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EX 13

Reorder No. 5109N  
JULIUS BLUMBERG, INC.  
NYC 10013  
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**LONG ISLAND POWER AUTHORITY**

**EXHIBIT E-4 ENGINEERING JUSTIFICATION**

**PREPARED PURSUANT TO SECTION 88.4**

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## EXHIBIT E-4 ENGINEERING JUSTIFICATION

### E-4.1 Engineering Justification and Relationship to Existing Facilities

The purpose of this Project is to replace the existing 1385 Cable with a new, more durable and more reliable system. The replacement of the existing 1385 Cable is identified as a "planned" project in the LIPA Energy Plan adopted by the LIPA Board of Trustees on June 23, 2004. On September 24, 2004 the LIPA Board of Trustees passed a resolution authorizing the LIPA's participation in the replacement of the existing 1385 Cable, making the 1385 Cable replacement a "committed" project in the LIPA Energy Plan. The need for the Project is based on short and long-term reliability needs, cost-control needs and environmental needs.

Placed in service in 1969, the existing 1385 Cable normally operates at two cables per phase. Each of the existing 1385 cables is energized, with one of the cables generally operating as a spare. From each terminal out to a water depth of approximately 35 feet, the existing 1385 cables are buried approximately 3-5 feet below the seabed. In addition, the inter-island portion between Sheffield Island and the Norwalk Harbor is buried below the seabed to a depth of approximately 1-13 feet. The remainder of the existing 1385 Cable, which represents approximately 80% of the overall installation, rests at or near the seabed surface.

Figure E-4.1 shows LIPA's electric transmission system including the existing 1385 Cable to be replaced. (See Figure E-4.1) The terminals for the new 1395 Cable will remain at the Northport and Norwalk Harbor substations.

The Northport substation interconnects with KeySpan Generation LLC's Northport Power Station, the largest power plant on Long Island with approximately 1,550 MW of generation produced by four steam units and a small gas turbine.<sup>12</sup> Power from the Northport Station as well as imports from the 1385 Cable are transmitted to LIPA's central load area using the major transmission lines that connect the Northport substation to the Pilgrim and Elwood substations. A phase angle regulator at Northport substation allows the flow on the 1385 Cable to be regulated.

At Norwalk Harbor, the 1385 Cable connects to the ISO New England ("ISO-NE") 115 kV grid using a 138 kV to 115 kV autotransformer. Norwalk Harbor is also the site of approximately 342 MW of generation produced by NRG Energy's Norwalk Harbor's two

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<sup>12</sup> New York Independent System Operator's ("NYISO's") 2004 Load & Capacity Data.

steam units and a small gas turbine.<sup>13</sup> The power from the 1385 Cable and the Norwalk Harbor units is transmitted to southwestern Connecticut using 115 kV transmission lines.

The new 1385 Cable, which consists of three solid dielectric 138 kV cables of three-conductor ("3/C") design, will be installed in the same corridor as cables 5-7 of the existing 1385 Cable. Installing the new 1385 Cable in 3 separate routes as opposed to 7 routes which currently exist and installing in a previously occupied area reduces the environmental impacts on the Long Island Sound while continuing to supply a nominal capacity of 300 MW between Norwalk, CT and Northport, NY. Since the new 1385 Cable is comprised of cables which are of solid dielectric design, there is no potential for fluid leaks to be caused by external damage or cable failure.

#### **E-4.2 Reliability and Economic Benefits**

Since being energized in 1969, the existing 1385 Cable has experienced 36 incidents with 58 damages to cables that have resulted in either limited capacity operation or total electrical failures. The causes for incidents included chafing from rock and corrosion, and bottom dragging of grappling hooks and anchors from both small and large vessels. As a result, frequent and extensive maintenance has been required for the existing 1385 Cable. Since 1990, the costs of the existing 1385 Cable repairs have exceeded \$45 million. It is anticipated that the new 1385 Cable will be installed in such a manner that it will eliminate most of these repair costs and improve the 1385 Cable reliability. The cables will be buried approximately six feet below the seabed for protection.

