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REPORT BY THE

Comptroller General

OF THE UNITED STATES

RELEASED

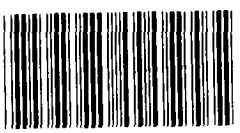
Economic Impact Of Closing The Indian Point Nuclear Facility

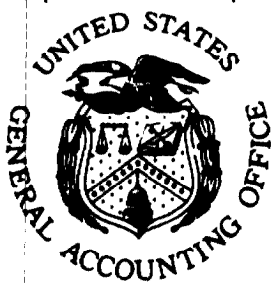
The close proximity of the Indian Point nuclear plant to the heavily populated New York City area has raised questions about the safety of its continued operations. What could be the economic impact on the utility owners and consumers if the nuclear plant were closed down?

Closing the Indian Point plant would not immediately affect power supplies in the New York City area under normal operating conditions. Failure to complete planned construction projects on schedule, however, could jeopardize reliable power supplies in the future.

With oil-fired generation as the only major source of replacement power, the loss of Indian Point could increase annual oil consumption in New York by about 20 million barrels in the first year and add more than $600 million a year to consumers' already high energy bills.

Programs already in existence to reduce oil usage and consumer costs would take on added significance with the loss of the nuclear units. Coordinated, expeditious efforts by the utilities and State and Federal agencies would be required to avoid potentially serious problems.





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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-200568

The Honorable John D. Dingell, Chairman
The Honorable Richard L. Ottinger
Ranking Majority Member
Subcommittee on Energy and Power
Committee on Interstate and
Foreign Commerce
House of Representatives

This report, prepared in response to your joint request of April 10, 1980, discusses the comparative cost of terminating the Indian Point facility versus adding the necessary safety requirements to protect the large surrounding population. It also discusses the financial impact it would have on the Consolidated Edison Company of New York, the Power Authority of the State of New York, and their customers.

At your request, we did not take the additional time needed to obtain agency comments on the matters discussed in this report. We did, however, discuss the results of our analysis with utility company officials.

As arranged with your offices, unless you publicly announce its contents earlier, we will not release this report for 30 days from the date of the report.

Comptroller General
of the United States

REPORT BY THE
COMPTROLLER GENERAL
OF THE UNITED STATES

ECONOMIC IMPACT OF CLOSING THE INDIAN POINT NUCLEAR FACILITY

D I G E S T

Concern over the safety of large numbers of people living in close proximity to nuclear powerplants has been accompanied by questions relating to the economic effects that would likely result if the plants were closed. GAO's analysis of the potential economic impact of closing the Indian Point nuclear facility, 30 miles north of New York City, disclosed that:

--Indian Point nuclear power is generated at about one-fourth the cost of that generated by comparable oil-fired units in the Con Edison system.

--The Indian Point units provide nearly one-third of the electric energy needed for Con Edison's franchise area customers but currently available non-nuclear generating capacity is sufficient to meet normal demands on the system.

--Continued reliability of service without Indian Point will depend on the successful completion of planned generating facilities and transmission line improvements.

--The loss of Indian Point could increase residual oil consumption in New York by about 20 million barrels the first year with declining amounts thereafter.

--Use of high cost low-sulphur oil to generate replacement energy could cost Con Edison and Power Authority of New York customers over $600 million during the first year. D6 05453

--Incremental revenue requirements for Con Edison to cover all costs resulting from closing Indian Point could amount to over $18 billion during the next 15 years and as much as $600 million annually for the Power Authority of New York.

--There are few, if any, options available to reduce oil consumption and costs that are not already being undertaken by the utility companies and included in revenue requirement forecasts.

NUCLEAR POWERPLANTS ARE AN ECONOMICAL SOURCE OF POWER

The Indian Point nuclear units provide an economical source of energy for customers of Con Edison and Power Authority of New York. Generation costs in 1979 were 1.2 cents per kilowatt hour for Indian Point 2 and less than 1 cent per kilowatt hour for Indian Point 3. These costs compare to oil-fired generation costs of 2.5 cents to 4 cents, depending on plant efficiency and usage levels. (See pp. 11 and 12.)

Total operating costs include items such as depreciation expense, taxes, and interest, which increase the per unit costs. Although, these fixed costs are common to all generating facilities, the per unit costs are greater for oil-fired generating plants than the Indian Point units. This results primarily because the nuclear units have a higher average kilowatt hour output. (See p. 14.)

Continued use of the Indian Point units will require expenditures by Con Edison and the Power Authority of New York in the next few years that would not be required for non-nuclear generating units. Funds will be required for safety-related modifications to the units required by the Nuclear Regulatory Commission and for radiological emergency response measures.

Although total costs are uncertain, planned and/or approved expenditures over the next few years amount to $35.3 million for Indian Point 2 and $35.5 million for Indian Point 3. Future Nuclear Regulatory Commission requirements and extensive plant repairs could add more than $145 million to the total. (See pp. 15 to 21.)

ADEQUATE POWER SUPPLIES WOULD BE AVAILABLE WITHOUT INDIAN POINT

The 9.6 billion kilowatt hours of energy provided by the Indian Point units in 1979 accounted for 32 percent of Con Edison's and the Power Authority of New York's sales to customers in the New York City area. The loss of these units, however, would not pose an immediate short-run threat to continued energy supplies because of adequate oil-fired generating capacity and the availability of purchased power.

GAO's analysis of franchise area generation and peak load estimates for the period 1981-84 shows a reserve margin of about 50 percent, including Indian Point. The loss of the nuclear units could result in the reserve margin dropping to 24 percent if peak load forecasts are accurate. This reserve margin is well above the 18-percent minimum required by the New York Power Pool. (See p. 30.)

The loss of Indian Point would have a greater impact on the Power Authority of New York than on Con Edison. The Power Authority of New York would fall below minimum reserve requirements without Indian Point 3 while Con Edison's reserve margin would be about 45 percent without Indian Point 2. (See p. 31.)

Future reliability without Indian Point will depend to a great extent on the completion of two new generating plants and the strengthening of transmission systems by the Power Authority of New York. These projects are to be completed by 1987 and lengthy delays could adversely affect the future reliability of the system, particularly during the summer peak periods. (See pp. 31 and 32.)

INCREASED REVENUE REQUIREMENTS WILL BE NEEDED WITHOUT INDIAN POINT

Closing Indian Point would require the utilities to replace the lost energy with oil-fired generation because all other available energy from coal, nuclear, or hydro sources is currently being used.

Replacement energy will require an additional 20 million barrels of residual and distillate oil--nearly 14 million barrels by Con Edison and the Power Authority of New York and the balance by other New York utility companies. The incremental cost of this additional fuel and related expenses is estimated to be over $600 million the first year and to increase to over $1.4 billion by 1992. (See pp. 38 and 42.)

Although Con Edison incurs the largest share of the total fuel costs, its per unit costs are less than those of the Power Authority of New York because it has a larger base over which to spread the costs. Con Edison's average cost per kilowatt hour for the incremental fuel costs, for example, range from 1.36 cents in 1981 to 3.15 cents in 1992. Comparable per unit costs for the Power Authority of New York are 4.19 cents and 6.24 cents, respectively. (See pp. 44 and 45.)

Total incremental revenue requirements for the companies include costs other than fuel that would be affected by closing the plant. These include construction and financing costs and dividend payments. Incremental revenue requirements for Consolidated Edison Co., over a 15-year period, 1980-94, vary depending on the assumptions used. Full cost passthrough to rate payers would increase revenue requirements by $18 billion over 15 years and rates would be 3.4 times as high in 1994 as they are in 1980. Regulatory restrictions limiting the amount of costs passed to consumers to 80 and 90 percent would reduce the burden on consumers by billions of dollars but would leave the utility company in serious financial condition by 1990. (See pp. 48 to 51.)

Incremental revenue requirements for the Power Authority of New York were estimated by company officials in several studies using various assumptions as to power supply conditions. The estimated costs ranged from a low of $173 million annually under optimum circumstances to a high of $600 million under a "worst case" scenario. Incremental cost differences on a kilowatt hour basis, however, were comparable, principally because all available sources of power are oil-based.

Power authority estimates indicated that losing Indian Point would nearly double its current rates. (See pp. 62 to 65.)

DECOMMISSIONING AND RELATED TERMINATION COSTS MAY NOT ADVERSELY AFFECT CONSUMERS

Closing Indian Point would require the expenditure of about $233 million to decommission the Indian Point units and dispose of the waste fuel. An additional $198 million would be lost due to unusable fuel that could not be salvaged and to contract termination costs. (See pp. 52 and 53.)

The estimated total cost of closing the units would be offset to some extent by not having to incur future costs that are already considered in the utilities' plans. Required safety modifications, radiological emergency planning, and certain major plant repairs or improvements would no longer be required. Estimated costs for these items are $220 million. Savings in operations and maintenance costs add an additional $59 million annually, although all of these costs would probably not terminate immediately. (See pp. 56 and 57.)

UTILITY COMPANIES AND STATE ENERGY PLANS HAVE CONSIDERED AVAILABLE ALTERNATIVES

There are a number of alternative measures available to reduce the consumption of residual oil if Indian Point is closed. All the presently feasible ones, however, are either already being taken by the companies or are factored into their financial forecasts that serve as the base cost for computing the incremental costs of closing Indian Point. Conservation programs, conversion of oil generation to coal, new coal plant construction, and maximum use of imported hydropower to reduce costs and oil consumption are either in operation or are planned. (See pp. 58 to 60.)

New York's Master Energy Plan includes the above alternatives, plus development of small hydroelectric facilities in the State. Potential energy shortages resulting from the loss of Indian Point could lead to expedited actions on these alternatives, both at the State and Federal levels. (See p. 66.)

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ABBREVIATIONS

Bcf	billion cubic feet
Con Edison	Consolidated Edison Company of New York
DEC	Department of Environmental Conservation
DOE	Department of Energy
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GAO	General Accounting Office
IP	Indian Point
kWh	Kilowatt hour
LILCO	Long Island Lighting Company
MTA	Metropolitan Transportation Authority
MW	Megawatt
NRC	Nuclear Regulatory Commission
NYPP	New York Power Pool
O&M	Operation and Maintenance
PASNY	Power Authority of The State of New York
SEO	State Energy Office
UCS	Union of Concerned Scientists

CHAPTER 1

INTRODUCTION

The Chairman and the Ranking Majority Member of the Subcommittee on Energy and Power, House Committee on Interstate and Foreign Commerce, requested that we assess the comparative costs of terminating the operation of the Indian Point (IP) nuclear generating facility versus the cost of complying with safety requirements necessary for adequate protection of the adjacent population. We were asked to address the following issues:

--The current costs of operating and maintaining the nuclear units.

--The estimated costs of complying with new and possible future Nuclear Regulatory Commission (NRC) safety requirements.

--The estimated costs of closing the units down and the effects of such an action on the consumers and the companies.

--The role of Government agencies in mitigating potentially adverse effects of closing the plant.

ROLE OF INDIAN POINT IN GENERATING ELECTRICITY FOR SOUTHEASTERN NEW YORK

The Indian Point nuclear facility consists of two nuclear generating units and a now-retired unit located approximately 30 miles north of the New York City limits. IP units 1 and 2 are owned by Consolidated Edison (Con Edison) and IP-3 is owned by the Power Authority of the State of New York (PASNY). All three units are Pressurized Water Reactors.

IP-1, a 265 megawatt (MW) combined oil and nuclear unit, was completed in 1962, one of the first commercially operated nuclear reactors in the United States. On October 31, 1974, the unit was shut down because it did not meet the NRC's interim criteria for emergency core cooling systems which had become more stringent subsequent to IP-1's completion. However, since 1974 IP-1 has been used by the Government and industry for research and development projects on nuclear safety and operations systems. On February 11, 1980, the NRC issued an order to show cause why the operating license for IP-1 should not be revoked, and why plans for decommissioning the unit should not be submitted to NRC. The order

was not contested since Con Edison had decided to retire the unit for economic reasons. On June 19, 1980, NRC revoked Con Edison's authority to operate IP-1.

IP-2 was put into commercial service in August 1973. Construction of IP-3 was started by Con Edison in 1969 but was sold to PASNY in 1975 before the unit was completed. PASNY completed the construction and placed IP-3 into commercial operation in August 1976. Both units were built by the Westinghouse Electric Corporation and have become an integral part of Con Edison's and PASNY's electrical generation systems.

In 1979, the two nuclear reactor units' generating capability (1,814 1/ megawatts (MW)) represented about 16 percent of the total generating capability of Con Edison and PASNY serving the New York City and Westchester County area. However, because they are used as baseload units, they accounted for 32 percent of all electricity generated during the year. According to Con Edison's estimate, the use of the two units during 1979 reduced oil needs by 18 million barrels.

OVERVIEW OF CONSOLIDATED EDISON COMPANY

Con Edison is a publicly owned utility company with total gross utility plant of $7.3 billion as of December 31, 1979. About $6.4 billion of these assets are related to the production, transmission, and distribution of electricity. The remaining assets are used in the production and sales of natural gas and steam and general utility plant.

Con Edison's electric service franchise area consists of the five boroughs (counties) of New York (except the Rockaway Peninsula in Queens) and the major part of Westchester County (see map). The service area covers about 600 square miles with a total population of over 8 million people. In 1979, Con Edison provided 26.7 billion kilowatt hours (kWh) of electricity to 2.7 million customers. In addition, Con Edison sold 2.66 billion kWh of electricity to PASNY and other electric utilities and delivered 5.2 billion kWh of electricity for PASNY to its New York City area customers.

Except for IP-2, all of Con Edison's generating units are typically fueled by some type of oil product or natural

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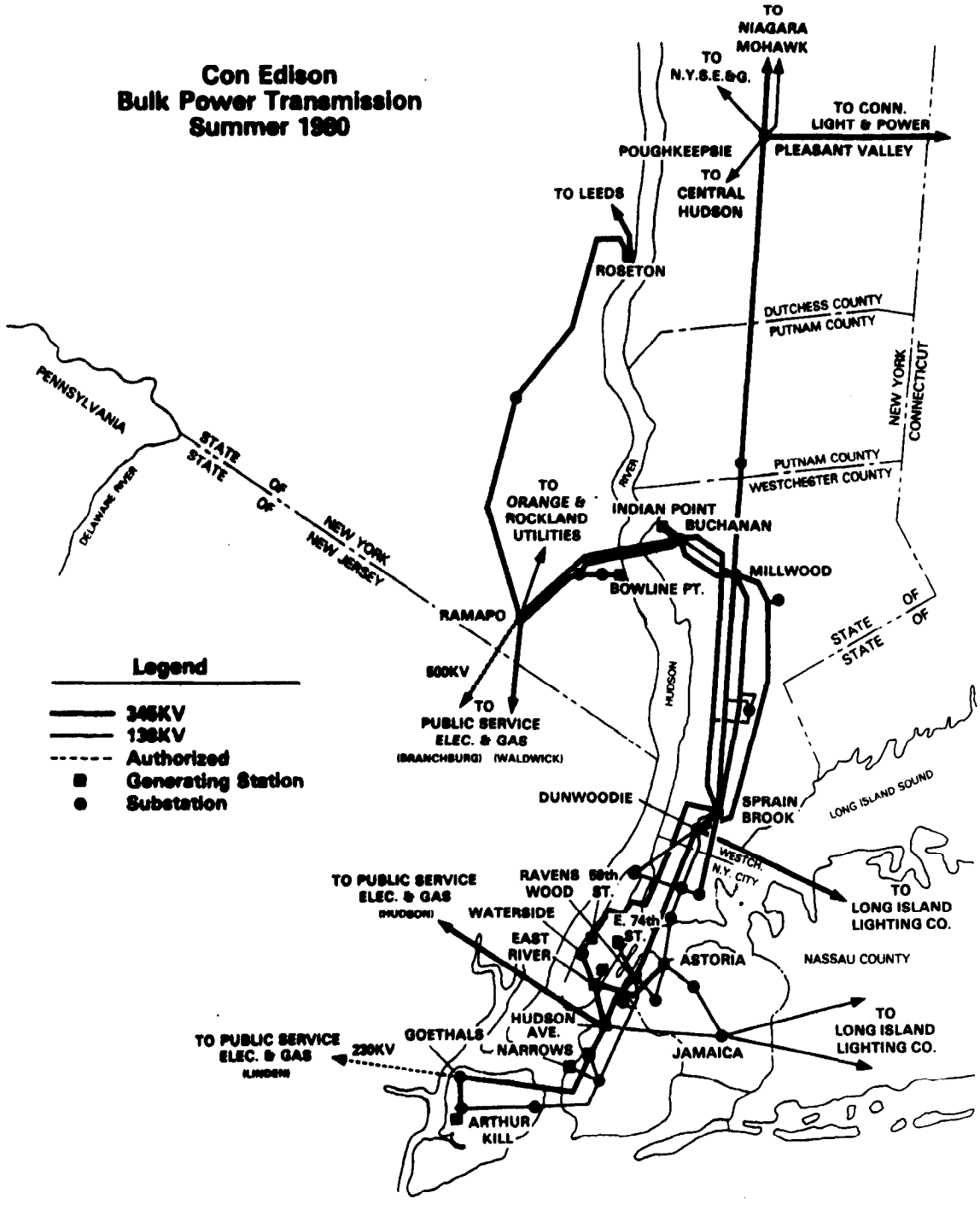
1/Summer ratings.


