THE 1981 TAX ACT AND THE ECONOMICS OF COAL AND NUCLEAR POWER

by

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I. INTRODUCTION: THE CORPORATE INCOME TAX AND ELECTRIC UTILITIES

In fiscal year 1951 the corporate income tax contributed a record 35% of Federal Government receipts. In 1981, this proportional contribution is expected to be 11%[1/]. Although the dollar value of corporate, personal, and social security contributions has increased, corporate income tax payments have not grown as rapidly as have payments from these other sectors, nor have corporate income tax payments matched the significant growth in Gross National Product. Gross domestic product from business and total GNP have each increased eight-fold in this period in contrast with a three-fold increase in corporate income tax payments.

In part, this change in the structure of taxation has occurred because salary and wage compensation has grown much more than profit.

A second factor is the continuing revision of the corporate income tax which, in the last 30 years, has placed income tax accounting on a significantly different conceptual basis than ordinary corporate and regulatory accounting. In colloquial language, an electric utility is now required to keep at least five "sets of books" to provide differential treatment of the same capital assets. These different requirements arise from different concepts applicable to corporate income analysis, Federal corporate income taxation, State corporate income taxation, State regulatory commission revenue determination, and local property tax assessment. If a utility fails to differentiate these accounting systems, it penalizes its shareholders and customers by causing increased tax liability, different revenue allowances, decreased profitability, and higher rates charged to customers.

This analysis focuses on four specific consequences of the corporate income tax as reflected in the Economic Recovery Tax Act of 1981:

(a) Effect of investment incentives on utility tax liability

(b) The impact of tax provisions on coal and nuclear power economics

(c) The financial incentive for premature construction

(d) The Three Mile Island accident and tax accounting

In this analysis, I am presenting new data on utility generating costs as affected by the 1981 Tax Act, summarizing previous research described in various publications, and making use of work by Kathleen Cole[2/].

The appropriate context for understanding the impact of tax provisions on specific coal and nuclear plants is provided by general statistics summarizing the tax status of utilities with major construction programs. This information is reported in the detailed income tax accounts and notes of utility corporations, and summarized in the U.S. Department of Energy statistical reports.

In New York, the three upstate utility corporations have had major construction programs in the 1970's. In the last seven years, the total reported current Federal income tax payment is negative. In this period, the utilities regularly reported positive net income and made dividend payments to shareholders. It is evident from the tax reconciliation accounts that the disappearance of current tax liability is caused in large part by the credits, deductions, and exclusions gained through the investment incentive provisions of the corporate income tax.

In California, for the years 1974-1979, the three major private utilities reported positive current tax payments seven times and negative or no payments eight times.

It should be emphasized that tax benefits accruing to utilities and tax incentives received by customers can differ significantly, particularly in the construction period and first years of operation of new facilities. In 1978, the six major Pennsylvania utilities had in aggregate a negative tax payment of -$19.1 million in Federal income taxes. However, one critical review estimates that these six Pennsylvania utilities charged their customers $252.8 million in operating tax expense during 1978. The difference is defined as "phantom taxes": $271.9 million. This is $66 per customer in 1978[3/].

This point is necessary to provide proper context for the preceding discussion of after-tax cost to utility. Tax subsidies are not necessarily equivalent to lower customer charges; a tax subsidy flows primarily to the utility. The degree and timing of distribution of tax benefits varies significantly from state to state.

In addition, it must be noted that tax subsidies accruing to utilities cause a heavier tax burden to be placed upon other business and personal income tax payers. A nuclear plant with a tax subsidy of 7¢/kWh will attain an annual subsidy of approximately $365 million for its owner. This requires greater tax contributions from other tax sources.

Primary interest here is given to the question of tax subsidies and their effect upon relative coal and nuclear power cost. However, active solar heating receives tax subsidies comparable to those accruing to nuclear power. A home heating system using active solar heating and electric heat from nuclear power appears to receive tax subsidies greater than any other heating system[4/].

