

NEW YORK POWER POOL
1985 SUMMER OPERATING RESERVE
PROJECTION AND ANALYSIS

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INTRODUCTION

This report provides an analysis of the New York Power Pool's (NYPP) projected 1985 summer operating reserve margins (available generation capacity above peak load) of the statewide system, Consolidated Edison Company of New York (Consolidated Edison), and Long Island Lighting Company (LILCO).

Staff considered the adequacy of the reserve margins on both an installed and operating basis. Consolidated Edison and LILCO have been studied independently due to their susceptibility to transmission contingencies.

Staff projected unavailable capacity figures statistically. Estimated peak loads, scheduled outages, installed capacity, and transfer limit information for the 1985 summer period were provided by the NYPP, Consolidated Edison, and LILCO.

Staff's findings and conclusions are based on a current estimate of operating conditions for the 1985 summer. If subsequent system events adversely affect the integrity of the bulk power supply system, a reassessment of system reliability will be necessary.

SUMMARY

The NYPP has projected that its peak load will reach 22,420 MW for the 1985 summer. This is 2 percent higher than the all time highest peak load of 21,971 MW which occurred on June 11, 1984. Consolidated Edison and LILCO peak loads are expected to be 7,625 MW and 3,300 MW respectively. Both utilities anticipate their peak loads to be higher than the 1984 peak -- Consolidated Edison by 1.5 percent and LILCO by 6.5 percent.¹

The NYPP requires each member system to maintain an 18 percent installed generating reserve above its peak load. If each member system maintains this 18 percent requirement, then the NYPP will have a 22 percent installed reserve margin. For summer 1985 the required installed capacity for NYPP, Consolidated Edison, and LILCO is 27,352 MW, 8,998 MW, and 3,894 MW, respectively (TABLE I). While the NYPP and Consolidated Edison have adequate installed reserves, LILCO, with 3,767 MW of installed capacity, will be short some 127 MW in meeting its requirement.

¹ LILCO's 1984 peak load of 3,096 MW would have been higher by approximately 120 MW or 3.9 percent were it not for a system wide voltage reduction on June 11. The LILCO peak is therefore projected as 2.6 percent over the calculated peak for 1984.

The NYPP also requires that each utility maintain generating capacity on line or quickly available (e.g., gas turbines) to meet its load plus an "operating reserve" to assist in meeting unplanned outages. This reserve is necessary so the power system can withstand emergencies with a greater measure of reliability.

Staff has forecasted that operating reserves at peak load times will be less than required for NYPP, Consolidated Edison, and LILCO. NYPP's anticipated operating reserve margin of 1,617 MW (TABLE VI) is short some 1,083 MW of meeting its 2,700 MW reserve requirement.¹ Similarly Consolidated Edison's projected operating reserve of 401 MW falls 512 MW short of its 913 MW reserve requirement (TABLE V). LILCO is projected to be 507 MW short of meeting its required reserve set at 391 MW (TABLE IV). Thus, it will have to buy capacity to meet both its load and operating reserve.

The NYPP and Consolidated Edison have strong tie lines to neighboring pools and systems that will enable delivery of energy in the event of a major loss of generation, assuming spare capacity is available. LILCO has transmission capacity sufficient to import energy to cover its load, but not to meet the operating reserve requirement. Under our projections, it will be necessary for LILCO to take operating relief measures to meet its needs, such as emergency

¹ Modifications to the interconnection with Hydro Quebec will allow importation of an additional 500 MW this summer. As noted below, this additional import capability will result in the need to provide a significantly higher pool operating reserve.

imports using Consolidated Edison transmission and voltage reduction. Under adverse circumstances, it is possible because of the limited transmission capability that load shedding may be necessary.

I. GENERATING CAPACITY

A. Installed Capacity

TABLE I shows that, based on this summer's projected peak loads, the NYPP, Consolidated Edison, and LILCO will have installed reserve requirements of 27,352 MW, 8,998 MW, and 3,894 MW, respectively. While Consolidated Edison and NYPP will meet this requirement, LILCO, for the first time in many years, will not. The 127 MW installed reserve shortage will have to be purchased from the NYPP. As we will discuss later, average levels of generator outages at LILCO are projected to exhaust its reserve, creating a high probability that LILCO will not be able to meet its peak load and operating reserve without relief measures.

