The Environmental Benefits of Re-powering KeySpan Electric Generating Plants in Meeting Future Demand

January, 2005

LONG ISLAND UNIVERSITY

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OVERVIEW

In August, 2002, the Center for Management Analysis (CMA) of Long Island University report, "The Feasibility of Re-powering KeySpan's Long Island Electric Generating Plants to meet future Energy Needs," concluded that the re-powering of KeySpan's existing steam electric units represented one of the best options for satisfying Long Island's future energy needs. The report observed that re-powering with combined cycle technology by using exhaust gas from combustion turbines to make steam to power the existing turbine generators could nearly double the efficiency of these units and potentially triple electric capacity. Other factors supporting the report's conclusion included the cost savings of re-powering over Greenfield projects, the relatively short construction schedule it would require and the possibility for an improved licensing process and better public acceptance.

Apart from these attractive features, however, the most compelling argument in favor of re-powering suggested by the August, 2002 report was the significant reduction in environmental impact that would result from converting existing plants to combined cycle operation. Clearly, whether re-powered or not, the existing KeySpan steam electric generating facilities will continue to be a part of Long Island's electric supply mix for the foreseeable future, whether KeySpan continues to own them or they are purchased by

LIPA or some other entity. For this reason, this report attempts to further explore in significant detail the full extent of the environmental benefits of re-powering the KeySpan plants by first selecting the most likely candidates to pursue for conversion and then examining the reduced air emissions from those units of NOx, SO_2, CO_2 and particulates compared to actual emissions from the existing plants in 2003.

KeySpan's existing steam electric plants can be grouped in to three categories by size: 100 MW, 175 MW and 375 MW. The facilities within these categories are essentially identical in terms of design philosophy. The 100 MW units, located in Far Rockaway and Glenwood Landing, date back to the late 1940's and due to their relatively small size, age and other site related factors would probably not be the most likely candidates for re-powering. On the other hand, the Northport site with four 375 MW units, the Port Jefferson site with two 175 MW units, and the Barrett site with two 175 MW units possess a number of characteristics that would make them potentially suitable for re-powering. Among the most important of these characteristics is at least some available space and potential access to natural gas supplies.

The standard building block combustion turbine identified for the conceptual re-powering design used in this report is the commonly used General Electric 7F unit with a nominal output of 175 MW. On this basis, it is assumed that two 7F units would be used to re-power each 175MW steam plant at Barrett and Port Jefferson resulting in a combined out put of 525 MW for each of these units. In the case of Northport four combustion turbine units would be coupled to each 375 MW steam plant to produce a 1,075 combined cycle unit. The operating efficiency of the combined cycle units would approach 60% as compared to 30-35% for the existing units. Using this conceptual design, the re-powering of all of the units would result in a maximum total increase in electric capacity of 4,200 MW for the three sites.

For the purpose of demonstrating air emission reductions from re-powering, it is necessary to have a baseline emission inventory for the existing units at Northport, Port Jefferson, and Barrett. This was obtained from three sources for 2003, the most recent complete year of data. The U.S. Environmental Protection Agency Clean Air Markets Data provides information on total emissions for NOx, SO2 and CO2 . The comparable information on particulates is contained in available KeySpan data. Finally, values for the total generation at each site for 2003, necessary to determine emission rates, is reported by the Energy Information Administration. This data shows that the annual emissions from each of the stations varies from millions of tons for the greenhouse gas CO2 to thousands of tons for NOx, SO2 and particulates. It also shows that the total generation for 2003 at Northport was over 7,500,000 mwhrs, at Port Jefferson over 1,600,000 mwhrs, and at Barrett over 1,300,000 mwhrs.

