SHOREHAM OPERATION VERSUS SHOREHAM ABANDONMENT

A Report Summarizing
the Findings of an
Economic Analysis
by LILCO's
Office of Engineering

Division of Public Affairs
May, 1983

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I. Introduction

In the wake of a proposal that the Shoreham Nuclear Power Station be abandoned, many questions have arisen about future Long Island electric costs. Accordingly, the Long Island Lighting Company has undertaken an analysis of future energy costs under two scenarios. One of these assumes Shoreham's operation beginning January 1, 1984; the other assumes that the nuclear power station is abandoned on January 1, 1985.

This report summarizes the preliminary findings of LILCO's analysis. It is to be stressed that the Company's evaluation of data gathered during this analysis is continuing. Additional conclusions may be reached; numerical estimates may be revised. This report is not intended as LILCO's last word on the impact of Shoreham's proposed abandonment. Rather, it is intended to serve as a starting-out point for discussion of that topic.

It is also to be stressed that this report examines, in detail, only one of the consequences of Shoreham's abandonment: the economic penalty, in terms of increased electric costs, that abandonment would bring. Failure of the nuclear plant to operate would also have significant effects in other areas. These include local property taxes, the cost of goods and services produced on Long Island and area unemployment. While our analysis does touch briefly on the property tax issue, it does not detail the impact of Shoreham's abandonment on other areas. In fact, the impact of these "secondary" abandonment effects may be even more significant, in economic terms, than the increase in electric costs that would result from such a decision.

II. Conclusions

1. Shoreham's abandonment would lead to a decline in the reliability of electrical service to LILCO customers until such time as alternate projects are completed. This decline would be felt in the form of 4 to 8 brownouts per year by 1990 and 45 to 70 annual brownouts by the year 2000.

2. Shoreham's abandonment would require the initiation of alternative programs to maintain reliable electric service.

3. The most attractive alternative to Shoreham's operation will involve the conversion, to coal, of existing oil-fired plants and the construction of new coal units.

4. Shoreham's abandonment will result in increased electric costs of $25 billion (actual undiscounted dollars) over the plant's life even in the absence of load growth.

5. Shoreham's abandonment will result in lifetime property tax hikes of at least $4-billion in those jurisdictions in which the power station is located. In the event alternate programs do not advance, the tax increase could rise as high as $11-billion.

6. Secondary effects of Shoreham's abandonment would increase the overall economic penalty to $55-billion to $90-billion depending on how high the ripple effect is multiplied through the economy.

III. Discussion

A. The Current Scenario

For years, Long Islanders have enjoyed reliable electric service. Although severe storms occasionally lead to blackouts the flow of electricity from generator to customer has generally been uninterrupted over the years.

This is the result of accurate load forecasting by Company experts coupled with proper planning to meet anticipated energy needs. As Long Island grew in leaps and bounds during the 1960's and '70's, LILCO met the challenge by constructing new facilities.

Because service reliability is so good, and because the area's population has stabilized, many people have concluded that new electrical generators are unnecessary. This is incorrect for several reasons.

1. Peak Electric Demand Forecast

As today's young people enter the work force (there are presently a million under 24) and businesses expand on Long Island, thousands of new jobs will be created in LILCO's service territory. Further, the maturation of today's youth will result in the formation of new family units and new households. In total, we anticipate the creation of 230,000 jobs and the addition of 100,000 new customers to the LILCO system by the end of this century.

As the number of households connected to the LILCO system increases, the amount of electricity used by individual appliances will decrease. This will result from technological improvements which increase the energy efficiency of frost free refrigerators, television sets, air conditioners and other equipment. Further decreases in individual energy consumption will result from the continuation of energy conservation efforts which are already underway.

While the net effect of customer growth, increased appliance efficiency and conservation cannot be forecast with certainty, LILCO predicts system load growth of 1.6% per year through the end of this century. This figure is slightly smaller than that developed by the State Energy Office and included in the State Energy Master Plan.

