourage private participation in the development of nuclear power technology and to accelerate the achievement of commercially feasible nuclear power; and

WHEREAS, the Contractor has submitted to the Commission a proposal whereunder, contingent upon the Commission's simultaneously entering into a contract with General Dynamics Corporation (hereinafter called the "Corporation") for the performance of a program of research and development directed towards the design, construction and operation of a Nuclear Power Plant, the Contractor will enter into a contract with the Commission for the design, construction and operation of said Plant and assume or provide for all capital costs as well as other costs incident to the design, construction and operation of the Nuclear Power Plant, which the Contractor will own; and

WHEREAS, the Commission is willing to enter into this contract with the Contractor under the terms herein provided, which include provisions for the waiver of certain of the Commission's established charges; and

WHEREAS, the Commission is willing to render certain financial and other assistance, including waiver of certain of the Commission's established charges, to the Corporation in the performance

of the necessary research and development effort leading to the design, construction and operation of said Nuclear Power Plant and in the performance of a program of post-operation research and development leading towards the further improvement and optimization of nuclear power plants of the type proposed; and

WHEREAS, it is anticipated by the parties to this contract that the design, development, construction and operation of the aforesaid Nuclear Power Plant will constitute a significant advance toward the attainment of commercially competitive nuclear power and that the information and experience so gained will be made available to the Commission for public use and will lead to further advances in subsequent nuclear power reactors; and

WHEREAS, the parties have agreed that the Contractor shall accomplish the work and perform the services necessary to place into operation and operate such a power plant, under the terms and conditions hereinafter recited; and

WHEREAS, this contract is authorized by, and has been negotiated under the Atomic Energy Act of 1954, as amended;

NOW, THEREFORE, the parties hereto do mutually agree as follows:

ARTICLE I—UNDERTAKINGS OF THE PARTIES

1. The Contractor shall, as expeditiously as may be practicable, effect the accomplishment of the undertakings hereinafter set forth:

a. The Contractor shall design, construct and operate until the end of the term of this contract a Nuclear Power Plant to be located at a site to be provided by the Contractor and approved by the Commission. Said Plant will be powered by an advanced high-temperature, graphite-moderated, helium-cooled prototype power reactor, designed to be fueled with graphite-clad elements, to be constructed in accordance with the description set forth in Appendix A which is attached

hereto and hereby made a part hereof. Any change in said reactor description shall be subject to the mutual agreement of the parties hereto. The site to be provided by the Contractor and which is subject to the approval of the Commission is located at Peach Bottom, York County, Pennsylvania. The Plant shall be operated as a part of the interconnected system of the Contractor. The Plant shall be operated at or above the system load factor of the Contractor (if the nuclear steam supply system is capable of such operation), to the extent consistent with the requirements of the post-construction research and development program to be undertaken pursuant to the contract between the Commission and the Corporation. The Contractor shall bear or be responsible for all costs incurred in the design, construction and operation of the Nuclear Power Plant, except as hereinafter expressly provided.

b. The Contractor shall apply for and use its best efforts to obtain all necessary licenses from the Commission and such other necessary approvals from Federal, State and local regulatory authorities as are required to permit the construction and operation of the Plant for the generation of electricity and its connection to the Contractor's bulk power system. It is understood that neither the execution of this agreement nor any implementation thereof by the Commission shall constitute a representation by the Commission or the Government that any of the necessary licenses or approvals are or will be granted. Nothing contained in this contract shall be construed to limit or otherwise affect the provisions or effect of any license or permit which may be issued to the Contractor by the Commission.

c. To the extent requested by the Commission, the Contractor shall keep and make available for inspection and study by the Commission and its representatives or designees and, in accordance with procedures approved by the Commission, require subcontractors of any tier to so keep and make available such records of technical, economic, and financial data (including actual costs of performing such work) as will en-

able the Commission to carry out the purposes of the Power Demonstration Program. To the extent requested by the Commission, the Contractor also will supply, and will require its subcontractors of any tier to supply, to the Commission for such purposes such data as the Commission may reasonably request during the term of this contract. The Commission will consult with the Contractor with respect to the form, content and frequency of such reports. After expiration or termination of this contract, and for such period as the Contractor shall operate the Plant, the Contractor will supply the Commission annual reports in such form and containing such data as shall be mutually agreed upon, on the economic and technical aspects of operation of the Plant. All information and reports furnished to or acquired by the Commission pursuant to this paragraph "c" may be used as the Commission sees fit.

d. During the period of operation of the Nuclear Power Plant under this contract, the Contractor will cooperate with the Commission and the Corporation in the performance of post-construction research and development approved in accordance with the terms of the contract between the Commission and the Corporation referred to in paragraph 2. a. of this Article.

2. The Commission will perform the undertakings hereinafter set forth:

a. The Commission, simultaneously with the execution of this contract, will enter into a contract with the Corporation for the performance of the necessary research and development effort leading to the design, construction and operation of the Reactor Plant, and for the performance of a program of post-construction research and development leading towards the further improvement and optimization of nuclear power plants of the type proposed; and in accordance with the terms of the said contract between the Commission and the Corporation, reimburse the Corporation for costs incurred in its performance of such research and development.

b. During the period of five (5) years from the issuance of the license to operate the Nuclear Power Plant and the period of lead time required for fabrication of fuel elements prior to the issuance of such license, the Commission will waive its use charges up to a maximum of Two Million Dollars ($2,000,000) with respect to source and special nuclear materials used or acquired by or on behalf of the Contractor for the purpose of operating the Nuclear Power Plant, including reasonable inventories of material in process during such periods.

c. The Commission will furnish the Contractor monthly reports of the accumulated charges waived pursuant to paragraph 2. b. of this Article.

d. In accordance with the Commission's announced policy concerning chemical processing of spent fuels from licensed reactors contained in 22 Fed. Reg. 1591, dated March 12, 1957, as it may be revised from time to time, the Commission agrees to enter into a separate contract with the Contractor to provide for processing of irradiated fuels from the Reactor Plant.

Article II—Term of Contract

1. The term of this contract shall commence on the date of execution hereof and shall end five (5) years after issuance of a Commission license to operate the Nuclear Power Plant for the production of power.

2. The Contractor agrees to use its best efforts to perform its obligations under this contract on a time schedule which will permit completion of construction of the Nuclear Power Plant on or before October 1, 1963, and attainment of zero-power criticality on or before December 31, 1963.

Article III—Termination

1. This contract may be terminated at any time by written mutual agreement of the parties. Any such termination shall be

effective in the manner and upon the date specified in said agreement.

2. The Contractor agrees that it will exert its best efforts to apply for and obtain all necessary licenses and permits from the Commission and such other necessary approvals from Federal, State and local regulatory authorities as are required in connection with the performance of its obligation hereunder to construct and operate the Plant. In making said "best efforts" commitment the Contractor agrees to take such action as is reasonable to place itself and the Project in a posture which would permit the Contractor to obtain appropriate regulatory licenses and approvals. In determining the reasonableness of any action so required, there shall be taken into consideration (i) the extent to which such action would increase the cost to the Contractor of constructing the Nuclear Power Plant; (ii) the fact that the Commission has agreed to contribute a maximum of $17,000,000 to the Project for the purpose of demonstrating the technical and economic feasibility of the Nuclear Power Plant; (iii) the fact that said purpose cannot be effectively accomplished without construction and operation of the Plant by the Contractor; and (iv) the fact that the Plant is being constructed as a prototype of future plants which are intended to be capable of achieving economic nuclear power, although the prototype is not expected to do so. If the Contractor, after considering the above criteria is of the opinion that it cannot reasonably be required to take the necessary action, and the performance of its obligations to construct and operate the Plant as contemplated under this contract cannot be carried out as a result of the Contractor's failure to take such action and to obtain the necessary regulatory approvals, the Contractor may terminate this contract subject to the following conditions:

(a) The Contractor shall notify the Commission in writing of the basis for its opinion that to take the action necessary to obtain appropriate regulatory approvals would impose an unreasonable burden upon the Contractor.

(b) If, within thirty (30) days after receipt of the said notice of the Contractor, the Commission does not inform the Contractor in writing of any Commission exception thereto, the Contractor may terminate the contract by written notice to the Commission.

(c) If the Commission takes exception within the manner and time period described in paragraph 2, b. of this Article and the parties are unable to agree upon a mutually satisfactory course of action within fifteen (15) days after receipt by the Contractor of notice of the Commission's exception, the question of whether or not the Contractor can reasonably be required to take such steps as may be necessary to obtain appropriate regulatory approvals shall be referred for final determination to a panel composed of three (3) individuals with wide experience and capacity in dealing with problems associated with atomic energy and its utilization for the production of electric energy, selected by mutual agreement of the parties. Failing mutual agreement of the parties upon selection of the panel within thirty (30) days after receipt by the Contractor of notice of the Commission's exception, the parties shall each select one individual with the required qualifications to serve as members of the panel. The two members so designated shall select a third individual with the required qualifications and the three shall constitute the panel. The cost of the services of the panel shall be borne equally by the Contractor and the Commission.

(d) The panel in reaching its decision as to whether or not the Contractor can reasonably be required to take the necessary action shall be guided by the criteria specified in paragraph 2 above and shall consult with the Commission and the Contractor and obtain such other information as it deems appropriate. The decision of the panel shall be reached as expeditiously as possible and the decision of the majority of the panel shall be binding upon the parties. If the panel decides that the Contractor can reasonably be required to take the action necessary to obtain the appropriate licenses and approvals, the Con-

tractor must so proceed or be in default of its obligations under this Contract. If the panel decides that the Contractor cannot reasonably be required to take such action the Contractor may terminate the contract by written notice to the Commission within fifteen (15) days after the date of said decision of the panel.

(e) Pending final decision of the panel, the Contractor shall proceed diligently with the performance of the contract unless otherwise authorized in writing by the Commission, provided, however, that the Contractor shall not be required to proceed with those steps which are necessary to obtain appropriate regulatory approvals and which are in issue under paragraph 2 of this Article pending the decision of the panel.

3. Without otherwise limiting or affecting the rights of the parties hereto,

(a) Either party may, at its election and upon written notice to the other party, be excused from further performance of its obligations under this contract in the event the other party is in default because of a material breach of its obligations hereunder and fails to cure such default within thirty (30) days after receiving said written notice.

(b) The Commission may, at its election and upon written notice to the other party, be excused from further performance of its obligations under this contract in the event the Corporation is in default because of a material breach of its obligations under Contract No. AT (04-3) 314 between the Commission and the Corporation, and the Corporation fails to cure such default within thirty (30) days after receipt of said written notice from the Commission.

(c) The Contractor may, at its election and upon written notice to the Commission, be excused from further performance of its obligations under this contract in the event the Commission is in default because of a material breach of its obligations under the contract between the Commission and the Cor-

poration referred to in paragraph 3 (b) above, and fails to cure such default within thirty (30) days after receipt of written notice from the Corporation, or in the event of the termination of said contract by mutual agreement.