A comparison of the emission rates for existing plants to the emission rates for re-powered units provides the most immediate indication of the potential air quality benefits from re-powering: the lower the emission rate, the less pollutants released for a given amount of generation. In making this comparison, it is assumed that the combined cycle emission rates reported in the Environmental Assessment for the permitted Pinelawn project on Long Island would be representative of emission rates for NOx, SO2, CO2 and particulates for the re-powered KeySpan units. Such a comparison shows that the emission rates for the re-powered units are dramatically less than for the existing facilities. The NOx and SO2 emission rate reductions for each station are over 90% and the reduction in the CO2 rates is over 80%. For Northport and Port Jefferson, the particulate emission rates are reduced over 80% and for Barrett 47%, due to the fact that Barrett burned mostly natural gas during 2003.

As another illustration of the environmental benefits of re-powering, it is instructive to examine what the actual total emissions for the existing plants would have been in 2003 if they had operated with the same emission rates as re-powered facilities. As would be expected the emission reductions from re-powering are again quite dramatic. The reduction in NOx emissions for 2003 would have been over 6,000 tons or 90% for Northport, 1000 tons or 80% for Port Jefferson and 900 tons or 92% for Barrett. Similarly for SO2, reductions of over 31,000 tons (95%) at Northport, 6,000 tons (98%) at Port Jefferson and 500 tons (88%) at Barrett. The reductions for CO2 are also seen to be significant at over 5,000,000 tons (86%) at Northport, 900,000 tons (84%) at Port Jefferson and 800,000 tons (84%) at Barrett. For particulates the reductions shown are over 1,000 tons (85%) for Northport, 300 tons (83%) for Port Jefferson and 50 tons (51%) for Barrett.

It is apparent at this point that the air emission reduction benefits of re-powering are so significant that margin exists to considerably increase the electric capacity of the re-powered units to meet future demand and still improve air quality over what now exists. To demonstrate this, a comparison was made between the actual emissions and the total emissions from each station re-powered to the maximum theoretical capacity previously described and operated at an 85% capacity factor. The remarkable results of this comparison underscore not only the benefits of re-powering but also its potential for meeting future increases in electric demand. For example in the case of Northport, with an increase in capacity of 2,800 MW (187%), it is possible to reduce 2003 emissions for NOx over 5,000 tons (78%), for SO2 over 31,000 tons (95%), for CO2 over 2,000,000 tons (39%) and for particulates over 700 tons (35%). Similarly, dramatic reductions occur at Barrett and Port Jefferson where the capacity is increased 200%. The one small exception is with the particulate emissions of the re-powered Barrett station that increase by about 200 tons. Again this is a result of the station mostly burning natural gas, a fuel very low in particulates, during 2003. A reduction in the capacity increase for the re-powering of this station would eliminate this exception.

The August, 2002 CMA report concluded that the re-powering of KeySpan's existing steam electric units represented one of the best options for satisfying Long Island's future energy needs. Taking this one step further, this report more fully explored the environmental benefits of re-powering. It demonstrated that re-powering the Northport, Port Jefferson and Barrett stations could produce significant improvements in air quality through emission reductions compared to actual 2003 emissions for these stations. In almost all of the comparisons, significant reductions were shown for total emissions up to millions of tons for the greenhouse gas CO_2 and reductions well exceeding 80% in many cases for NO_x, SO_2, and particulates. In fact this general result held when the capacity of the existing stations was almost tripled through re-powering

In considering these results, it should not be overlooked that the environmental benefits of re-powering are in part dependent on the availability of clean burning natural gas. For this reason, it is important that initiatives to provide additional natural gas supplies to Long Island be aggressively pursued. Examples of such initiatives include the Islander East Pipeline, and possibly the Broadwater LNG Project, if safety concerns can be adequately addressed.

It is remarkable that through re-powering it is conceivable to economically provide additional electric capacity of 4,200 MW, requiring no new sites for generation, and at the same time significantly improve Long Island's air quality. No other alternate source of electricity for this region could achieve this. As such it should be imperative that re-powering assume the highest priority in the development of any electric supply strategy for Long Island. Up to this point in time this has not been the case, and the consideration of re-powering has not been pursued with the proper sense of urgency.