Con Edison
Bulk Power Transmission
Summer 1980
TO NIAGARA MOHAWK
TO N.Y.S.E.&G.
TO CONN. LIGHT & POWER
POUGHKEEPSIE
PLEASANT VALLEY
TO CENTRAL HUDSON
TO LEEDS
ROSETON
DUTCHESS COUNTY
PUTNAM COUNTY
NEW YORK
CONNECTICUT
PENNSYLVANIA
STATE OF NEW JERSEY
DELAWARE RIVER
PUTNAM COUNTY
WESTCHESTER COUNTY
TO ORANGE & ROCKLAND UTILITIES
INDIAN POINT
BUCHANAN
MILLWOOD
BOWLINE PT.
RAMAPO
STATE OF NEW YORK
500KV
TO PUBLIC SERVICE ELEC. & GAS
(BRANCHBURG) (WALDWICK)
HUDSON
Legend
345KV
138KV
Authorized
Generating Station
Substation
DUNWOODIE
SPRAIN BROOK
LONG ISLAND SOUND
WESTCH.
N.Y. CITY
TO LONG ISLAND LIGHTING CO.
TO PUBLIC SERVICE ELEC. & GAS
(HUDSON)
RAVENS WOOD
59th ST.
WATERSIDE
E. 74th ST.
EAST RIVER
ASTORIA
NASSAU COUNTY
HUDSON AVE.
GOETHALS
NARROWS
JAMAICA
TO LONG ISLAND LIGHTING CO.
TO PUBLIC SERVICE ELEC. & GAS
(LINDEN)
220KV
ARTHUR KILL

gas--when natural gas is available for boiler fuel use. During 1979, residual oil accounted for about 81 percent of the total fuel used by the utility for electric generation, 18 percent was natural gas, and 1 percent was distillate oil. Federal approval to burn natural gas extends through May 1981, but its continued use after that is uncertain. If approval is not renewed, increased amounts 1/ of residual oil would have to be used.

OVERVIEW OF THE POWER AUTHORITY OF THE STATE OF NEW YORK

PASNY is the largest State-owned utility in the Nation, with total gross utility plant of $4.07 billion as of December 31, 1979. PASNY finances, builds, and operates electric generating and transmission facilities for purposes specified by New York statute. PASNY has no geographically defined service territory. It is directed by law to serve certain classes of customers, both in New York State and in neighboring States.

In 1979, PASNY served 50 municipal and rural cooperative distribution systems in New York State and 1 cooperative customer in Pennsylvania and New Jersey. In addition, PASNY supplies power to each of the seven investor-owned utilities in New York State and to the State of Vermont. A number of high load factor industrial customers--generally located in upstate New York--are also served under long-term contracts.

In 1974 and 1975, PASNY purchased the uncompleted Astoria 6 oil-fired plant and the IP-3 nuclear unit from Con Edison with funds obtained from the issuance of bonds under its 1974 General Purpose Bond Resolution. Over the next few years, it took responsibility from Con Edison to serve a number of public bodies in southeast New York. Among customers in Con Edison's service area receiving power from PASNY are the Metropolitan Transportation Authority (MTA), the New York City Housing Authority, the Port Authority of New York and New Jersey, the city and State of New York, and towns, villages, schools, and water districts in Westchester County.

1/Sixty billion cubic feet (Bcf) of natural gas is approximately equal to 10 million barrels of oil. In 1979, Con Edison burned 50 Bcf of natural gas and could burn more than 76 Bcf in 1980.

PASNY serves its customer loads from a combination of hydroelectric, nuclear, and oil-fired units (see map). PASNY owns some transmission lines but generally relies on both transmission and distribution lines belonging to other utility companies. The electric power generated by IP-3 and Astoria 6, for example, is sent out over Con Edison's transmission and distribution circuits.

ROLE OF THE NEW YORK POWER POOL

The New York Power Pool (NYPP) is comprised of the seven major investor-owned utility companies in New York State and PASNY. The New York Power Pool Agreement originated with the seven investor-owned companies and became effective September 1, 1966. PASNY became a participating member on October 11, 1967.

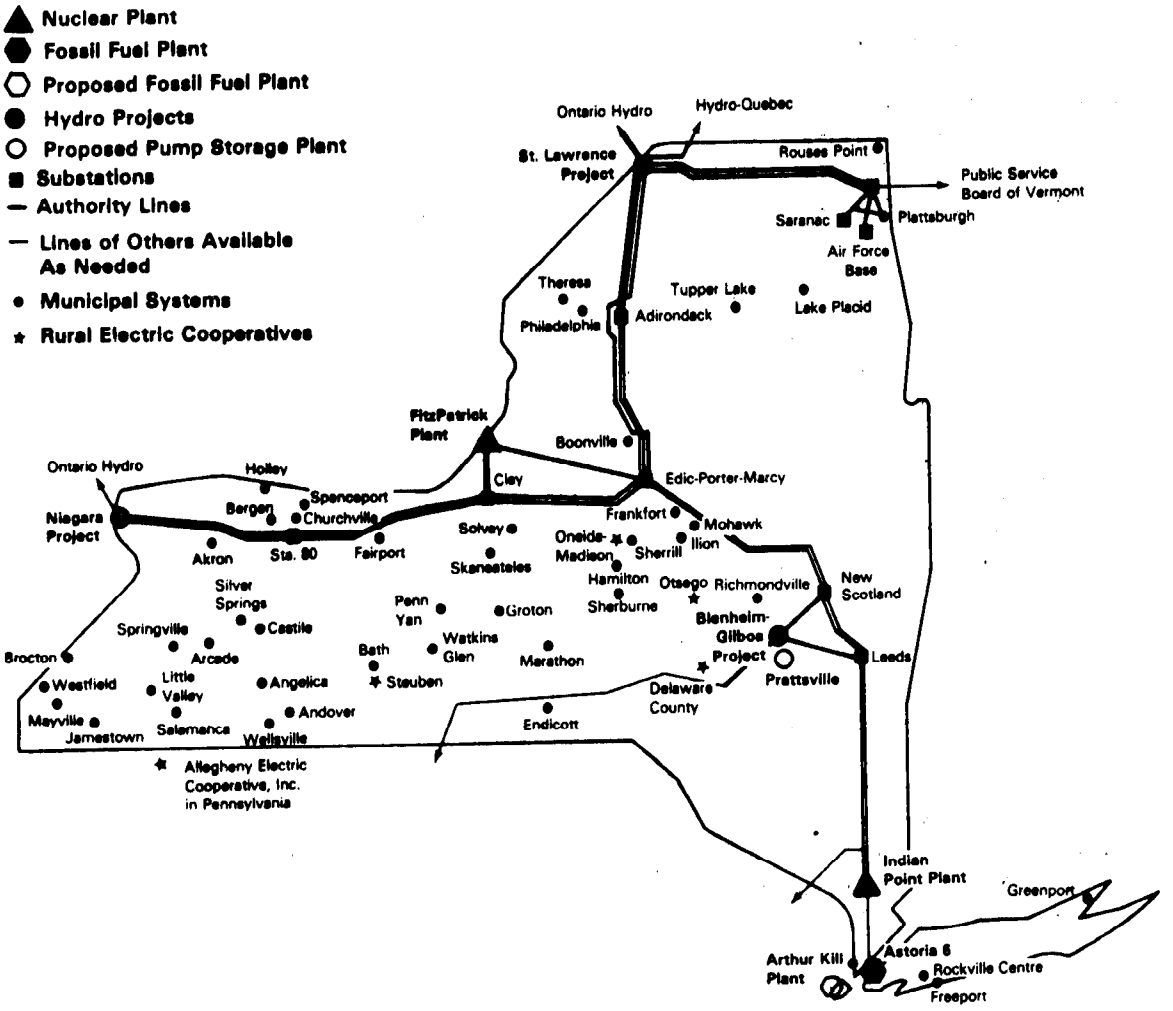
Among the benefits the member companies seek to obtain by coordinating the operations and planning of the State's electric system are increased reliability of service and reduced capital and operating costs. These are achieved by centrally managing generating and transmission facilities and operating them on an economic dispatch basis. This means that the lowest operating cost units for the system as a whole are generally put on line first--subject to transmission limits and area security restraints. Higher cost units are brought in as demand increases.

A Power Pool Control Center located near Albany, New York, coordinates the operations of the member companies of the pool insofar as they may affect the reliability of the bulk power supply on the interconnected systems in New York State. The control center dispatches energy on an economy basis and monitors internal and external operations of the Power Pool to ensure unimpaired overall security of bulk power supply at all times. The NYPP purchases electricity from other power pools when neighboring systems indicate energy is available on an economic basis.

The total capability of the New York State Interconnected Systems is 29,697 MW (summer) and 30,752 MW (winter). The NYPP 1980 base plan generating capacity mix is 12 percent nuclear (vs. 10 percent for the U.S.), 11 percent coal, 59 percent oil (vs. 26 percent for the U.S.), 16 percent hydro, and 2 percent purchases. The projected portion of the base plan nuclear generating capacity for 1988 is 16 percent (vs. 20 percent nuclear for the Nation).

Power Authority
of
The State of New York

TRANSMISSION AND POWER GENERATION FACILITIES



UNION OF CONCERNED SCIENTISTS
PETITION AND NRC RESPONSE

On September 17, 1979, the Union of Concerned Scientists (UCS) 1/ filed a petition with the NRC for decommissioning IP-1 and suspending operation of IP-2 and 3. The petition requested that the Commission suspend operation of IP-2 and 3, alleging that "their known safety deficiencies preclude operation without undue risk to the health and safety of the public," until the potential consequences of a severe accident are determined and a decision as to the site's suitability for nuclear powerplants is subsequently made. The UCS further stated in their petition that if the NRC decides that the Indian Point units should continue operations, such operation should be permitted only during periods of peak demand. On February 11, 1980, NRC's Director of Nuclear Reactor Regulation issued a decision which recommended that IP-1 be retired as an operating reactor but found that IP-2 and IP-3 could continue operation without any undue risk to the public. On May 30, 1980, the NRC overruled the staff's recommendation not to conduct further inquiry into the UCS claims against IP-2 and IP-3. The NRC directed that a Task Force be formed to consider the risk of Indian Point compared to other reactors. On June 26, 1980, the NRC Task Force on Indian Point issued its report. The report found in substance that while the Indian Point site was approximately 10 times more risky than a typical site due to surrounding population levels, the probability of a serious accident at Indian Point was also approximately 10 times less than with a typical design. The report concluded that the overall societal risk of the Indian Point units is about the same as a typical reactor on a typical site, although the risk to individuals is about 10 times less than at a typical site.

The UCS petition, although addressed only to Indian Point, has prompted the NRC to consider the generic issue of nuclear reactors located in areas of high population density. IP is only one of several such reactor sites.

1/A nonprofit corporation described as a coalition of scientists, engineers, and other professionals who state that they are "concerned about health, safety, environmental, and national security problems."

OUR RELATED WORK

Our report, "Three Mile Island: The Financial Fallout" (EMD-80-89, July 7, 1980), addressed the financial effects of a forced closure of a nuclear facility on the owner utility. We concluded that the closure of the two nuclear units at Three Mile Island has had a significantly adverse impact on the utilities' ability to raise capital, to pay dividends, and to contain power costs to consumers. Our report "Areas Around Nuclear Facilities Should Be Better Prepared for Radiological Emergencies (EMD-78-110, Mar. 30, 1979) stated that most nuclear facilities seemed prepared to respond to nuclear releases within their boundaries, but it is questionable whether the public beyond plant boundaries would be adequately protected. We made recommendations to cognizant agencies to increase their preparedness for a nuclear accident and to condition new plant licensing on having State-approved emergency plans. The agencies have responded to our recommendations and have either taken or are taking the necessary implementing actions.

OBJECTIVES, METHODOLOGY, AND SCOPE

The general nature of the Subcommittee request required extensive assessments of the most likely future conditions and cost. As a result, it was necessary to model the probable operations of the Con Edison system under various scenarios including a situation where no nuclear power would be available from the Indian Point units. The scenarios included assumptions concerning future construction, certain transmission line limitations, and assumed fuel costs. To do this modeling, Con Edison contracted with the General Electric Company (GE) to run its multi-area production cost program for the period 1980-92 using our scenarios. The results of the computer runs were analyzed and assessed by us for reasonableness based on numerous discussions with Federal and State energy officials as to their perceptions of the likely effects of closing down Indian Point.

The electric power flows within the New York Power Pool system demonstrating the existing transmission constraints were modeled for us by the Power Pool engineers. A FERC electrical engineer assisted us in evaluating the transmission system constraints.

Using our scenarios and the output of the production cost model, an independent consultant selected by us ran computerized models of Con Edison's cost of service and revenue requirements for the period 1980-94. The effect of the company's return on equity capital resulting from a change in investor's perception of the company's risk factor

from losing the nuclear unit was assessed by the consultant and incorporated into the financial model. We reviewed the results of the consultant's work and satisfied ourselves as to the reasonableness of his methodology and assumptions used.

We held numerous meetings with cognizant Federal and State officials, obtained and analyzed documents, studies, reports, and related data. We also discussed the potentially adverse effects of rate increases with PASNY's largest industrial customer in New York City as well as State officials. The possibility of providing electric utility customers financial assistance to compensate for increased energy costs was also discussed.

The contractual obligations for serving customers in the New York area by Con Edison and PASNY were examined by our legal staff. Our staff interviewed utility company lawyers and State Energy Office officials on the same matter.

We limited our work to the development and analyses of the comparative costs of continuing to operate the Indian Point units or closing them down in 1981. As such, we did not address (1) the issue of the units' inherent operational safety or (2) the question of nuclear plant siting.

CHAPTER 2

NUCLEAR POWER ELECTRIC COSTS ARE RELATIVELY LOW BUT NEW YORK CITY AREA RATES REMAIN HIGH

In 1979, the direct production cost for Con Edison to generate electric energy from its IP-2 nuclear unit was 1.2 cents per kWh. This compared favorably to an average of 4.25 cents per kWh for energy produced from its large fossil-fired steam generators and 7.9 cents from its gas turbine peaking units. During the same period, PASNY's IP-3 nuclear unit's direct production cost was .9 cents per kWh.

There are costs in addition to the direct costs of electric generation, however, that are incurred and charged to customers. For Con Edison, these include depreciation expense, administration and general expense, taxes, interest, and return on investment. Most of these costs are allocated by various methods to all operations of the company. In 1979, the share of these costs attributed to IP-2 amounted to about $39.5 million, or an additional 0.8 cents per kWh. PASNY's equivalent costs for IP-3 were over $52 million, or an additional 1.1 cents per kWh. Average fixed costs for fossil-fired units were 1.6 cents per kWh.

Some utility costs are unique to nuclear plant operations. Spent fuel disposal, decommissioning, safety improvements, and emergency planning comprise most of these costs. While some of these costs are already included in consumer rates, additional costs are yet to be incurred. Consumer rates will be increased to some extent as a result of these costs.

Although nuclear power generation and hydroelectric imports have replaced large quantities of high cost oil-fired generation, electric rates for Con Edison's customers are higher than for any other utility company in the country. PASNY has been able to contain its rates to some extent, principally through lower cost generation and purchases, its tax-exempt status, and no requirement to earn a return on investment.

TOTAL OPERATING COSTS OF NUCLEAR UNITS LOWER THAN FOSSIL-FUEL UNITS

Con Edison generated nearly 23 billion kWh of electricity from its powerplants in 1979, and PASNY added another 7.2 billion kWh to serve its customers in the Con Edison

franchise area. About 9.6 billion kWh of the more than 30 billion kWh generated came from the two Indian Point nuclear units.

An analysis of production cost statistics for Con Edison and PASNY operations shows that the Indian Point units produced electricity at a much lower cost per kWh than comparable units fueled by oil and/or natural gas. This is true even when costs other than for direct production are added since non-production costs are allocated and added to all units on an equitable basis.