2. Generation Retirements

Like any machinery, power plants have limited useful lives. There comes a time when the cost of repairs becomes prohibitive and sound business judgement dictates that aging units be retired.

The retirement schedule for existing generating units, assuming a normal retirement (35 years) and an extended retirement (45 years) is shown on the following table. For the purpose of this study, a 45 year retirement has been assumed.

GENERATING UNIT	CAPACITY (MW)	NORMAL* RETIREMENT YEAR	EXTENDED** RETIREMENT YEAR
Pt Jeff 1	48	1984	1994
Pt Jeff 2	48	1986	1996
Montauk 2-4	6	1987	1997
Glenwood 4, E Hampton 2-4	118	1988	1998
Far Rockaway 4, Southampton 1	123	1989	1999
Glenwood 5, Southold 1	126	1990	2000
E F B 1, W B 1, Pt Jeff GT	223	1992	2002
Northport GT, Glenwood GT 1	32	1993	2093
Pt Jeff 3	186	1994	2004
Pt Jeff 4	326	1996	2006
W B 4, Sho GT, E F B GT 9-12	244	1997	2007
Glenwood GT 2&3	98	1998	2008
E F B 2	190	1999	2009
Holtsville 1-5	225	2000	2010
Holtsville 6-10	240	2001	2011
Northport 1	370	2003	2013
Northport 2	370	2004	2014
Northport 3	370	2008	2018
Northport 4	370	2012	2022

* 35 Years for Steam Units, 25 Years for Gas Turbines

** 45 Years for Steam Units, 35 Years for Gas Turbines

CUMULATIVE GENERATION RETIREMENTS
(MW)

YEAR	NORMAL LIFE	EXTENDED LIFE	YEAR	NORMAL LIFE	EXTENDED LIFE
1984	48	-	1994	910	48
1985	48	-	1995	910	48
1986	96	-	1996	1236	96
1987	102	-	1997	1480	102
1988	220	-	1998	1578	220
1989	343	-	1999	1768	343
1990	469	-	2000	1993	469
1991	469	-	2001	2233	469
1992	692	-	2002	2233	692
1993	724	-	2003	2603	724

3. Installed Generation Deficiencies

The retirement of aging facilities, coupled with modest load growth, result in an installed generation deficiency. This becomes critical in light of LILCO's New York Power Pool (NYPP) contractual obligation to maintain an installed generating reserve of 18%.

It is important to understand that this 18% reserve is necessary under reciprocal utility agreements for assistance in meeting demand during peak periods. If LILCO operated alone, for example, and with an installed generating reserve of only 18%, an unacceptable number of brownouts could be expected. Maintenance of present reliability levels would require an installed reserve capacity of 40% if LILCO were operating alone.

The replacement of retired generators is essential if LILCO is to meet its contractual obligation to the NYPP. Thus, Shoreham's abandonment would lead to a deficiency in the Company's reserve capacity requirements of 46 MW in 1985, 94 MW in 1986 and 252 MW in 1990. These deficiency figures would increase significantly if Nine Mile Point #2 is abandoned or if load growth proceeds at a rate exceeding 1.6% per year.

4. Brownouts

At present, LILCO strives for a level of system reliability that will maintain a probability of two to three brownouts per year. Such a reliability level could not be maintained in the absence of new generating capacity. Thus, Shoreham's failure to operate would lead to a significant decrease in system reliability until such time as alternate capacity became available. By 1990, 4 brownouts per year could be expected with this number increasing to 45 by the year 2000.

The situation would be exacerbated if the future importation of large quantities of electricity from Hydro Quebec requires the maintenance of a larger New York Power Pool spinning reserve. Should this be the case, as many as 8 brownouts might be expected in 1990; 70 brownouts would be forecast for the year 2000.

5. Fuel Reliability

At present, all electricity generated on Long Island is produced at power stations which burn oil. There are no coal, nuclear or hydroelectric plants currently operating in Nassau or Suffolk.