INTRODUCTION

In August, 2002, the Center for Management Analysis (CMA) of Long Island University report, "The Feasibility of Re-Powering KeySpan's Long Island Electric Generating Plants to Meet Future Energy Needs," concluded that the re-powering of KeySpan's existing steam electric units represented one of the best options for satisfying Long Island's future energy needs. In arriving at this conclusion, the report observed that re-powering with proven combined cycle technology by using exhaust gas from combustion turbines to make steam to power conventional turbine generators at existing plants could nearly double the efficiency of KeySpan's steam electric units, some of which date back to the 1950's. The report also noted that due to the combined output of existing generators and the generation from newly added combustion turbine components, the electric capacity of the older units could nearly be tripled.

Other factors supporting the August, 2002 report's conclusion included the $200-400 per kilowatt cost savings for re-powering over a Greenfield combined cycle plant due to the many components and systems that are already in place and can be utilized at existing sites such as land, electric and gas transmission systems and, most importantly, the steam turbine generator. This contributed to the report's estimate of between $800-$1,000 per kilowatt for the total cost of re-powering. Also, the report found that the construction of re-powered units could be carried out over one to two years and that the loss of capacity for peak periods during this time could be avoided with proper sequencing and parallel work. Another positive feature noted in the report was that, from a licensing and acceptance standpoint, re-powering projects might even be supported by host communities because of the potential for increased property taxes and improved facility operations.

Apart from these attractive features, however, the most compelling argument in favor of re-powering suggested by the August, 2002 report was the significant reduction in environmental impact that would result from converting existing plants to combined cycle operation. Clearly, whether re-powered or not, the existing KeySpan steam electric generating facilities will continue to be a part of Long Island's electric supply mix for the foreseeable future, whether KeySpan continues to own these units or they are purchased by LIPA or other entities. For this reason, a more detailed examination is called for of the true extent of the environmental benefits of re-powering Long Island's existing steam electric plants. Building on the August, 2002 study, this report endeavors to do that by first selecting the most likely candidate sites for re-powering and then examining the emissions from those sites of NOx, SO2, CO2 and particulates compared to actual emissions from existing plants in 2003.

RE-POWERING CANDIDATE SELECTION FOR ENVIRONMENTAL REVIEW

Keyspan's existing steam electric plants can be grouped into three categories by size: 100 MW, 175 MW and 375 MW. The facilities within these categories are essentially identical in terms of design philosophy. The units each rated at 100MW are located in Far Rockaway and Glenwood Landing. Due to their relatively small size, age dating back to the late 1940's and other site related considerations ,such as available space, electric transmission capability, and available gas supply, they would probably not be considered as likely candidates for re-powering. On this basis, they have been eliminated from further review in this report.

The 175 MW size facilities are located at the E.F. Barrett site in Island Park and at the Port Jefferson site. The Barrett site is relatively large and contains two units which are both potential conversion candidates. A high pressure natural gas main at the Barrett site is tied to the underwater pipeline that connects to New Jersey and the interstate pipelines from the gulf area. With moderate augmentation this line may be capable of supplying the incremental amount of gas needed by the larger combined cycle facility. The electric transmission intertie to the LIPA system, however, would have to be up rated to handle the added capacity associated with re-powering.

The Port Jefferson Site also contains two 175 MW units which are virtually identical to the Barrett units. While the Port Jefferson site is not as large as Barrett and the conversion scenario would be more complicated, there should be sufficient space to accommodate the re-powering of both units. Unlike the Barrett scenario, gas supply at Port Jefferson is dependent on additional gas supplies from potentially the Islander East Pipeline across Long Island Sound to the Shoreham area or possibly the Broadwater LNG Project. Also, as is the case with Barrett, the electric transmission intertie to the LIPA system would have to be up rated to handle the added capacity associated with re-powering.

The Northport site contains four virtually identical 375 MW units which are the newest and largest steam plants owned by KeySpan on Long Island. The site is fairly large and should be able to accommodate the conversions of all four units. Increased gas supply would be needed from the Iroquois system to handle the requirements of a four unit re-powering. An upgrade to the electric transmission exits also would be required.