A unit cost comparison can be somewhat misleading, however, because the wide cost disparity in fuel prices results in the nuclear units being run more than the fossil units. This allows the fixed costs of the nuclear units to be spread over a much larger kilowatt hour base than the other, less-utilized, units thereby reducing the per kWh cost. Estimated per unit costs of running fossil-fuel units at higher levels, however, are still greater than for nuclear units.

Direct costs of power generation

Direct costs for electric power generation are a composite of fuel, operation and maintenance, and supply expense. These expenses comprise a large share of total operating costs. Because they are readily identified, they are useful for cost comparison purposes. Total electric operating costs for Con Edison in 1979 were about $2.3 billion. Over $845 million of the amount were direct production costs. PASNY's comparable costs for the 1974 project (comprised primarily of IP-3 and Astoria 6) were approximately $403 million total operating and $194 million direct production costs.

Table 2-1 shows the 1979 direct production cost data for the two Indian Point nuclear units, both in total dollars and on a per net kWh basis.

Table 2-1

Production Cost Data for
Indian Point Units-1979

Type of cost	Indian Point 2 Total cost	Indian Point 2 Cost per kWh (¢)	Indian Point 3 Total cost	Indian Point 3 Cost per kWh (¢)
Fuel	$27,136,221 (note a)	.565	$15,485,661	.323
Operations	6,854,606	.143	14,457,776	.301
Maintenance	15,857,390	.329	14,428,068	.300
Other supplies	7,952,963	.166	(note b)	(note b)
Total	$57,801,180	1.203	$44,371,505	.924

a/Includes $10,566,143 for reprocessing spent fuel.

b/Included in operations and maintenance accounts.

The costs per kWh for the Indian Point units are much lower than the average of Con Edison's conventional generating plants or the production costs for PASNY's Astoria 6 plant. For 1979, production costs for the conventional units were 4.25 cents per net kWh and 4.0 cents per net kWh for Astoria 6.

The costs of nuclear generation are also lower than any of Con Edison's individual plant costs. Cost comparisons between the nuclear units and three of Con Edison's conventional units are shown in table 2-2.

Table 2-2

Production Cost Comparisons for
Nuclear and Selected Conventional Baseload
Generating Units-1979
(Cents per kWh)

Type of Cost	Generating unit IP-2	IP-3	Arthur Kill	Ravens-wood	Roseton
Fuel	.565	.323	3.604	3.254	2.451
Operations	.143	.301	.124	.082	.026
Maintenance	.329	.300	.245	.386	.042
Other supplies	.166	NA	.045	.043	.016
Total	1.203	.924	4.018	3.765	2.535

Other plant expenses affect total operating costs

Production costs offer a good initial comparison for comparable generating units, and it is apparent from the previous tables that IP-2 and IP-3 provide relatively low cost power for the Con Edison/PASNY system. To obtain the full cost of power production chargeable to customers, however, other costs must be considered.

Certain fixed costs are incurred by the utilities that are not dependent on the units of electric energy produced by the powerplants. The major fixed cost items for Con Edison are depreciation, taxes, interest, general administration, and return on investment. Depreciation expense is directly related to the capitalized cost of each individual generating unit. The appropriate depreciation rate for IP-2 was set by the New York Public Service Commission (PSC) in Opinion 79-8, dated April 6, 1979. In its Opinion, the PSC adopted a 27-year remaining service life method of recovering the original cost. Other fixed costs are allocated to specific units by one or more methods.

PASNY, as a public power authority, does not use a depreciation expense account or pay taxes. It finances all of its capital projects through debt financing and its bond resolutions specifically exclude depreciation as an operating expense. However, PASNY collects in its rates amounts for the retirement of its bonds as required by the bond resolutions. Bond interest and administrative expenses are the other fixed cost components.

To develop a more complete cost of producing electric power from the nuclear units, table 2-3 shows the costs that need to be added to the direct production expenses previously identified. For comparison purposes, we have included the total fixed costs allocated by Con Edison to its conventional baseload units.

Table 2-3

Fixed Costs Attributed to Generating Units-1979

Cost category	Generating unit: Indian Point 2	Indian Point 3	Conventional baseload
	(000 omitted)		
Bond retirement	-	$ 5,456	-
Depreciation	$ 9,096	-	$ 34,734
Other fixed costs	30,387	46,721	227,309
Total	$39,483	$52,177	$262,043
Net MWh production	4,804,928	4,797,684	16,367,784
Additional costs (cents per kWh)	0.822	1.088	1.601

One additional cost applicable only to nuclear units should be added to the cost of operating IP-2 in 1979. In the Public Service Commission's April 6, 1979, rate order, Con Edison was allowed to begin including a decommissioning charge of $3.14 million annually in its depreciation. For 1979, approximately two-thirds of this amount or $2.1 million would have been included in customer rates.

We pointed out earlier that a unit cost comparison can be somewhat misleading if the units are not run within a similar capacity output range. For the units included in table 2-2 on page 12, IP-2, IP-3, and Roseton had comparable plant capacity factors 1/ in the 60-percent range. The Arthur Kill and Ravenswood units, however, were only used 32.2 percent and 28.8 percent of the time, respectively.

To assess the cost effects of running conventional units at a higher capacity factor, Con Edison analyzed the impact of increasing the average plant factor on six conventional baseload units from 32.7 percent to 63.5 percent--IP-2s actual plant capacity factor for 1979--and computed

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1/A percentage measure of usage computed as follows:

$$\frac{\text{Annual kilowatt hour generation}}{\text{Annual average hourly net capacity X hours in year}}$$

the likely effects on average costs per kWh. At that operational level, output and fuel costs increase proportionately to the change in plant capacity but operation, maintenance, and fixed costs were assumed to remain constant. The result of spreading more kilowatt hours over a total cost base was a decrease in the cost per kWh from 5.37 cents to 4.35 cents. Under normal operating conditions, however, if Con Edison's conventional baseload generation were substituted for IP-2 generation, the actual capacity factors would increase to less than 50 percent. The average kWh costs for the baseload units, therefore, would only decline slightly and would still remain well above the costs for the nuclear units.

CONTINUED OPERATION OF NUCLEAR UNITS WILL RESULT IN ADDITIONAL COSTS

The continued use of the Indian Point units will require additional expenditures by Con Edison and PASNY in the next few years. Funds will be required for safety-related modifications to the units required by the NRC and for radiological emergency response plans. Although the actual total costs are uncertain at the present time, approved/estimated expenditures for these two purposes over the next few years amount to $35.3 million for Con Edison and $35.5 million for PASNY. Additional NRC safety requirements would further increase these future cost estimates.

Con Edison has also estimated that extensive steam generator repairs on IP-2 that would cost $100 million or more and shut the plant down for up to 1 year will be necessary sometime after 1983. Although the steam generators on IP-3 have similar problems, PASNY anticipates spending about $45 million for plant improvements to mitigate the need for extensive repairs and associated plant outages.

Safety-related plant modifications

Nuclear plants are subject to modifications and improvements mandated by NRC or undertaken voluntarily by the licensees to improve their safety factor. As of January 1980, Con Edison had budgeted $18.4 million for safety improvements to IP-2 in its 5-year construction program (1980-84). The purpose of the expenditures and estimated costs are as follows:

Purpose of expenditure	Estimated cost IP-2
	(000 omitted)
Three Mile Island lessons learned program	$10,800
Supplemental fire protection	4,174
Additional storage and processing of low level waste	2,699
Reactor vessel supports	735
Total	$18,408

After Con Edison's 5-year construction program was approved, the NRC issued additional requirements and increased the workscope of many of the original requirements. To account for these changes, an estimated $12.5 million increase in the construction budget is presently being requested. This will bring the total planned/ estimated costs to $30.9 million.

Between January 1979 and August 1980, PASNY's Board of Trustees approved expenditures totaling $31.1 million to comply with NRC requirements. The purpose of the expenditures and estimated costs are given below:

Purpose of expenditure	Estimated Cost IP-3
	(000 omitted)
Three Mile Island lessons learned program	$16,060
Supplemental fire protection	1,815
Reactor vessel supports	730
NRC committments	9,090
Near site studies	2,705
Steam generator inspection and possible decontamination	650
Total	$31,050

PASNY officials estimate an additional $10 to $11 million may be required for further improvement. This amount is only tentative and no estimate had been submitted to the Board of Trustees for approval as of September 30, 1980.

The affect of these costs on customers' rates will depend on how PASNY's Trustees choose to handle them and on how the New York PSC allows Con Edison to recover them. Small non-capital expenditures might be included as current operations and maintenance cost. In this case, ratepayers would be charged the full cost as it is incurred. Expenditures for capital improvements would be added to the company's rate base and, in Con Edison's case, depreciated over a period of time, thereby recovering only a small part of the cost from the ratepayers in any one year.

The NRC staff is currently studying the issue of whether additional modifications are needed to further improve the safety factor for plants located near large population areas. Con Edison and PASNY are both involved in this study with NRC. Some of the design changes being considered are a vented, filtered containment pressure relief system, core retention devices, and hydrogen control. During the period May 7 through June 18, 1980, NRC staff met with Con Edison, PASNY, and Commonwealth Edison Company officials in a series of six technology-exchange meetings to discuss the potential consequences of core degradation and core melt accidents and associated phenomenology for the Indian Point and Zion units. 1/

The NRC/utility company meetings were preceded by a study of nuclear accident mitigation at the Indian Point and Zion plants conducted jointly by Sandia National Laboratories, Los Alamos Scientific Laboratory, and Batelle Columbus Laboratories. The object of the study was to identify methods for significantly reducing the likelihood of large airborne releases of radioactivity resulting from core melt accidents where the containment ruptures above ground level.

As of September 30, 1980, no decision had been made by NRC as to which, if any, design modifications might be required at Indian Point, and no cost estimates for making the modifications have been prepared. NRC, of course, will

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1/Zion nuclear units 1 & 2 are located near Chicago, Illinois and are owned by Commonwealth Edison Company.

not use the economic cost as a criteria for design modifications and Con Edison officials said they are reluctant to commit funds for this purpose until the changes being considered are found to materially aid safety and until they know which modifications will be required. In the meantime, the utilities are conducting a comprehensive Probability Risk Assessment study to determine the risks involved and the resultant risk reduction, if any, from various plant modifications.

At our request, Con Edison performed a sensitivity analysis of the effects of a $50 million capital expenditure on consumer rates in 1985. The analysis showed that when the $50 million investment was placed in service, additional revenue requirements of about $10 million per year would be required from customers. With expected revenues of $5.9 billion in 1985 under Con Edison's 15-year Financial Plan, the incremental revenue requirement would represent an increase of only 0.169 percent. Con Edison does not believe, however, that any required modification would require such a large capital outlay.

Radiological emergency response planning

Con Edison and PASNY estimate that their cost for emergency response planning and implementation will be about $8.8 million. The two utilities are working on the planning together, but no firm cost-sharing arrangement has been finalized. PASNY Trustees approved expenditures of $100,000 through August 1980, and Con Edison reported that about $1 million had been expended as of September 1, 1980.

A Con Edison official provided us a schedule of estimated costs for the emergency response plan but noted that estimates are difficult to make at the present time. For example, he pointed out that the quantity and adequacy of communication equipment are under study. Also, annual maintenance costs are difficult to estimate because of lack of experience. Con Edison's and PASNY's cost summary estimates are shown below.

Indian Point Emergency
Response Plan Cost Estimate

Task I	
Emergency response and evacuation plans	$ 959,000
Task II	
Environmental monitoring and communication	7,559,000
Task III	
Emergency response organization	262,000
Total	$8,780,000

The Con Edison officials pointed out that Task III includes a public relations function that has not been fully defined and for which no cost was included. He also pointed out that the final cost of a public notification system, which is part of Task II, has not yet been determined.

Federal, State, and county offices are also involved in the radiological emergency planning process. At the Federal level, NRC has the responsibility for reviewing the licensees' emergency plans for the reactor site and assuring itself that the proper elements are in place. The Federal Emergency Management Agency (FEMA) has the responsibility for review and approval of State and local planning and preparedness in the areas around the plant. In the event of an emergency, NRC would be responsive to problems at the nuclear plants site. FEMA would be responsible for coordinating all Federal activities offsite including assistance to State and local government organizations. Other Federal agencies involved to some extent in nuclear emergencies are the Department of Energy, Environmental Protection Agency, and the Food and Drug Administration.

The planning activities of the Federal agencies are not site specific but are category specific. Consequently, the addition or deletion of one or more nuclear units has little or no impact on their total agency costs.

A number of New York State and county agencies are involved in emergency planning and implementation since they

have the basic responsibility for offsite planning. Because of its location, Indian Point affects four adjacent counties requiring a certain level of planning and implementation in each one.

Planning at the State and local levels was still in the drafting stage at the completion of our audit work and cost estimates provided were very tentative. The source of funding has yet to be determined. As of June 6, 1980, a State official reported to the FEMA regional director that no additional State or county funds had been appropriated for staff, equipment, etc., and that there was no indication there would be any such appropriations. The New York legislature, however, has a bill before it which would require the State's utility companies that own reactors to provide funds--$2 million initially plus $500,000 annually for each reactor.

The Project Manager for the State's Nuclear Emergency Planning Group informed us that the New York State component of estimated costs for the startup of the Indian Point improved emergency preparedness is approximately $4.25 million. Subsequent annual costs are estimated to be about $1.22 million. He said about 80 percent of the cost will be for accident assessment and evaluation. The remaining 20 percent will be for training of State and local staff.

An official of Westchester County's Office of Civil Defense offered an undocumented estimate of radiological emergency planning costs for the four counties adjacent to Indian Point. He said initial costs could be about $1.5 million, with about $200,000 per year needed thereafter.

We believe that although actions are being taken and some progress is being made, there are too many uncertainties at this time to assess either the actual costs of emergency planning or its practical implementation. From the cost estimates provided to us, it does not appear that the costs incurred will materially affect (1) the financial health of Con Edison and PASNY if they are required to bear the cost or (2) customer rates if these costs are flowed through as part of the companies' operating costs.

Future plant repairs are likely

Con Edison reported in its 1979 Annual Report that nuclear generating units similar in design to IP-2 have experienced corrosion problems in their steam generators. The company's inspection of IP-2 showed a similar problem

which will probably require replacement or retubing of the steam generators. Con Edison does not expect to have to do this work until after 1983, and possibly even later than that. The current estimate of the cost for the work is about $100 million, with the unit out of service for up to 1 year.

An expenditure of $100 million for capital improvements would undoubtedly be capitalized and put into Con Edison's rate base. Cost recovery, therefore, would be spread out over a number of years because IP-2 is assumed to have a 27-year remaining life as of 1979. The replacement cost for the approximately 5 billion kWh of output lost during the repair period would, however, have to be recovered in rates during the outage period unless the repair and outage costs were recovered from the steam generator manufacturer. The replacement power cost is uncertain as it would depend on whether Con Edison would generate it from its oil-fired plants or purchase it from other utilities. In 1979, the incremental cost for oil-fired generation was about two and one-half times purchase power costs. Future fuel price escalations and availability of power purchases, however, could greatly change the 1979 ratio.

PASNY officials said that the IP-3 steam generators are experiencing similar corrosion problems. PASNY, however, is not projecting the same extensive repair costs as Con Edison. Instead, PASNY anticipates spending about $45 million for plant improvements based on recent technological improvements intended to significantly extend steam generator life and mitigate any requirements for extensive repairs and associated plant outages.

CON EDISON CUSTOMER RATES ARE HIGHEST IN NATION

Con Edison customers currently pay higher electric rates per kilowatt hour of consumption than any other utility customer in the country. These high costs result from a number of factors unique to Con Edison. The low operating costs of the Indian Point units, however, have helped contain these customer costs.

Comparison of kilowatt hour costs of selected utilities

A comparison of average kilowatt hour costs for Con Edison, with both neighboring utility companies and utilities across the country, shows the high rates for electric power paid by Con Edison customers.

Table 2-4

Average Cost to Customer for the Twelve Months Ending December 31, 1979 (in cents per kWh of sales)

	Residential customer	All customers
Consolidated Edison Co. of New York	10.62	8.83
Long Island Lighting Co. (New York)	7.30	6.42
Public Service Electric and Gas Co. (New Jersey)	7.01	5.70
Boston Edison Co. (Mass.)	6.51	5.31
Power Authority of New York (New York City area)	NA	5.22
Jersey Central Power and Light Co.	6.43	5.16
Arizona Public Service Co.	5.63	4.50
Commonwealth Edison Co. (Illinois)	5.14	4.23
Southern California Edison Co.	4.72	4.29
Arkansas Power & Light Co.	4.16	3.24
Georgia Power and Light Co.	4.01	3.48

Con Edison's rates have increased even more in 1980. As of August 31, 1980, residential rates were averaging 11.65 cents per kWh and the average for all customer rates was 10.41 cents per kWh.