2. NUCLEAR POWER COST AND TAXATION

Table 1 summarizes the economic benefits of nuclear power which have led utility managements in the past to prefer nuclear power. Note that, in early 1981, nuclear fuel delivered to a reactor costs only an estimated 56¢ per million Btu. Coal is more than twice as expensive, and natural gas and oil even more so.

Some utility managements expect nuclear power's fuel cost advantage to continue to provide a competitive edge for nuclear power. In Part "B"

Table 1. Comparative Fuel Cost and Total Generating Cost

A. Comparative Cost of Utility Fuel, early 1981, actual or estimated current

	price, per million Btu	price, per unit
1. uranium fuel	56¢	$1.57/gram
2. coal	$1.42	$30/ton
3. natural gas	$2.54	$2.60/mcf
4. oil	$5.44	$34/barrel

B. Projected Future Generating Cost, Commonwealth Edison, ¢/kWh levelized cost, 1991-2026 (?)

	Coal	Nuclear Power
Capital charges, including health and safety regulation	6.8¢/kWh	8.9¢/kWh
Fuel, operation, maintenance and insurance expense	11.4¢	4.2¢
Decommissioning	0¢	0.2¢
Total generating cost	18.2¢/kWh	13.3¢/kWh

Sources: Current fuel cost for conventional fuel is from U.S. DoE, "Cost and Quality of Fuels for Electric Utility Plants," May 1981. Current uranium fuel cost is based upon calculations by the author. Commonwealth Edison projections are from Corey, p. 22.

in Table 1, a Commonwealth Edison projection indicates their belief in continued economic preferability of nuclear power.

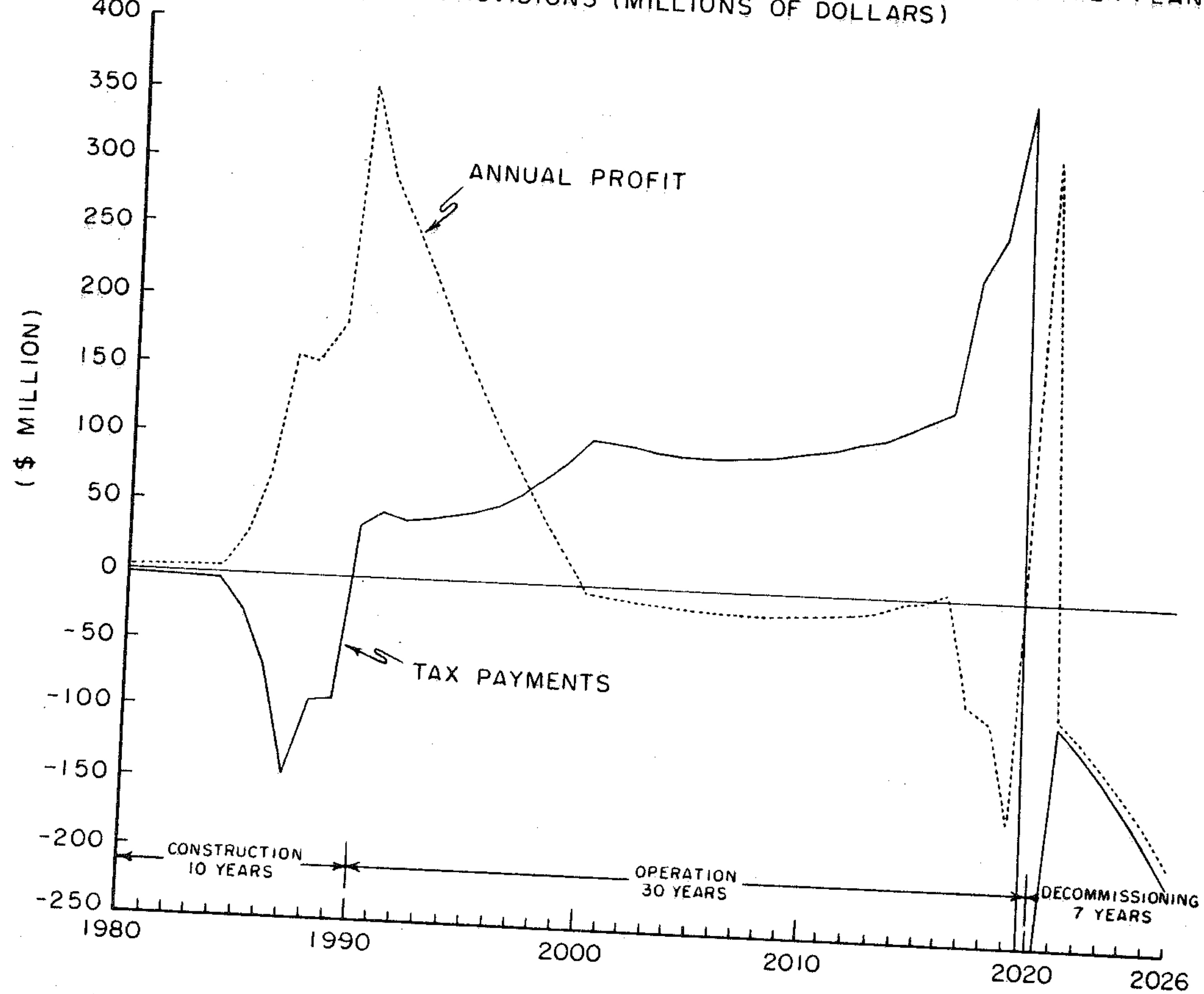
The tax provisions under consideration here provide a considerable impetus to nuclear power development. Let us hypothesize a nuclear plant ordered in 1980, and examine the tax implications before and after the 1981 Tax Act. The model utilized represents a nuclear plant with a planning horizon of 47 years. This time period consists of a 10-year construction period, a 30-year operating period, and a 7-year decommissioning period. The model utilizes 165 variables, 100 of which change over time. It is described in detail elsewhere[5].