Because of the size of the units at Northport, Port Jefferson and Barrett, as well as the characteristics of the sites for these stations, they have been chosen as likely re-powering candidates for the environmental review of this report. It should be noted that LIPA has also examined these sites as part of their consideration of re-powering.

CONCEPTUAL DESIGNS

For the purpose of this study, the two 175 MW Port Jefferson units, the two 175 MW Barrett units and the four 375 MW Northport units are considered for re-powering. The standard building block combustion turbine identified for the conceptual re-powering design is the General Electric 7F unit with a nominal output of 175 MW in simple cycle application. There are hundreds of these that have been put in operation over more than a 10 year period.

Two 7F combustion turbines would be used to re-power each 175 MW steam plant at Port Jefferson and Barrett. As a result, the output from each of the units would increase from 175 MW to 525 MW. For the two unit conversion at Port Jefferson and Barrett, the total capacity of the re-powered combined cycle units at each site would be 1050 MW, for an increase in output for each station of 700 MW.

In the case of Northport four combustion turbines would be coupled with each of the 375 MW steam turbines to produce a 1,075 MW combined cycle unit. All four Northport re-powered units would have a total output of 4,300 MW which is a 2,800 MW increase in the current 1,500 MW output of the station's four steam electric plants.

When combining the increased capacity at the Port Jefferson, Barrett, and Northport re-powerings, Long Island's base load electric generation would increase by a very significant 4,200 MW. This represents the maximum reasonable re-powering scenario for these KeySpan steam facilities. To put this added capacity in perspective, over the last several years about 500 MW of simple cycle generation has been added to the approximately 5,000 MW of older KeySpan units.

The re-powered combined cycle units will have heat rates, the measure of fuel burned to produce a kilowatt of electric power, in the range of 7,000 btu/kwhr with overall cycle efficiency of close to 60%. This is in contrast to the existing steam units with heat rates in the 10,000 – 11,000 btu/kwhr and efficiencies of between 30-35%.

AIR EMISSIONS FROM EXISTING PLANTS

U.S. Environmental Protection Agency Clean Air Markets data provides a quantification of the actual air emissions from the KeySpan plants considered for re-powering for the year 2003 for NOx, SO2 and CO2. In addition available KeySpan data provides information on particulate emissions for the same year. The Energy Information Administration in EIA-906 also provides data on the actual total generation at each of the re-powering candidate sites. All of this information is summarized in Table 1, 2003 Air Emission for Northport, Port Jefferson, and Barrett Steam Electric Generating Stations. In the table emissions are reported in tons and electricity generated in mwhrs. With the 2003 data being the most recent information available for a complete year, it was assumed to be a reasonable measure of what can be expected annually for comparison to what could be expected from re-powered units.

The table shows that the annual emissions from each of the stations varies from millions of tons for the greenhouse gas CO2 to thousands of tons for NOx, SO2 and particulates. Because of its size the largest amount of generation occurs at Northport, 7,507,089 mwhrs. Both Port Jefferson and Barrett, at comparable size, generate similar amounts of electricity, 1,629,111 mwhrs and 1,318,472 respectively.

Table 1

2003 Air Emissions for Northport, Port Jefferson, Barrett
Steam Electric Generating Stations

	Northport	Port Jefferson	Barrett
NOx (tons)[1]	7,520	1,262	994
SO2 (tons)[1]	32,963	6,631	643
CO2 (tons)[1]	5,931,734	1,136,207	961,660
Particulates (tons)[2]	2,018	389	110
Electricity Generated (mwhrs)[3]	7,507,089	1,629,111	1,318,472

[1] U.S Environmental Protection Agency Clean Air Markets-Data and Maps for 2003.

[2] KeySpan data.

[3] U.S. Department of Energy, The Energy Information Administration (EIA), 2003 Jan-Dec. EIA – 906 Monthly Time Series File, Source – EIA-906.