Each of the three (3) new cables will initially be nominally rated at 150 MW<sup>14</sup>. The cables may operate in one of two configurations. The first configuration would have two of the cables operating in parallel, with the third used as a spare. In this configuration, the Project will operate at the same 300 MW nominally rated transfer capability as the existing 1385 Cable with a nominal 150 MW spare capability to be used in the event of a single cable failure. Since this option replaces equipment in kind, there is no need for a New York Independent System Operator ("NYISO") System Reliability Impact Study ("SRIS"). In the second configuration each of the three (3) new cables will be nominally rated at 150 MW, but will operate in parallel at approximately 100 MW each. As in the first configuration, the

<sup>13</sup> NEPOOL 2004-2013 Forecast Report of Capacity, Energy, Loads, and Transmission, referred to as "the 2004 CELT Report."

<sup>14</sup> 300MW is the nominal rating of the existing 1385 Cable. It has a normal operating rating of 286 MW based on a 95 % power factor. This is otherwise expressed as 300 MVA because 300 MVA at 95% power factor is equal to 286 MW and, at 100% power factor, 300 MVA is equal to 300MW.

total Project will operate at the same 300 MW nominally rated transfer capability as the existing 1385 Cable. In the event of a single cable failure, the remaining two cables can be operated at 150 MW each to carry the full 300 MW capacity until such time as the failed cable can be brought back on line. There is currently no plan to operate the new 1385 Cable at any rating above the nominal 300 MW rating. Prior to operating the new 1385 Cable as three parallel cables under the second configuration described above, or at any rating above the nominal 300 MW rating that the NYISO considers *a material change*, an SRIS will be completed, and other applicable permit/regulatory approvals acquired, prior to implementing such change.

The following sections discuss some of the benefits and need for the Project.

#### **E-4.2.1 Environmental Need of Project**

The environmental need for the Project is based on two environmental consent orders. LIPA and CL&P are parties to Administrative Consent Orders (“ACOs”) with Connecticut Department of Environmental Protection (“CTDEP”) (1996) and New York State Department of Environmental Conservation (“NYSDEC”) (1998). These orders required, among other things, that the environmental impacts from fluid leaks from the existing 1385 Cable be studied and that plans be developed to mitigate such potential environmental impacts. In a June 24, 2004 settlement agreement among LIPA, CL&P, Cross Sound Cable Company LLC and the State of Connecticut, LIPA and CL&P agreed to develop and implement a plan for the replacement of the existing 1385 Cable.

In addition to reliability degradation and economic penalties, the loss of the 1385 Cable will result in decreased access to the environmental benefits of new efficient and low emission generators in New England. The 1385 Cable allows utilities to “share” generation resources through energy purchases. In the past several years, a number of new, low emission generators went on line in New England. Without the 1385 Cable, there will be reduced opportunity to take advantage of these units.

#### **E-4.2.2 Reliability Benefits**

The New York State Reliability Council (“NYSRC”) and the New York ISO (“NYISO”) set a number of standards to assure the reliability of the New York power system. One of the key standards are the statewide and locational installed capacity requirements for Load Serving Entities (“LSEs”). As previously noted, LIPA had a locational installed

capacity requirement of 98 percent of peak demand in 2001. Since then, the NYISO's locational requirement was 93 percent and 95 percent of the expected summer peak demand in 2002 and 2003, respectively. This requirement was further updated by NYISO in February 2004 to 99 percent<sup>15</sup>. This increase can be attributed to improvements in the reliability evaluation methodology, more pronounced load growth in the downstate region, and recent outages experienced on underwater transmission cables connecting Long Island to the rest of the power grid. Outages negatively impacted the NYISO's assessment of the reliability of LIPA's interconnections, resulting in emergency provision of on-Island generation capacity and the increase in LIPA's locational installed capacity requirement.

The reliability need for the Project is directly related to historic outages of the existing 1385 Cable. In the past five year period, the existing 1385 Cable has been partially or fully out of service 33 percent of the time. This is one of the worst reliability records of any New York or New England Cable. The new solid dielectric 1385 Cable will not be subject to dielectric fluid leaks and by virtue of its burial beneath the seabed of the Long Island Sound, will be less susceptible to interruptions caused by physical damage to the cables. Under normal operation and in the absence of external damage, the new 1385 Cable is expected to operate throughout its useful life.

Maintaining the high level of availability from LIPA's existing generating resources is also a concern. Long Island's transmission and capacity constraints are aggravated by the fact that the generating infrastructure in LIPA's electrical system is relatively old. The majority of the generating resource capacity comes from facilities that are more than 30 years old, and a significant portion of the generating capacity is derived from facilities that are more than 40 years old. During the summer of 2002 peak demand period, virtually all of the generating facilities under LIPA contract were operating, and well over 95 percent of the generating capacity was available -- this exceeded LIPA's availability expectations for such units (Kessel, 2004).