(d) The Contractor agrees that, if it shall unilaterally abandon the construction of the Nuclear Power Plant under this contract for reasons other than (a) a contract amendment under which the Commission approves such abandonment, or (b) a cause beyond the control of the Contractor and without its fault or negligence (including inability to obtain necessary licenses or regulatory approvals or adequate liability insurance coverage), the Contractor shall reimburse the Commission for the Commission's expenditures under Contract No. AT(04-3) 314 between the Commission and the Corporation except to the extent that the Commission determines that any such expenditures have resulted in the acquisition by the Government of property, patents or other value. The provisions of this parargaph (d) are not intended to establish any right on the part of the Contractor to abandon the construction of the Plant under this contract.

4. The Contractor agrees to exert its best efforts to obtain adequate indemnity and liability insurance coverage in connection with the performance of its obligations hereunder, but the Contractor shall have the right to terminate this contract, without further expense to the Commission and upon written notice to the Commission, if the performance of any of its obligations as contemplated under this contract cannot be carried out because of the Contractor's inability to obtain adequate indemnity or liability insurance coverage.

5. Neither the Government nor the Contractor shall be required to reimburse the other or pay directly for any costs or expenses by reason of the termination of this contract, under the provisions of paragraph 2, subparagraph 3. b. and c., or paragraph 4 of this Article III.

Article IV—Project Organization

1. The Contractor has entered into an agreement dated November 19, 1958, with High Temperature Reactor Development Associates, Inc. (hereinafter called "HTRDA"), a non-profit, non-stock, Delaware corporation composed of fifty-two (52) Member Companies, and an agreement dated November 18, 1958, with said Member Companies, whereby in consideration for specified financial contributions aggregating $16,500,000 by the Member Companies toward research and development associated with the design and construction of the Nuclear Power Plant, HTRDA and its Member Companies will receive such technical knowledge, information and experience as will assist them in future years to design, construct and operate larger nuclear plants of improved efficiency. The Contractor agrees to maintain said agreements in effect until the termination or expiration of this contract and all new agreements and modifications to the said existing agreements wherein Member Companies obligate themselves to participate in and support the work which the Contractor is performing pursuant to the terms of this contract, shall be subject to review and approval by the Commission prior to execution.

2. Nothing contained in the agreements referred to in paragraph 1 of this Article shall in any way relieve the Contractor of its obligation under this contract to design, construct and operate the Nuclear Power Plant; nor shall the failure of HTRDA or any of its Member Companies to meet their obligations under the said agreements relieve the Contractor of its obligations under this contract.

Article V—Inventions

1. Whenever any invention or discovery is made or conceived by the Contractor or its employees in the course of, or in connection with, any work for which the Commission has provided funds under the contract between the Commission and the Corporation or under this contract, or by employees of the Contractor while assigned to another Commission contractor, to a Commission facility,

or during utilization of the services of the Commission or Commission contractor personnel, or whenever any invention or discovery useful in the production or utilization of special nuclear material or atomic energy, as defined in the Atomic Energy Act of 1954, as amended, is made or conceived by the Contractor or its employees in the course of, in connection with or under this contract, the Contractor shall furnish the Commission with complete information thereon; and the Commission shall have the sole power to determine whether or not and where a patent application shall be filed, and to determine the disposition of the title to and the rights under any application or patent that may result; provided, however, that the Contractor, in any event, shall retain at least a non-exclusive, irrevocable, royalty-free license, with the right to grant sublicenses to Member Companies of HTRDA, under said invention, discovery, application or patent. Subject to the license and licensing rights retained by the Contractor, the judgment of the Commission on these matters shall be accepted as final; and the Contractor for itself and its employees, agrees that the inventor or inventors will execute all documents and do all things necessary or proper to carry out the judgment of the Commission.

2. Whenever any invention or discovery is made or conceived by the Contractor or its employees in the course of, in connection with, or under this contract, other than as provided for in paragraph 1 of this Article, the Contractor shall promptly furnish the Commission with complete information thereon and shall specify at the time of such disclosure whether or not the Contractor desires to file a patent application, subject to Commission security restrictions and requirements. The Contractor shall have the rights and title to any such invention or discovery and agrees to grant a non-exclusive, irrevocable, royalty-free license to the Government for governmental purposes under said invention, discovery, application or patent; provided, however, that if the Contractor advises that it does not desire to file a patent application, the Commission may file such application, in which event the rights under said invention, discovery, application or patent shall be determined in accordance with paragraph 1 of this Article.

3. No claim for pecuniary award or compensation under the provisions of the Atomic Energy Act of 1954, as amended, shall be asserted by the Contractor or its employees with respect to any invention or discovery made or conceived in the course of, in connection with, or under the terms of this contract.

4. Except as otherwise authorized in writing by the Commission, the Contractor will obtain patent agreements to effectuate the purposes of paragraphs 1 and 2 of this Article from all persons who perform any part of the work under this contract, except such clerical and manual labor personnel as will not have access to technical data.

5. Except as otherwise authorized in writing by the Commission, the Contractor will insert in all subcontracts provisions relating to inventions and discoveries prescribed or approved by the Commission.

6. As respects any invention or discovery owned by the Commission or in which the Commission has the right to grant a royalty-free license, the Commission herewith grants to the Contractor a non-exclusive, royalty-free license to make and use any such invention or discovery in the construction or operation of the Nuclear Power Plant and similar plants. However, the Commission makes no representation or warranty that the exercise of this license will not result in infringement of any patents owned by third parties, nor does the Commission assume any liability or responsibility to the Contractor or the Corporation for infringement of other patents owned by third parties resulting from the exercise of the foregoing license or from the manufacture, construction, use or operation of the Nuclear Power Plant, or any associated equipment or apparatus, or the use of any method or process by the Contractor or the Corporation.

ARTICLE VI—INSPECTION OF PROJECT

The Commission and its duly authorized representatives and designees shall have the right to inspect the work, records, reports,

information, data and activities of the Contractor, its subcontractors and suppliers of any tier under this contract at such time and in such manner as it shall deem appropriate. The Contractor agrees upon appropriate notice from the Commission to permit visits to the site of the project by persons designated by the Commission.

Article VII—Health and Safety

1. In its operation of the Nuclear Power Plant, the Contractor shall comply with the conditions of its license to operate the Plant and shall comply with and be responsible for safety under all applicable rules, regulations and orders of the Commission. Further, the Contractor shall, to the extent it participates in research and development work undertaken pursuant to the contract between the Commission and the Corporation at the Plant, and to the extent such work is not covered by applicable Commission rules, regulations and orders governing operation of the Plant, exercise jointly with the Corporation the same responsibilities for work at the Plant as are assumed by the Corporation under its contract with the Commission. The Contractor shall make no claim for compensation or damages by reason of or in connection with any interruption of Plant operation resulting from the failure of the Contractor to comply with its operating license or the applicable rules, regulations and orders of the Commission, or by reason of the failure of the Contractor or the Corporation to carry out its said joint responsibility in connection with research and development work at the Plant.

2. Nothing contained in this Article shall be construed to grant, vest, or create any rights in a person not a party to this contract, provided, however, that this provision shall not be construed to limit or impair any rights which any person may have under applicable Federal or State statutes.

Article VIII—Examination of Records

1. The Contractor agrees that the Commission and the Comptroller General of the United States or any of their duly authorized

representatives shall have access to and the right to examine any of its directly pertinent books, documents, papers and records involving transactions related to this contract until the expiration of three (3) years after the termination or expiration date of this contract unless the Commission authorizes their prior disposition.

2. The Contractor further agrees to include in all its subcontracts hereunder a provision to the effect that the subcontractor agrees that the Commission and the Comptroller General of the United States or any of their duly authorized representatives shall have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor involving transactions related to the subcontract until the expiration of three (3) years after final payment under such subcontract unless the Commission authorizes their prior disposition. The term "subcontract" as used herein means any purchase order or agreement to perform all or any part of the work or to make or furnish any materials required for the performance of this contract, but does not include (a) purchase orders not exceeding $1,000.00, (b) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public, or (c) subcontracts or purchase orders for general inventory items not specifically identifiable with the work under this contract.

3. Nothing in this contract shall be deemed to preclude an audit by the General Accounting Office of any transaction under this contract.

Article IX—Assignment

Neither this contract nor any interest therein or claim thereunder shall be assigned or transferred by the Contractor, except as expressly authorized in writing by the Contracting Officer.

Article X—Covenant Against Contingent Fees

1. The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract

upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

2. Unless otherwise authorized by the Contracting Officer in writing the Contractor shall cause provisions similar to the foregoing to be inserted in all subcontracts and purchase orders entered into under this contract.

Article XI—Officials Not to Benefit

No member of or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

Article XII—Renegotiation

1. Unless and except to the extent that exemption may be granted by or pursuant to section 106 of the Renegotiation Act of 1951, as amended, or to the extent that said Act, as amended, may be determined by the Renegotiation Board to be inapplicable to this contract, this contract is subject to said Act of 1951, as amended, and shall be deemed to contain all the provisions required by section 104 of said Act.

2. Subject to the provisions of paragraph 1 of this Article, the Contractor agrees to insert the provisions of this Article including this paragraph 2, in all subcontracts made by it specified in section 103 (g) of the Renegotiation Act of 1951; provided, that the Contractor shall not be required to insert the provisions of this Article

in any subcontract exempted by or pursuant to section 106 of the Renegotiation Act of 1951, as amended.

Article XIII—Notices

1. Whenever under this contract either party is required or permitted to give notice or to furnish any report, information, estimate, statement or other document to the other party, such notice or document may either be delivered or mailed by regular mail. The giving or furnishing of such notice or other document shall be deemed to occur for all purposes under this contract (1) in the case of delivery of such notice or document on the date of such delivery, or (2) in the case of mailing of such notice or document on the second business day following the date of post-mark of such mailing, provided, that notices or other documents furnished pursuant to paragraph 2 of Article III shall be given or furnished by delivery or by registered mail, and the giving or furnishing of such notice or other documents shall be deemed to occur for all purposes under this contract on the date of such delivery or such receipt of registered mail.

2. Notices or other documents to be given or furnished to the Commission shall be delivered or mailed to the Manager of Operations, Oak Ridge Operations Office, Atomic Energy Commission, Oak Ridge, Tennessee. Notices or other documents to be given or furnished to the Contractor shall be delivered or mailed to L. R. Gaty, Vice President, Philadelphia Electric Company, 1000 Chestnut Street, Philadelphia 5, Pennsylvania.

3. Either party may at any time change a previous designation of individual or address to which notices or other documents are to be sent by giving notice in writing of such change of designation to the other party.

Article XIV—Option to Purchase

1. Without prejudice to any other rights the Commission may have in the event of a default by the Contractor, the Commission shall have the right and option to purchase the Reactor Plant and

related facilities if, at any time after the initial pouring of concrete for the foundation of the reactor portion of the proposed Plant, the Contractor fails to continue with the construction or operation of the proposed reactor during the period required by this contract for any reason other than causes beyond the control and without the fault or negligence of the Contractor, including (i) acts of God, strikes, Governmental authority, fire or the public enemy, (ii) the inability of the Contractor to obtain the necessary licenses and permits, or adequate liability insurance coverage, (iii) the termination of the contract between the Commission and the Corporation, or the termination of this contract by mutual agreement. For the purposes of this section "Reactor Plant and related facilities" shall not be construed to include the Contractor's power generating plant and equipment. Upon the Contractor's failure to proceed with construction or operation of the Plant, the Commission shall, within six (6) months after such failure has continued for a period of three (3) months, inform the Contractor in writing whether or not the Commission desires to exercise its option to purchase the Reactor Plant and related facilities; provided, however, that in computing such six (6) months period, there shall be excluded any period during which either House of the Congress of the United States is not in session by reason of adjournment of more than three (3) days. In the event that this purchase option is exercised by the Commission, the Contractor will then sell to the Commission the Reactor Plant and its related facilities, including all parts, components, and equipment in their then existing status and condition, and in addition make arrangements as may be appropriate to lease to the Commission for a period sufficient to permit ten (10) years of operation of the Reactor Plant and related facilities, necessary real estate and related rights owned by the Contractor, including water rights, and rights to access, adequate for the Commission's intended operation.