Factors affecting Con Edison electric rates

A number of factors have been linked to the high rates for Con Edison customers. Geographically, the five boroughs of New York City and the service area in Westchester County comprise the most concentrated urban area in the country. This situation has posed unique problems to the company with regard to the type of generating plant required, transmission and distribution facilities, fuels which can be used, and revenue collections. In addition, Con Edison is the city's biggest taxpayer.

To help accommodate to the wide divergence in energy loads between summer peak periods and winter demands, Con Edison maintains inefficient combustion turbine units for over 20 percent of its generating capacity. These units were initially installed to provide needed capacity because of uncertainties associated with the Cornwall pumped storage project and nuclear project delays. Usage is held to the minimum accounting for less than 2 percent of total electric generation in 1979.

Con Edison's transmission and distribution system is almost entirely underground in its franchise area. This is more costly to install, maintain, and service than overhead lines and increases the cost disparity between Con Edison and other utilities even further. Wage rates for its over 23,000 employees are also higher than rates paid in other large metropolitan areas. Con Edison officials said these higher costs account for 8 percent of the difference between Con Edison customer bills and those of the average urban utility customer.

While the above factors influence electric power costs, the biggest single increment is the cost of oil. To meet emission standards in the city, Con Edison's conventional baseload units are fueled primarily by expensive low-sulphur oil. A higher sulphur oil is used, however, in the Bowline Point and Roseton plants. In 1979, Con Edison used 26.1 million barrels of oil to produce over 13 billion kWh of electricity--about 60 percent of its total production. Con Edison paid nearly $507 million for its oil supplies, or 76 percent of its total electric generation fuel costs for the year. Expenditures for oil also accounted for 60 percent of Con Edison's total production costs for all electric power produced in 1979.

Oil costs will represent an even greater share of Con Edison's production costs in 1980. In January 1979, the New York harbor posted price for 0.3 percent sulphur residual oil was $15.53. By December 1979, the price was $26.12. Con Edison's average cost for the 12 month period was $19.41.

For the first 6 months of 1980, oil prices stabilized to some extent, but Con Edison's average price for the period was $27.35. This represents an increase of about $8 per barrel. If oil consumption in 1980 approximates that used in 1979, Con Edison's fuel costs will increase by about $207 million excluding gross revenue and sales taxes.

IP-2 cost helps reduce average of cost to customers

The lower operating cost and the high utilization of IP-2 is a large factor in keeping Con Edison rates somewhat contained. As we pointed out earlier, the 1979 total operating cost per kWh was about 2.0 cents for IP-2 and 5.8 cents for Con Edison's conventional units. This cost differential will become more evident in future years as oil prices escalate. In 1980, for example, nuclear power costs remained at about 2.0 cents per kWh but the higher cost of oil increased the total operating cost of baseload conventional units to

6.95 cents per kWh. A PASNY official responsible for fuel procurements expects low-sulphur oil prices to double by the mid-1980s. A 1980 study by the Massachusetts Institute of Technology indicates a doubling of oil prices by the late 1980s.

PASNY RATES ARE HIGH BUT LESS THAN CON EDISON'S RATES

PASNY provides electric service to its customers in Con Edison's franchise area from a combination of nuclear, hydro, and oil-fired generation. It also buys power from Con Edison on an as-needed basis.

PASNY bills its customers under 11 separate rate schedules with some of its large customers billed under as many as three separate schedules. For comparison purposes, we have averaged the cost per kWh for each of the six major classes of retail customers. These average costs for the period January through June 1980, are shown below.

Table 2-5

Average Cost of Electric Power for PASNY Retail Customers January - June 1980

	Total sales (megawatt hours)	Average cost (cents per kWh)
Metropolitan Transit Authority	1,062,000	6.137
New York City	979,000	8.471
N.Y.C. Housing Authority	434,000	7.146
Port Authority of N.Y. and N.J.	306,000	6.289
Westchester Public Agencies	152,000	9.213
New York State	102,000	7.376

PASNY's rates are influenced by the amount of power generated by IP-3, the Astoria 6 oil-fired plant, and by the amount of hydropower it can import from upstate New York. The Astoria 6 unit requires the same high cost low sulphur content oil as Con Edison's plants and is therefore affected by about the same fuel cost consideration. It is a newer plant, however, than Con Edison's units and its somewhat lower heat rate than the system average makes it a more efficient unit to operate in terms of fuel consumption. During 1979, PASNY obtained 30 percent of its total energy requirements for the New York City area from Astoria 6.

PASNY raised its rates in February 1980, to all of its New York City customers except the largest one--the MTA. The PASNY Board determined that the MTA was having financial difficulties and the State Energy Law encourages public transportation to conserve energy. Since a high MTA rider level reduces gasoline consumption, rates need to be kept at a reasonable level and the Board decided that MTA electric rates should not be further increased during 1980.

Based on the Board's decision, the $51.8 million in increased revenue requirements for 1980 have been allocated to the rest of PASNY's customers. 1/ PASNY officials said they are trying to contain the increased costs of generation from IP-3 and Astoria 6 by importing hydropower from its Niagara/St. Lawrence projects and the Blenheim-Gilboa pumped storage facility. Charges for these two power sources are about 0.5 and 0.7 cents per kWh respectively, which is much less than PASNY's other power supply costs.

PASNY's success in containing current future rate increases with hydropower appears to be uncertain. Supplies of hydropower are dependent on river flow, contract customer demand, and transmission limitations. In addition, all available hydropower is being brought into the New York City area because of its low cost. As shown in table 2-6, not only are available supplies uncertain, but considerable quantities were already being brought in prior to the latest rate increase.

1/Con Edison officials said they are protesting charges which exceed those paid by the MTA.

Table 2-6

Transfers of Hydropower Into the New York City Area by PASNY January-June 1980

	Supply source (MWH)		
	Niagara/ St. Lawrence	Blenheim-Gilboa	Total
January	188,845	6,585	195,430
February (note a)	206,924	12,560	219,484
March	161,082	12,050	173,132
April	169,134	11,286	180,420
May	49,829	9,355	59,184
June	29,020	4,711	33,731

a/Rate increase became effective.

Hydropower has helped contain rates, however, and comprised 28 percent of PASNY's total New York City area retail requirements during the period January through June 1980.

CHAPTER 3

ELECTRIC POWER WILL BE AVAILABLE WITHOUT INDIAN POINT BUT AT A HIGHER COST

The Indian Point nuclear units play an important role in the electrical generation system operated by Con Edison and PASNY. The 9.6 billion kWh of energy provided by the units in 1979 constituted a large share of both the utilities total generation and the total energy sales to customers in Con Edison's franchise area. The loss of these units to the system, however, would not pose an immediate shortrun threat to system reliability under normal operating conditions. The reserve margin would drop to the point, however, where the occurrence of multiple outages of major generating units could adversely affect this reliability.

The utilities' primary reliability problem without IP involves their ability to continue meeting summer peakloads. Their success will depend on the level and duration of the peak, the operating availability of the remaining and planned generating capacity, firm supplies of energy from outside sources, and adequate transmission line capacity. If planned improvements to New York's transmission network are completed as currently scheduled, and Canadian energy supplies are developed as planned, Con Edison and PASNY should have adequate supplies of electricity to meet their customers' needs. Underlying all of the possible contingencies is the concern regarding the area's dependence on imported oil and the possibility of oil supply interruptions.

Two more predictable effects of losing the nuclear units would be the increased cost that would accrue to franchise area consumers and the detrimental effects on the utilities' financial conditions. The initial impact would come from replacing nuclear fuel with principally higher-cost oil. It is estimated that total residual and distillate oil consumption for the NYPP system would initially increase about 20 million barrels per year. Incremental costs for this oil-fired energy would be about $600 million for the first year with increasing amounts thereafter. Con Edison would incur about 60 percent of the cost, or an average cost per kWh of 1.36 cents. PASNY's share, however, would be spread over fewer kilowatt hours and would increase the average cost per kWh by 4.19 cents. For a large PASNY customer like MTA, initial annual costs would increase from its current level of about $130 million to $217 million. Replacement energy costs for PASNY do not include any capacity charges which would likely be incurred if IP-3 were permanently closed.

Fuel costs in succeeding years are expected to increase. At an assumed escalation rate of 9 percent per year, total direct fuel cost increases could reach $1 billion per year by 1989. Options available to reduce oil consumption, such as conservation, coal conversion, and imported non-oil energy are already factored into the utilities' base plan with IP in service so little opportunity exists for further oil reductions.

Closing the nuclear units would also result in increased costs in areas such as decommissioning, nuclear fuel disposal, and contract terminations. These would be offset to some extent by avoiding some expected future costs if the units continue to operate. The net effect of these costs, spread out over a few years, would be negligible in relation to the large increases in fuel costs.

The extent to which the costs from closing the units would be shared by the utility companies and their customers would be determined by the State PSC and PASNY's Board of Trustees. If the PSC allowed no cost passthrough, Con Edison could be insolvent within 2 years. Conversely, full cost recovery with an earned return on common equity of 15 percent would keep Con Edison financially solvent but would cost ratepayers a total of $18 billion over the next 15 years.

With IP-2 and 3 in operation, and PASNY planning to construct two additional generating stations by 1987, Con Edison has no plans to add additional capacity of its own until the late 1990s. The loss of Indian Point, however, would require construction expenditures earlier than planned. Con Edison officials estimate replacement capacity in the 1990's would cost over $3.5 billion. Although consumers would not bear any of these costs until the plant was completed, earnings during the construction period would have to be maintained at a level that would make Con Edison's securities more attractive to investors.

ADEQUATE GENERATING CAPACITY IS AVAILABLE TO MEET FRANCHISE AREA DEMAND

The loss of the Indian Point units would decrease Con Edison's and PASNY's generating capability by over 1,800 MW, or about 15 percent of total system capacity. However, the combined remaining resources of the utilities appear to be sufficient to meet projected load requirements at least through the mid-1980s. Planned capacity additions by PASNY for use in the Con Edison franchise area will, if constructed as scheduled, provide an added measure of reliability.

Current capacity provides a large reserve margin

Con Edison and PASNY have a total of 70 individual generating units, including Con Edison's part ownership of the Roseton and Bowline Point plants, that can provide electric energy to the Con Edison franchise area. The total 1980 summer capacity of these units is 11,146 MW, as shown in table 3-1.

Table 3-1

Generating Capacity of Con Edison and PASNY Units (Summer Rating in MW)

Type of unit	Capability	Percent of total capability
Baseload - nuclear	1,814	16
Baseload - conventional	6,413	58
Peakload (steam)	932	8
Combustion turbines	1,987	18
Total capacity	11,146	100

In addition to its own generating units, Con Edison has firm contracts for 961 MW of power generation outside of its franchise area during the summer period. Therefore, total capacity available for the summer peak is actually over 12,000 MW.

The primary aim of a utility company is to have enough generating capacity to meet its peakload plus adequate reserves to meet planned and unscheduled outages, system operating requirements, and unforeseen loads. A reserve margin of 20 to 25 percent is generally considered adequate by most utility companies and by regulatory agencies. Because Con Edison and PASNY belong to the NYPP and share in the benefits of pooling, they are only required by the pool to maintain a minimum margin of 18 percent in excess of their annual peakload. PASNY officials pointed out, however, that the franchise area has large generating units and numerous older units with higher outage rates; therefore a higher reserve margin is warranted.

As indicated in table 3-2, the franchise area has had a substantial reserve margin and with IP in service this is expected to continue at least through 1984.

Table 3-2

Actual/Estimated Reserve Margin for Con Edison Franchise Area (1977-84)

Year	Total capacity	Peak-load	Reserve margin
	---------MW---------		(Percent)
1977	12,119	8,232	47
1978	11,995	7,698	56
1979	12,080	7,789	55
1980	a/12,041	8,346	44
1981(note a)	12,023	8,070	49
1982(note a)	12,027	8,130	48
1983(note a)	12,012	8,180	47
1984(note a)	11,995	8,230	46

Source: Consolidated Edison Co. data.

a/Estimated.

On March 11, 1980, Con Edison issued a 5-year forecast for the 1980-84 period. At that time, the franchise area peakload for 1980 was estimated to be 8,000 MW. The actual peakload of 8,346 MW was reached on July 21, 1980.

The loss of the Indian Point units would reduce the reserve margin of the system to about 24 percent by 1984 if the forecasts are accurate and no other provisions are made to either reduce peakloads or increase power purchases from external sources. An analysis of the Con Edison system conducted by the Department of Energy (DOE) indicated that the immediate shutdown of Indian Point would reduce the ability to control bulk power transmission voltages primarily during periods of low load. To fully provide equivalent light load voltage control if the units were shutdown, additional

operating equipment would be required. DOE estimated that such equipment could not be installed before 1985.

The loss of IP would have a greater effect on PASNY than on Con Edison. In 1979, Con Edison customers had a peak demand of 6,702 MW with 10,547 MW of available capacity. If IP-2 had not been available, Con Edison's reserve margin would still have been 45 percent, more than double what is required. PASNY had a peakload of 1,101 MW and an available capacity of 1,540 MW, for a reserve margin of 40 percent. The loss of IP-3 would reduce PASNY's available capacity to 809 MW which is not enough to even meet the peakload of its franchise area customers let alone have any capacity in reserve.

PASNY has a contract with Con Edison that provides some backup support in the event PASNY cannot meet its customers' requirements. The contract was entered into after PASNY purchased IP-3 and Astoria 6 and assumed responsibility for providing power to a segment of Con Edison's franchise area customers--all tax-exempt public entities. Under the contract provisions, Con Edison is required to provide power to PASNY's customers to the extent possible whenever PASNY cannot provide service from its own units.

The extent of Con Edison's commitment to PANSY is unclear, however, as a permanent loss of capacity was apparently not envisioned by either company at the time the contract was signed. Utility officials generally agreed that PASNY would provide all the power it could from its own resources and purchase the balance from Con Edison. If this arrangement increases PASNY's rates above Con Edison's rates, PASNY's customers could obtain service directly from Con Edison after 120 days notice to PASNY.

Additional powerplant construction by PASNY will add to system reliability

PASNY currently plans to build two large generating facilities with completion in 1987. The Travis plant is a 700 MW coal and refuse-fired powerplant at Arthur Kill on Staten Island in New York City. The other planned facility is a 1,000 MW pumped storage plant at Prattsville in central New York State. The output of these plants will go primarily to the New York City area to meet expected increased load requirements and to replace part of Con Edison's oil-fired capacity.

The addition of the Travis plant in particular would compensate to some extent for the possible loss of the Indian

Point units. The reserve margin would be increased and the Travis plant location would improve system reliability because generation would not be restricted by transmission limitations. The Prattsville pumped storage facility would provide energy during peakload periods but is not expected to have a significant impact on reducing oil consumption.

PASNY has not yet received final siting approval for Travis from the New York State Siting Board nor the necessary Federal Energy Regulatory Commission (FERC) license for Prattsville. Con Edison has no plans to construct any additional generation facilities of its own until the 1990s. It is depending instead on supplies from the proposed PASNY units. If PASNY does not receive construction approval, Con Edison officials said they would have to consider constructing units of their own; however, based on current leadtimes, plants could not be completed before 1992.

THE LOSS OF INDIAN POINT WOULD CHANGE THE UTILITIES' ELECTRIC GENERATING MIX

The actual operation of any one generating unit is a function of several factors: system load, type and cost of fuel, unit efficiency, system reliability, and the needs of other pool members. Unit operations are also influenced by the availability and cost of power purchases from other utilities.

Nuclear units are run at maximum capacity whenever possible because of their low fuel costs. Conversely, high cost combustion turbines are usually only operated to meet daily peakloads. The other conventional generating units are used to provide baseload energy, meet normal peak demands on the system, and provide system reliability.

Baseload units would normally be expected to have an average annual use of between 65 and 70 percent providing sufficient load is available to support their output. Combustion turbines, however, are not designed for continuous service and would normally be expected to be operated no more than about 17 percent of the total annual hours. Because of Con Edison's low annual system load factor, the availability of nuclear generation, energy from the more efficient Roseton and Bowline Point oil-fired units, Canadian power purchases, and NYPP economy energy purchases most of the Con Edison and PASNY conventional baseload generating units operated at about a 38-percent plant factor or slightly more than one-half the normally expected level. Table 3-3 shows the actual net generation and corresponding plant factor by type of unit for 1979.