This hypothetical nuclear plant is to be built in Pennsylvania. The specific economic assumptions for both nuclear and coal plants are in the Appendix.

Figure 1 shows the time path of profit and current tax liability. Profit means before tax net income, less actual current tax expense. It is assumed that the tax provisions are as they will be when fully effective. The ESOP[6] 1.5% investment tax credit is eliminated, making 10% the maximum investment tax credit. The tax life for the 30-year nuclear plant is now 10 years. Accelerated depreciation at 200% is used for one year, followed by sum-of-the-years-digits depreciation for the remaining 9 years of tax depreciation. Interest payments continue to be deductible.

In addition, all tax benefits arising from the tax life, the accelerated rate, and the investment tax credit must now be normalized. This means, as suggested above, that regulatory commissions must set rates to allow utility companies to collect revenue now as if these provisions did not exist. The regulatory commission and the utility may then choose to amortize these benefits to customers over the life of the facility by essentially deducting the balance

FIGURE 1. ANNUAL TAX PAYMENTS AND AFTER-TAX PROFIT, NUCLEAR POWER PLANT 1981 TAX ACT PROVISIONS (MILLIONS OF DOLLARS)



of imaginary tax payments from the rate base.

The interaction of full normalization with the tax benefits creates the pattern in Figure 1. Annual profit is at its highest level during the construction period and the first years of the operating period. Profit is actually negative for the remaining 20 years of operation and for the decommissioning period. The exception in this last 27 years is the first year after operations cease. It is assumed that all fuel costs, including spent fuel disposal, are charged to expenses during plant operations. The first year after the plant ceases operations, there is a sizable spent fuel disposal cost. This was previously charged to customers, and to expenses. But for tax purposes, this spent fuel cost is a deduction only in the time period in which it actually occurs, creating a tax deduction applied to income from other facilities. Hence the anomaly of a profit.