2. Upon the expiration of such lease, the Government shall continue to exercise control over and remove as expeditiously as possible all radioactive facilities, parts and materials from the

leased premises or decontaminate as expeditiously as possible all radioactive facilities, parts and materials, and notify the Contractor of its intention to either remove other facilities, parts and materials from the leased premises or abandon them. If the Government notifies the Contractor of its intention to remove such other facilities, parts and materials from the leased premises, it shall remove them within a reasonable time after the termination of the lease. In any event, the Government shall leave the leased premises in a reasonably safe and orderly condition. Title to all facilities, parts and materials abandoned by the Government shall pass to the Contractor.

3. The property and rights to be sold and leased to the Commission, and the price to be paid therefor, will be mutually agreed upon by the parties. If the parties are unable to agree, such disagreement shall be considered a dispute concerning a question of fact within the provisions of Article XVI of this contract, but in no event will such price exceed the Contractor's original acquisition, engineering, fabrication, and construction costs, less depreciation applicable during the operating period, nor will it include research, development, or other costs incurred in anticipation of such fabrication, engineering, construction, or acquisition of tangible property.

ARTICLE XV—SUBCONTRACTS

The Contractor will incorporate or cause to be incorporated in each purchase order and subcontract for the performance of any of the work under this contract such provisions as are required by Article I, subparagraph 1. c. and Articles V, VI, VIII, X, XII and XVII of this contract.

ARTICLE XVI—DISPUTES

1. Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. Within thirty (30) days from

the date of receipt of such copy, the Contractor may appeal by mailing or otherwise furnishing to the Contracting Officer a written appeal addressed to the Commission, and the decision of the Commission shall, unless determined by a court of competent jurisdiction to have been fraudulent, arbitrary, capricious, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence, be final and conclusive; provided, that if no such appeal to the Commission is taken, the decision of the Contracting Officer shall be final and conclusive. In connection with any appeal proceeding under this Article, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract in accordance with the Contracting Officer's decision.

2. This "Disputes" clause does not preclude consideration of law questions in connection with decisions provided for in paragraph 1, above; provided that nothing in this contract shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

Article XVII—Security

1. In the performance of the work under this contract the Contractor shall, in accordance with the Commission's security regulations and requirements, be responsible for safeguarding restricted data and other classified matter and protecting against sabotage, espionage, loss and theft, the classified documents, materials, equipment, processes, etc., as well as such other material of high intrinsic or strategic value as may be in the Contractor's possession in connection with performance of work under this contract. Except as otherwise expressly authorized by the Commission the Contractor shall upon completion or termination of this contract transmit to the Commission any classified matter in the possession of the Contractor or any person under the Contractor's control in connection with performance of this contract, not including, however, any classified matter received by the Contractor under an access permit issued by the Commission.

2. The Contractor agrees to conform to all security regulations and requirements of the Commission.

3. The term "Restricted Data," as used in this Article, means all data concerning (a) design, manufacture, or utilization of atomic weapons; (b) the production of special nuclear material; or (c) the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the Restricted Data category pursuant to section 142 of the Atomic Energy Act of 1954, as amended.

4. Except as the Commission may authorize, in accordance with the Atomic Energy Act of 1954, as amended, the Contractor shall not permit any individual to have access to Restricted Data until the designated investigating agency shall have made an investigation and report to the Commission on the character, associations, and loyalty of such individual and the Commission shall have determined that permitting such person to have access to Restricted Data will not endanger the common defense and security. As used in this paragraph, the term "designated investigating agency" means the United States Civil Service Commission or the Federal Bureau of Investigation, or both, as determined pursuant to the provisions of the Atomic Energy Act of 1954, as amended.

5. It is understood that disclosure of information relating to the work or services ordered hereunder to any person not entitled to receive it, or failure to safeguard any Restricted Data or any top secret, secret, or confidential matter that may come to the Contractor or any person under the Contractor's control in connection with work under this contract, may subject the Contractor, its agents, employees, and subcontractors to criminal liability under the laws of the United States. (See the Atomic Energy Act of 1954, as amended, 68 Stat. 919. See also Executive Order 10104 of February 1, 1950, 15 F. R. 597.)

6. Except as otherwise authorized in writing by the Contracting Officer, the Contractor shall insert where applicable, provisions similar to the foregoing in all subcontracts and purchase orders under this contract.

Article XVIII—Definitions

1. As used in this contract:

a. The term "Contracting Officer" means the person executing this contract on behalf of the Government and includes his successors or any duly authorized representative of any such person.

b. The term "Commission" means the United States Atomic Energy Commission or any duly authorized representative thereof, including the Contracting Officer, except for the purpose of appeals under Article XVI.

c. The term "Nuclear Power Plant" or "Plant" means the prototype nuclear power reactor referred to in paragraph 1. a. of Article I and includes the site and all conventional and reactor facilities on the site, pertaining to this project.

d. The term "Reactor Plant" means the prototype nuclear power reactor referred to in paragraph 1. a. of Article I and includes the necessary fuel elements and heat exchangers for said reactor.

e. The term "Project" means the "Nuclear Power Plant," and all supporting work including research, development, and engineering performed on and off-site.

In Witness Whereof, the parties hereto have executed this contract as of the day and year first above written.

United States of America

/s/ By Frank K. Pittman
Director, Division of Reactor Development, U. S. Atomic Energy Commission

Philadelphia Electric Company

/s/ By R. G. Rincliffe
President

I, V. J. WALSH, certify that I am the Secretary of the corporation named as Contractor herein; that R. G. RINCLIFFE who signed this contract on behalf of the Contractor was then President of said corporation; that said contract was duly signed for and on behalf of said corporation by authority of its governing body and is within the scope of its corporate powers.

IN WITNESS WHEREOF, I have hereunto affixed my hand and the seal of said corporation this 27 day of Aug, 1959.

(Corporate Seal) /s/ V. J. WALSH.

Contract No. AT(40-1) 2586

Appendix A

The Nuclear Power Plant will include a helium-cooled, graphite-moderated, nuclear reactor, designated as HTGR, gas circulation system, steam generator, turbine generator, and other necessary auxiliary systems and components. The reactor will be designed to be fueled with graphite-clad fuel elements containing thorium and highly enriched uranium. The plant will be designed to be capable of a heat power level of 115 megawatts and electrical output of approximately 40 megawatts when fueled with graphite-clad fuel elements and cooled by helium gas at about 300 psi pressure, and with a reactor coolant outlet temperature of approximately 1380° F. The steam generation rate will be designed to be approximately 367,000 lbs. per hour at 1450 psig and 1000° F. at the turbine.

The fuel elements will consist of uranium and thorium dispersed in graphite in the form of fuel compacts contained in graphite. The reflector will be graphite. It is anticipated that the fuel elements in the first core will be metal-clad, resulting in a somewhat lower operating temperature and an approximate heat power level of 90 megawatts. If metal-clad elements are used, they will be replaced by and the plant will be operated with graphite-clad elements after sufficient information is available to establish the feasibility of operation of the plant with a graphite-clad core. Any metal-clad elements which are used to fuel the reactor may be so used until it is operationally desirable to remove them and the graphite-clad elements may be introduced gradually into the core in replacement of the metal-clad elements as they are removed.

Materials of construction, design criteria, and specifications, provision for shield containment, components associated with the reactor plant, and the turbo generator plant will, as indicated by a continuous survey of the best technology known and an active research and development program, be such as to provide a safe, useful, economical operating life of said plant with due consideration for the scheduled completion date.

OCA EXHIBIT NO. 37

DOCKET NO. R-850152

3M 12-17-85
NBJ

Q. IR-OCA-15-13. Refer to Attachment E, page 2, of the volume entitled "Decommissioning Cost Estimates for Peach Bottom Atomic Power Station, Units 2 and 3." Please explain why Peach Bottom 1 had a "planned limited life."

A. IR-OCA-15-13. Peach Bottom 1 had a planned limited life as explained in PECo's petition to the PUC to retire the unit and is restated here as follows:

Petitioner's Peach Bottom Atomic Power Station Unit No. 1 is a nuclear generating unit powered by a high temperature, gas-cooled reactor and having a capacity of 40 megawatts. The unit was constructed as a prototype under an Atomic Energy Commission demonstration program pursuant to a contract between Petitioner and the Atomic Energy Commission, whereby Petitioner undertook to construct the unit and operate it for a period of five years. This unit first generated in 1967 with the use of the first nuclear core and, by agreement with the Atomic Energy Commission, was extended beyond the original five-year operating period to provide for the use of a second nuclear core and the accumulation of additional operating data. The unit is presently operating under an Atomic Energy Commission Provisional Operating License which expires on June 24, 1974. A renewal of the license is being sought to authorize operation until exhaustion of the nuclear fuel in the second core, which is expected to occur by December, 1974. Petitioner will seek authorization under Atomic Energy Commission regulations to decommission the unit. Peach Bottom Unit No. 1 has fulfilled its purpose as a prototype unit, has already been operated beyond the five-year period originally contemplated under the Atomic Energy Commission's Demonstration Program, and no provisions have been made for the fabrication of a third nuclear core.

Responsible Witness: V.S. Boyer, Vice President - Nuclear Power

OCA EXHIBIT NO. 55

DOCKET NO. R-850152

PM 12-17-85 Nby

PHILADELPHIA ELECTRIC COMPANY

Bimonthly Report #10

To Pennsylvania Public Utility Commission

On Status of The Limerick Project

November 27, 1985

LIMERICK UNIT 1 AND COMMON

COST MILESTONES - SUMMARY

(MILLIONS)

	FORECAST					ACTUALS				
	Direct	AFUDC	Overheads	Monthly Totals	Cumulative	Direct	AFUDC	Overheads	Monthly Total	Cumulative
Cost to Date 4/30/85					$3,415.0					$3,415.0
Actual May - June 1985	$ 30.1	$ 52.5	$0.1	$ 82.7	$3,497.7	$27.7	$ 52.5	$0.1	$ 80.3	$3,495.3
July - August 1985	$ 30.3	$ 55.3	-	85.6	$3,583.3	$24.0	$ 55.4	$0.2	$ 79.6	$3,574.9
September - October 1985	$ 19.5	$ 55.9	$0.1	$ 75.5	$3,658.8	$15.2	$55.7	$0.1	$71.0	$3,645.9
November - December 1985	$ 17.7	$ 56.2	-	$ 73.9	$3,732.7					
January - February 1986	$ 12.6	$ 74.7	-	$ 87.3	$3,820.0					
After February 1986	-	$330.4	-	$330.4	$4,150.4					
TOTAL	$110.2	$625.0	$0.2	$735.4	$4,150.4	$66.9	$163.6	$0.4	$230.9	

November 27, 1985

TABLE C-1
REPORT NO. 10

DOCKET NO. R-850152

8 M 12-17-85
Kb.

PENNSYLVANIA PUBLIC UTILITY COMMISSION, ET AL

VS.