Table 3-3

Generating Characteristics of
Con Edison and PASNY Units
1979

Type of Unit	Net generation	Plant factor
	(megawatt hours)	(Percent)
Baseload - nuclear	9,602,612	60.4
Baseload - conventional	18,780,464	38.0
Peakload - (steam)	1,364,473	15.5
Combustion turbines	421,226	1.9
Total generated	30,168,775	

Purchased Power-6,517,241 megawatt hours.

To assess the change that would probably occur without the Indian Point units, Con Edison, in conjunction with PASNY and the Long Island Lighting Co., (LILCO) modeled the operations of the NYPP using the General Electric Company's (GE) Multi-Area Production Cost Program. The program simulates the NYPP generation and transmission system, dispatching generating units within the State much as the NYPP computer does in actual operation. The GE program recognizes transmission limitations throughout the State and dispatches energy subject to those limitations.

At our request, Con Edison had the program run for the period 1981-92. While production costs applicable to each company in the NYPP can generally be determined by the model, no distinction was made between PASNY and Con Edison within the Con Edison franchise area.

The following four production cost simulations were run based on "base plan" and "alternate plan" scenarios.

1. The "base plan" is defined as the existing power system with IP-2 and 3 operating and PASNY's Travis and Prattsville plants completed by 1987. This is consistent with Con Edison's base 15-year financial plan submitted to the New York PSC.

2. The "base plan" without IP-2 and 3.

3. The "alternate plan" is defined as the base plan but without the Travis and Prattsville plants.

4. The "alternate plan" without IP-2 and 3.

Certain assumptions were made for such items as NYPP expansion plans, availability factors, fuel prices, coal conversion, and transmission transfer limits. Details of these assumptions are given in appendix II.

The changes that would likely result under the conditions postulated in the scenarios are discussed below.

The base plan

The base plan with IP-2 and 3 in service generally follows the basic generating/purchasing mix for the Con Edision franchise area in 1979 as noted in table 3-3. Indian Point's operation over the 1977 to 1979 period averaged slightly more than 10 billion kWhs of energy, the maximum occurring in 1977 at 10.7 billion kWhs. A slightly more optimistic role for the Indian Point units during the 1980s is postulated to reflect the operational maturity of the units based upon operating data for nuclear generating units of the same size and class. The production cost model shows the IP units operating at a consistent 69-percent plant capacity, assuming normalized refueling schedules. Any output less than this will require either additional oil-fired generation or increased power purchases because total energy load requirements gradually increase. The model shows the additional energy load being met by increased purchases until after 1987 when PASNY's two new units are planned for completion. At that time, an additional 4 billion kWh of energy are produced by the baseload units and purchases decline.

The loss of the IP units puts a bigger load on all generating units and increases power purchases. The addition of PASNY's Travis plant is again a factor in meeting more of the load requirements with conventional baseload units.

Tables 3-4 and 3-5 show the source and quantity of energy for the franchise area under the base plan simulations for selected years during the 1981-92 time period.

Table 3-4

Schedule of Electric Energy Generation and Purchases in Con Edison Franchise Area For Selected Years-With Indian Point

Source of generation	Amount generated			
	1981	1986	1988 (note a)	1992
	(megawatt hours)			
Nuclear	11,354,031	11,119,369	11,072,436	11,025,504
Baseload (conventional)	14,797,981	15,334,600	19,343,670	22,129,155
Peakload (steam)	110,625	217,063	32,664	188,403
Combustion turbine	-	20,855	-	52,530
Total generated	26,262,637	26,691,887	30,448,770	33,395,592
Purchases	9,551,927	11,991,182	8,162,202	7,551,885
Total available	35,814,564	38,683,069	38,610,972	40,947,477

a/Travis and Prattsville plants in service.

Source: GE Multi-Area Production Cost Program.

Table 3-5

Schedule of Electric Energy Generation and Purchases in Con Edison Franchise Area For Selected Years-Without Indian Point

Source of generation	Amount generated			
	1981	1986	1988 (note a)	1992
	(megawatt hours)			
Nuclear	328,527	93,865	46,933	-
Baseload (conventional)	21,547,391	19,685,745	24,096,377	27,278,857
Peakload (steam)	524,229	506,128	221,580	453,620
Combustion turbine	86,951	225,192	18,761	419,597
Total generated	22,487,098	20,510,930	24,383,651	28,152,074
Purchases	13,277,466	17,172,139	14,227,321	12,795,403
Total available	35,784,564	37,683,069	38,610,972	40,947,477

a/Travis and Prattsville plants in service.

Source: GE Multi-Area Production Cost Program.

The alternate plan

PASNY's inability to complete the Travis and Prattsville plants as scheduled further changes the generating mix in the years after 1987. Table 3-6 shows this effect under the four production cost simulations for 1988.

Table 3-6

Comparative Electric Energy Generation and Purchases With and Without Indian Point and PASNY Facilities-1988

Source of generation	Amount generated			
	Base plan		Alternate plan	
	With IP	Without IP	With IP	Without IP
	(megawatt hours)			
Nuclear	11,072,436	46,933	11,072,436	46,933
Baseload (conventional)	19,343,670	24,096,377	16,905,640	21,817,869
Peakload (steam)	32,664	221,580	145,162	515,557
Combustion turbine	-	18,761	8,777	38,791
Total generation	30,448,770	24,383,651	28,132,015	22,419,150
Purchase	8,162,202	14,227,321	10,478,957	16,191,822
Total available	38,610,972	38,610,972	38,610,972	38,610,972

Source: GE Multi-Area Production Cost Program.

ADDITIONAL BASELOAD GENERATION WILL INCREASE OIL CONSUMPTION

The changed generating mix resulting from the closing of Indian Point would require the additional use of an average of 15.9 million barrels of residual oil per year through 1992. The largest increase will come during the first few years when oil would be the only available alternative fuel. The planned use of coal and power purchases would serve to reduce incremental future oil requirements. While Con Edison/PASNY would be the biggest users of the extra oil, other NYPP members would also have to increase their consumption to help make up for the lost IP generation.

Increased oil consumption shared by New York utilities

The increased consumption of residual oil to replace the lost nuclear generation from IP would be shared by all but one of the NYPP members (New York State Gas & Electric Co., uses no oil). Con Edison and PASNY, however, would use 63 percent of the total needed over the 12-year period. Table 3-7 shows where the additional oil would be used.

Table 3-7

Quantity of Residual Oil Needed to Replace Indian Point Generation 1981-92

Year	Total	Quantity needed Con Edison/ PASNY	Other utilities
	(000 omitted)		
1981	19,370	13,752	5,618
1982	19,328	12,906	6,422
1983	18,727	11,381	7,346
1984	17,044	9,642	7,402
1985	16,570	9,854	6,716
1986	15,371	7,276	8,095
1987	14,380	5,918	8,462
1988	17,199	8,442	8,757
1989	16,851	9,085	7,766
1990	17,586	10,477	7,109
1991	16,613	9,957	6,956
1992	16,407	9,070	7,337

Source: GE Multi-Area Production Cost Program.

Providing replacement power for Indian Point is the responsibility of Con Edison and PASNY. Due to NYPP economic dispatch, however, they can take advantage of lower cost energy available from the NYPP member systems. Under the power pool concept of economic dispatch, generating units that have the lowest operational costs are dispatched first. Since the upstate utilities use a higher sulphur content oil than Con Edison/PASNY, their units are generally less costly to operate. The amount of energy that can be transmitted into the Con Edison franchise area for resale, however, limits the amount of higher sulphur oil that can be used by the other utilities. As indicated in table 3-7 the amount of oil used by other utilities

remains fairly constant over the 12-year period. Some increase is noted in the mid-1980s as planned capacity additions to the upstate transmission lines are completed and additional energy can be transferred.

The decline in the amount of residual oil needed by the State as a whole and by Con Edison/PASNY is a reflection of the utilities' coal conversion program and the completion of the Travis coal plant in 1987. It also reflects the anticipated availability of power from Canadian sources as the transmission network is strengthened.

Availability of oil supplies is questionable without Indian Point

Con Edison/PASNY are the largest single users of low sulphur (0.3 percent) residual oil in the United States. About 85 percent of their oil supplies is imported, principally from Caribbean refineries, Nigeria, and Algeria. Their 1979 consumption of 28 million barrels of low-sulphur residual oil for both electric and steam generation represents about 38 percent of the total amount of that fuel estimated to have been imported into New York during 1979 and about 25 percent of estimated low sulphur oil imports into the United States. Residual oil use in 1980 is expected to be about 30 million barrels.

Con Edison has several contracts for residual oil with two contracts terminating in 1981 and one in 1982. Exxon has been supplying about 60 percent of the company's low sulphur oil. Exxon, however, has notified Con Edison that it does not expect to renew any contracts after 1983. One of Con Edison's previous suppliers elected not to renew its contract when it expired in early 1979; another supplier did the same in 1978. There are a number of suppliers still operating in the east coast market, and Con Edison may not have too much difficulty in replacing the oil currently supplied by Exxon if the crude oil market remains relatively stable. Furthermore, oil consumption is expected to decline as coal conversion occurs and energy imports increase. However, the loss of natural gas use, which currently replaces over 10 million barrels of oil annually, would counter the assumed oil reduction to some extent in future years.

With the IP units out of service, however, expected oil consumption just for electric energy production will increase by about 12 million barrels annually in 1981 and 1982. Planned coal conversions in 1983 and additional Canadian energy will reduce the incremental need to about

9 million barrels and the decline will continue through 1987. Delays in converting Con Edison's Ravenswood and Arthur Kill oil units to coal and the continuation of current transmission limitations would leave Con Edison's/ PASNY's low sulphur residual oil needs at a level which could be difficult to meet if world supply sources were to tighten up.

An Exxon official said that although there is currently excess refining capacity in the Caribbean, the major question is the future supply of crude oil in the world market. In addition, users of the 0.3-percent sulphur residual fuel oil face problems not experienced by other residual oil users. Refiners need low sulphur crude oil to start with or a certain amount of blending is required to meet the specifications for the low sulphur end product.

The relatively limited market for low sulphur residual oil also makes it very sensitive to changes in demand from large users. The shutdown of Indian Point would cause a substantial increase in the demand for low sulphur oil--more than 10 percent of present demand along the eastern seaboard. Con Edison and Exxon officials believe that this increased demand could result in additional increases in the price of all low sulphur oil. Although the potential price increase is uncertain, Con Edison officials believe it could be as much as 15 percent.

Con Edison expects to burn about 80 billion cubic feet of natural gas in some of its generating units during 1980 under waivers granted by the FERC. According to Con Edison officials, this gas use replaces over 11 million barrels of oil. The FERC approval to use the natural gas for boiler fuel expires May 31, 1981. If FERC approval is not renewed at that time, Con Edison would be required to switch back to burning oil, putting further pressure on the low sulphur oil market.

COST EFFECTS OF LOSING INDIAN POINT WILL VARY BETWEEN CON EDISON AND PASNY

The required replacement of over 1,800 MW of nuclear generating capacity with oil or other higher cost power sources will result in substantial cost increases for Con Edison and PASNY. With Indian Point shut down, direct costs for fuel and/or purchased power plus related expenses for 1981 are estimated to exceed what is presently budgeted

by $607 million. The incremental costs by 1992 are expected to be $1.448 billion. This does not include an estimated $243 million annually resulting from price increases related to the increased demand. Delays and cancellations of coal conversion and planned construction projects could increase the estimated 1992 incremental costs to over $1.7 billion. Additional revenue will also be required to cover higher interest charges resulting from accelerated construction programs and increased earnings levels to compensate investors for the higher perceived risks of greater oil dependence. However, these costs will be of a much lesser magnitude than the direct costs.

The incremental costs required by the loss of Indian Point will affect both the companies and their customers to different degrees. Although Con Edison's incremental costs would be higher than PASNY's incremental costs, Con Edison's costs could be spread over a much larger sales base than PASNY's costs. As a result, the average increase in direct costs on a per kWh basis for 1981 would be about 1.36 cents. PASNY's costs, however, could increase by as much as 4.19 cents per kWh for its replacement energy in 1981. Such an increase would represent a 68-percent increase over the current rate level for PASNY's largest customer if the costs were allocated proportionately to all customers.

Direct cost increases will be substantial

Con Edison and PASNY spent over $1.2 billion in 1979 for fuel, purchased power, and related expenses. The increased costs for these same items are estimated to be $607 million in 1981, increasing to $1.488 billion by 1992 if Indian Point is shut down. As shown in table 3-8 these additional costs reflect the change from operating the two systems with Indian Point to operating it without Indian Point based on NYPP operations as computed by the production cost model simulation.

Table 3-8

Increased Production Costs for the Con Edison Franchise Area Due to Closing Indian Point 1981-92

Year	Direct fuel cost	Inventory expense	Working capital expense	Gross revenue tax and sales tax	Total cost
	(in millions of dollars)				
1981	554	8	11	34	607
1982	565	9	11	35	620
1983	519	8	10	32	569
1984	731	8	14	45	798
1985	737	8	14	46	805
1986	709	7	14	44	774
1987	646	6	12	40	704
1988	782	9	15	48	854
1989	915	11	17	57	1,000
1990	1,146	14	22	71	1,253
1991	1,185	14	23	73	1,295
1992	1,327	14	25	82	1,448

Source: Consolidated Edison Company and GE Multi-Area Production Cost Program.

The above cost increments are based on a number of assumptions. The base plan, which is the starting point for the comparison, assumes that transmission facilities into southeastern New York State will be installed by 1986 to increase imports of Hydro Quebec energy. Con Edison estimated that failure to complete these facilities as scheduled would increase fuel costs by $46 million annually.

Con Edison is required by the PSC to maintain a minimum fuel inventory level. To generate replacement power, additional fuel would have to be held in inventory. Because the company is allowed to earn a return on the inventoried fuel, additional costs would be incurred to cover the increased earnings.

An additional cash working capital allowance is also required to cover the higher fuel expense. The PSC requires that a formula method be used in the determination of the cash working capital requirement. One-eighth of the annual fuel expense is considered an appropriate measure of the

cash working capital allowance for this expense. A before-tax carrying charge of 20 percent was applied to the cash working capital allowance for Con Edison (10 percent for PASNY) to compute the additional amount added to consumers' revenue burden.

Con Edison collects a gross revenue tax of 6.1 percent and a sales tax of 8.0 percent from most its customers. PASNY collects no taxes from its customers except in connection with Con Edison's delivery service charge. For estimating purposes, Con Edison used a composite tax of 6 percent for the franchise area cost.

The incremental costs shown in table 3-8 were developed assuming that PASNY's proposed Travis and Prattsville generating facilities will be completed in 1987. Failure to complete these projects increases the companies' costs by $1.167 billion as shown in the "alternate plan" production cost simulation for the 12-year period. Because the incremental costs will be the same under the "base plan" and the "alternate plan" until 1987, the additional incremental costs from not adding the two new plants would only occur during the last 6 years of the simulation period. Table 3-9 shows the increased cost for the 6-year period if the Travis and Prattsville plants are not constructed.

Table 3-9

Additional Cost to Con Edison and PASNY Without Travis and Prattsville Plants

Year	Base plan without Indian Point	Alternate plan without Indian Point	Increased cost
	---------(in millions of dollars)--------		
1987	704	841	137
1988	854	1,025	171
1989	1,000	1,205	205
1990	1,253	1,329	76
1991	1,295	1,582	287
1992	1,448	1,739	291
Total increase			1,167

Source: GE Multi-Area Production Cost Program.

Incremental costs affect Con Edison and PASNY average production costs differently

For production cost simulation purposes, PASNY's IP-3 and Astoria 6 generating units are included as part of Con Edison's franchise area. While there is a considerable exchange of energy between the two utilities in meeting the area's total energy load requirements, charges to customers are based on the average costs to generate and purchase energy for their individual electric power systems. Consequently, the effects of losing the Indian Point units need to be examined for each utility separately. By allocating to each utility the incremental costs shown in table 3-8 on page 42 and comparing these costs to each system's expected energy requirements, an average cost per kWh was determined. Tables 3-10 and 3-11 show this analysis for the Con Edison and PASNY systems.

Table 3-10

Average Increase In Fuel-Related Cost Per Kilowatt Hour From Closing Indian Point Units-Con Edison

Year	Total cost including taxes	Expected kilowatt hour sales	Average cost per kilowatt hour
	--------(000 omitted)-------		(cents)
1981	$348,450	25,680,000	1.36
1982	399,210	25,800,000	1.55
1983	394,780	26,110,000	1.51
1984	510,460	26,600,000.	1.92
1985	486,460	26,860,000	1.81
1986	482,700	27,000,000	1.79
1987	409,600	27,220,000	1.50
1988	565,890	27,510,000	2.06
1989	715,750	27,660,000	2.59
1990	761,380	27,980,000	2.72
1991	810,050	28,310,000	2.86
1992	906,390	28,820,000	3.15

Source: GAO Analysis of data from Consolidated Edison Co.