LILCO's total reliance on oil-fired plants puts customers at a disadvantage for two reasons:

- they are subject to significant price increases at the whim of foreign producers and

- they are subject to shortages of fuel when periods of turmoil in other parts of the world interrupt oil deliveries.

Add to these facts the fact that 80% of all homes on Long Island are heated by oil and you have a local situation that can only be described as unhealthy.

B. Base Expansion Plan (Including Shoreham)

In order to meet modest load growth in the future, LILCO applied for and received permits necessary to construct the Shoreham Nuclear Power Station. A nuclear station was decided upon for reasons of fuel diversity and cost.

For the purposes of LILCO's study, the base expansion plan (including Shoreham) was assumed to consist of the following elements:

The Shoreham Nuclear Power Station. In service on January 1, 1984 and providing 809 MW.

Nine Mile Point # 2. Scheduled to begin operations in January, 1987. LILCO owns 18% of this project, or 194 MW.

Unconventional Generation. The Company is assuming the availability of 50 MW of such capacity by 1985 and an additional 50 MW by 1990. Such power can be generated through refuse fired plants, cogenerators and small wind generators.

Interconnection With Other Utilities. By 1990, the Company plans to complete construction of a major interconnection to the rest of the interconnected grid. This transmission line will permit the purchase of electricity from other systems during periods of peak demand, thus avoiding brownouts in some cases. It will also enhance LILCO's ability to purchase more economic power from upstate coal and nuclear facilities as well as hydro power from Canada and PASNY.

New Coal Unit. Current projections make it appear that the need for additional generating capacity (to meet LILCO's NYPP generation reserve requirements) will arise in 1999. To meet this need, the Company plans construction of a 400 MW coal unit, to be in service by that date.

C. Alternate Base Expansion Plans

As stated earlier, modest load growth and the retirement of aging plants make it necessary to construct new generating capacity. If Shoreham is not permitted to operate, the power that it would have generated must be replaced.

1. New 400 MW Coal Units

Current economics on Long Island are such that, absent nuclear power, coal plants are most desirable for meeting future energy needs. Further, it appears that the construction of small units, as needed, is preferable to the building of a single, large unit.

For the purposes of this analysis, LILCO assumed installation of a 400 MW coal unit in 1994 and a second, similar unit, in 1996. Further, in order to improve reliability from a fuel diversity point of view, the analysis assumes conversion of two units at the Company's E.F. Barrett station and two units at the Port Jefferson station from oil to coal firing. These conversions would be completed between 1988 and 1991.

The expenses involved in implementing this alternative are significant. In addition to Shoreham's cost, it would add to customers' bills the cost of building two new units and converting four. In all, adoption of this alternative would lead to an economic penalty of $25 billion. [For a breakdown of this penalty on a year-by-year basis, see Appendix 1.]

2. Shoreham Conversion to Coal

One possibility, advocated by opponents to nuclear power, involves the conversion of the Shoreham facility to coal firing. Such a project is massive, but possible. Current estimates are that the conversion could be completed by 1995.

In fact, conversion of the Shoreham plant to coal-firing may be done in either of two ways. The first possibility would result in a generator capable of producing 769 MW, or about 5% less than the nuclear plant which is nearing completion. The second possibility incorporates a so-called "topping generator" which would increase the plant's capacity to 986 MW.

For the purpose of analyzing the cost impact of implementing the conversion alternative, expenses of building two new 400 MW units (used in the previous

scenario) were replaced by the projected conversion expense. Our analysis puts the total economic penalty of coal conversion at $48.5 billion, $38.2 billion if a "topping generator" is used. [A year-by-year analysis of the economic penalty is shown in Appendices 2 and 2a.]

3. Load Management and Deeper Conservation

One alternative, which would eliminate the need for additional generation capacity, involves a load management program (including conservation voltage reduction), Company investment in deeper conservation efforts and additional unconventional generation. Such programs would include the installation of facilities that could be used to directly shed load during peak periods.