PHILADELPHIA ELECTRIC COMPANY

RATE INVESTIGATION DOCKET 438, ET AL

* * * * * * * * * *

DIRECT TESTIMONY OF VINCENT S. BOYER

OCTOBER 1977

TESTIMONY OF VINCENT S. BOYER

Q. Mr. Boyer, would you please state your name and address for the record.

A. Vincent S. Boyer, 2301 Market Street, Philadelphia, Pennsylvania.

Q. By whom are you employed, Mr. Boyer, and in what capacity?

A. I am Vice-President, Engineering and Research Department for the Philadelphia Electric Company.

Q. What is your educational background?

A. I received my Bachelor of Science Degree in Mechanical Engineering from Swarthmore College in 1939. I received my Master of Science Degree in Mechanical Engineering in 1944 from the University of Pennsylvania. I have also taken graduate courses in nuclear reactor engineering and nuclear instrumentation at the University of Pennsylvania and Drexel University.

Q. Can you tell us something about your experience prior to your present position?

A. In 1939, I joined Philadelphia Electric Company as an Engineer of Plant Tests in the Electric Operations Department. Following service in the United States Navy from 1944 to 1946, I returned to Philadelphia Electric Company and served in various supervisory positions in power stations where I had responsibility for the maintenance and operation of boiler plant equipment. In 1951, I was transferred to the Mechanical Engineering Division where I was engaged in power station design. I was appointed Assistant Superintendent of the Company's Cromby Station in 1953 and I assisted in directing the operator's training program and in placing the two units of the Cromby Station in service. In 1956, I was appointed Superintendent of the Cromby Station. In 1960, I was designated Superintendent of the Company's Peach Bottom Atomic Power Station and in 1963 I was appointed Manager of Nuclear Power in the Electric Operations Department. In January 1965 I was designated Manager of the Electric Operations Department. In October, 1968, I was appointed to my present position of Vice-President, Engineering & Research.

Q. I show you an exhibit which has been marked for identification as B-1 and ask you if that was prepared under your direction and supervision?

A. Yes.

Q. Please briefly explain the nature of Exhibit B-1.

A. This is a document which was prepared in order to provide a thorough explanation of the methods used by the Company in forecasting annual peak loads and energy sales. Based on the annual peak load review the nature and amount of generating capacity which must be added in order to properly serve the public is determined. This document also explains in some detail the reasons for installing the current and near term future generating capacity.

We believe that the decisions, necessarily made many years ago because of the long lead time required for the installation of major generating stations, were reasonable ones based upon the facts which then existed and upon thoroughly prepared estimates of future growth. If the completely unexpected Arab oil embargo of late 1973 and the resulting recession had not occurred, the generating reserves available now and for the next few years would have been barely adequate.

I also wish to call attention to the fact that the estimated loads of the future may prove to be as wrong as all those loads estimated for 1974, 1975, 1976 and 1977. Moreover, the apparent 32% reserve of 1979 would be only 24% if Salem No. 2 is not in service until the Fall of 1979; and if Limerick No. 1 does not come on line before the Summer of 1983, the

installed reserve in that summer would be only 11% instead of the indicated 23%. By the same token, if the economy in the Philadelphia area improves at a faster rate than presently foreseen, the estimated reserves would also be significantly diminished.

Another factor which I wish to call to your attention is that if the criterion of loss of load of once in 10 years is to be retained, the reserve requirement may soon have to be increased above 20%. The reason for the possible increased reserve requirement is that the unplanned outages of major new generating units have exceeded the unplanned outages experienced in the past on which the 20% reserve margin was based. If these large units, both fossil-fueled and nuclear, continue to experience greater mechanical difficulties than generating units have in the past, then the planned reserve margin could well increase to 25% or above.

Q. As you have noted, page 3 of Exhibit B-2 lists the generating units in service last summer. Do you plan to take any of those out of service in the near future?

A. Yes. The Company has determined that for economic reasons Barbadoes Nos. 3 and 4 (130 mw total) and Richmond No. 12 (108 mw) should be placed on a cold standby status for the time being. They are presently not needed, and placing them on standby will effect a savings in operating expense.

The Company has studied the economics of retiring or putting on a cold standby status its older intermediate units. These studies have shown that these three units would effect a savings of between $1.85 million and $3.2 million by mothballing them until their capacity is needed. The predicted schedule to recall these units to active service is: One

Exhibit B1

PHILADELPHIA ELECTRIC COMPANY

Explanation of Load Forecasting and of Present and Future Generating Reserve Capacity

a short time and also provide peaking generating capacity for the Philadelphia Electric Company system. The Croydon combustion turbines are more efficient than the simple heat cycle turbines and can be used as intermediate generating capacity. They have a heat rate of approximately 10,000 btu/kwh (34% efficiency) as compared to 14,000 btu/kwh (24% efficiency) for simple heat cycle units. The regenerative heat cycle type of unit was not available from manufacturers until 1972. Eddystone #3 and #4 units also provide the intermediate cycling generating capacity needed to supply the Philadelphia Electric Company energy requirements.

Current Generating Capacity Additions

Currently, the only Philadelphia Electric Company generating units under construction are Salem No. 2 (a jointly-owned unit) and Limerick No. 1 and No. 2. These three units are nuclear units which have long lead times. All three have been delayed from their original service dates. Further delay in the installation of these units would be uneconomical. Even if the annual peak load remained constant over the next eight to ten years, the savings in fuel costs by operating these units will more than offset the costs incurred by completing their construction.

Statement 3-A

SUPPLEMENTAL TESTIMONY OF

VINCENT S. BOYER

Q. Mr. Boyer, have you submitted previous testimony and exhibit material with respect to Philadelphia Electric Company's system annual peak load and capacity forecast?

A. Yes, I sponsored Exhibit B-1 on this subject. Table I of Exhibit B-1 is PE's peak load and capacity forecast based on the Company's 1976 energy sales forecast which was current at the time Exhibit B-1 was prepared.

Q. Have you reviewed the 1977 energy sales forecast discussed in Mr. Morlok's testimony and developed a revised system annual peak load and capacity forecast?

A. Yes. I have reviewed the 1977 energy sales forecast, which is prepared under Mr. Morlok's direction, and based on this forecast have revised the PE system annual peak load forecast as shown on Table A. The peak loads shown were forecast using the methodology described in Appendix A of Exhibit B-1.

The annual peak load and installed generating capacity forecast shown on Table A is now being used for planning purposes. Two annual peak load estimates and the anticipated percent reserves based on our current generation capacity addition and retirement program are shown. The Base Line estimated annual peak loads are the principal bases for our proposed long term Construction Budget and Forecast, although increasing consideration is being given to High Estimate annual peak loads.

During the next few years, the uncertainty of the effects of the energy policies and laws being formulated at the National level and the uncertainty of the effects of the amount of economic activity in our area, as is more fully discussed by Mr. Morlok, have prompted us to consider a range of annual peak loads. As with any forecast the accuracy of the basic assumptions directly affect the accuracy of the forecast. If there is an upsurge of economic activity in the PE service territory in excess of that assumed in the Base Line forecast, then PE may very well experience the High Estimate annual peak loads also shown on Table A. As we have learned from past experience, unforseen and unforseeable events can substantially alter actual load levels from that which we expect.

For example, as was recently pointed out by the Mayor of the City of Philadelphia, there is a considerable increase in the planned construction activity in the near future in the City, such as the commuter rail tunnel, the ARCO refinery expansion and the Airport high speed line. Each of these events, and others, could well increase load levels above those projected in the base case.

Q. Why is it important to consider the High Estimate peak loads when planning a program of generating capacity additions?

A. Historically, we have planned generating capacity additions using the Base Line annual peak load forecast to

determine the need.

However, as indicated in my prior response, there is greater uncertainty in energy sales forecasting and hence peak load projections at the present time compared to prior years. The effect of this uncertainty on reserve levels can be seen by comparing Table A to Table I of Exhibit B-1. For example, in even as short a period as one year (i.e., 1976 energy sales forecast vs. 1977 energy sales forecasts), there has beena change in anticipated generation reserve levels of as much as 18% for the early 1980's. While this particular change is an increase in reserve levels, peak load forecasts can also fall short of actual peaks as occurred in the late 1960's resulting in a similar decrease in reserve levels. In the early 1970's when the available reserve generating capacity was lower than anticipated we had the option to install short lead time oil-fired generating units. Because of current U.S. Government policies, short lead time oil-fired generating units can no longer be used to bridge the gap if installed generating capacity shortages occur.

Large generating units are planned well in advance of their service dates because of the long period of time required to license and build such plants. If the annual peak loads grow at a more rapid rate than expected, the installation of large generating units cannot be expedited.

Electric utilities are mandated to provide reliable service which our customers now expect. If installed generating capacity should be inadequate to supply the High Estimate peak load, there is nothing to be done but reduce or eliminate service to selected customers in order to reduce the load. In 1970 this situation occurred and portions of the PE system were shut down on a rotating basis. To avoid a similar occurrence in the future, we must now carefully consider the potential consequences of our high case projections.

Q. Will you please explain the differences between the annual peak load estimates of Table I of Exhibit B-1 and those in Table A.

A. In the light of the new reduced energy sales forecast, we have reduced our Base Line peak load estimates from those shown on Table I of Exhibit B-1 to those shown on Table A. The High Estimate peak load shown in Table A has essentially the same growth rate as the previous Base Line peak load estimates but delayed by one year. These reductions in peak load forecasts result in an anticipation of increased generation reserve levels.

Q. Based on the new annual load estimates which are lower than the previous forecast, has the planned generating capacity addition and retirement program been reviewed?

A. Yes, we have reviewed our construction schedule and have concluded that no significant changes are presently required.

The 238 mw of capacity which we plan to "mothball" in 1978, pursuant to permission received from the PUC, have been removed from the installed generating capacity. These units which are about 3% of the total installed capacity can be returned to service if and when they are needed by system load conditions or for local area reinforcement. A unit which has been "mothballed" is capable of being returned to service at a later date and is placed on cold standby status to take advantage of reduced operating costs.

Q. Why are you maintaining the same construction schedule for generating units already under construction even though this possibly means having higher than normal reserves?

A. The completion of the generating units on a timely schedule insures the lowest possible construction costs for the unit because the equipment can be purchased at a lower cost and there would be less AFDC if the schedule is not delayed. In addition, since the new units have much lower operating costs than our existing older units, customers benefit earlier from the reduction in fuel adjustment charges if the unit is not delayed.