Should the existing 1385 Cable fail again, it represents the loss of access of up to 286 MW of support (318 MW during a long term emergency - LTE) from off-Long Island resources. This support can come from resources located in New England as well as New York. Although southwest Connecticut is currently constrained due to transmission limitations, ISO-NE is working to improve the transmission capability to the area.

<sup>15</sup> NYISO Studies, 2002, 2003, 2004

The 1385 Cable connects two reliability-constrained regions, Southwest Connecticut and Long Island. South West Connecticut is one of the most transmission-constrained regions within ISO-NE. Support from the 1385 Cable is essential to maintaining reliability within the region when there are transmission or generation constraints in Southwest Connecticut. The new 1385 Cable will provide valuable support to the Norwalk Harbor area of Connecticut while the Southwest Connecticut transmission system is being upgraded to handle long term needs.

The 1385 Cable helps maintain the reliability of the Long Island system by providing a pathway for emergency power supplies in the event that there is a major transmission or generation outage on Long Island. With respect to New York, the absence of the 1385 Cable will negatively impact the ability to import over the New York ties. Alternating current (“AC”) transmission interconnections such as the 1385 Cable have the advantage of a “dynamic” response to a rapid load change or the loss of a generating unit or transmission line; i.e., the interconnection can almost immediately pick up load to the level of the LTE rating. The absence of the 1385 Cable will reduce the normal import capability level across the NYISO/Long Island interface (i.e. the 345 kV Y-49 and Y-50 interconnections) by approximately 80 MW. This is due to the lack of the ability to pick up additional power for a contingency loss of either one of the 345 kV interties.

The GE Multi-Area Reliability Simulation (“MARS”) has been utilized to assess the system reliability impact on the New York State power system of the loss of the 1385 Cable. MARS enables the user to accurately assess the ability of a power system to adequately satisfy customer load requirements. Long Island and New York City have limited transmission interconnections, which define local installed capacity requirements, in addition to a statewide requirement, which can be met in part by these interconnections. For example, in 2001, LIPA was required to have 98 percent of its projected peak load served by installed generating capacity located on Long Island. In addition, LIPA is required to meet a statewide installed capacity of 118 percent. Even with the addition of a new NYPA 44 MW GT in 2001 the NYISO determined that Long Island was approximately 100 MW short of the required on-Island capacity.<sup>16</sup> Based on these analyses, loss of the 1385 Cable would have resulted in the violation of the Loss of Load Expectation (“LOLE”) criteria by 2002. The NYISO uses a criterion of one load shed in ten years due to lack of installed capability.

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<sup>16</sup> NYISO 2001-2002 Locational Installed Capacity Requirements Study, Revised 02/15/2001

Additional MARS simulations have shown that, statistically, the loss of the 1385 Cable can result in approximately a doubling of the LOLE. Recent analyses indicate that the existing 1385 Cable reduces the Long Island locational requirements by approximately 2.4 percent. The new 1385 Cable will reduce the locational requirement by approximately 4.4 percent. The difference is mainly due to the fact that the new 1385 Cable will be less prone to failures because it will have less splices and will be buried for protection. In addition to reducing the Long Island locational requirement, the new 1385 Cable will also contribute to a reduction of the New York State Installed Reserve Margin ("IRM").

#### **E-4.2.3 Load Growth Impacts on Region Need**

The NYSRC and NYISO reliability criteria described above require that LSEs on Long Island and New York City have sufficient capacity to meet peak summer demand plus a reserve margin. This reserve margin is needed in the event that certain resources become unavailable due to forced outages or that summer peak demand is higher than anticipated. These criteria prescribe that LSEs must maintain a reserve margin calculated based on the LSE load. Thus, the rate of load growth has an impact on the need for the Project. The Project is part of the solution that would help Long Island to continue to meet anticipated demand in the summer of 2007 and beyond.