Table 3-11

Average Increase In Costs Per Kilowatt Hour From Closing Indian Point Units-PASNY

Year	Total cost	Expected kilowatt hour sales	Average cost per kilowatt hour
	-------(000 omitted)------		(cents)
1981	$258,550	6,170,000	4.19
1982	220,790	6,440,000	3.43
1983	174,220	6,789,000	2.57
1984	287,540	7,022,000	4.09
1985	318,540	7,235,000	4.40
1986	291,300	7,449,000	3.91
1987	294,400	7,663,000	3.84
1988	288,110	7,877,000	3.66
1989	284,250	8,091,000	3.51
1990	491,620	8,286,000	5.93
1991	484,950	8,482,000	5.72
1992	541,610	8,677,000	6.24

Source: GAO analysis of data from GE Multi-Area Production Cost Program and Consolidated Edison Co.

The increased cost per kWh for Con Edison in 1981 would represent a 11.7-percent increase in 1980 average residential rates (January through August 1980). If PASNY's additional costs were allocated to its customers on a per kWh basis, rate increases would range from 45 to 95 percent over 1980 costs.

Revenue requirements are a better indicator of the total cost of closing Indian Point

The direct costs discussed in the preceding sections represent the major portion of the total increased costs that could occur with an Indian Point shutdown. The loss of the units, however, affect the costs of other activities of the utilities as well, such as construction programs, financing options, and dividend policy. The extent to which each of these activities is affected dictates the cost impacts that result under the different scenarios. These cost impacts are in turn translated into revenue requirements which Con Edison's customers ultimately must pay. Because PASNY, as a public power authority, operates under a different set of parameters, its revenue requirements will be addressed separately.

A financial model of the Con Edison company shows changing revenue requirements

Con Edison is currently a moderately healthy, well-financed company. Con Edison is cited by one consultant 1/ as having (1) a higher than average common equity ratio in its capitalization structure, (2) an excellent cash position, (3) lower than average construction requirements, and (4) favorable pretax interest coverage. However, the company's market-to-book ratio (which represents an investor-determined intercompany index of common stock investment value) and its bond ratings indicate that investors do not look as favorably upon Con Edison as they do upon other utility companies. While this lack of confidence does not necessarily affect Con Edison at the present time because it generates its cash needs from internal sources, any event that would require external funding could pose difficulties for the company.

To obtain the best estimate of the full impact on Con Edison and its customers of closing Indian Point, we utilized the services of Stone & Webster Management Consultants, Inc., to simulate the effects of selected scenarios on Con Edison's revenue requirements for the period 1980-95. We started with the four basic scenarios that we used in the production cost model, i.e., Con Edison's base plan with and without Indian Point and its alternate plan with and without Indian Point. From this base, the Stone & Webster consultant modeled 32 simulations. The assumptions used in the simulations included varying levels of (1) cost recovery allowed by the PSC, (2) cost of common equity, (3) return on common equity, (4) interest costs, and (5) interest coverage requirements.

To determine the effects of the various scenarios on Con Edison's customers, the total revenue requirements were computed for each year. To determine the effects on Con Edision, a base case was first established. Using this base case, the effects on the company under varying degrees of rate relief and financial restrictions were determined.

The results of the scenarios are best summed up by comparing the revenue requirements and financial parameters of the base case to the results of four other cases. The

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1/Mr. Wayne Monteau, Vice President, Stone & Webster Management Consultants, Inc., New York, New York.

first case assumes that ratepayers pay all additional costs necessitated by closing Indian Point. The second case puts all additional costs on the shareholder. The third and fourth cases represent a compromise, with the company being allowed to recover 80 percent of its fuel costs in one case and 90 percent in the other. Although we included the above sharing arrangement in our scenarios, the New York PSC has always allowed the full passthrough of fuel costs.

The next five tables (3-12 through 3-16) are summaries of the key data developed by the financial model for each of the five cases described above. Following each table is a short discussion of the key factors shown by that particular scenario.

Table 3-12

Con Edison's Base Case
for Its 15-Year Plan
1980-1994

Year	Operating revenues	Cash from operations	Pretax interest coverage
	(in millions of dollars)		
1980	3,867	337	3.53
1981	4,064	344	3.48
1982	4,508	249	3.84
1983	4,835	277	3.81
1984	5,111	287	3.61
1985	5,640	239	3.48
1986	6,083	258	3.26
1987	6,729	283	3.02
1988	7,486	331	2.95
1989	8,014	365	2.95
1990	8,790	240	2.75
1991	9,569	211	2.48
1992	10,257	97	2.22
1993	11,249	155	2.12
1994	12,208	156	1.99
Total:	$108,410		

Source: Stone & Webster Management Consultants, Inc.

Key factors: the $108.4 billion in operating revenues reflect the total cost to ratepayers over the next 15 years assuming Con Edison receives regulatory treatment similar

to that received in the recent past. It is the total cost to ratepayers of normal operations and establishes the level of rates over the 15-year period if all significant variables are held constant. Rates increase by 2.8 times over the 15-year period.

Cash from operations remains satisfactory and the pretax interest coverage is sufficient to allow debt financing as available from the market.

Table 3-13

Base Case Without Indian Point Assuming Full Cost Passthrough (1980-94)

Year	Operating revenues	Cash from operations	Pretax interest coverage
	(in millions of dollars)		
1980	3,867	351	3.69
1981	4,983	560	5.55
1982	5,390	278	6.01
1983	5,654	449	6.61
1984	6,113	504	7.06
1985	6,689	395	7.56
1986	7,122	450	8.16
1987	7,749	481	7.16
1988	8,606	512	6.18
1989	9,275	484	4.84
1990	10,249	259	3.89
1991	11,130	172	3.09
1992	12,335	301	3.11
1993	13,330	224	2.87
1994	14,608	587	3.13
Total:	$127,100		

Source: Stone & Webster Management Consultants, Inc.

Key factors: This is the best case from the shareholder's point of view, but the additional cost to ratepayers is $18.69 billion. In this case, the company earns enough to (1) pay the added costs of operations, (2) attract capital on reasonable terms, and (3) properly compensate its investors. Rates, however, would be 3.4 times higher than 1980 rates.

If PASNY does not build the Travis and Prattsville plants (Alternate Plan) but full cost reimbursement is allowed, the cost to ratepayers would increase by another $4.7 billion over the 15 years. This would make 1994 rates 4.0 times higher than 1980 rates.

Table 3-14

Base Case Without
Indian Point Assuming
No Passthrough of Added Costs
1980-1981

Year	Operating revenues	Cash from operations	Pretax interest coverage
	(in millions of dollars)		
1980	3,867	351	3.69
1981	4,064	-212	0.02

Source: Stone & Webster Management Consultants, Inc.

Key Factors: This is the worst case from the shareholders and consumers point of view. As evidenced by the negative cash from operations, the company goes bankrupt in 1981 as it cannot generate cash either internally or externally.

Table 3-15

Base Case Without
Indian Point Assuming
80 Percent Cost Reimbursement
1980-94

Year	Operating revenues	Cash from operations	Dividends per share	Earnings per share	Pretax interest coverage
	(in millions of dollars)				
1980	3,867	351	2.68	4.40	3.69
1981	4,505	222	2.95	3.14	2.77
1982	4,949	83	3.14	3.78	2.55
1983	5,200	199	3.36	3.95	2.69
1984	5,579	207	3.52	3.60	2.46
1985	6,131	96	3.52	3.53	2.41
1986	6,539	144	3.52	3.52	2.39
1987	7,151	178	3.52	3.48	2.30
1988	7,995	197	3.52	3.31	2.17
1989	8,632	121	3.52	3.02	1.97
1990	9,556	-139	3.52	2.65	1.69
1991	10,410	-353	3.52	2.36	1.47
1992	11,192	-647	3.52	0.70	1.22
1993	12,202	-863	3.52	0.65	1.19
1994	13,181	-877	3.52	0.12	1.14
Total:	$117,089				

Source: Stone & Webster Management Consultants, Inc.

Key Factors: Although the ratepayers would pay an additional $5.69 billion dollars through 1990, Con Edison would be insolvent by 1990 as it cannot generate enough cash after that time as indicated by Cash From Operations and Pretax Interest Coverage.

Table 3-16

Base Case Without
Indian Point Assuming 90 Percent
Cost Reimbursement
1980-94

Year	Operating revenues	Cash from operations	Dividends per share	Earnings per share	Pretax interest coverage
	(in millions of dollars)				
1980	3,867	351	2.68	4.40	3.69
1981	4,560	274	2.95	3.60	3.10
1982	5,004	96	3.17	4.28	2.87
1983	5,245	222	3.42	4.43	2.87
1984	5,637	239	3.69	4.27	2.67
1985	6,191	129	3.77	4.29	2.61
1986	6,594	180	3.77	4.28	2.56
1987	7,201	214	3.77	4.21	2.44
1988	8,055	247	3.77	4.15	2.30
1989	8,705	209	3.77	3.90	2.12
1990	9,646	-51	3.77	3.58	1.85
1991	10,508	-211	3.77	3.23	1.63
1992	11,300	-439	3.77	1.50	1.36
1993	12,310	-623	3.77	1.35	1.31
1994	13,289	-622	3.77	0.60	1.26
Total:	$118,112				

Source: Stone & Webster Management Consultants, Inc.

Key Factors: Ratepayers will pay an additional $9.7 billion but the nonrecovery of only 10 percent of the added fuel costs will force the company into bankruptcy in the early 1990s. This scenario also illustrates the long-term effects of the PSC only allowing Con Edison to earn the same 10.5 percent on common equity that it has earned, on average, since 1977.

PASNY's revenue requirements influenced by contractual commitment and bond financing terms

PASNY finances its power projects by issuing bonds and then recovers sufficient funds through its rates to customers to cover all operating costs, including interest, and repay the bonds as determined by the bond resolution. PASNY's rates are not subject to the provisions of the New York Public Service Law nor to regulation by or the jurisdiction of the New York PSC. Consequently, although most of the added costs that PASNY would incur by the loss of Indian Point are similar to Con Edison's costs, PASNY's financial structure is not conducive to the same kind of modeling as we used for Con Edison.

An assessment of PASNY's future revenue requirements is further complicated by its contractual commitment to Con Edison for part of the Astoria 6 power. The extent to which this commitment would be maintained changes PASNY's revenue needs since the loss of IP-3 puts it into a capacity deficit even with full use of Astoria 6. The bond resolution that provided financing for IP-3 and Astoria 6 also funded a major transmission line in upstate New York. If net revenues above bond coverage requirements from this project are included, additional revenue requirements to compensate for the loss of IP-3 are reduced by about $6 million annually.

PASNY officials developed several estimates of the utility's revenue requirements without IP-3 generation. The studies varied in scope, depth of analyses, assumptions, and time periods covered. However, the scenarios used were essentially the same--the varying levels of service provided to Con Edison from Astoria 6.

The basic conclusions drawn from the three studies are that the total dollar impact on PASNY can vary widely--from $173 to $600 million annually depending on what assumptions are made as to PASNY's relationship with Con Edison. One study that covered the period 1980-87 showed an average annual increase of $23 million in revenue requirements after an initial first-year cost increase of $226 million.

One of the studies assessed the likely impact on PASNY's customers and found that there would be relatively little variance in the incremental cost per kWh under the various scenarios. This appears to be true because whether the additional power generation comes from Astoria 6 or is purchased,

it would have to be largely oil-fired generation, at least for the next few years. The incremental costs developed in the studies are shown below.

	Scenario (note a)		
	A	B	C
Generation replaced (000s of MW)	7,265	3,331	2,986
Increased cost of service (millions of dollars)	$596.9	$279.7	$244.3
Incremental cost differential (cents/kWh)	8.22	8.40	8.18

a/Scenario A. Full service without IP-3.

Scenario B. Reduce Con Edison service to 25 percent of Astoria 6 capacity.

Scenario C. Reduce Con Edison service to 0 percent of Astoria 6 capacity.

An average cost per kWh increase of the magnitude shown above would more than double PASNY's current rates.

ADDITIONAL COSTS OF CLOSING INDIAN POINT ARE NOT COVERED BY THE MODELS

The premature closing of IP-2 and 3 would accelerate the expenditure of about $233 million over a period of 6 years for decommissioning the units and disposing of the spent fuel. In addition to decommissioning costs, potential losses from unused nuclear fuel and contract terminations could amount to another $198 million. While some of these costs have been and are being collected from current rate payers, an accelerated collection plan to cover the remainder of the costs would have to be instituted if the units were closed in the near future.

To some extent, the decommissioning costs would be offset by budgeted expenditures included in the financial model or projected for future periods that would not have to be made if IP were shut down. Consequently, the incremental costs actually incurred would be reduced.

Because the permanent shutdown of IP at the present time would be a unique event, the costs involved are necessarily preliminary estimates only. Furthermore, the

timing of the closure would affect the amount of losses that might be incurred. Even if more exact costs could be determined, however, the allocation of the costs between company and consumer would probably involve lengthy regulatory and perhaps judicial proceedings.

Although we developed most of the cost estimates based on closing Con Edison's IP-2, we have assumed that the similarities of the two units would result in comparable costs to PASNY for IP-3. The costs shown in succeeding sections are for both units and are assumed to be allocated equally to each company unless otherwise indicated.

Decommissioning and spent fuel costs are still uncertain

Although a few small nuclear reactors have been decommissioned in the United States, no major facility the size of IP has been decommissioned. Cost estimates available, therefore, are tentative and subject to a number of uncertainties. One major uncertainty is the method of decommissioning the units. One of three methods is usually considered in cost studies--mothballing the unit, inplace entombment, or dismantlement. Each method has its advantages and disadvantages and related costs. Mothballing, for example, has the lowest initial cost but requires continuous surveillance. Inplace entombment goes a step further than simple mothballing but also requires continuous security measures. Both of these methods also limit the use of the site for any other purpose. Dismantlement has the highest initial cost but effectively clears the powerplant site for other uses. Although there is some question as to how soon dismantlement could proceed after shutdown, a Con Edison official said that such work could begin as soon as a decommissioning plan was formalized and approved by the NRC although some trade-offs would be required. Special tooling for cutting out pieces of the reactor would be required. Radiation limitations for workers, shielding devices, and available burial sites for the dismantled radioactive materials are other factors that would have to be considered.

From our review of available studies and discussions with nuclear engineers, it appears that dismantling IP-2 and 3 is a reasonable choice. It is estimated that this method would cost about $50 million each at current prices. Since it could take up to 6 years to complete the decommissioning/dismantlement process, final costs would be expected to be much higher in our present inflationary environment.

Con Edison, for example, estimated the dismantlement cost of IP-2 at $135 million in the year 2006 based on an initial cost estimate of $24.5 million in 1975 dollars.

The premature decommissioning of IP-2 and 3 would presumably include the dismantlement of IP-1 at the same time. While there would be some cost savings expected by dismantling all units at the same time, a current estimate of $150 million total cost is probably conservative.

Disposal costs for removing the spent nuclear fuel are closely linked to the timing of the decommissioning process. The spent fuel is presently stored onsite until such time as it can be transferred to a final repository--either permanent storage or a reprocessing plant. Current production costs at Con Edison and PASNY include an amount for spent fuel disposal based on permanent storage.

If IP were shutdown in the near future and dismantled, all the spent fuel stored onsite would have to be moved. Since there is no permanent disposal site currently designated, a temporary site would have to be designated and the spent fuel would have to be moved and stored at an intermediate location and transferred later to a permanent site. Con Edison estimates the costs of this interim step at $47.6 million at current prices for IP-1 and 2. Given the relative quantity of fuel used, costs to PASNY for IP-3 would probably add another $35 million making the total cost about $83 million in current dollars.

Closing Indian Point would result in financial penalties

Con Edison and PASNY would incur substantial losses from disposing of unused nuclear fuel and from terminating nuclear fuel contracts. The extent of the losses would largely depend on the timing of the shutdown and the salvage value of any nuclear fuel being processed at that time.

A fully loaded nuclear fuel core is worth about $100 million. The core is designed to provide full-load operation for a period of 48 to 54 months with replacement of one-third of the fuel each cycle (about 16 to 18 months). Therefore, at any one time, at least $50 million worth of usable fuel is in the reactor core. Once it is irradiated, the fuel cannot be salvaged.