The higher reserve margins predicted for the immediate future also benefit customers because the Company will have greater flexibility in scheduling maintenance of generating units and transmission lines thus minimizing the amount of overtime work that might otherwise be required in order to get work done during critical load periods. The higher

reserve margins also benefit our customers because of the improved reliability that is inherently produced by an up-to-date, modernized plant as compared to an outdated system. This factor also enables us, as we did just recently during the extreme cold weather, to make significant energy sales to other utilities and assist such Companies to avoid service disruptions in their territories. This also paves the way for assistance to us when we need help. The revenue from these sales are credited against service costs thereby benefiting our customers.

Finally, the Philadelphia area and our customers realize the significant benefits with our nuclear units in operation because our dependence on fossil fuels, particularly oil, is considerably less. This minimizes the potential disruptions that can come from oil embargoes, transportation problems, and miners strikes.

Q. What would be the consequence of delaying the Limerick construction schedule?

A. The Limerick units are needed to provide generating capacity in the mid 1980's. Table B shows the percent generating capacity reserves with and without the Limerick units for both the Base Line and High Estimate peak load forecasts. As can be seen from Table B without the first Limerick unit the 1983 reserve generating capacity falls to 25% based on the Base Line peak load estimate and 13% based on the High Estimate. While 25% is considered today to be an adequate reserve capacity, a 13% reserve capacity is well below our reserve objective. In fact,

without the Limerick units and should the High Estimate peak loads occur, generating capacity reserve levels will become negative by 1986.

If the Limerick construction schedule were delayed from its planned installation dates of 1983 and 1985 the final costs of the unit would be increased by approximately $140 million for each year that a unit is delayed.

Q. Would you please explain further the effect on revenue requirements if Limerick #1 is delayed?

A. As indicated in the answer to Consumers Advocate Interrogatory Question #80, advancing the service date of Limerick #1 by a year would lower annual revenue requirements by approximately $16 million per year. This reduction consists of $4 million per year of lower capital-related costs and $12 million per year of lower expense-related costs. As indicated in that answer, advancement of the unit would require a significant rate increase in the first year, but the customers save money every year thereafter. A $16 million per year net savings represents the levelized annual effect of the year by year revenue requirements.

If Limerick #1 were delayed by one year the economic effects would be just the opposite to that indicated in the answer to Question #80. In the first year there would be a net reduction in revenue requirements due to the postponement of the capital charges despite higher fuel costs. However, every year thereafter there would be an increase in revenue requirements due to the $140 million net increase in the capital costs of the unit.

Over the life of the plant the levelized annual revenue requirements would be approximately $16 million per year higher.

Q. On Page APP-D3 of Exhibit B-1 there is a table of required reserve levels for the PJM Interconnection by years. Have similar required reserve levels been recalculated during 1977?

A. No. The required reserve levels for the years 1977 through 1985 are considered to be the same as they were calculated in 1976. These PJM required reserve levels, which average about 24% (1977 to 1985) were calculated using the then current annual peak load forecasts. A change in the annual peak load estimates would not significantly change the percent reserve requirements.

The required reserve levels are not as precise as the numbers might indicate. Although the method used to calculate the required reserves (as described in Exhibit B-1 in Appendix D) is sophisticated and the percent reserve requirements are reasonably insensitive to changes in annual peak load forecasts, the percent reserve is very sensitive to changes in a number of other factors. For instance, it depends on the size and type of the planned generating capacity additions and requirements, the anticipated preventive maintenance of existing and planned generating units and the expected forced outage rates of existing and planned generating units. In addition, the anticipated load shape is an important factor in calculating required reserves. Accordingly actual reserve requirements

may exceed those presently being forecasted. In addition, an increase in expected peak load would require a corresponding increase in total required capacity.

Q. Will you please explain why the required reserve levels for the PJM Interconnection have been increasing?

A. The increase in PJM reserve requirements is due to the installation of larger units and to the decrease in availability of generating units. Specifically many of the oil-fired units have been converted from coal to oil in order to meet environmental regulations. These units were not designed for the cyclic operation which they have experienced because of the high cost of oil. This cyclic operation has led to component failure directly attributable to the problem of stresses created by temperature changes. In the recent past, coal-fired units burned high ash content coal because better quality coal was unavailable. This has lead to high forced outages from boiler tube problems which are now being experienced. Outages of nuclear units have been prolonged by the retrofit of safety systems to meet ever increasing safety requirements.

Q. What is the significance of this indicated increase in required reserve levels?

A. The significance is that in order for PJM to maintain the same reliability as in the past (i.e. the loss-of-load-probability of one day in ten years) generating reserve margins on the order of 25% may have to be maintained.

TABLE A

ANNUAL PEAK LOAD AND INSTALLED GENERATING CAPACITY FORECAST

Year	Generation Changes	Installed Generating Capacity-Mw	Base Line Estimated Peak Load Mw	Base Line Reserves %	High Estimate Peak Load Mw	High Estimate Reserves %
1978	-130 mw: Mothball Barbadoes 3&4 -108 mw: Mothball Richmond 12	7960	5700	40	6010	32
1979	+474 mw: Salem 2	8434	5850	44	6230	35
1980		8434	6050	39	6520	29
1981	-17 mw: Deration*	8417	6250	35	6810	24
1982	-12 mw: Deration**	8405	6480	30	7130	18
1983	+1055 mw: Limerick 1 Retire Richmond 12	9460	6710	41	7460	27
1984		9460	6940	36	7800	21
1985	+1055 mw: Limerick 2 -124 mw: Retire Chester 5&6	10391	7150	45	8130	28
1986		10391	7350	41	8440	23
1987		10391	7550	38	8740	19

* The results of the addition of sulfur dioxide removal equipment at Eddystone and Cromby.

** The result of the additions of cooling towers and sulfur dioxide removal equipment at Cromby.

System Planning Division
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1/24/78

TABLE B

Percent Reserves with and Without Limerick Units

	Base Line Reserves (%)		High Estimate Reserves (%)	
	With Limerick Units	Without Limerick Units	With Limerick Units	Without Limerick Units
1983	41	25	27	13
1984	36	21	21	8
1985	45	16	28	2
1986	41	13	23	(2)
1987	38	10	19	(5)

( ) Negative reserves

System Planning Division
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1/24/78

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Nb1

SUPPLEMENTAL STUDY OF LIMERICK'S EFFECT ON PECO REVENUE REQUIREMENTS

(Presented to PUC Staff on 7/22/80 by V.S. Boyer & E. Kasum)

Additional economic studies were made to supplement the information provided to the PUC on May 28, 1980 in order to further demonstrate the advantage of completing Limerick as soon as possible. These studies compared a 1985-87 schedule for nuclear units at Limerick with several coal alternatives, and included the effect of variations in fossil fuel escalation, Limerick capacity factor, Limerick capital costs, and zero PECO load growth on the nuclear-coal comparisons. This new information, in the form of curves showing differential revenue requirements, was presented to the PUC at a follow-up meeting on July 22. Following is a listing and brief description of these curves:

Curve I — Effect of Installing Limerick in 1985-87 on PECO Total Electric Sales Revenue.

This curve shows the savings resulting from the operation of Limerick increasing from $70 million in 1985 to approximately $700 million in 1989 based on the listed assumptions.

Curve II — Limerick Nuclear and Coal Alternatives vs. Installing No Additional Capacity.

This curve demonstrates the lower revenue requirements of completing Limerick Nuclear Station (1985-87 S.D.) compared to three coal alternatives placed in service at the earliest possible date of 1988.

The first coal option examined was the conversion of Limerick to coal. The cost of conversion, based on an estimate of Gilbert Associates, plus the sunk costs of the nuclear plant with AFDC to 1988 total approximately $5.5 billion. The advantage of nuclear over this alternative averages over $1.1 billion annually in revenue required from 1988 through 1994.

Curve VI — Effect of Nuclear Capacity Factor & Increased Nuclear Capital Costs

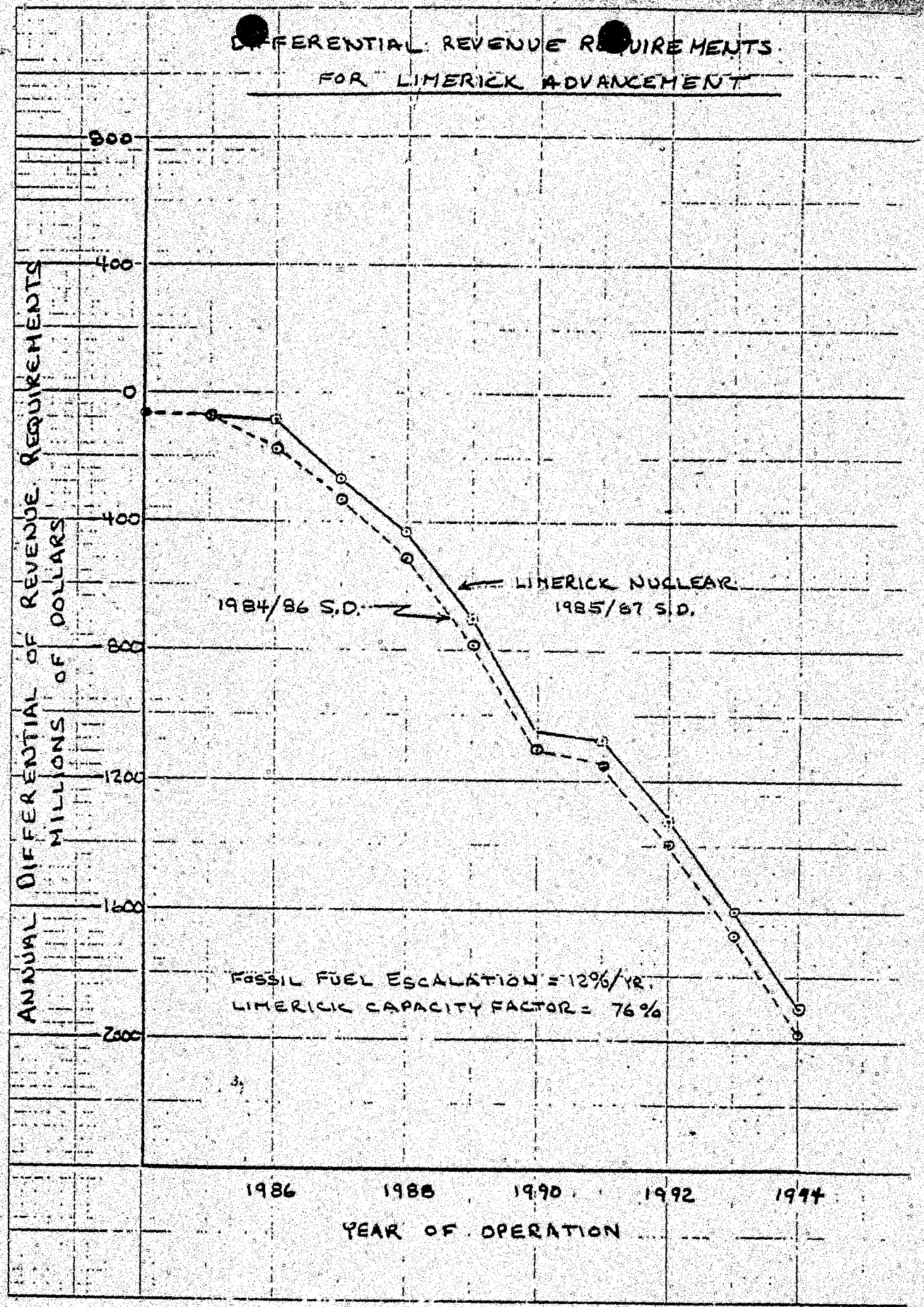
This curve combines the results of Curves IV and V. With both a reduced capacity factor and an increased capital cost the Limerick nuclear plant still requires less revenue than if it were converted to coal. For the 1988-94 period, this annual difference averages approximately $500 million less with 12% fuel escalation, and $400 million less with 8% fuel escalation.