##### **E-4.2.3.1 Historic Experience**

LIPA's recent experience with peak demand demonstrates that additional resources and improved reliability are essential to Long Island. In 2001, for example, the NYISO's 2001 Load & Capacity Data report forecasted LIPA's 2001 summer peak demand to be 4,519 MW which necessitated some 5,310 MW of capacity to accommodate the reserve margin. In addition, as a result of limited transmission capacity available to import power to Long Island, the NYISO determined that, for the summer of 2001, Long Island was required to have a locational-based installed capacity requirement of 98 percent of summer peak demand.<sup>17</sup> In the summer of 2001, however, only about 4,400 MW of LIPA generating capacity was available on Long Island. To meet the remainder of its needs, LIPA relied on demand side management ("DSM") programs and high voltage transmission lines that are able to import power from off-Island resources. Even with the availability of these

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<sup>17</sup> Locational Installed Capacity Requirement Study, February 15, 2001

additional resources, however, LIPA's demand was very close to the limit of its capacity.

The severe heat wave that struck the Northeast in August 2001 demonstrated how narrow LIPA's margin was. LIPA reported that it had reached a peak of 4,560 MW on August 8, 2001, only 85 MW shy of the available electric supply at the time<sup>18</sup>. The next day, LIPA reached a system peak of 4,579 MW when it had only 4,700 MW of capacity to meet that demand from firm and emergency supply sources, leaving a reserve of only 121 MW. LIPA stated that it was able to meet this demand only with the assistance of a 5 percent voltage reduction by the NYISO and the closing of state, county and town government facilities. LIPA estimated that, without these actions, the peak would have been 100 MW to 150 MW higher.<sup>19</sup>

The reliance on the 1385 Cable is further apparent when Long Island's needs are looked upon in total, i.e., Long Island control area during that same period. On August 8, 2001, while LIPA's peak was 4,560 MW, the Long Island control area of the NYISO reached an all time peak load of 4,906 MW, which significantly exceeded the previous peak of 4,757 MW reached on July 6, 1999. (The system peak on August 9 – which was significantly reduced by voltage reduction, early dismissal of government employees, and public appeals—was only 16 MW lower than the August 8 peak.) At that time, the Long Island system had essentially reached its limit from the standpoint of both system voltage and energy supply. During the period August 7-10, the existing 1385 Cable was loaded as follows during peak hours: 100-120 MW on August 7 and 150-160 MW on August 8-10 except when capacity was recalled by ISO-NE on August 9.

In 2002, to address another potential capacity shortfall, approximately 400 MW of peaking generation was put in service in LIPA's territory. Despite this addition, Long Island again ended up in a very tight power supply situation. During a heat wave beginning on July 29, 2002, LIPA reported that peak demand soared to 5,059 MW with approximately 5,600 MW of capacity available.<sup>20</sup> In 2003, LIPA anticipated another summer during which its capacity resources would be stretched to the limit. LIPA stated that, should it experience an extreme demand of 5,300 MW, its maximum supply of 5,600 MW would leave a reserve margin of only 300 MW, which would be significantly less than the 18 percent margin called for by the

<sup>18</sup> LIPA press release dated August 8, 2001

<sup>19</sup> LIPA press release dated August 9, 2001

NYISO.<sup>21</sup> As a result, another 100 MW of peaking generators and 132 MW of temporary emergency generators were installed for the 2003 summer. Relatively mild summer weather enabled LIPA to avoid the problems encountered in 2001 and 2002; though the blackout of August 14, 2003, served as a disquieting reminder of the importance of adhering to applicable reliability criteria, and the fragility of the Northeast regional electric supply system. Mild weather conditions in 2004 combined with the addition of two generating plants at Freeport, the operation of the new CSC and 176 MW of temporary emergency generators (LIPA has contracted with 96 MW of temporary emergency generation through 2007 to meet its short term supply needs) helped satisfy Long Island needs.

#### **E-4.2.3.2 Future Load Growth**

Current projections for energy needs on Long Island indicate that peak demand will continue to grow. The NYISO concluded in 2002 that, even with the downturn in the economy and the effects of September 11, 2001, an additional 7,100MW of new generating capacity will be needed in New York by 2005 to reduce electricity prices by 20 to 25 percent and to avoid shortages that threaten system reliability.<sup>22</sup> The NYISO, in its most recent Power Alert<sup>23</sup> found that: "New York State needs at least 5,000-plus MW of additional capacity developed in the next five years (2003-2008) to enhance reliability and security, keep prices competitive, and benefit the environment. A majority of these 5,000-plus MW should be built in the downstate and Long Island areas."