AIR EMISSION RATES FROM RE-POWERED PLANTS

To make comparisons between the actual emissions from existing plants and repowered units, information on the emission rates from combined cycle plants is necessary. This data was obtained for this report from the Environmental Assessment prepared in June 2004 for Pinelawn Power by TRC Environmental Corporation and Nixon Peabody and is used as representative of the emission rates for re-powered KeySpan units. Table 2 contains a listing of these emission rates for NOx, SO2, CO2 and particulates expressed in lbs/mwhrs of electricity generated. These emission rates are based on Best Available Control Technology that requires the latest selective catalytic recombiners for NOx control and the use of natural gas fuel and low sulfur distillate fuel oil. In addition, since the combined cycle and re-powered units would have the capability to burn either natural gas or distillate fuel oil, each having different emission rates, the values contained in Table 2 are proportioned based on the estimated mix of natural gas and distillate oil that would be consumed. This is assumed to be 8,040 hrs of natural gas firing and 720 hrs of distillate oil firing.

Table 2

Air Emission Rates for New Combined Cycle Plants[1]

NOx Emission Rate (lbs/mwhr)	0.087
SO2 Emission Rate (lbs/mwhr)	0.048
CO2 Particulate Emission Rate (lbs/mwhr)	228
Particulate Emission Rate (lbs/mwhr)	0.082

[1] Taken from Environmental Assessment, Pinelawn Power LLC, Babylon, New York, June 17, 2004. Prepared by TRC Environmental Corporation and Nixon Peabody, LLP using proportional emission rates assuming 8040 hrs of natural gas firing and 720 hrs of distillate oil firing per year.

AIR EMISSION RATE COMPARISIONS

The air emission rates for an electric generating facility are a measure of its potential impact on air quality: the lower the emission rate, the less pollutants released to the atmosphere for a given amount of electric generation. Table 3 presents a comparison of the 2003 emission rates for the Northport, Port Jefferson and Barrett stations to that for re-powered combined cycle plants at these sites. The emission rates for the existing plants were determined by dividing the total emissions by the electricity generated in 2003 listed in Table 1.

As can be seen in Table 3, the emission rates for the re-powered units are dramatically less than for the existing facilities. The NOx emission rate reduction for each station is over 90%. The same can be said for the reduction in emission rates for S02. In the case of CO2, the emission rates for the re-powered units are over 80% less then the rates for the existing units at each station. For Northport and Port Jefferson, the particulate emission rates are reduced over 80% in the re-powered unit, and for Barrett 47%. In the case of the latter this lower reduction is primarily due to the fact that Barrett burned mostly natural gas during 2003.

Table 3

Comparison 2003 Air Emission Rates[1] to Re-powered Combined Cycle Air Emission Rates[2]

	Northport Station	Port Jefferson Station	Barrett Station
NOx (lbsmwhr)			
Existing	2	1.6	1.5
Re-powered	0.087	0.087	0.087
Reduction	1.913 (96%)	1.513 (95%)	1.413 (94%)
SO2 (lbs/mwhr)			
Existing	8.78	8.14	0.93
Re-powered	0.048	0.048	0.048
Reduction	8.732 (99%)	8.092 (99%)	0.882 (95%)
CO2 (lbs/mwhr)			
Existing	1,580	1,395	1,459
Re-powered	228	228	228
Reduction	1,352 (86%)	1,167 (84%)	1,231 (84%)
Particulates (lbs/mwhr)			
Existing	0.514	0.521	0.154
Re-powered	0.082	0.082	0.082
Reduction	0.432 (84%)	0.439 (84%)	0.072 (47%)

[1] Emissions rates for existing plants determined by dividing total emissions by electricity produced as shown in Table 1 for each station and each type of air emission.
[2] Re-powered combined cycle emission rates taken from Table 2.