Current tax expense is negative during the construction period, modest in the first 10 years of operation, and is largest in the last 20 years of operation.

This time pattern provides a financial incentive for premature construction of nuclear power plants. Because of the tax benefits and the allowance for funds used during construction, the plant earns a profit at an accumulated value of $700 million during its construction period.

It should be pointed out that this timing pattern, as peculiar as it may seem, does not give shareholders an excessive return over the full 47-year period. The model indicates that, if shareholders had invested their construction money in other funds, the amount accumulating over 47 years would be equivalent to the accumulated value of the peculiar profit stream in Figure 1.

However, the amortized present value of the current tax expenses is actually slightly negative for the Figure 1 values. In other words, with present deductions, credits, and exclusions, the multi-billion dollar revenue from a new power plant is--over the full economic period of the facility--exempt from corporate income tax liability.

The significance of this tax subsidy is evident in Table 2. The cost of the hypothetical nuclear plant discussed above with the 1981 Tax Act provisions is 15.6¢/kWh over the operating period 1990-2019. It should be remembered that, through normalization, shareholders are earning a fair return and, eventually, customers share in the tax benefits.

In the next column, the after-tax cost with the previous provisions indicate 16.1¢/kWh. The effect of the 1981 Tax Act is seen to be an increase in the value of tax subsidies to nuclear power.

The third column shows after-tax cost with no tax subsidies. There is no accelerated cost recovery system, no investment tax credit, and there are no interest deductions. AFUDC income[7/], however, remains exempt when earned. The result: 22.5¢/kWh. Nuclear power, then, is attaining a tax subsidy of 6.9¢/kWh, equal to 44% of its cost to the utility. The typical 1,000 megawatt plant studied here produces 5.3 billion kWh in a typical year. The annual subsidy, then, is $365 million per year for this plant. The construction of an additional 100,000 megawatts of new capacity as currently planned creates a national annual equivalent subsidy for these plants which is approximately $35 to $40 billion each year. As noted above, the net amortized tax liability is negative for each new plant.

3. COAL AND NUCLEAR POWER ECONOMICS

The second row in Table 2 shows similar coal plant data from analyses prepared by Kathleen Cole. The economic assumptions are also given in the Appendix. The tax provisions are similar, except that the tax life for a coal

Table 2. Tax Subsidies: Nuclear and Coal Generating Cost
levelized cost, 1990-2019

	Tax Act of 1981	1980 Tax Provisions	Total Cost No Subsidies	Subsidy 1981 Tax Act
Nuclear Generation	15.6¢/kWh	16.1¢/kWh	22.5¢/kWh	6.9¢/kWh
Coal Generation	16.5¢/kWh	16.8¢/kWh	19.8¢/kWh	3.3¢/kWh

plant is now 15 years for a plant expected to operate 35 years. This is the only significant qualitative difference between coal and nuclear power taxation. The nuclear plant is enabled to claim full tax depreciation in 10 years, the coal plant in 15.

The after-tax cost of the coal plant is 16.5¢/kWh, above the nuclear cost. The unsubsidized cost for coal would be 19.8¢/kWh. The corporate income tax system itself reversed the ordering of lowest and highest cost. The subsidy accruing to nuclear power is more than twice that received by coal plants.

The coal subsidy is only increased by three-tenths of 1¢/kWh by the 1981 Tax Act. The significance of the new tax provisions is that they place additional emphasis on an existing major tax advantage held by nuclear power.

Having made the point about the significance of tax provisions to nuclear power, it should be recognized that Table 2 does not indicate the full economic picture to an alert utility management. The coal capital cost of $836/kWh in 1980 dollars was selected from the actual reported experience of a New York utility in the process of constructing a new coal plant with full sulfur removal equipment. Hence the coal estimate might have been viewed as realistic.