LIPA has taken steps to address these shortfalls. Two new 79 MW combined cycle plants are being constructed at Pinelawn and Bethpage for completion in 2005. These capacity additions and 96 MW of temporary emergency generators that will be in service for the summer periods from 2005 to 2007 will enable LIPA to stay ahead of demand growth in the short term. With respect to longer term, LIPA is pursuing a new interconnection to PJM, the Neptune Cable Project, scheduled for 2007; 140 MW of new wind turbines off the south shore of Long Island, the Offshore Wind Project, scheduled for late 2007 (for ICAP purposes the Project will be counted for approximately 35 MW); and a new 326 MW combined cycle power plant in

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<sup>20</sup> LIPA press release dated July 30, 2002

<sup>21</sup> LIPA press release dated June 10, 2003

<sup>22</sup> NYISO Power Alert, 2002

<sup>23</sup> NYISO Power Alert III, 2003

Brookhaven, Caithness Bellport, scheduled for 2008; as well as 75 MW of energy efficiency resources.<sup>24</sup>

The construction of further generation on Long Island by the summer of 2007 to "replace" the existing 1385 Cable would not be consistent with LIPA's strategic plan. Further, the inadequacy of additional conservation/DSM efforts as an alternative to the Project is discussed in Exhibit 3, Section 3.4.

On an annual basis, LIPA's summer peak demand has been increasing at a rate of about 3 percent per year,<sup>25</sup> and LIPA's energy demand has also risen. For example, on a per-household basis, average residential consumption has increased 14 percent over the last five (5) years, despite conservation and energy efficiency programs (Kessel, 2004). LIPA's electricity demand models projected that an extreme heat wave similar to August 2001 could have driven LIPA's 2003 peak-hour demand as high as 5,300 MW, translating into a growth in peak demand of about 5 percent.<sup>26</sup>

Additionally, LIPA experienced new winter peaks in 2004. In January 2004, LIPA set a new one-hour winter peak demand record of 3,606 MW. This represents a 159 MW, or 4.6 percent, increase over the previous winter peak of 3,447 MW that occurred on January 27, 2003.<sup>27</sup>

LIPA's system analysis assumes that the 1385 Cable will continue to operate to meet Long Island's energy needs. Without the 1385 Cable, the prospects of meeting Long Island's energy needs are far more uncertain, as discussed below. LIPA's projections of future energy needs on Long Island indicate that the peak demand, assuming normal weather conditions, will grow on average by approximately 85 MW per year between now and 2013 after reductions for conservation measures are considered (average load growth before conservation reductions is about 105 MW per year). In 2003, LIPA's energy requirements were about 20.5 million megawatt hours (MWh) and are projected to increase approximately 270 thousand MWh per year for this period.<sup>28</sup>

<sup>24</sup> LIPA Press Releases dated May 26, 2004, June 23, 2004 and September 29, 2004

<sup>25</sup> LIPA Press Release dated December 16, 2003

<sup>26</sup> LIPA Press Release dated June 10, 2003

<sup>27</sup> LIPA Press Release dated January 16, 2004

<sup>28</sup> LIPA Energy Plan, 2004

Given this level of growth, the loss of a large generating unit or major transmission interconnection could have a devastating impact on LIPA's electrical system. To maintain system reliability and to guard against these potentially severe consequences, LIPA has developed a stringent set of criteria that takes into consideration the specific operational conditions or contingencies that impact LIPA's resource planning for its service area. These criteria require LIPA to have sufficient resources available to ensure uninterrupted service to the residents of Long Island.

#### **E-4.2.4 Economic Benefits**

The GE Multi-Area Production Simulation ("MAPS") program has been utilized to assess potential economic penalties associated with the loss of the existing 1385 Cable. MAPS is a production simulation program developed by GE for utility planners. MAPS accurately simulates the operation of an interconnected power system in accordance with the least cost system dispatch, while respecting transmission limits and constraints. Based on MAPS results, the potential production cost penalty associated with the loss of the import capability over the existing 1385 Cable will amount to approximately \$2 million per year.

While the primary benefits of the Project to both Connecticut and Long Island are electric system reliability and reduction of environmental impacts, evolution of the NYISO and ISO-NE into a coordinated Northeast regional market with Pennsylvania, New Jersey, Maryland ("PJM") as well as planned transmission improvements in Southwestern Connecticut are expected to increase the potential economic benefits.