Curves VII & VIII — Effect of Zero Load Growth

Curve VII assumes zero load growth for PECO only, while Curve VIII shows the effect of no load growth for both PECO and the PJM Interconnection. For both cases the revenue requirements for nuclear are substantially less than that required for Limerick converted to coal. These curves also indicate that even under the assumption of no increase in energy consumption for PECO only, nuclear units at Limerick would provide savings by the third year of operation when compared to adding no new capacity if fuel escalated at 12%. For the assumption of zero load growth in both PECO and PJM with 12% fuel escalation, Limerick shows savings in revenue requirements by 1990.

Curve IX — Effect of Advancement of Limerick

This curve indicates the annual savings due to a one year advancement of Limerick nuclear units to 1984-86. These savings average over $70 million per year for the 10 years, 1985-94.



7/15/80

OCA EXHIBIT NO. 58

DOCKET NO. R-850152

6M 12-17-85
N67

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April 24, 1985

Ms. Susan Weisman, Secretary
Delaware River Basin Commission
P. O. Box 7360
West Trenton, New Jersey 08628

Re: Application for Temporary Modification
of Limitations on Use of Schuylkill River
Water D-69-210 CP (Final) Revised

Dear Ms. Weisman:

Transmitted herewith for filing with the Commission are an original and six copies of Amendment No. 1 to Philadelphia Electric Company's Application in the above referenced matter dated April 23, 1985. This Amendment No. 1 consists of a revised application form and Attachment 1-A thereto and revises the Company's March 15, 1985 Application in response to Mr. David B. Everett's letter of April 2, 1985.

Very truly yours,

Edward G. Bauer, Jr.

EGB,JR:pkc

Enclosures

DELAWARE RIVER BASIN COMMISSION

Type of Application: (Check one or more – see reverse side)

(a) Addition to the Comprehensive Plan.....( )
(b) Change in a Comprehensive Plan Project.....(X)
(c) Approval under Section 3.8 of the Compact.....(X)
(d) Inclusion in "A-List" of the Water Resources Program.....( )

Pursuant to the Delaware River Basin Compact and the Rules of Practice and Procedure of the Delaware River Basin Commission, application is hereby made for review of the project described below:

For Use of Commission
Docket No.
Date Received
Action by Commission

(A) Application From:
Name Philadelphia Electric Company
Mailing Address 2301 Market Street, Philadelphia, PA 19101
Telephone (215) 841-4000
Name of Counsel Edward G. Bauer, Jr. and Eugene J. Bradley
Name of Engineer V. S. Boyer

(B) Type of Project: (Check)
(1) Impoundment.....( )
(2) Withdrawal of Water.....(X)
(3) Disposal of Wastes.....( )
(4) Stream Encroachment.....( )
(5) Well.....( )
(6) Other.....( )

(C) Description of Project:

For 1985, withdrawal of water from the Schuylkill River for consumptive use at Limerick Generating Station Unit No. 1 by temporary substitution of in-stream monitoring of dissolved oxygen levels in place of 59°F temperature constraint incorporated in Docket No. 69-210 CP (Final) (November 5, 1975); and as necessary, release of varying amounts of water not exceeding 32.5 cfs, from water supply storage as appropriate, the flow constraint contained in said docket to be inapplicable to any such releases.

Signature of Authorized Person V. S. Boyer
Name V. S. Boyer
Title Sr. V.P., Nuclear Power
Date April 23, 1985

Application of Philadelphia Electric Company
For Temporary Suspension of 59° Temperature
Constraint and Blue Marsh or Other Releases as Back-up Supply

Analysis of substituting Dissolved Oxygen Criteria. The water allocation by DRBC for the Limerick Generating Station, as approved by Commission's Docket No. D-69-210 CP (Final) (November 5, 1975), contains constraints on the withdrawal of water for consumptive use from the Schuylkill River. Water may not be used for the operation of one unit when the flow (not including future augmentations by Commission) as measured at the Pottstown gage is less than 530 cfs (342 mgd) or when the river water temperatures below Limerick are above 15°C (59°F) except during April, May, and June when the flow is in excess of 1791 cfs (1158 mgd).

The flow and temperature constraints were reviewed separately to determine their effect on water availability for various years. Based on flow records for the Schuylkill River as collected by the USGS at Pottstown for the period from 1927 through 1983, 57 years, the number of days of water unavailability because of the flow constraints were determined for an average year, the drought of record year and the drought years of 1980 and 1981. In an average year, the number of days experiencing a flow below 530 cfs is 52 days. The drought of record year 1965 experienced 167 days of flow shortage, followed closely by 1966 with 161 days of shortage. The recent drought years of 1980 and 1981 had low flows for 141 days and 105 days, respectively. See DER "Assessment of Bucks County Proposals For Alternatives to the Point Pleasant Water Supply project" at p. 21 (June 1984).

Water temperature records are not as complete as flow records. The Pennsylvania DER obtained daily temperatures in the Schuylkill River from October 1944 to September 1949 at Pottstown. It was found that temperatures vary seasonally and are approximately the same every year. See DER "59°F Restriction on the Schuylkill River Water Withdrawal, Limerick Nuclear Power Plant" at p. 3 (September 1983).* Normally, temperatures begin exceeding 15°C about May 1 and remain above 15°C until the end of September or into October. The DRBC docket provision lifts the temperature restriction during high river flows in April, May, and June. In an average year, this reduces the unavailability of water due to high temperatures to about 120 days. Therefore, the temperature requirement would preclude Schuylkill River withdrawals for Limerick during the summer and early fall of a normal year for approximately four months. Review of the USGS Surface Water Records for Philadelphia shows that water would have been unavailable based on the temperature criteria alone in 1965 for 181 days and in 1966 for 171 days. Sampling at Limerick in 1980 and 1981 showed that temperature alone would have prohibited withdrawals 150 and 138 days respectively. These years were reviewed because they are drought years as discussed earlier, and restricted days would exceed those in a normal year.

The operation of Limerick is dependent upon the availability of water. In the absence of the Point Pleasant facilities and water from the Delaware River during 1985, a more detailed review of the constraints was made; and possible modifications to the criteria were considered.

*Since this document uses calendar years, all references herein are also to calendar years.

The substitution of dissolved oxygen (DO) levels in the water for the temperature criteria has been proposed because the temperature constraint is based upon decreased DO levels above 59°. For the reasons discussed below, however, the proposed substitution will probably not provide significant benefits by yielding a great number of additional days of Schuylkill water availability in drought periods as 1985 to date and as anticipated for the remainder of the year. Under a drought scenario for 1985, interim availability of water supply storage will still be necessary for the continuation of the Limerick ascent to full power.

The purpose for which the temperature limits were established primarily relates to the dissolved oxygen levels in the water. Monitoring DO levels at six stations conservatively located behind six dams rather than temperature at one location would provide, therefore, protection to water quality for the year 1985. See DER "Assessment of Bucks County Proposals For Alternatives to the Point Pleasant Water Supply Project" at p. 18 to p. 20 (June 1984). Under the temporary, substituted criteria proposed by PECO, Schuylkill withdrawals could be made when DO levels as measured at the various locations exceed the Pennsylvania water quality standard for the Schuylkill River, 5.0 mg/l minimum daily average and 4.0 mg/l minimum instantaneous value.

Available data substituting a DO constraint for the temperature constraint were reviewed for the years of interest. Accordingly, a correlation was conducted to determine benefits in additional days of water availability for those years.

The year 1968 was selected as an average year to study because flow dropped below 530 cfs, the critical value for operation of one Limerick unit, on 55 days. In the calendar year 1968, criteria data to make a correlation were available 276 days. DO data were missing much of the year, and values that are available were taken at Philadelphia. Considering the 276 days of data, water could have been withdrawn 177 days or 64% of the time under the present constraints of flow and temperature. Substituting DO monitoring for the temperature criteria would have permitted water withdrawals 41 more days or 218 days, 79% of the year.

It was planned to study the drought year of record, 1965; but because DO data were lacking, the year 1966 was analyzed. As noted earlier, 1966 had almost as many low flow days as 1965 and consequently was a good representative of the record drought year. In the calendar year 1966, data were available 326 days for a correlation. Water could have been withdrawn only 122 days or 37% of the time under present constraints of flow and temperature. Substituting DO monitoring would have permitted withdrawals 50 more days or a total of 172 days, 53% of the year. However, only 20 of these days would be in the months of June through December.

Review of the recent drought years of 1980 and 1981 indicates that the substitution of DO monitoring for temperature constraints may not significantly increase the number of days water could be withdrawn. In 1980, data was available 296 days; and of these water could be withdrawn based on flow and temperature constraints 153 days or 52% of the time. Substituting DO monitoring would have increased the withdrawal days by only four days to 53% of the year. Those four

days were in the months June through December. In 1981, data was available 287 days; and of these water could be withdrawn based on flow and temperature constraints 187 days or 65% of the time. Substituting DO monitoring would have increased the withdrawal days by six days to 67% of the year. Five of those days were in the months June through December. The 1980 and 1981 data reflect DO readings from water sampling at Limerick.

Two other aspects associated with DO monitoring should be noted. The first is diurnal swings of DO levels. The DO data used in the correlation for 1980 and 1981 taken at Limerick were instantaneous or grab samples and not 24-hour averages. Hourly values of DO for 24-hour periods were made in the Limerick area in the early 1970's, one day a month from March through December. It was found that the lowest values of DO normally occurred in the early morning, 4 a.m. to 8 a.m. The sampling was conducted generally in the 8 a.m. to 10 a.m. period so values obtained are conservative when considering daily average criteria and near the minimum value because the upswing was just beginning. The DO data obtained at Philadelphia included minimum, maximum, and average values. This permitted correlation of the data to both the minimum daily average and minimum instantaneous DO criteria.

The second item has to do with the sampling locations. DO samples were obtained at Philadelphia (R.M. 10.1) and Limerick (R.M. 48). In a study made under an agreement with the DER for the purpose of developing a Comprehensive Water Quality Management Plan, a centerline profile of DO values was presented for more than 120 miles of the Schuylkill River. See Water Resources Engineers, Inc. "Water

Quality Modeling...." at p. VI-30 (December 1977). This study shows low DO areas in the river at Limerick and above Fairmount Dam in Philadelphia at (R.M. 12). Because DO sampling data used in the above correlation were obtained in or close to the indicated low DO level areas, DO monitoring at the six sites behind the low head dams downriver from Limerick will adequately protect the environment.

As indicated by the review, DO monitoring increases the number of days that water can be withdrawn in a year. In drought years, the number of days may be few because low flow becomes the dominant constraint. In such periods, the total days of flow restriction extends almost over the entire period of high water temperatures when the DO monitoring program would have permitted withdrawals.