TOTAL EMISSION COMPARISION

As another illustration of the environmental benefits of re-powering, it is instructive to examine what the actual emissions for the existing plants would have been in 2003, if they had been re-powered with combined cycle technology. Assuming that each station would produce the same electrical output as indicated in Table 1 and that the emission rates for each station would be the same as those listed in Table 2 for new combined cycle plants, Table 4 presents a comparison of the actual total emissions for each station in 2003 with what would have been the case if the units had been re-powered.

As would be expected from the comparison of emission rates in Table 3, the emission reductions from re-powering reported in Table 4 are again quite dramatic. The reduction in NOx total emissions for 2003 would have been over 6000 tons for Northport, 1000 tons for Port Jefferson and 900 tons for Barnett. This represents reductions of 90%, 80% and 92% respectively. Similarly for SO2, reductions of over 31,000 tons (95%) at Northport, 6,000 tons (98%) at Port Jefferson, and 500 tons (88%) at Barrett are seen. The reductions for CO2 are also seen to be significant at over 5,000,000 tons (86%) at Northport, 900,000 tons (84%) at Port Jefferson and 800,000 tons (84%) at Barrett. And for particulates the reductions shown are over 1000 tons (85%) for Northport, 300 tons (83%) for Port Jefferson, and 50 tons (51%) for Barrett.

Table 4

Comparison 2003 Actual Emissions to Total Emissions from Re-powered Combined Cycle Plant Producing Same Electric Output

	2003 Actual (tons)	Re-powered Plant[1] (tons)	Emission Reduction(tons)
Northport Station			
NOx	7,520	734	6,786 (90%)
SO2	32, 963	1,533	31,430 (95%)
CO2	5,931,734	855,808	5,075,926 (86%)
Particulates	2,018	308	1,710 (85%)
Port Jefferson Station			
NOx	1,262	259	1,003 (80%)
SO2	6,631	132	6,499 (98%)
CO2	1,136,207	185,719	950,488 (84%)
Particulates	389	67	322 (83%)
Barrett Station			
NOx	994	83	911 (92%)
SO2	643	79	564 (88%)
CO2	961,660	150,306	811,354 (84%)
Particulates	110	54	56 (51%)

[1] Calculated by multiplying the emission rates in Table 2 by the electricity produced for each station as listed in Table 1.

2003 TOTAL EMISSION COMPARISON TO MAXIMUM RE-POWERING

Evident from the comparison in Table 2 of emission rates and Table 3 of 2003 total emission reductions, the environmental benefits of re-powering are so significant that margin exists to considerably increase the electric capacity of the re-powered units to meet future demands and still improve air quality over what now exists.

To demonstrate this, Table 5 presents a comparison of the actual 2003 total emissions for Northport, Port Jefferson and Barrett (Table 1) to the total emissions from each station re-powered to the maximum theoretical capacity noted previously in this report.
It is assumed in this comparison that the re-powered plants operate at an 85% capacity factor.

An examination of Table 5 reveals some remarkable results, underscoring not only the benefits of re-powering, but also its potential for meeting future increases in electric demand. For example in the case of Northport, with an increase in capacity from re-powering of 2800 MW (187%), it is possible to reduce 2003 emissions for NOx over 5000 tons (78%), for SO2 over 31,000 tons (95%), for CO2 over 2,000,000 tons (39%) and for particulates over 700 tons (35%). For Port Jefferson the capacity increase would be 700 MW (200%), with emission reductions for NOx over 800 tons (68%), for SO2 over 6000 tons (94%), for CO2 over 200,000 tons (22%), and for particulates over 68 tons (18%). And for Barrett the capacity increase would be 700 MW (200%), with an

NOx reduction over 500 tons (60%), an SO2 reduction over 200 tons (40%), a CO2 reduction over 70,000 tons, but an increase in particulates of over 200 tons (191%).

The major reason for the relatively small increase in particulates over a year for Barrett, a departure from the results for the other stations, is that during 2003 Barrett burned mostly natural gas which is very low in particulates. In reality, this would probably not be a factor at Barrett because it is unlikely that the station would be re-powered to its maximum capacity. The same can be said for re-powering at other stations. Actually re-powering could take place unit by unit, or with a design involving a smaller capacity addition, tracking increasing demand and favoring the converting of those units with cost advantages due to physical features such as space availability and practical concerns for transmission and fuel availability.