B. Scheduled Outage

Indian Point 3 (965 MW capacity), owned by NYPA, is scheduled to be out of service this summer for refueling and maintenance. No other major generating unit has been scheduled out of service this summer in the downstate area. There are units scheduled for overhaul in the upstate area and the New York Power Pool is closely examining the possible rescheduling of certain work.

Several sizeable units are or will be undergoing spring maintenance with planned early June return-to-service dates. Units in this category include Roseton 2 (600 MW), Astoria 3 (353 MW), Bowline 2 (600 MW), and Port Jefferson 2 (370 MW) for a total of 1,923 MW.

Some of these units could experience delayed return-to-service dates thereby reducing the operating reserve margin further during the beginning of the summer period. Last year the NYPP (and many of its member systems individually) experienced its record summer peak load of 21,971 MW on June 11, 1984. The early peak electric demand occurred during the scheduled outage of a large amount of capacity. The NYPP had to purchase energy from Canada to meet its operating needs while Pennsylvania-New Jersey-Maryland (PJM) had to go into a voltage reduction. If high loads occur, therefore, in the late spring, scheduled outages and extended spring outages can cause operating reserve shortages.

C. Total Unavailable Capacity

Total unavailable capacity is that amount of generation unavailable to meet load. This includes planned or scheduled outages, forced outages, deratings, and capacity out for economic reasons (reserve shutdown). TABLE II, included at the end of this report, presents the average amount of unavailable capacity for the summers of 1982, 1983, and 1984, as well as a forecast for the summer of 1985. The forecast is based on the unplanned average outage level of the three prior summers plus the specific planned outages for this summer. Staff projects that LILCO will have 593 MW of generation out of service during the summer; Consolidated Edison, 1,847 MW (does not include Indian Point No. 3 or Polletti of PASNY); and NYPP, 7,839 MW.

II. TRANSMISSION CAPACITY

A. Consolidated Edison Company of New York

Consolidated Edison's normal transmission import capability for summer 1985 is expected to be 4,003 MW (TABLE II). Normal transmission limits are set so that the loss of one facility will not overload any of the others. Under storm watch operating conditions, and the greater likelihood of transmission outages, transmission limits are set so that the loss of two facilities will not overload any of those remaining in service.

For summer 1985 the storm watch transmission import capability will be 2,663 MW. The import limits for both normal operation and storm watch conditions are some 600 MW lower than last summer. Changes in generation and transmission circulation patterns for this summer have caused the reduced import level.¹

Subtracting total committed capacity of 2,653 MW² from the normal and storm watch transfer limits results in emergency transfer capability of 1,350 MW and 10 MW, respectively. These amounts can be used for economy purchases from upstate to reduce expensive Consolidated

¹ Includes increased imports from Hydro Quebec over the 765 kV tie line, the operation of Somerset (not in service last summer) and altered power flows in New Jersey. The maximum flow on the 765 kV is increasing from 1,300 MW to 1,800 MW due to improvements on the Canadian side.

² Committed to firm purchases and energy from Consolidated Edison's generation located north of its service territory.

Edison oil-fired generation. It should be pointed out that utilization of transmission import capability to import energy for any reason is subject to the availability of external generation.

B. Long Island Lighting Company

LILCO's normal transmission import capability is expected to be 260 MW. This is LILCO's share of the normal capacity of its major tie to Consolidated Edison. LILCO has a 138 kV tie line with Connecticut from Northport with a normal limit of 140 MW. However, the New England pool has indicated that it expects severe operating problems in peak periods, and it is unlikely that it will be able to deliver any power to LILCO during peak load periods.

The normal rating of the tie lines to Consolidated Edison is 560 MW. However, because Consolidated Edison co-owns the major tie line with LILCO, by agreement, Consolidated Edison utilizes 300 MW of that capacity to wheel power to Brooklyn and Queens. During emergencies, if Consolidated Edison's generation is available at Astoria, Consolidated Edison could drop the wheeling of electricity to its territory and therefore deliver an extra 300 MW to LILCO. Under emergency conditions it is also likely that an additional 13 MW could be imported to LILCO over other smaller ties with Consolidated Edison. Therefore TABLE IV shows an emergency transmission import capability of an additional 313 MW to LILCO. This scenario assumes that at least some Astoria units are operating. There is likely to be an economic penalty to Consolidated Edison in running Astoria units above their economic level.