For the purposes of this study LILCO has chosen, as a goal, a reduction of 400 MW in peak load by 1994. Attainment of this goal would obviate the need to install the first of two 400 MW coal plants which were called for in the first abandonment scenario. It would, however, require the installation of load shedding equipment and incentive payments to participating customers.

The gross penalty to LILCO customers of abandoning Shoreham, constructing a single coal unit (to be completed in 1996) and implementing load management programs is estimated at $26.5 billion [as shown in Appendix 3].

It is to be stressed that Load Management and Deeper Conservation programs are contemplated even if Shoreham is permitted to operate. The construction of new plants and the implementation of energy conservation programs are not mutually exclusive courses of action.

D. LILCO's Methodology

1. The Cost of Electricity

Economic penalty figures contained in this report are estimates derived through computer analyses using accepted accounting principles and assumptions which were reasonable when made. Extensive use was made of two particular computer aids:

A Production Cost Model was used to calculate total annual fuel, variable operations and maintenance costs.

A Regulatory Analysis Model (RAM) was used to examine LILCO's long-range revenue and financial requirements.

In addition, a loss of load probability program was used to calculate the probability of brownouts on the system.

The economic models were used to estimate costs in the 26 years following Shoreham's abandonment with extrapolations used for the following 14 years. A 40 year period was studied since that is the probable life of Shoreham's operating license.

In the abandonment case, a 20 year amortization period for Shoreham's sunk cost was assumed. Annual revenues required for this purpose include:

- the cost of the plant at the time of abandonment divided by 20,

- the annual return or interest on the unamortized portion,

- Federal Income taxes associated with the amortization and

- gross revenue taxes.

It is assumed in the base expansion plan (including Shoreham) that the nuclear plant receives a low level power license and is fuel loaded this year in preparation for commercial operations in early 1984. The abandonment analysis assumes one year of litigation before a final decision is made and an abandonment cost of $3.6 billion. This figure does not include Shoreham's initial nuclear fuel core which would have no salvage value if the plant receives a low power license before the decision to abandon is made.

For purposes of projecting revenue requirements, we have assumed a four year phase-in of Shoreham's cost. While the Company has proposed a three year plan, a four year proposal has been offered by the Public Service Commission staff and a five year plan has been recommended by the Consumer Protection Board.

It must be stressed that the analysis herein studies a series of intricate steps, each with its own economic ramifications. Because it is difficult to forecast the extent of these ramifications, the penalty of Shoreham's abandonment cannot be predicted with certainty. For this reason, the Office of Engineering

analysis is intended merely as a starting point for discussion of the issue.

2. Other Costs - Tax Consequences

Abandonment of the Shoreham Nuclear Power Station would reverberate through the Long Island economy. Removal of the nuclear plant from local tax rolls would lead to massive increases in property taxes for those properties that remain. In addition, employment would be lost and consumer prices would be increased to cover higher manufacturers' costs for electricity.

It is not the purpose of this report to analyze costs which are beyond the Company's control. Tax information is readily available, however, and is discussed briefly here.

Should the Shoreham Nuclear Power Station not be allowed to operate, property taxes incurred at the site would not be included in the cost of electricity. Government revenue lost when the plant is removed from area tax rolls would have to be made up, however, through increased levies on other property owners. In the first ten years following abandonment, this would require the collection of nearly $650 million in additional property taxes by the County of Suffolk, Brookhaven Town, the Shoreham-Wading River School District and the local fire district.