Table 5

Comparison 2003 Actual Emissions to Total Emissions from Stations
Re-powered to Maximum Capacity[1]

	Existing Station (2003)	Maximum Re-powering	Comparison
Northport			
Capacity (MW)	1,500	4300	2,800 (187% increase)
NOx (tons)	7,519	1,635	5,884 (78 % reduction)
SO2 (tons)	32,963	1,590	31,373 (95% reduction)
CO2 (tons)	5,931,734	3,649,938	2,281,796 (39% reduction)
Particulates	2,018	1,313	705 (35% reduction)
Port Jefferson			
Capacity (MW)	350	1,050	700 (200% increase)
NOx (tons)	1,262	402	860 (68% reduction)
SO2 (tons)	6,631	389	6,242 (94% reduction)
CO2 (tons)	1,136,207	891,252	244,955 (22% reduction)
Particulates (tons)	389	321	68 (18% reduction)
Barrett			
Capacity (MW)	350	1,050	700 (200% increase)
NOx (tons)	994	402	592 (60% reduction)
SO2 (tons)	643	389	254 (40% reduction)
CO2 (tons)	961,660	891,252	70,408 (7% reduction)
Particulates (tons)	110	321	211 (191% increase)

[1] Total emissions for maximum re-powering determined assuming 85% capacity factor.

CONCLUSION

The August, 2002 CMA Report, "The Feasibility of Re-Powering KeySpan's Long Island Electric Generating Plants to Meet Future Energy Needs", concluded that the re-powering of KeySpan's existing steam electric units represented one of the best options for satisfying Long Island's future energy needs. In arriving at this conclusion the report observed that re-powering was attractive for a number of reasons including: its high operating efficiency; the increase in electric capacity it results in; its cost savings over Greenfield projects; the relatively short construction schedule it would require, and the possibility for an improved licensing process and better public acceptance.

Apart from these attractive features, however, the most compelling argument in favor of re-powering suggested by the August, 2002 report is the significant reduction in environmental impact that would result from converting existing plants to combined cycle operations. To more fully explore this desirable outcome, this report has attempted to quantify the environmental benefits of re-powering. It has demonstrated that re-powering the Northport, Port Jefferson and Barrett stations could produce significant improvements in air quality through emission reductions compared to actual 2003 emission for these stations. These reductions for NOx, SO2, CO2 and particulates are shown in terms of emissions rates, total emissions in 2003 with assumed combined cycle emission rates, and total emissions with re-powering to maximum capacity at Northport, Port Jefferson and Barrett. In almost all of these comparisons, significant reductions were shown for total emissions up to millions of tons for the greenhouse gas CO2 and reductions well exceeding 80% in many cases for NOx, SO2 and particulates. In fact this general result held when the capacity of the existing stations was almost tripled through re-powering.

In considering the results, it should not be overlooked that the environmental benefits of re-powering are dependent not only on an improvement in efficiency and the use of high technology pollution control equipment, but also the availability of clean burning natural gas. For this reason, it is important that initiatives to provide additional natural gas supplies to Long Island be pursued aggressively. One such initiative is the Islander East Pipeline that would come into Shoreham from across Long Island Sound. Another possibility is the Broadwater proposal for an LNG terminal in the middle of Long Island Sound. If safety concerns for this project can be adequately addressed, it could result in environmental benefits for the region by providing natural gas supplies for re-powering.

It is remarkable that through re-powering it is conceivable to economically provide additional electric capacity of 4,200 MW, requiring no new sites for generation, and at the same time significantly improve the air quality of Long Island. No other alternate source of electricity for this region could achieve this. As such, it should be imperative that re-powering assume the highest priority in the development of any electric supply strategy for Long Island. Up to this point in time this has not been the case, and the consideration of re-powering has not been pursued with the proper sense of urgency.