III. LOAD AND OPERATING RESERVE FORECAST

A. Consolidated Edison Company of New York

TABLE V summarizes a staff estimate of 1985 summer electric load, generating capacity, and operating reserve for Consolidated Edison. Total installed capacity plus firm purchases and NYPA generation will equal 12,141 MW. This will meet the forecast peak load of 8,775 MW with a 3,366 MW gross generating reserve margin. Projected unavailable capacity of 2,965 (which assumes Indian Point 3 out of service for maintenance) at the time of the peak results in a net generating reserve margin (operating reserve) of 401 MW. This level is not adequate to meet Consolidated Edison's operating reserve requirement of 913 MW.

To meet its reserve requirement at the time of its peak load Consolidated Edison will have to purchase reserve and depend on its transmission import capacity for its delivery in the event of an unexpected loss of generation. TABLE V shows that Consolidated Edison's transmission import capability of 1,350 MW (from TABLE III) will handle the operating reserve deficiency with a 638 MW surplus.

B. Long Island Lighting Company

TABLE IV summarizes a staff estimate of the 1985 summer electric load, capacity, and reserves for the LILCO system. LILCO has experienced operating reserve deficiencies during periods of high load each of the last two summers. We expect conditions in 1985 to be significantly worse. Load growth in the LILCO territory has been higher than anticipated. For example, Draft STATE ENERGY MASTER

*This is less than the
peak experienced in 1984
i.e. - 3096 + 120 = 3216.*

PLAN III projected a 1985 peak at 3121 MW. The current projection of the company (reviewed for reasonableness by our economic research staff) is 3300 or almost 180 MW higher. In addition, LILCO in the past has depended on a transmission line tie to New England for about 140 MW. New England's capacity problems make it extremely unlikely that any capacity will be available over this tie. Rather, we expect that the NYPP will be called upon during the summer to help New England.

Our projection shows that LILCO's generation will not meet its operating reserve requirements at the time of its peak load. In fact, assuming average levels of unavailable capacity -- 583 MW -- LILCO may not even be able to meet its forecast load, i.e., LILCO will have to import energy over its tie lines. The normal transmission import capability of 260 MW should be sufficient to import enough capacity for LILCO to meet its peak load, but the company will have virtually no operating reserve for emergencies. Under these circumstances, relief measures will likely become necessary.

We have provided on TABLE IV a listing of possible operating relief measures that can be taken to meet capacity shortages. Combining these measures, LILCO should be able to avoid actual load shedding during high load periods because the total relief provided, 485 MW, is greater than the projected operating reserve deficit. This assumes however, that voltage reduction is implemented and, more

importantly, that generation is available at Astoria on the Con Ed system to allow the emergency import of 313 MW from Consolidated Edison on the Con Ed tie.

During high load periods LILCO may be buying virtually its entire reserve from the NYPP. Under our projections, LILCO would be required to implement relief measures if unavailable capacity is "normal". In the event that LILCO loses a major generating unit (in addition to the units covered by the average or normal unavailable capacity figures), LILCO's tie lines would become overloaded. To prevent these lines from tripping out of service and compounding the problem, load shedding would be required immediately. Our forecast, which indicates load and capacity almost in balance with no reserve, suggests that load shedding could occur, although it is not likely.

From an operating perspective we conclude that LILCO's capacity shortage problem will cause an increased potential for the need to use operating relief measures including voltage reduction.

C. New York Power Pool

TABLE VI summarizes staff's estimate of the 1985 summer electric load, capacity, and reserves for the entire NYPP system. The NYPP expects to have 30,948 MW of installed capacity and, in addition, plans to purchase 928 MW of firm capacity. The total of 31,876 MW is 9,456 MW greater than the anticipated summer peak load of 22,420. This gross generating reserve margin of 9,456 MW will be adequate to sustain staff forecasted outage levels of 7,839 MW. However, the resulting net operating reserve of 1,617 MW

will not be sufficient to meet the NYPP's own operating reserve standard of 2,700 MW. An important change this year that impacts the shortfall is the increase of import capacity on the 765 kV tie to Hydro Quebec from 1,300 to 1,800 MW. Under the pool's procedures, sufficient capacity should be available equal to 1-1/2 times the largest likely ~~system contingency~~. The operating reserve requirement is 750 MW higher than last year to protect against the potential loss of the Canadian tie.