#### **E-4.3 Date of Completion and Impact of Delay**

The Project is expected to be completed in the Spring of 2007, and the new 1385 Cable therefore should be available for service for the summer 2007 capability period. Delay in completion of the Project will result in continued risk of extended outages to the existing 1385 Cable, and the potential that the existing 1385 Cable might have to be removed from service indefinitely.<sup>29</sup> Outages to the existing 1385 Cable would cause loss of the reliability, environmental and economic benefits described above. Failure to replace the Cable would not only have significant adverse reliability impacts, but clearly would be counter to the June

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<sup>29</sup> The cable is currently operating under two consent orders, Administrative Consent Order (WC 5191): State of Connecticut v. The Connecticut Light and Power Company and Long Island Lighting Company (1996) and NYSDEC (1998).

24, 2004 Settlement Agreement with Connecticut that was developed by Governor George Pataki and LIPA and the most recent agreement with Connecticut Light and Power.<sup>30</sup>

#### E-4.4 System Studies

Since the Project consists of a replacement for the existing 1385 Cable, no material change to the electrical system is expected. As such, extensive system impact studies were deemed unnecessary and were not performed.<sup>31</sup> As a an example in support for the immaterial change, Power Technologies issued a report of an analysis entitled “Norwalk Harbor to Northport 138 kV Cable Replacement - Review Thermal and Voltage Performance” for Northeast Utilities Service Company that investigated the impact of the existing 1385 Cable replacement in October 14, 2002. The study concluded, “The system performance with the proposed cable for all practicable purposes is the same as with the existing cable.”

The new 1385 Cable is expected to have substantially the same electrical characteristics as the existing 1385 Cable. To the extent that it differs slightly, the impact on the electric system will be immaterial. This is because the 1385 Cable is terminated at both ends with transformers, i.e., a phase shifter at Northport and the autotransformer at Norwalk Harbor. The characteristics of the two transformers at either end of the 1385 Cable, which will remain unchanged, contribute to the overall impedance of the 1385 Cable circuit. As such, any variation in the actual impedance of the new 1385 Cable would be moderated by the transformers and thus will not be material. With respect to thermal flows, the phase shifter will continue to regulate the power flow.

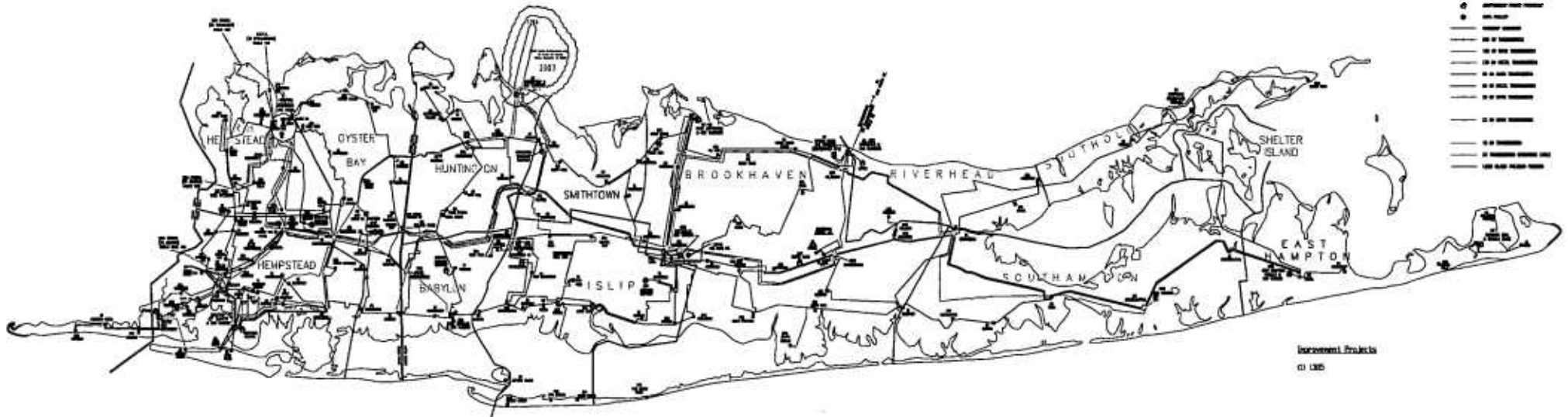
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<sup>30</sup> LIPA Press Release September 28, 2004

<sup>31</sup> A waiver for the Article VII requirement 16 NYCRR 88.4(a)(4) regarding the need to file “system studies, showing expected flows on the line under normal, peak and emergency conditions, including effects on stability of the interconnected system” was filed on November 19, 2001.



LONG ISLAND POWER AUTHORITY TRANSMISSION SYSTEM



Incremental Projects  
1987