Con Edison officials illustrated the possible losses by referring to IP-2s next refueling period which is scheduled for early 1981. The next region or fuel load ready to be put

in the reactor core is worth $46.7 million. The unamortized value of the partly used fuel remaining in the core is about $42 million. If IP-2 is closed just prior to refueling, then Con Edison officials estimated that about $30 million of the cost of the new region could be salvaged. However, if refueling occurs and IP-2 is closed shortly after it is restarted, the entire cost of the core would be lost. Therefore, the loss for Con Edison could range from $59 to $89 million.

PASNY officials have estimated the fuel loss from closing IP-3 would be about $98 million based on the current value of the fuel in the core and in process.

Contract terminations due to closing the units would result in further costs to the utilities. Con Edison's major contract is for fabricating nuclear fuel for regions 8 and 9. If this contract were terminated, the costs could be as high as $5 million since it is questionable how much of the uncompleted product could be sold. Termination of other fuel contracts could add another $5 million. PASNY estimates their contract termination loss at $41 million.

In summary, the estimated total costs for decommissioning/dismantling the IP units, disposing of the spent fuel, and terminating contracts is conservatively estimated at $431 million, as shown below.

Decommissioning/dismantlement	-	$150 million
Spent fuel disposal	-	83 million
Loss of fuel	-	157 million
Contract termination costs	-	41 million
Total cost		$431 million

DECOMMISSIONING COSTS COULD BE OFFSET BY EXPECTED FUTURE EXPENDITURES NOT REQUIRED

There are some offsetting costs to the above estimated expenditures, however, that would reduce the costs of closing the units. Budgeted expenditures over the next few years to comply with NRC-mandated safety changes would not have to be incurred if the units were not operating. As we pointed out in chapter 2, about $62 million has been budgeted or estimated to be spent by 1985 for these changes. Some of these funds are already spent, but there would be some offset if the units were closed in the near future. Expenditures that are being made to study the need for further safety

changes would also be avoided although the total savings from this measure was not available. PASNY, however, reported spending $3.5 to 4.0 million annually to study the issues surrounding the need for cooling towers at the IP units. Con Edison and PASNY also expect to spend at least $8.8 million on radiological emergency response planning. Again, these expenditures are being incurred at the present time and estimated savings would depend on when IP is shutdown.

Closing IP would also reduce future operation and maintenance (O&M) costs and some administrative and general costs. However, Con Edison does not believe they will vary much for some time after a complete shutdown. In 1979, Con Edison reported expenditures of $30.6 million for operating labor, maintenance, and supplies at IP-2. PASNY's O&M costs for 1979 were $28.8 million for IP-3. Eliminating these costs would save an estimated $59 million annually.

The largest single cost offset would be the avoidance of future plant repairs. Con Edison is currently projecting expenditures of $100 million for steam generator repairs sometime after 1983. PASNY hopes to solve a similar problem at IP-3 by spending $45 million for plant improvements.

Our analysis indicates that the immediate shutdown of IP would preclude the expenditure of approximately $220 million in capital improvements, emergency planning, and study costs plus annual O&M costs of $59 million. For the Con Edison/ PASNY consumer, therefore, cost savings over the next 5 years could about offset the approximately $431 million needed to dismantle the IP plant. This would then leave the consumers with the incremental fuel costs as the principal economic penalty for the premature closing of Indian Point.

Con Edison officials pointed out an additional element that could affect the final costs of closing IP. A Government order to shutdown the units would likely result in the assertion of claims for condemnation awards by the utilities. Although Con Edison has estimated that such claims could be substantial, we have not examined the issue and evaluated the prospects of such claims being upheld.

CHAPTER 4

AVAILABLE OPTIONS HAVE BEEN CONSIDERED BY UTILITY COMPANIES AND STATE ENERGY PLANS

The loss of Indian Point would result in a substantial increase in the costs of providing electric power to consumers and would also adversely affect utility efforts to reduce their dependence on oil as a boiler fuel. However, the short-term alternatives available over the next few years are already in some stage of implementation. The analyses that were discussed in chapter 3 assumed the implementation of most of the available measures since they are a part of Con Edison's and PASNY's plans. The improvements envisioned in later years will require a concerted effort by regulatory agency decisionmakers to bring them about.

SHORT-TERM EFFORTS TO MINIMIZE COST INCREASES AND OIL CONSUMPTION ARE ALREADY BEING TAKEN

The increasing uncertainty of low-sulphur oil supplies and the continuing need to seek frequent rate increases caused Con Edison and PASNY to initiate several measures to minimize cost increases and oil consumption. Among the several measures taken were (1) consumer conservation programs, (2) conversion of oil-fired plants to coal, (3) construction of coal and pumped storage generation facilities, and (4) increased purchases of less costly power. Some positive results have occurred, but certain constraining influences have limited the utilities' success in achieving their objectives.

Diesel cogeneration is also being developed by individual consumers in the franchise area. Installations to date have reduced Con Edison's electric load to some extent, and it appears that there are opportunities for further development. The generators being used are either oil or gas burning, however, and there are serious questions about their environmental impacts in the franchise area and their economics as it relates to total oil and gas use.

Conservation offers hope for oil reduction but not necessarily price declines

Energy conservation is one of the quickest ways to reduce electric power consumption--and thereby reduce oil consumption. Conservation efforts are not new to the

New York City area, however, as Con Edison has been a leader in home energy conservation programs since 1971. The program was further expanded in November 1979 when Con Edison opened its Conservation Center in midtown Manhattan to provide energy information and education to consumers. Home energy audits which identify areas where energy savings can be made are offered by the company. More recently, an infra-red aerial photographic scanning program has been instituted to detect heat losses from buildings. Con Edison has also been encouraging commercial establishments to use load-limiting devices and other energy management techniques designed to aid in reducing peakload demands on the system.

The success of these programs is hard to measure although Con Edison officials believe there have been substantial oil savings. Statistically, total sales to customers in Con Edison's franchise area have declined from their peak of 34.6 billion kWh in 1973 to 32.8 billion kWh in 1979. Average use per residential customer also dropped over the same period--from 3,609 kWh to 3,255 kWh annually. This is only 37 percent of the national average usage. In 1979, only 28 percent of Con Edison's residential customers used more than 300 kWh of electricity per month. Reducing peakloads in the system has been more of a problem. Peakloads vary from year to year and while the trend since 1973 has been downward or steady, the 1980 peakload experienced in July exceeded all previous peak demands.

The relatively small amount of electricity used by individual households appears to offer minimal opportunity to significantly reduce consumption further although there is undoubtedly some potential for additional energy savings in this sector. However, increased emphasis on conservation measures in the commercial and industrial sector may significantly reduce oil consumption in the future. Although this class of customers represents only 12 percent of all customers, it uses about 69 percent of all power sold. Con Edison's forecasts of future sales reflect the effects of increased conservation by consumers.

Conservation measures may be able to reduce oil consumption in the franchise area but reductions in consumer prices are unlikely. The high peakloads and the utilities' limited access to purchased power supplies require Con Edison to maintain its current generating capacity--even though it may not be fully utilized. The reduction in kWh consumption through conservation leaves fewer kWhs to be spread over the same investment base. As a result, while customer bills are reduced by conservation, the reduction is less than anticipated because of the increase in per unit costs.

Oil-to-coal conversions can affect both oil dependency and consumer rates

The increased use of coal to replace current oil-fired capacity can reduce both oil consumption and electric rates. Con Edison has estimated that converting three of its oil-burning plants to coal would replace 15 million barrels of oil annually and save its customers over $300 million in fuel costs and related taxes. Con Edison has started work on this conversion process and it will proceed with or without Indian Point. The company received approval from the Environmental Protection Agency (EPA) in August 1980, to burn high-sulphur (1.5 percent) oil in the three units planned for conversion as a first step to burning coal. The higher sulphur oil equates to emissions produced by burning 1.0 percent coal. EPA regional officials told us, however, that this approval was for a 1-year test period only. Further assessments will be made during the test period and at its conclusion as to the emissions that will be allowed from the units if they burn coal.

New construction planned by PASNY could reduce oil-dependence

New powerplant construction offers no immediate relief from oil dependency but does offer both supply and rate relief near the end of the 1980s if the plants are completed as scheduled. PASNY currently has plans to build a 700 MW coal-and-refuse-fueled powerplant on Staten Island in New York City. If construction approval is given, PASNY anticipates completing the plant in 1987, with the energy going primarily to replace Con Edison's oil-fired generation. The new plant is expected to save about 7 million barrels of oil and $150 million annually.

PASNY has also applied for a Federal permit to build a 1,000 MW pumped storage hydroelectric project about 100 miles northwest of New York City. The project would store electric energy for use during peak demand periods--again primarily to serve the New York City area--reducing the need for costly oil-burning generation. This project is also scheduled for completion in 1987. The non-construction of these projects would further aggravate the impact of closing IP.

Power purchases are less costly than oil generation but are currently limited by transmission constraints

The most immediate alternative to oil generation is to purchase power from other utilities. Excess energy is presently available from both upstate New York and Canadian utilities but Con Edison and PASNY are already importing as much energy as can be delivered over existing transmission lines.

Purchased power costs have been less than oil-fired generation costs. PASNY's firm purchases from Hydro Quebec for the franchise area, for example, averaged 2.3 cents per kWh in 1979 compared with 5.85 cents per kWh for power from oil-fired generation and 2 cents for nuclear generation.

Additional electric energy could be purchased from these utilities but transmission links between upstate and southeastern New York limit additional transfers until the existing lines are strengthened or new ones are built. Ontario Hydro, for example, has offered PASNY 1,000 MW of firm coal-fired power until 1990 but it would require a new transmission line from Niagara Falls to New York's southeast area, probably at Pleasant Valley north of the Indian Point site. A Massachusetts Institute of Technology researcher told us that Hydro Quebec spilled 17 billion kWh of energy over its hydroelectric dams in 1979 because it could not be transmitted to load centers. This is about one-half of Con Edison's annual requirements.

PASNY does not expect to be able to increase its present import level of Hydro Quebec energy until about 1984. From 1984 through 1987, however, PASNY expects to import over 12 billion kWh of energy to replace higher-cost energy in New York State. Although the supply of this available energy is expected to decline after 1987, PASNY expects to continue importing at least 6 billion kWh annually through 1995. These expected imports are already included in the utilities' planning.

To bring in additional Hydro Quebec surplus energy, improvements are needed to the existing transmission system. Although the New York utilities are reasonably well interconnected at the present time, the uneven distribution of generation facilities in upstate New York and major load centers in the southeast pose real problems for the transfer of low-cost energy. Large energy transfers from north to south are presently limited by three segments of the

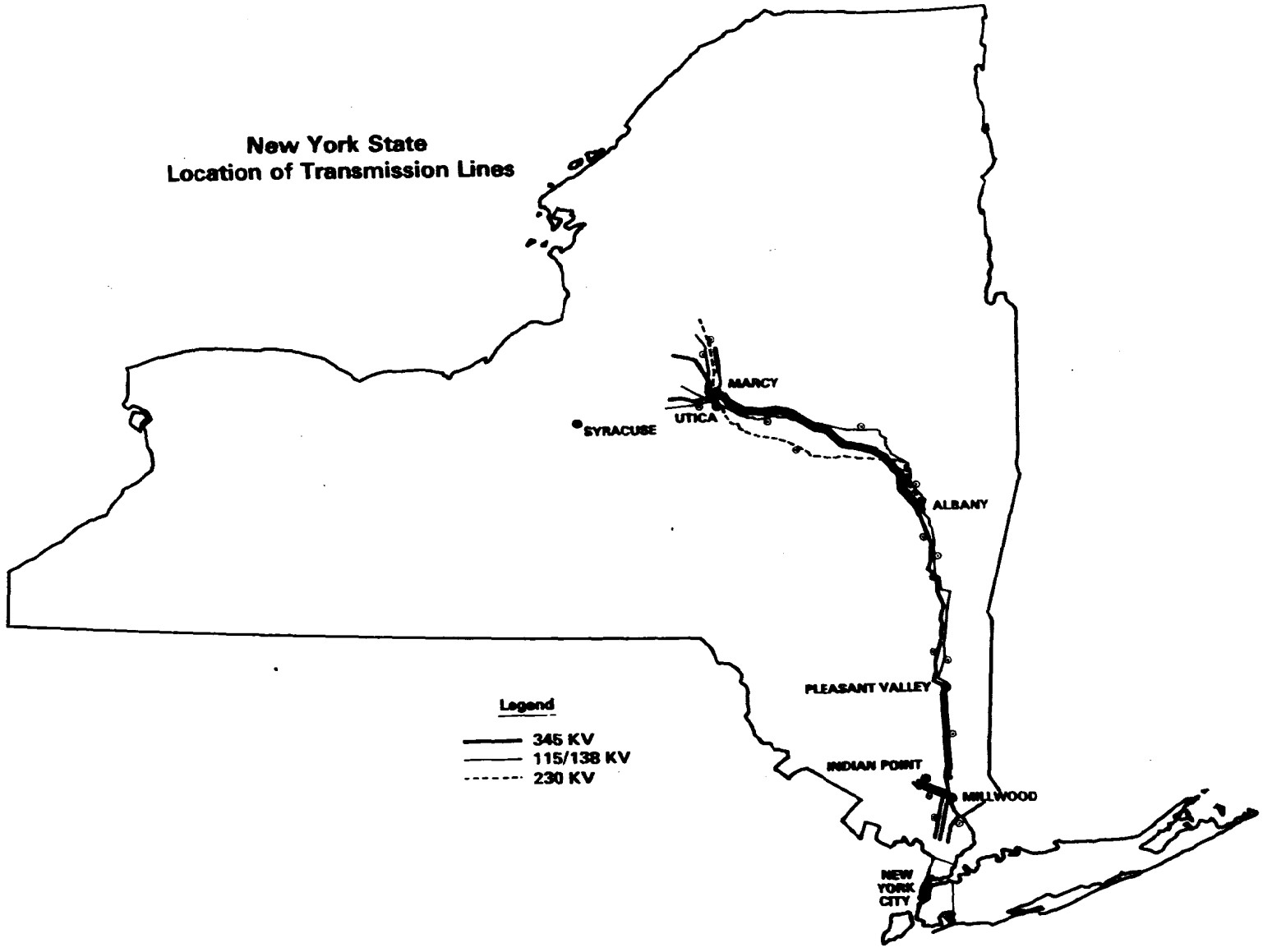
transmission system stretching from Utica to Millwood (see map). Con Edison owns the lines from Millwood to Pleasant Valley and other utilities own the lines from Pleasant Valley to Albany and from Albany to Utica.

At the present time, the capacity of the Millwood-Pleasant Valley segment limits the north-south flow of energy. Con Edison has been improving this segment, however, and has completed upgrading two circuits from 138 KV to 345 KV. It is still limited to 500 MW over its firm committments for upstate power, however, because two parallel 345 KV circuits are out of service while they are being upgraded. When this project is completed in 1983, Con Edison's capacity will exceed its firm committments by 2000 MW.

With Con Edison's improvements completed, the transfer limitations move to the Pleasant Valley-Albany and Albany-Utica segments. These segments establish Con Edison's import capability at 1,000 MW of capacity in excess of its firm commitments. Primarily because of its role as a public power authority, PASNY has been planning to increase the capacity of these two segments. Projected construction work completion on the lines is targeted for 1986, but this is contingent on obtaining the necessary permits and materials in a timely manner. PASNY officials said there may be strong opposition in the area to constructing more transmission lines which could delay completion of the work. Consequently, the 1986 date appears to be optimistic.

Without the improvements on the Southeastern New York-Utica transmission lines presently planned by PASNY, very little additional energy from upstate New York and Canada will be available to customers in the franchise area. Even if Indian Point continues to operate, the need to reduce New York's dependence on oil remains. Beyond the oil-to-coal conversion planned for existing units and new coal-fired capacity, additional power transfers from the north represent the next most viable alternative to reduced oil-dependence. These transfers are not unlimited, however, but are constrained by the amount of power that can be delivered over PASNY's 765 KV line from Canada.

Increased energy imports would continue to help contain energy costs to consumers although not to the extent they do at the present time. As we pointed our earlier, Hydro Quebec energy has been available to PASNY and Con Edison for 2.3 cents per kWh under a firm purchased power contract. That contract expires in 1981, however, and future energy purchases will be priced in relation to the cost of energy


New York State
Location of Transmission Lines
MARCY
UTICA
SYRACUSE
ALBANY
PLEASANT VALLEY
INDIAN POINT
MILLWOOD
NEW YORK CITY
Legend
345 KV
115/138 KV
230 KV

that is being replaced. For PASNY and Con Edison, displaced energy would be oil-fired. The current contract cost of Hydro Quebec surplus energy is 80 percent of replacement energy cost. A Quebec City Department of Energy official said that although the 80-percent figure is negotiable, it is being used as the basis for contracts with other United States and Canadian purchasers. Consequently, the future cost will be more than the utilities are paying now but depending on the cost of transmitting the energy, it should be somewhat less than generating their own energy with oil.