The nuclear estimate, however, was a planning figure given by an architect engineer. That value of $966/kWh is considerably less than the costs currently being experienced[8/]. In addition, Table 2 and Figure 1 assume conventional values for the future cost of decommissioning. In other words, decommissioning is assumed to cost a modest $50 million in 1980 dollars, and spent fuel disposal a modest $8 million annually, in 1980 dollars. With Three Mile Island decommissioning cost estimated to be an unknown amount in excess of $1 billion[9/], and without any operable programs or facilities for spent fuel, these conventional assumptions will probably be orders of magnitude less than actual future costs. If so, the responsibility for these assumptions may become a serious legal question. In some ways, the litigation arising out of the uranium cartel, Three Mile Island, and West Valley may be relevant to future controversy about responsibility for erroneous planning values in decommissioning and spent fuel disposal.

4. TAX INCENTIVES AND THE THREE MILE ISLAND ACCIDENT

Given the magnitude and timing of tax subsidies as they apply to nuclear power facilities, it is possible that the accident at Three Mile Island Unit 2 could have been influenced by these incentives[10/]. The Rogovin study addresses the problem in considerable detail.

It appears that General Public Utilities Corporation (GPU) received a $31 million tax benefit for 1978 by placing the plant in operation on December 30, 1978[11/]. Current Pennsylvania and Federal income tax payments in the absence of TMI-2 (Three Mile Island Unit 2) were estimated to be $15 million. Placing TMI-2 in operation on December 30 apparently allowed GPU to receive a net $16 million in 1978 rather than pay $15 million.

However, a $31 million tax benefit must be seen as rather insignificant for a corporation with GPU's annual revenues of $1.5 billion. Further, if operation was delayed from December 1978 to 1979, the tax benefit would not be lost, but simply transferred to 1979.

The Corporation also reported reserve capacity of 40% with TMI-2 and 25% without TMI-2[12/]. Capacity availability, then, could not have been a major motivation for operation of TMI-2.

In my judgment, it would not be logical for GPU management to encourage improper operation of TMI-2 in order to attain the tax benefit cited here. Rather, it seems to me that GPU operates in a normal tax and regulatory environment, and would not logically risk safe operations to attain very limited financial benefit[13/].

There is not sufficient information publicly available to judge whether the linkage between operation of TMI-2 and rate cases for the three GPU subsidiaries would create a significant incentive for early operation of the plant. The Rogovin report is unclear on this point, and the Kemeny report does not appear to discuss it. However, GPU itself articulates this incentive most precisely in its 1978 Annual Report[14/]:

> Future earnings trends depend heavily on our ability to attain adequate and timely rate relief. This is particularly important regarding the costs associated with building and operating the new 880-megawatt TMI-2. Our objective has been to secure early recognition in our base rates of this facility, which is jointly owned by our three operating companies.

Overall, I think the tax benefits received by the December 30, 1978 operating date are not substantively linked with the accident on March 8, 1979. The tax system clearly promotes premature construction, but, once a plant is nearly completed, there is litte incremental incentive for premature operation.

However, if tax and financial incentives were to encourage premature and unsafe operations of power plants, it is clear that the results of such actions are much greater for a nuclear plant than for a coal plant. The kinds of accidents which may arise from premature operation of a coal plant have consequences of immeasurably lesser significance than accidents of nuclear plants.

5. CONCLUSIONS

Operating experience to date has shown that nuclear power is less costly than coal generation on an after-tax basis for those utilities with successfully operating nuclear facilities. At present, many utility planners believe that nuclear power continues to enjoy a competitive advantage with respect to coal plants; this is also on an after-tax basis.

However, investigation of the special investment credits, deductions, and exclusions in the Internal Revenue Code shows that nuclear power enjoys a large tax subsidy which is in considerable excess of that attained by coal facilities. This is because the capital cost of nuclear power receives a greater magnitude of investment incentives.