IV. WORST CASE ANALYSIS

Staff has utilized average historical operating data to project operating conditions for summer 1985. Our outage forecast is based on average historical data and the NYPP and the member systems' projected load is based on average weather conditions assuming some additional amount for growth. If conditions at the time of the peak load are not close to average, then our projection will not be accurate.

Taking into consideration the fact that record peak loads have occurred outside the principal hot months of the summer each of the last two years (September 6, 1983, and June 11, 1984), it is possible that a major hot spell during the mid-summer months would result in loads significantly higher than projected. If a significantly higher load were to occur at the same time that generator outages were above average, major operating problems could result.

Except for LILCO, staff's projection excludes the use of operating relief measures, such as voltage reduction and load shedding. Under worst case conditions (significantly higher load than projected and higher than average generator outages) operating relief measures, including voltage reduction become likely throughout the pool and load shedding may be required in southeast New York.

TABLE I
INSTALLED RESERVE REQUIREMENTS ^{1/}

	<u>LILCO</u>	<u>Consolidated Edison</u>	<u>NYPP</u>
Installed Capacity	3,714	9,451	30,948
Firm Purchase	<u>53</u>	<u>900</u>	<u>928</u>
TOTAL CAPACITY	3,767	10,351	31,876
Forecast Peak Load	<u>3,300</u>	<u>7,625</u>	<u>22,420</u>
Required Capacity ^{2/}	3,894	8,998	27,352
Surplus or (Deficiency)	(127)	1,353	4,524

^{1/} From data supplied by LILCO, Consolidated Edison, and NYPP.

^{2/} NYPP requires each member system to maintain 18 percent installed generating reserves above its system peak load. Required installed capacity is 1.18 times the peak load. This is projected to result in NYPP installed capacity of 1.22 times its peak load.

TABLE 11
TOTAL UNAVAILABLE CAPACITY AND PLANNED OUTAGES^{1/}
- Mid-June thru Mid-September -

Year	Total Unavailable Capacity (MW)	Planned Outages (MW)	Unplanned Outages (1-2) (MW)	Total Capacity (MW)	% of Capacity Unavailable (1 divide 4)	% of Capacity Planned (2 divide 4)	% of Capacity Unplanned (3 divide 4)
LONG ISLAND LIGHTING COMPANY							
1982	668	183	503	3,721	17.6	4.1	13.5
1983	836	236	387	3,721	17.1	6.4	10.7
1984	547	262	285	3,721	14.7	7.0	7.7
1985 ^{2/}	533	212	371	3,714	15.7	6.7	10.0
CONSOLIDATED EDISON COMPANY OF NEW YORK							
1982	2,222	98	2,123	9,368	23.7	1.1	22.7
1983	1,118	66	1,053	9,330	12.0	0.7	11.3
1984	2,051	833	2,018	9,422	30.3	8.8	21.6
1985 ^{2/}	1,047	121	1,726	9,451	19.5	1.3	18.3
NEW YORK POWER POOL							
1982	8,077	1,080	6,997	30,107	26.8	3.6	23.2
1983	7,232	1,631	5,591	30,238	23.9	5.5	18.5
1984	6,972	1,754	5,318	30,308	23.0	5.8	17.2
1985 ^{2/}	7,838	2,308	5,534	30,048	28.3	7.1	19.2

^{1/}From data supplied to the department by LILCO, Consolidated Edison, and NYP& except as noted.

^{2/}Staff projection using average levels of unplanned outages over the last three summers and adding planned outages for this summer.