Shoreham's contribution to the funding of local programs cannot be overemphasized. In 1983, Shoreham's tax liability will approach $41 million. Ninety-seven percent of all taxes collected by the local fire district are provided by the nuclear plant. Ninety-two percent of all taxes collected by the Shoreham-Wading River School District are plant-generated. In the Town of Brookhaven and County of Suffolk the figures are 22% and 6%, respectively.*

It is obvious, therefore, that Shoreham's abandonment would have a devastating impact on

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* A dispute between LILCO and the Town of Brookhaven currently exists over the nuclear plant's assessment for tax purposes. Nothing contained herein should be taken as an endorsement of the town's assessment practices as they presently exist or as they will affect the power station in the future. Future tax projections contained in this analysis are estimates of the plant's liability under assessment policies which are currently in use. The matter is being litigated.

residents of the taxing jurisdictions in which the plant is located. Preliminary studies suggest that increases of the following magnitude are likely:

County of Suffolk:	13% *
Town of Brookhaven:	42%
Shoreham-Wading River School District:	1,600%
Local fire district:	4,800%

If action is taken to alleviate the impact of Shoreham's abandonment on the school district, as has been proposed, increases in county taxes shown above could double.

During its lifetime, Shoreham can be expected to pay $11 billion in local property taxes. The loss of these revenues would have to be added to increased electric costs in determining the economic impact of the plant's abandonment. If new power stations are constructed to replace Shoreham's capacity, the tax impact of abandoning the nuclear plant would be mitigated.

3. The "Ripple" Effect

In addition to raising electric costs and property taxes, Shoreham's abandonment would ripple through the economy. A loss of confidence in the local political leadership -- which some have suggested could result from abandonment -- could raise interest rates on municipal borrowings. An increase in mortgage foreclosures is a certainty as higher electric and tax costs make it impossible for some borrowers to meet their obligations. Prices for goods and services produced in the Long Island region will increase as higher production costs are passed on to consumers.

It is difficult to quantify these effects. The literature suggests that the base abandonment cost be multiplied by two or three; the State Energy Office Master Plan suggests a state multiplier of more than five for New York. Assuming a multiplier of two or three, the total cost penalty of Shoreham's abandonment could reach 55 to 90 billion dollars.

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* This figure represents the increase in county taxes which would be paid by residents of the Town of Brookhaven. County taxes for residents of Suffolk's other towns would increase from 6% to 8% if Shoreham is abandoned.

E. Sensitivities

As has been stated, the business of forecasting is inexact. The non-occurrence of anticipated events and the occurrence of events which could not have been expected make forecasting little more than educated guesswork. This is especially true in the area of fuel prices which are subject to world conditions that cannot be foreseen.

For this reason, we have subjected our analysis to a variety of sensitivity tests. These tests were intended to determine the impact of possible variations in our assumptions on the results. Three major areas were covered: fuel cost, future plans and economic conditions. Several examples of these tests are provided below.

1. Fuel Costs

   a. The volatile nature of oil prices was amply demonstrated during the 1970's. In 1973-74, oil prices quadrupled. In 1979-80 they doubled again. Coal prices tended to follow oil prices.

      Our study assumed oil price declines until 1987, followed by annual increases of 2% for oil and 1% for nuclear and coal.

      Since future prices cannot be predicted with any degree of certainty, we examined the impact of a 50% oil price rise in 1987 on the overall penalty from Shoreham's abandonment. The result: an increase of 7.4 billion.

   b. If air quality concerns lead to requirements that LILCO burn lower sulfur oil, the economic penalty would, likewise, increase. The burning of 1% sulfur oil in Suffolk and .3% sulfur oil in Nassau would, for example, add $1.2 billion to the Company's revenue requirements. This would include the cost of scrubbers at the converted units at Port Jefferson and E.F. Barrett.

2. Future Plans

   a. Failure to convert the Port Jefferson and E.F. Barrett stations to coal would reduce the economic penalty of Shoreham's abandonment by $1.1 billion.

   b. If load growth should occur at a rate of 2.5% a year (instead of the 1.5% assumed in the study), the cost to abandon Shoreham would remain unchanged.

c. If there is no future load growth, the penalty to abandon Shoreham would increase by $2.4 billion.

3. Economic Conditions

a. Should long range inflation total 4% (including a 2% reduction in the cost of money and a 50% reduction in real fuel escalation rates), rather than the 6% assumed in this study, the penalty to abandon Shoreham would be reduced by approximately $10 billion.

b. The base comparison assumed the long term cost of money will fall to 14% for equity and 11% for bonds. If the long term cost for money only falls to 15% for equity and 12% for bonds, the penalty for abandoning Shoreham increases by approximately $3.8 billion.