The 1981 Tax Act has three major consequences for utility evaluation of generating costs. First, the tax lives are further reduced, so a nuclear plant will have a 10-year tax life and a coal plant will have a 15-year tax life. Second, the method of depreciation is changed so that the double declining balance rate of 200% may be replaced by sum-of-the-years-digits when this is beneficial to the utility. Third, the maximum investment tax credit rate is reduced from 11.5% to 10.0%. Finally, full normalization is now required for the tax benefits arising from new facilities.

The net effect of the Tax Act is to increase the tax subsidy for both generating methods, but the increased subsidy is greater for nuclear power. On the basis of after-tax cost to utilities, the tax subsidy to nuclear power is about 45% of cost, and the tax subsidy to coal generation is about 20% of after-tax cost to the utility. The net amortized tax liability is apparently negative for both plants.

In addition to these tax incentives, Federal policies with respect to cost analyses of future reactor decommissioning and waste fuel disposal may be unrealistically low, yet are the basis for current utility planning.

I conclude that, in the absence of tax subsidies accruing to nuclear power, no utility would prefer nuclear power to coal generation on economic criteria. In three States which have been studied[15/], coal power is always less costly without tax subsidies. If low planning values are assumed for plant investment, decommissioning, and spent fuel disposal, then tax subsidies can cause nuclear power to appear less costly.

These tax subsidies have been generally viewed by Congress "as investment capital supplied, in effect, by the Federal government to the utility through the tax system"16/. There is no basis to suppose that economic efficiency requires these subsidies to promote nuclear power to a greater extent than coal generation or other forms of energy production or conservation.

6. FOOTNOTES

1. *Economic Report of the President*, 1981 (p. 319) and 1968 (p. 283). The year 1951 is selected to emphasize contrast. Between 1947 and 1959, the corporate income tax usually contributed between 25% and 30% of Federal tax receipts.
2. In bibliography, see Chapman, and Cole.
3. Richard E. Morgan, "Phantom Taxes Update," Environmental Action Foundation, April 1980. This analysis summarizes individual accounts reported in *Statistics of Privately Owned Electric Utilities*, U.S. Department of Energy.
4. D. Chapman, et al., "Energy Production and Residential Heating," p. 31. Also, a detailed comparison appears in Cole's work.
5. In particular, the Chapman/California Energy Commission publication. The *Natural Resources Journal* paper describes the application to Pennsylvania.
6. Employee Stock Ownership Plan. Under pre-1981 provisions, a maximum 1.5% ITC (investment tax credit) could be claimed above the 10%. This 1.5% would be contributed to the ESOP. Eventually, future ESOP contributions will be linked to payroll. See Price-Waterhouse for a summary of this and other provisions.
7. AFUDC: Allowance for funds used during construction, including both debt and equity components.
8. The planning figure of $966/kW is from Gibbs & Hill. They report $851 in 1979 dollars which, escalated at 13.5%, is $966 in 1980 dollars. In the 1981 New York Power Pool report, the construction costs for the Shoreham and Nine Mile #2 nuclear plants were reported to average $2,001/kW in 1980 dollars.
9. General Public Utilities Corporation, "TMI-2 Recovery Program Estimate" and "News Release," August 8, 1980.
10. This discussion is based upon my review of the question for the Pennsylvania State Senate Special Committee on Utility Taxation.

11. According to "Change in Federal Income Taxes," a schedule provided by P.J. Daley on August 13, 1980. The Rogovin report discusses the same subject with slightly different values; perhaps these different values did not include Pennsylvania income tax effects. See Rogovin, vol. 2, p. 216.

12. GPU Annual Report, 1978, p. 31.

13. The Rogovin analysis reached a similar conclusion: p. 204.

14. Annual Report, 1978, p. 2.

15. The same conclusion holds for New York and Indiana as for Pennsylvania, as reported in Chapman, et al., Ohio River Basin Energy Study; also, "The Status of Nuclear Power in New York," and the Natural Resources Journal paper.