Increased use of cogeneration could reduce demand for energy

Cogeneration is the combined production of electrical or mechanical power and process heat. Where electric energy and heat are both needed in the same facility, cogeneration has the advantage of producing the same amount of energy with less fuel than separate conventional steam and electrical systems.

Con Edison has had a few building owners switch from Con Edison power to their own onsite generating facilities. Other Con Edison customers are also considering going to cogeneration. New York University, for example, is planning to install a 6.5 MW cogeneration facility for part of its building plant. Con Edison believes that the potential for loss of customers through cogeneration is considerable because the use of these facilities avoids State and local gross receipts and sales taxes. Cogeneration facilities also qualify for the investment tax credit, another financial incentive.

Con Edison's preliminary analysis of the potential for cogeneration indicates that about 250 of its customers with an aggregate monthly peak demand of 750 MW could find it an economically attractive venture. The company has also stated, however, that the loss of that many customers would mean higher rates for those remaining because fewer kWhs are spread over a relatively stable rate base.

Although Con Edison officials recognize the potential for cogeneration to reduce its system demand, they are also concerned about the potentially adverse effects of additional cogeneration facilities as they relate to increased pollution and their effect on increased use of coal in the franchise area. A Con Edison official said that a study done for the company by Environmental Research and Technology, Inc., concluded that 240 MW of diesel cogeneration could result in nitrogen dioxide levels that

would exceed current ambient air standards for midtown Manhattan. While some emissions from cogeneration units using distillate oil are lower than from oil-fired utility plants, the cogeneration output increases average ground level ambient sulphur dioxide concentrations because they use short chimneys.

Con Edison officials view the increased pollution from cogeneration facilities as a possible obstacle to their plans for converting some of their oil-fired units to coal and to building PASNY's Travis plant on Staten Island. Although coal conversion of 1,800 MW of oil-fired capacity would increase nitrogen oxide and sulphur dioxide emissions, company officials believe that by venting the emissions through tall stacks there will be minimal effects on ambient air quality. Nevertheless, the Clean Air Act and Federal and State regulations preclude increasing emissions in areas that are in violation of national ambient air quality standards. Since cogeneration could place the area in violation of air quality standards, increased cogeneration--from Con Edison's perspective--trades 2 million barrels of oil saved each year by cogeneration units for 15 million barrels saved annually by coal conversion and another 7 million barrels saved by building the Travis plant. Because of these concerns, additional cogeneration has not been included in Con Edison's analysis of future needs.

We doubt that sufficient detailed analysis has been made of the numerous factors and trade-offs involved in the cogeneration issue to support a position for or against the concept as a viable way to decrease oil dependence. The uniqueness of each specific cogeneration application in terms of fuel supply, emissions levels, air quality standards, effects on future installations of other pollutant-emitting facilities, and continuing relationships expected from the utilities requires a site-specific case-by-case analysis as to its viability.

THE ROLE OF GOVERNMENT AGENCIES

Both State and Federal agencies have responsibilities that relate to adverse circumstances that could occur in southeastern New York if IP were closed. Although the possible consequences of losing nuclear power were not addressed in its master energy plan, the New York State Energy Office (SEO) has already identified the need to actively pursue the alternative courses of action discussed earlier to reduce New York's oil dependence. At the Federal level, DOE and FERC are the principal agencies involved

in mitigating any adverse effects of closing Indian Point. EPA, however, would probably be involved with the State office with respect to maintaining emmission standards or granting waivers if necessary.

State agencies have an active role in electric utility affairs

The New York PSC and SEO have the primary responsibility for electric power supplies and utility operations in the State. According to SEO officials, the State's utilities still have a major role in the planning process but the State has taken over the final decisionmaking for forecasting and siting of facilities. PSC officials said that although Con Edison is responsible for serving customers in its franchise area, the PSC sets the rates to be charged, makes sure that Con Edison plans for adequate power supplies at the most reasonable cost, and becomes involved with siting of plants and transmission facilities.

In March 1980, the SEO issued its State Energy Master Plan and Long-Range Electric and Gas Report. The Plan provides the framework for energy-related decisions made throughout New York. Furthermore, the Plan controls all energy-related decisions made by the State and is the guide for energy-related decisions in the private sector. The findings in the report with respect to projected electric demand are binding on the State Board on Electric Generation Siting and the Environment with respect to any determination of need for future steam electric generating facilities. The specific findings related to projected electric and gas demand are also binding on the PSC with respect to the determination of need for major electric and gas transmission facilities.

The Master Plan recognizes that the State's oil dependency is too high even with IP operating and proposes a variety of strategies to reduce this oil dependency. These include increased (1) conservation measures; (2) use of renewable resources, including hydropower, (3) coal use; (4) gas use; and (5) use of imported hydroelectric power from Canada.

It is apparent, therefore, that the groundwork has already been completed and that actions to mitigate the effects of increased dependency on oil, or possible lack of generating capacity, are already in process or could be put in process. Implementation on a timely basis would require quick action by the various regulatory bodies.

The PSC could also mandate some form of rate structure that would limit the increased costs to lower-income consumers. This might, however, come in conflict with the move to base electric rates on marginal cost if the lower rates to selected consumers could not be justified on that basis.

The State Department of Environmental Conservation (DEC) would also play an important role in the utilities' ability to compensate for the loss of IP. Coal conversion of existing units, new coal-fired generation, and increased use of cogeneration facilities influence ambient air quality levels. The extent to which these efforts can be pursued is dependent on DEC's assessments as to waivers that can be granted and the trade-offs that can be made among pollutant-emitting facilities and still meet national air quality standards.

Federal agencies play a more passive role in State problems

DOE normally functions in an advisory or monitoring role with respect to individual utility companies and to State power issues. DOE officials can, and do, present reliability or adequacy assessments on site specific transmission lines when requested to do so by a State agency or a utility company. DOE's presentations, however, carry no more weight in the proceedings than any other qualified party. In the present New York transmission issue, DOE officials are consulting with the NYPP and PASNY to emphasize the importance of strengthening the transmission network.

A DOE official stated that DOE's activities in the utility area can become more direct. If IP were closed and emergency conditions developed in New York, DOE presently has authority to (1) move oil supplies to New York utilities, (2) dictate transmission flows and order physical interconnections, and (3) require the NYPP to go to non-economic dispatch.

Other than for its wholesale rate setting authority, FERC's role in New York would involve the licensing of hydroelectric projects proposed in the State's Master Plan. Numerous sites with the potential for generating up to 725 MW of electricity have been identified. An expedited licensing process by FERC could foster the development of this renewable resource and reduce future oil consumption.

APPENDIX I

ROOM 3217
HOUSE OFFICE BUILDING ANNEX NO. 2
PHONE (202) 225-1050

CONGRESS OF THE UNITED STATES
HOUSE OF REPRESENTATIVES
SUBCOMMITTEE ON ENERGY AND POWER
OF THE
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE
WASHINGTON, D.C. 20515

April 10, 1980

The Honorable Elmer B. Staats
Comptroller General
General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Staats:

Recent studies of the March 18, 1979 accident at the Three Mile Island nuclear power plant have raised serious questions as to the advisability of siting nuclear facilities near large population centers. In their November 5, 1979 appearance before this Subcommittee, the Commissioners disclosed that the Nuclear Regulatory Commission was in the process of reviewing the present siting criteria, together with the past operational safety records of individual plants, and that, as a consequence of this review, certain nuclear plants may be required to install new safety equipment, or be derated or even cease operation altogether. The then Chairman of the Nuclear Regulatory Commission made specific reference to Consolidated Edison Company's Indian Point facility near New York and Commonwealth Edison Company's Zion plant near Chicago as examples of facilities which, because of their proximity to major population centers, may not be able to comply with additional safety requirements and may therefore cease operation.

In order to understand the economic consequences of such possibilities, we are requesting that your office undertake a comprehensive analysis of the comparative costs of terminating the operation of the abovementioned plants versus the cost of complying with additional safety requirements needed to adequately protect adjacent population. In conducting this analysis, we expect that you would include consideration of the following issues:

(1) What is the current cost to utility customers for operating these nuclear units? What additional capital improvements are being planned for these units? What other costs for maintaining these units will be borne by ratepayers? By taxpayers?

(2) What alternative actions are being considered to upgrade the safety of these plants in order to reduce the danger to nearby population centers? What is the estimated cost of each alternative?

APPENDIX I

(3) What is the feasibility and cost of establishing and maintaining an effective radiological emergency response plan at each of these facilities?

(4) What costs would be involved in closing down the units and how would these costs be covered and accounted for?

(5) If the units were closed, what steps would be necessary to provide adequate, reliable alternative power supplies? In answering this question, consider (among other factors):

(a) the historical down-time records of these units

(b) the reserve requirements of the respective grids of these units

(c) the availability and cost of replacement power

(d) the fuel source of alternative power supplies

(6) What role might government agencies play in mitigating potentially adverse effects of closing the plants?

In the course of conducting this analysis, we request that, whenever possible, you assess the impact of these particular costs on the utility, shareholder, ratepayer and taxpayer, and identify how they would be apportioned among each category. Furthermore, we understand that your office is presently studying the possibility of converting nuclear fueled plants to other forms of fuel. Because of this Subcommittee's interest in this issue, we ask that you keep us appraised of the progress of this study, and, wherever possible, include relevant information regarding Indian Point and Zion in this request, especially if the generic study is delayed beyond the anticipated release of our report. In the event that the generic study is not pursued, we specifically request that you include this alternative in the requested cost analysis.

The Subcommittee would also like to see these cost figures computed on a per ratepayer, per year basis for the remaining life of the individual units.

The Subcommittee recognizes the difficulties of performing the requested analysis, but believes the information obtained will materially aid the Subcommittee in carrying out its responsibilities. Given the current concern about nuclear safety issues, we would like to have your analysis by September 30, 1980. We further understand that to meet that date it may be necessary to complete the study of the Zion plant at a date later this year.

APPENDIX I

If you have any questions, please contact Mr. Michael Ward (225-1030) or Mr. David Gold (225-6506).

Sincerely,

John D. Dingell
Chairman

Richard L. Ottinger
Ranking Majority Member

JDD/JLC

METHODOLOGY AND ASSUMPTIONS

UTILIZED IN THE GENERAL ELECTRIC

COMPANY MULTI-AREA PRODUCTION COST PROGRAM

STUDY METHODOLOGY

The computer program used to simulate the electric production cost impact of a shutdown of Indian Point for each year during the study period was the General Electric Company's (GE's) Multi-Area Production Cost Program. This program simulates the operation of the New York Power Pool (NYPP) electric generation and transmission system. The program, in effect, dispatches generating units within the State on an hour by hour basis for the period under study, much as the NYPP computer system does in dispatching the electric system on a daily basis. The GE program recognizes transmission limitations on major transmission interfaces throughout the State and dispatches energy within the State subject to those limitations.

This particular program, which is in the final stages of development, is an expansion of the program regularly utilized by Con Edison and the NYPP for its planning studies. Although the basic program methodology is the same, the version used for the preparation of this report includes a simulation of the reconstruction of the NYPP billing procedures so that production costs applicable to a given company may be determined; however, no distinction is made between the Power Authority and Con Edison within the Con Edison Service area. By virtue of this feature the benefits of economy energy exchanges in NYPP are considered.

For purposes of this program the State is divided into 11 different areas with identified transmission interfaces. The load model shape for each area is based on historical load data for the particular areas. The peak load and energy forecasts for the State and for individual companies reported by the member electric systems of the NYPP in the annual planning report to the State Energy Office is also utilized as input data. Within each area, generating units are designated by company ownership, including a breakdown of multiple ownership units. Generating units are typically modeled by an incremental heat rate curve, fuel type, maintenance costs, maintenance periods, and forced and partial outage rates. The program considers generating capacity which "must run" for area security purposes and operating reserves stipulated by the NYPP operating procedures.

Transmission transfer limits used in the program are the "normal limits" and assume all lines once in service are continuously available throughout the entire 12-year simulation period. This conservative assumption tends to underestimate the production cost penalty since outages reduce transfer limits and the ability to replace oil with other energy sources.

A number of production cost simulations were performed for the study period 1981 through 1992. A "Base Plan" defined as the existing system and current generation expansion schedule with the Power Authority's planned Prattsville Pumped Storage Project (1000 MW) and Travis (a 700 MW coal/refuse plant), in service in 1987, was studied and an "Alternate Plan" which assumed that these two plants are not constructed was also studied. These scenarios are consistent with the base 15-year financial plan recently submitted to the New York State Public Service Commission by Con Edison. For each plan, production cost simulations were conducted to determine the production expense with and without the Indian Point Units No. 2 & No. 3 in service.

STUDY ASSUMPTIONS

The key assumptions made in the studies are discsussed below.

A. "Base Plan" and "Alternate Plan" for Con Edison -

The "Base Plan" for Con Edison's system 1/ includes the completion of the Authority's Prattsville and Travis plants, the output of which is currently projected to be almost entirely dedicated to supply both Con Edison and Power Authority load in the Con Edison Service Area. With these plants in service in 1987, Con Edison is not projected to require new generating capacity to maintain adequate reserves until the turn of the century. The shutdown of Indian Point under this scenario results in the advancement of the need for new capacity to the mid-1990s.

1/PSC Case No. 27679, Long Range Construction Program Submitted on Behalf of Consolidated Edison Company of New York, Inc.

APPENDIX II

Under the "Alternate Plan" with Prattsville and Travis assumed not to be constructed and with Indian Point shutdown, new capacity is required to supply load in the service area by the late 1980s.

B. NYPP Generation Expansion Plans -

Generation expansion plans for the State are in accordance with the plans presented by NYPP to the State Energy Office in its April, 1980 submittal, 1/ supplemented where necessary to reflect more recent information.

C. Indian Point Availability Factor -

Based on required maintenance periods and partial and full forced outages, the Indian Point units are assumed to have an annual availability factor (maximum potential capacity factor) of 69 percent for each year of the study period.

D. Fuel Prices -

1. Oil

The initial prices of 0.3 percent sulfur oil assumed in the study for 1980 was $30 per barrel, including the 4-percent fuel use tax for fuel purchased in New York City. Prices assumed for higher sulfur content oils are slightly lower than this price. The escalation rate assumed was a conservative 9-percent per year for low sulfur oils and 8.5 percent for higher sulfur oils (greater than 2%) through 1992. This is consistent with the rates utilized by members of NYPP in planning studies. This escalation rate does not consider the potential impact of the loss of federal oil entitlements, now scheduled to be terminated in October of 1981, which could cause a steep increase in the price of imported oil.

1/Report of Member Electric Systems of the New York Power Pool and the Empire State Electric Energy Research Corporation Pursuant to Section 5-112 of the Energy Law of New York State.

2. Coal

The price of coal is dependent upon the sulfur content and the origin of the coal, i.e., eastern coal or western coal. Eastern coal with a sulfur content of 1.0 percent, as planned to be burned at Con Edison's Ravenswood 3 and Arthur Kill plants, is estimated to cost $2.00 per million Btu in 1980. Higher sulfur coals would cost somewhat less. All coal prices are estimated to escalate at 9.6 percent per year through 1985 and 7.2 percent thereafter. These rates are also consistent with the rates utilized by members of NYPP in planning studies.

E. Coal Conversion -

The simulations assumed the conversion to coal burning of about 3,300 MW of capacity within the State during the early to mid-1980s, of which about 1,750 MW would be Con Edison generation units located within New York City.

F. High Sulfur Test -

Con Edison currently has received permission to burn 1.5-percent sulfur oil in Ravenswood 3 and Arthur Kill 2 and 3 for a test period extending to August of 1981. Since the high sulfur test is designed to evaluate the environmental impact of burning coal in these units, actual dispatch of these units will approximate operation on coal, to the extent economically possible. As a result, the dispatch of these units would not vary significantly with the availability of Indian Point. To accommodate this in these studies, the units were modeled as burning 0.3-percent sulfur oil until the units are converted to 1 percent sulfur coal.

G. Fixed Indian Point Operation and Maintenance Expense -

Since operation and maintenance expenses at a nuclear plant are largely fixed and would not vary for some time even after a complete shutdown, these costs were assumed to be independent of plant availability. In 1981 the expense is assumed to be $35 million.

APPENDIX II

H. Transfer Limits -

Normal transfer limits are used as input data to the program for each of the 10 transmission interfaces in the State from 1981 through 1992. Such transmission transfer limits do not reflect scheduled or unscheduled outages. Major transmissions reinforcements south of Marcy, in central New York State, have been assumed to be in service by 1986.

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