The water needs for Limerick during 1985 for the continuation of startup (see Exhibit 5) will reach an average of 22 cfs during the months of August, September, and October. By substituting DO monitoring for the temperature criteria, a reduction or saving in the amount of water PECO would need from a water supply storage reservoir of about 44 acre-feet would result for each additional day that water can be withdrawn from the Schuylkill River. Modeled against the drought year 1966, 20 days would be saved for the balance of 1985 or a net reduction of 880 acre-feet from storage.

In conclusion, the effect of the removal of the temperature restriction is uncertain at best, particularly in a drought year; and it is clear that supplemental water from storage is essential. Nevertheless, the temperature limitation should be lifted for 1985 and the DO monitoring approach adopted because it appears likely that at least a few days would be "saved" in 1985 with the corresponding reduction in need for water from storage.

STATEMENT OF VINCENT S. BOYER,

SENIOR VICE PRESIDENT,

PHILADELPHIA ELECTRIC COMPANY

D-69-210 CP (Final) Revised

My name is Vincent S. Boyer. I am Senior Vice President, Nuclear Power, Philadelphia Electric Company ("PECO"), owner and operator of the Limerick Generating Station ("Limerick"). It is the purpose of my brief oral statement, as well as PECO's prepared testimony which I will ask be incorporated into this record as if read, to summarize the material contained in our application, as amended, and supporting documentation.

I anticipate that the NRC will issue a full power operating license for Limerick in late May 1985. In order to proceed with the power ascension program for Limerick Unit 1, PECO will require a temporary supply of supplemental cooling water for the remainder of 1985. The partially constructed Point Pleasant Pumping Station, which will provide supplemental cooling water from the Delaware River when temperature or flow constraints preclude withdrawals from the Schuylkill River and/or Perkiomen Creek, will not, for reasons beyond PECO's control, be completed in time to support Limerick operations in 1985. Consequently, an interim supply of supplemental cooling water will be required to permit operation of Unit 1.

In order to meet this interim need, PECO has requested that, in 1985, DRBC authorize the substitution of instream monitoring of dissolved oxygen levels for the 59°F temperature constraint on

withdrawals from the Schuylkill River and, as necessary, the release of varying amounts of water, not exceeding 32.5 cfs, from water supply storage. In view of the inventory of water supply storage under DRBC control, the Blue Marsh Reservoir appears to be the most probable source.

PECO recognizes that 9 cfs of Blue Marsh water supply storage is earmarked for Western Berks Township. Of the 55 cfs of firm yield in Blue Marsh, 46, cfs is unallocated for 1985. PECO is seeking to use only a portion of the presently unallocated storage, about 22 cfs on average in September, October and November, which has not bee designated for any other purpose in 1985.

PECO's request for relief is far more limited than that proposed by Bucks County and Del-Aware Unlimited, Inc. and rejected by DRBC in Resolution 84-20 (August 15, 1984). PECO requests only temporary relief for the remainder of 1985. Unlike the Bucks County/Del-Aware proposal, PECO's application does not seek to reopen and overturn the previous DRBC docket decisions granting Section 3.8 approval to the Point Pleasant diversion project. Rather, PECO's application for interim relief demonstrates its resolute intent to complete the Point Pleasant project. Granting the PECO application will protect, rather than defeat, the rights and interests of the parties to the Point Pleasant project docket decisions.

In contrast to the Bucks County/Del-Aware proposal, PECO's application contains a realistic estimate of cooling water needs for Limerick and seeks only interim relief, rather than a permanent supply

throughout Limerick's entire operating life. Also, PECO is not requesting any release from the 6,600 acre-feet of water quality storage in Blue Marsh. Accordingly, the temporary use requested by PECO will not interfere with future DRBC allocations of Blue Marsh storage to other users, nor will it impair DRBC's use of water quality storage to protect water quality in the Basin. Moreover, PECO's application, unlike the Bucks County/Del-Aware proposal, will not adversely affect the capability of public water suppliers to meet domestic consumption needs in Bucks and Montgomery Counties through the Point Pleasant project. Finally, unlike the Bucks County/Del-Aware proposal, PECO is not requesting a permanent change in the 59°F temperature constraint on Schuylkill withdrawals.

There is a need for the power to be generated by Limerick Unit 1. Delays in full power operation will increase the cost of Unit 1 by $34 million per month. In addition, the fuel costs of PECO's customers will be increased by $15 million per month. Thus, the cost of delaying the ascension to full power program is estimated to be $49 million per month.

There will be no adverse effect on the environment from the temporary suspension of the 59°F temperature constraint on withdrawals from the Schuylkill River. This withdrawal constraint is intended to reduce stresses on stream water quality caused by consumptive losses at LGS when water quality is significantly affected by organic waste assimilation. PECO's proposed monitoring program will meet this concern by utilizing Pennsylvania water quality standards for dissolved

oxygen in the Schuylkill River to limit withdrawals from natural river flow and also trigger releases of water from water supply storage.

Cooling water needs for Limerick during 1985 for the continuation of startup will reach an average of 22 cfs during the months of September, October, and November. By substituting dissolved oxygen criteria for the temperature limitation, a reduction or saving of about 44 acre-feet in the amount of water PECO would need from water supply storage would result for each additional day that water can be withdrawn from the Schuylkill River. Modeled against the drought year 1966, 20 days would be saved for the balance of 1985 or a net reduction of 880 acre-feet from storage. Modeled against 1980 only 4 days would be saved. Nevertheless, lifting the temperature limitation for 1985 and substituting a dissolved oxygen monitoring program should be approved because it appears likely that at least a few days of additional withdrawals would be gained in 1985 with the corresponding reduction in the need for water from water supply storage.

Releases from existing water supply storage in 1985 will be necessary for the short interim period requested when river flow or dissolved oxygen constraints would otherwise prevent withdrawals from the Schuylkill. There will be no adverse effect on the environment from such releases. Releasing water supplies from Blue Marsh or other storage would have a beneficial impact upon overall water quality downstream. Further, release of water from Blue Marsh for Limerick would not adversely affect recreational use of the reservoir.

PECO recognizes that Blue Marsh and other storage must be available to assist in meeting the needs of downstream users in a drought and that DRBC has authority to use the water supply storage of Blue Marsh Reservoir to meet downstream water quality objectives. Nonetheless, under the "pooled water" concept, drought hardships should be shared on an equitable basis among all Basin users. Equitable demands upon all impoundments would be made to meet flow augmentation needs for water supply and water quality in a drought period.

In sum, grant of the requested temporary substitution of dissolved oxygen criteria for the 59°F temperature constraint on withdrawals from the Schuylkill River and, as needed, release of water from the Blue Marsh Reservoir or other Basin water supply storage will permit scheduled operation of Limerick without adverse impact to the environment.

DOCKET NO. R-850152

8-J 12-17-85

BEFORE THE DELAWARE RIVER BASIN COMMISSION

In the Matter of	)	Application for
	)	Temporary Withdrawal
	)	of Water When Flow at
Philadelphia Electric Company	)	Pottstown Gage is in
	)	Excess of 415 cfs
	)	D-69-210 CP (Final)
	)	Revision No. 4

APPLICANT'S TESTIMONY

Introduction

1. My name is Vincent S. Boyer. I am Senior Vice President, Nuclear Power, Philadelphia Electric Company ("PECO"), which is owner and operator of the Limerick Generating Station.

2. PECO is seeking approval from the Delaware River Basin Commission ("DRBC") for withdrawal, during 1985, of water from the Schuylkill River for consumptive use at Limerick Generating Station, Unit 1, when the flow as measured at the Pottstown gage is in excess of 415 cfs (268 mgd) and the dissolved oxygen levels in the Schuylkill River exceed the values incorporated in Docket No. D-69-210 CP (Final) (Revised) (May 29, 1985). Thus, PECO is seeking approval of a temporary reduction in the existing flow constraint of 530 cfs.

3. As discussed in detail below (¶¶44-45), on October 2, 1985, the Executive Director, DRBC, issued an emergency certification authorizing PECO to withdraw water from the Schuylkill River under the terms of its application pending

B. Alternatives to Temporary Withdrawal of Water when Flow at Pottstown Gage is in Excess of 415 cfs

55. PECO has considered various alternatives for a temporary supply of supplemental cooling water to Limerick for the period of 1985 when docket decision constraints preclude withdrawals from the Schuylkill and Perkiomen. An alternative is not realistic and need not be considered unless capable of being promptly implemented. Thus, an alternative cannot require construction or major modification of existing facilities.

56. No action - Due to flow and dissolved oxygen constraints imposed by DRBC on withdrawals of water from the Schuylkill River for consumptive use, the Schuylkill will be largely unavailable for such withdrawals during the period June to late in 1985. Because the permanent supplemental water supply from the Point Pleasant project will be unavailable for this period, Limerick cannot continue with start-up testing and ascend to full power operation without an interim source. The cost of not operating Limerick for lack of water during that period is estimated to be $44 million per month. See Affidavit of John S. Kemper, Vice President, Engineering and Research, PECO (September 20, 1985) (attached to application).

57. Ontelaunee Reservoir - This reservoir is located on Maiden Creek, a tributary to the Schuylkill River upstream of the Limerick plant, and is owned by the City of Reading for use as a water supply source. Ontelaunee has 11,640

OCA EXHIBIT NO. 60

DOCKET NO. R-850152

PM 12-17-85

NL

COMMONWEALTH COURT OF PENNSYLVANIA

PHILADELPHIA ELECTRIC COMPANY,	:	
	:	
Petitioner	:	No. 2365
	:	
v.	:	Commonwealth Court
	:	
PENNSYLVANIA PUBLIC UTILITY COMMISSION,	:	Docket 1982
	:	
Respondent	:	

BRIEF FOR PETITIONER

PHILADELPHIA ELECTRIC COMPANY

In support of its Petition for Review of the Order of the Pennsylvania Public Utility Commission, entered August 27, 1982 at Investigation Docket No. I-80100341.

Robert H. Young
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APPENDICES

APPENDIX B

Affidavit of Vincent S. Boyer, Senior Vice President - Nuclear Power, sworn September 30, 1982.

AFFIDAVIT OF VINCENT S. BOYER
SENIOR VICE PRESIDENT-NUCLEAR POWER

VINCENT S. BOYER, whose business address is 2301 Market Street, Philadelphia, Pennsylvania, on oath deposes and says:

1. I am Senior Vice President - Nuclear Power of Philadelphia Electric Company. In that position, I am responsible for management of the construction of the Limerick Nuclear Generating Station ("Limerick") as well as for various matters in connection with the Company's operating nuclear generating stations. From 1968 to 1980, I was Vice President - Engineering and Research, with direct responsibility for the design and construction of all new electric generating plants, including Limerick and the Company's existing nuclear plants. Prior to 1968, I served as Superintendent of the Company's Peach Bottom Atomic Power Station and as Manager of Nuclear Power in its Electric Operations Department. As a result, I have had over twenty years of active experience with nuclear plant construction and operation.

As Senior Vice President - Nuclear Power, I am directly involved in the Limerick project. I or my staff are familiar with the scope and progress of the Project, both as respects its construction and the several federal and/or state regulatory examinations presently pending or recently completed. I am responsible to Senior Management for reporting on project cost and schedule, and for developing cost and other data for evaluating project scheduling decisions.