16. See House Committee on Ways and Means, July 30, 1980, p. 3.

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APPENDIX: ECONOMIC ASSUMPTIONS IN COAL AND NUCLEAR POWER COST ANALYSIS

The models used here examine the major economic accounts and variables over the full planning horizon for each type of facility. For a nuclear plant, this 47-year period consists of a 10-year construction period, 30 years of operation, and 7 years for decommissioning. For the coal plant, the 41-year period consists of a 6-year construction period and 35 years of operation.

The coal model is adopted from the nuclear model. The latter model utilizes 165 variables, 100 of which change over time on an annual basis. It is described in "Nuclear Economics: Taxation, Fuel Cost, and Decommissioning."

Table 3. Major Assumptions in Analysis

1. Capital structure for new plants
   - 50% debt at 12% interest
   - 35% common stock equity at 14% after-tax return
   - 15% preferred stock equity at 12% after-tax return

2. Construction period
   - Nuclear power: 10 years
   - Coal plant: 6 years

3. Capacity, electrical
   - Nuclear plant: 1,000 MWe
   - Coal plant: 850 MWe

4. Capacity factor
   - Nuclear plant: rises, stabilizes, and declines. Average is 60%
   - Coal plant: 65%

5. Operating life
   - Nuclear plant: 30 years, 1990-2019
   - Coal plant: 35 years, 1987-2021

6. Fuel cost
   - Nuclear plant: see Table 4 (about .8¢/kWh in 1980 dollars)
   - Coal plant: $1.266/$\overline{\text{m}}$Btu in 1980 and 10,600 Btu/kWh

Table 3. (continued)

7. Operations, maintenance, insurance, and administration cost

   Nuclear plant:

      operations and maintenance: $26.7 million in 1980

      administration and insurance: 1.5% of initial rate base

   Coal plant: 7.6 mills/kWh in 1980 dollars

8. Capital cost

   Nuclear plant: $966/kW in 1980 dollars

   Coal plant: $830/kW in 1980 dollars

9. Inflation and escalation

   Note: Specific escalation equals the product of overall inflation and real inflation. E.g., for nuclear investment, (1.09)*(1.041) = 1.135

   General: 9%, from 1978 through the entire period

   Nuclear investment: 4.1% real inflation

   Coal investment: 2.5% real inflation

   Nuclear fuel: equivalent to 0.8% real inflation

   Coal fuel: 1.75% real inflation, 1980 onward

   Nuclear O&M: 9% real inflation

   Coal O&M: 9% real inflation

10. State and Federal income taxation

   Federal corporate income tax rate: 46%

   Pennsylvania corporate income tax rate: 10.5%

Table 4. Nuclear Fuel Cycle Assumptions

Fuel cycle activity	Price mid-1979	Real inflation rate	Equilibrium annual quantities	Lead (+) or lag (-) years from first use
uranium ore	\$43.60/lb U_3O_8	1%	465,133 lb U_3O_8	+3
conversion	\$4.41/kg U	0%	173,300 kg U	+3
enrichment	\$89.02/kg SWU	1%	114,127 kg SWU	+2
fabrication	\$100.00/kg U	0%	27,143 kg U	+1
spent fuel transportation	\$16.00/kg U	1%	27,143 kg U	-3
waste disposal	\$250.00/kg U	0%	27,143 kg U	-3

Note: The inflation rates in this table interact with the overall inflation rate as in Table 2. The product of general overall inflation and real inflation defines the specific rate. For example, for uranium ore, 1.09*1.01 = 1.101. The specific rates are commonly referred to as escalation rates. General sources of information are the U.S. Energy Information Administration's Monthly Energy Review, and its Annual Report to Congress, and Cady and Hui, "NUFUEL."

These assumptions were used in the 1980 analyses which are the basis for 1981 Tax Act comparisons. Current 1981 fuel cycle assumptions would include a lower yellowcake price and higher values for the other stages.