TABLE III
TRANSFER LIMITS
UPSTATE NEW YORK TO CONSOLIDATED EDISON^{1/ 2/}

	Normal <u>Operating Conditions (MW)</u>	Storm Watch <u>Operating Conditions (MW)</u> ^{3/}
Absolute Limit	4,003	2,663
Less Committed Capacity:		
Consolidated Edison		-
Northern Capacity		
Bowline	800	800
Roseton	480	480
Fitzpatrick	160	160
Hydro Quebec	740	740
LILCO Obligation	300	300
NYSEG Obligation	146	146
Long Island Municipals	<u>27</u>	<u>27</u>
TOTAL COMMITTED	2,653	2,653
Surplus Available for Emergency Transfer	1,350	10

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- 1/ From data supplied by Consolidated Edison. Assumes Indian Point 3 is out of service.
- 2/ Includes power through the Public Service Electric and Gas System (New Jersey) and into New York City.
- 3/ Under storm watch conditions transfer limits are established so that the simultaneous loss of two transmission facilities does not cause the remaining lines to exceed emergency limits. Normal limits are established based on the loss of a single transmission line.
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TABLE IV

LILCO: OPERATING RESERVE SUMMARY

<u>CAPACITY</u>	<u>1985 (MW)</u>
LILCO Installed	3,714
FitzPatrick	<u>53</u>
 TOTAL CAPACITY	 3,767
 <u>LOAD</u>	
Peak Load	3,300
 TOTAL LOAD	
Capacity minus load (Gross Reserve)	467
Less Forecast Unavailable ^{1/}	<u>583</u>
Operating Reserve	(116)
Operating Reserve Requirement ^{2/}	391
Surplus or (Deficiency)	(507)
Transmission Import Capability	260
Less dedicated Imports	53
Less NYPA customers	64
Surplus or (Deficiency)	(364)
Relief Measures: Municipal Generation	52
Emergency Transmission Import	313
Voltage Reduction	<u>120</u>
	485

^{1/} Staff projection using average levels of unplanned outages over the last summers and adding planned outages for this summer.

^{2/} Reserve requirement represents LILCO's share of NYP operating reserve requirement based on 1,800 MW single contingency in 1985 and a 2,400 MW single contingency thereafter. The largest single contingency is the tie to Hydro Quebec, 765 MW, which will be able to carry 1,800 MW in 1985 and 2,400 MW beginning in 1986.

^{3/} Municipals: 27; Brookhaven: 27; Cawman: 10.

TABLE V

Consolidated Edison: Operating Reserve
Summary Summer 1985^{1/}

	<u>Forecast (MW)</u>
CAPACITY:	
Consolidated Edison	9,451
Polletti	925
Indian Point 3	965
Firm Purchases:	
Hydro Quebec	740
Fitzpatrick	160
TOTAL CAPACITY	12,141
PEAK LOAD:	
Consolidated Edison customers	7,625
NYPA customers	1,150
TOTAL LOAD	8,775
Capacity minus load (Gross Reserve)	3,366
Less Forecast Unavailable Capacity	2,965 ^{2/}
Operating Reserve	401
Operating Reserve Requirement	913 ^{3/}
Surplus (Deficiency)	(512)
Transmission Import Capability	1,350
Surplus	838

- 1/ From data supplied by Consolidated Edison except as noted.
- 2/ Staff projection using average levels of unplanned outages over the last three summers for Consolidated Edison service territory generation (includes NYPA generation) and adding planned outages for this summer.
- 3/ The NYPP sets the statewide operating reserve requirement by multiplying the single largest contingency by 1.5. For 1985 summer the largest contingency will be the 765 kV tie to Hydro Quebec loaded at maximum of 1,800 MW. (1,800 x 1.5 = 2,700 MW.) Consolidated Edison's portion of this is 913 MW.

TABLE VI

NYPP: Operating Reserve Summary Summer 1985^{1/}

	<u>Forecast (MW)</u>
CAPACITY:	
Installed	30,948
Firm Purchases	928
	<hr/>
TOTAL CAPACITY:	31,876
LOAD:	
NYPP	22,420
	<hr/>
Capacity minus Load (Gross Reserve)	9,456
Less Forecast Unavailable Capacity	7,839 ^{2/}
Operating Reserve	1,617
Operating Reserve Requirement	2,700
Surplus or (Deficiency)	(1,083)

1/ From data supplied by the NYPP except as noted.

2/ From TABLE II.