F. Other Reliability Concerns

A final area which ought to be mentioned is the importance of rate relief to the continuance of discretionary programs to maintain service reliability.

Following a decline in reliability during the late 1970's, LILCO initiated several programs to reverse the trend. Absent the revenue needed to continue these programs, reliability of the Company's electrical distribution system would diminish. This diminution would be felt through an increase in the number and duration of outages experienced by LILCO customers.

It is not LILCO's intent to permit service to become unreliable. The prospect is mentioned merely as a possibility if rate relief is not forthcoming.

Appendices

APPENDIX 1

ANNUAL PENALTY TO ABANDON SHOREHAM AND BUILD TWO 400 MW COAL UNITS
($ X Million)

YEAR	PENALTY	YEAR	PENALTY
1984	0	2004	560
1985	677	2005	1210
1986	197	2006	750
1987	291	2007	665
1988	142	2008	755
1989	165	2009	704
1990	83	2010	734
1991	114	2011	681
1992	67	2012	733
1993	33	2013	713
1994	551	2014	769
1995	501	2015	772
1996	897	2016	848
1997	927	2017	836
1998	986	2018	873
1999	679	2019	913
2000	652	2020	951
2001	503	2021	999
2002	506	2022	1046
2003	502	2023	1096

TOTAL $25.0 Billion

APPENDIX 2

ANNUAL PENALTY TO ABANDON SHOREHAM AND CONVERT SHOREHAM TO COAL
($ X Million)

YEAR	PENALTY	YEAR	PENALTY
1984	(3)	2004	840
1985	454	2005	1624
1986	94	2006	1834
1987	118	2007	1907
1988	(35)	2008	1935
1989	(1)	2009	1855
1990	(52)	2010	1290
1991	22	2011	1675
1992	33	2012	1653
1993	87	2013	1729
1994	134	2014	1736
1995	1223	2015	1884
1996	1247	2016	1677
1997	1260	2017	1965
1998	1844	2018	2043
1999	1140	2019	2123
2000	1523	2020	2211
2001	973	2021	2305
2002	893	2022	2406
2003	386	2023	2514

TOTAL $48.5 Billion

APPENDIX 2a

ANNUAL PENALTY TO ABANDON SHOREHAM AND CONVERT SHOREHAM TO COAL WITH TOPPING TURBINE
($ X Million)

YEAR	PENALTY
1984	0
1985	468
1986	129
1987	193
1988	44
1989	82
1990	29
1991	98
1992	101
1993	139
1994	171
1995	1312
1996	1338
1997	1338
1998	1370
1999	653
2000	1215
2001	672
2002	1085
2003	634
2004	1127
2005	550
2006	599
2007	1271
2008	1263
2009	1310
2010	1094
2011	1219
2012	1169
2013	1547
2014	1278
2015	1447
2016	1381
2017	1742
2018	1506
2019	1574
2020	1647
2021	1725
2022	1809
2023	1904

TOTAL $38.2 Billion

APPENDIX 3

ANNUAL PENALTY TO ABANDON SHOREHAM & PROCEED WITH LOAD MANAGEMENT & DEEPER CONSERVATION

($ X Million)

YEAR	PENALTY	YEAR	PENALTY
1984	(1)	2004	677
1985	660	2005	571
1986	195	2006	562
1987	269	2007	1616
1988	116	2008	842
1989	145	2009	880
1990	101	2010	652
1991	177	2011	809
1992	178	2012	818
1993	176	2013	816
1994	130	2014	835
1995	55	2015	888
1996	(7)	2016	904
1997	608	2017	955
1998	614	2018	994
1999	1038	2019	1034
2000	1087	2020	1079
2001	1047	2021	1126
2002	727	2022	1177
2003	776	2023	1232

TOTAL $26.5 Billion