I appeared as a major witness on behalf of the Company in the Limerick Investigation, where I explained the Company's planning decisions which led to the construction of Limerick, the subsequent decisions to defer station completion, the cost estimates for the plant, the economic justification of Limerick completion as compared to other alternatives and other matters relating to the cost, engineering and anticipated operating performance of Limerick.

2. I have reviewed the Pennsylvania Public Utility Commission's ("PUC") Order in its Limerick Investigation at Docket No. I-80100341 ("August 27 Order"), and have been informed of the Company's decision to appeal that Order and seek a suspension of its effectiveness pending review in the Commonwealth Court. I have further been informed that the August 27 Order requires the Company to notify the Commission within 120 days as to whether it will cancel or suspend construction of Limerick 2, states that the Commission will not register future security certificates where the proceeds of such securities are intended to finance Limerick 2 and will deny recovery of AFUDC on additional investment in Limerick 2 when requested in a future rate proceeding. I am informed that, as a result of these and other findings, the capital dollars available for Limerick construction in 1983, 1984 and 1985 will almost certainly be insufficient to permit completion of Limerick 2 by its presently scheduled service date of 1987. It is my purpose in this Affidavit to examine the cost consequences to the Company of the PUC's mandated cancellation and suspension alternatives, and the

extent to which these consequences can be reduced if the Company's requested supersedeas is granted.

3. Limerick 2 was scheduled for completion in 1987 at the time of the Commission's May 7 action. Although the Company has not yet made a decision as to what alternative it believes should be selected (i.e. prompt completion, suspension and deferred completion or cancellation), suspension of the effectiveness of the August 27 Order is essential if all three alternatives are to remain available to the Company. The Commission's Order permits only limited expenditures on Limerick 2 as follows:

> We will also permit the Company to finance and accrue AFUDC on the incremental costs attendant to shutting down construction at Unit 2 and maintaining that unit in a safe condition pending the resumption of construction should the Company opt to suspend construction at that unit. The former may include items such as: the cost of terminating presently effective construction contracts; protecting the site from the elements; or completing certain portions of the project so that construction may be resumed efficiently. The latter would encompass any additional investment necessary to protect the safety of the public or the construction employees.

Unless engineering and design work at Limerick 2 continues at the present time and a restart of construction is permitted in mid to late 1983, the Company will lose a major portion of its experienced supervisory, engineering and construction work force presently employed at Limerick. Loss of this work force would require a substantial deferral of Limerick completion and substantial additional costs, as more fully described below. Moreover, and again as described below,

substantial labor utilization and other efficiencies which reduce construction costs will be lost unless the requested supersedeas is granted.

4. If the Company is required to suspend work on Limerick 2 for even one year's duration, which I am informed is the likely minimum if the supersedeas here requested is not granted and the Company must await completion of the appellate proceeding before resuming Limerick 2 construction, the following additional costs will be incurred:

A. Demobilization and Remobilization Cost

Demobilization costs will be incurred as work is completed on Limerick 1 and manpower and equipment resources are demobilized in lieu of shifting to Limerick 2. Examples of demobilization costs include:

- Masonry and HVAC - Originally scheduled to commence on Limerick 2 as Limerick 1 was completed, these contractors will be required to remove equipment, manpower materials and offices from the site until commencement of Limerick 2.
- Limerick 2 Work-in-Place - Pumps, the reactor, feedwater heaters, the structure, etc. must be prepared for lay-up to prevent degradation and to satisfy NRC quality requirements.

Costs to remobilize are a direct result of demobilization and involve labor to redeploy materials and equipment as well as to correct any degradation that may have occurred.

Total costs for demobilization and remobilization are estimated at $1 million for a one-year deferral of Limerick 2. These costs have been developed based upon an examination of affected contracts and a knowledge of the construction activities and equipment required. The cost of additional equipment protection is based on employing a force of fifty craftsmen for a period of two months. These costs are entirely unproductive, i.e. do not advance completion progress.

B. Contract Deferral/Cancellation Costs

Nearly all subcontracts were let for completion of both Limerick units on a specific schedule. Suspension of Limerick 2 would result in negotiation of revised contractual arrangements to reflect an extended schedule. These costs include:

- Negotiation of overheads and profit - Additional costs would be incurred for management, equipment and supplies as a result of longer durations on site. Contractors would request additional profit for increased costs and durations.
- Interruption of shop fabrication - Shop Fabrication cycles would have to be rearranged to exclude fabrication of Limerick 2, thus increasing cost.
- Cancellation/delay costs would also be incurred for Limerick 2 material on order.

Total costs for subcontracts and material orders are estimated at $8 million. Costs for extended contract overheads and the resultant additional profit on these costs were developed by reviewing the contracts; considering their progress status and

estimating the new work durations. Consideration was given to inflationary increases in costs previously constrained and to costs incurred to maintain contract or availability in order that work could resume expeditiously. Allowances for costs of interrupting material fabrication between Unit 1 and Unit 2 were derived from a review of each contract's value and production status. An added contractor cost of 5% for loss of labor productivity has been assigned where work continuity is affected.

C. Increased Costs Due to Loss of Efficiency

Deferral of Limerick 2 would result in significant cost increases as the result of lost efficiency. These include:

- Loss of manual labor productivity improvement typically experienced in a second unit as a result of several identifiable factors. These include loss of continuity, experience, and performing Limerick 2 work simultaneously or in sequence with Limerick 1 work.
- Increased security processing time on Limerick 2 as a result of rescheduling a larger portion of Limerick 2 work after implementation of permanent NRC required security.
- Non-manual costs as a result of retaining site management personnel for an additional year.
- Engineering costs for (a) increased field support, (b) project management, and (c) additional exposure to design changes due to the extended schedule.
- Increased cost of performing work on portions of

Limerick 2 while Limerick 1 is operating. Under applicable NRC regulations, additional security precautions and restrictions as to access and freedom of movement on Unit 2 construction activities at the station are imposed once Unit 1 is completed.

Increased costs for contruction power, PECO field support, engineering and overheads associated with an extended schedule.

The total cost of the above for a one-year suspension would be $83 million. These costs were developed by reviewing manpower estimates for the various categories of project labor and adjusting them to reflect increases caused by the delay. The additional labor dollars were then calculated using the appropriate wage rates. Construction power cost increases were developed from usage histories and applicable rates. An additional contingency allowance was judgmentally applied to cover regulatory change exposure.

D. Cost of Plant Maintenance During Shutdown

During the time that Limerick 2 is suspended, costs will be incurred to maintain the facility and equipment. This work is performed by skilled labor and subjected to formal inspection to satisfy NRC quality requirements. These costs include (a) inspection, maintenance and storage of all procured materials and equipment at our off-site storage facility; (b) inspection and maintenance of materials and equipment in the laydown yard; and (c) maintenance and inspection of all work presently in place.

Estimated cost is $2 million per year estimated from historical labor and material costs for this function.

E. Escalation

Escalation refers to the increase in construction costs attributable to inflation in material acquisition and labor costs over time such as occurred during all periods of the recent past. Assuming an annual rate of 9%, Unit 2 costs will be increased $84 million for a one-year deferral. The increase in cost is based on performing all work one year later then scheduled, thus escalating each year's work an additional 9%.

F. AFUDC

A one-year deferral will increase the AFUDC cost of Unit 2 by $291 million. The increase in AFUDC results from the application of the anticipated AFUDC rate during 1983 - 1989 to the cash flow developed for the one year deferral program and comparing the value to the non-deferred program's AFUDC.

G. Summary

To summarize, the following cost consequences would result from a one year deferral in completion of Limerick 2 such as would be required if the requested supersedeas is not granted.

		Million Dollars
a)	Demobilization and Remobilization	1
b)	Contract Deferral/Cancellation	8
c)	Loss of Efficiency	83
d)	Plant Maintenance	2
e)	Escalation	84
f)	AFUDC	$291
	Total	$469

5. One alternative posed by the Commission is the cancellation of Limerick 2. The cost of this alternative, assuming the termination of all planned and permitted construction activity under the August 27 Order upon December 31, 1982 and ignoring post-1982 AFUDC on existing and permitted additional investment is $476 million for Limerick 2 and $459 million for Limerick 2 associated common plant. Completion of nearly all common plant is of course required for even Limerick 1 operation and such plant becomes a used and useful part of Unit 1 investment if Limerick 2 is not completed.

6. Suspension of engineering and construction efforts for Limerick 2 beyond the time when experienced engineering and construction personnel become available as the result of completion of the Limerick 1 effort, will unnecessarily increase the cost of Limerick 2. The ability to assign experienced personnel to Limerick 2 tasks immediately following completion of Limerick 1 tasks, thus benefitting from the experience and training gained on Limerick 1, improves productivity and thereby reduces cost. Estimates of such construction productivity improvement and resulting reduced cost for the second unit of a two unit plant range from 5% to 15%. This range of improvement is determined based upon comparative data from projects of similar magnitude where such flow was interrupted versus where it was not. Furthermore, the advantage of flexibility of manpower utilization, i.e. where the assignment of engineering and construction personnel can be alternated between Limerick 1 and 2

for efficiency of manpower utilization, is eliminated by the August 27 Order. This advantage is especially significant during the latter stages of Limerick 1 construction (i.e. mid-1983 and beyond) when resolution of remaining design details and changes dictated by final inspections and preliminary operations require manpower which cannot be accurately predicted but which could be temporarily obtained from the Limerick 2 work force if construction of that unit is then being pursued.

The Bechtel San Francisco office design and engineering effort for Unit 1 and Common plant will be substantially completed at the end of 1982 and a reduction in work force will have begun. It is forecasted that 300 of the 500 engineering personnel will have been removed from the project by the end of 1983. Nearly two-thirds could be assigned to Limerick 2 design as they become available. 1200 man-years of San Francisco office engineering and support, 2400 man-years of Limerick site engineering, supervision and support, and 5400 man-years of construction work remain to complete Limerick 2. During the majority of the Limerick 2 construction period (i.e. 1984 to 1988 assuming a late 1983 restart), it is estimated that about 1700 construction workers, including 700 pipefitters and 400 electricians, will be employed. Field engineering, supervision and support personnel will peak at 700, producing a Pennsylvania based work force of 2400 persons. Major layoffs would

begin in early to mid-1983.

Accordingly, unless the option to restart Limerick 2 construction in mid to late 1983 is maintained by suspension of the effectiveness of the August 27 Order, a very significant deferral of Limerick 2 completion will be required as the result of the loss of experienced supervisory and construction personnel. Only suspension of the Commission's Order maintains the alternative of a short duration deferral and avoidance of potentially unnecessary costs. Moreover, only suspension of the Commission's Order permits full use of labor in a cost effective and efficient manner at both Limerick Units 1 and 2, thereby substantially reducing costs as described above.

AND I FURTHER depose and say that the foregoing is true and correct to the best of my knowledge, information and belief, and that I am competent and authorized by Philadelphia Electric Company to testify thereto.

VINCENT S. BOYER

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF PHILADELPHIA

Sworn to and subscribed
before me this ____ day
of _____, 1982.

Notary Public

My Commission Expires: