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EX 3

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LONG ISLAND POWER AUTHORITY

EXHIBIT 3 ALTERNATIVES

PREPARED PURSUANT TO SECTION 86.4

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EXHIBIT 3 ROUTE SELECTION, DECOMMISSIONING/INSTALLATION ALTERNATIVES, AND ENERGY ALTERNATIVES

The Project has been planned, sited, and designed to avoid or minimize impacts to environmental resources within the Project area. The Project is intended to replace seven (7) existing fluid-filled paper insulated cables with three (3) state-of-the-art solid-dielectric cables that will be better protected, more reliable and will eliminate the potential for release of dielectric fluid into the environment. The preferred approach with respect to the existing cables in Long Island Sound is to remove all seven cables as described in this exhibit, except where dictated by environmental concerns. Although alternative submarine routing and landfall locations were studied extensively, the preferred route for the new 1385 Cable will lie within the existing Cable Corridor and utilize existing landfalls and substation interconnections in order to avoid environmental impacts to the greatest extent possible.

This exhibit analyzes alternatives to decommissioning the existing 1385 Cable, alternative routes, and alternatives for meeting energy requirements, including energy conservation. Data from extensive field evaluations, published literature, and agency consultations was used to guide alternatives analyses. The findings of these evaluations are presented below.

3.1 Alternatives to Decommissioning of Existing 1385 Cable

The purpose of this Project is to replace the existing 1385 Cable with a new more durable and more reliable system. A component of this effort is the decommissioning of the existing 1385 Cable. The decommissioning alternatives analyzed include:

1. Complete removal of the existing 7 fluid filled cables from Northport terminations to NY - CT State Line within Long Island Sound.
2. Combination of removal and/or retirement in place of the existing 7 fluid filled cables

   These alternatives were analyzed based on the following information:

   - Depth of existing cables under sediment surface;
   - Analysis of geophysical data;
   - Analysis of geotechnical data;
   - Sediment resuspension and transport characteristics;
   - Analysis of benthos;
   - Proximity of existing cables to sensitive receptors including mapped and unmapped shellfish beds, wetlands, and protected wildlife species and habitat areas;
   - Potential degradation of the existing cables if retired in place; and
   - Terms and conditions of right-of-way agreements.

The following alternatives for decommissioning the existing cables in New York all assume that the new cables will be installed within the existing Cable Corridor (see Section 3.2 below), and that the decommissioning will be phased so that interruptions to the 1385 Cable are minimized. The Applicant proposes to drain, flush, and collect the dielectric fluid from the existing cables and remove them to the state-line, as described under Section 3.1.1. Where preferable due to environmental considerations, segments of the existing cables may be retired in place in New York waters, as an alternative described below in Section 3.1.2.

3.1.1 Complete Removal From Northport Terminations to NY – CT State Line Within Long Island Sound (Preferred Approach)

Three (3) or four (4) of the existing cables (the eastern-most cables shown in Figure 3-1) will be removed initially. The remaining cables will remain energized, providing uninterrupted transmission during decommissioning/installation until the new 1385 Cable is installed and operational. The existing cables will be removed under the following general sequence:

- Insulating fluid will be flushed from the existing cables, collected at Norwalk Harbor substation or Northport substation, and, pursuant to and in compliance with all applicable regulations and waste programs, transported to a licensed facility for disposal.
- Surface-laid submarine sections of the existing 1385 Cable (beginning from where it emerges from the Sound sediments at approximately the –35-foot isobath in New York waters and running north to where it re-enters the sediments at the –35-foot isobath in Connecticut waters) will be cut, capped, and vertically lifted to a barge, either rolled onto reels or cut into sections, and landed.
- Near-shore buried portions of the existing 1385 Cable will be removed by direct lift, and assisted where necessary by jet-plowing or hand-jetting.
- The upland existing 1385 Cable sections at Northport Landfall to be removed will be removed using standard excavation procedures.
- The removed cables will be properly disposed of, either by salvage or recycling in compliance with all applicable regulations.

Following installation, testing, and commencement of operation of the new 1385 Cable, the remaining three (3) or four (4) of the existing cables will be decommissioned and removed using the same general procedures outlined above.

3.1.2 Combination of Removal and/or Retirement in Place Where Necessary or Appropriate

Three (3) or four (4) of the existing cables (the eastern-most cables shown in Figure 3-1) will be removed initially. The remaining three (3) or four (4) of the existing cables will remain energized and in-service, providing uninterrupted transmission service until the new 1385 Cable is installed and operational. All seven (7) existing cables would be decommissioned under the same sequence as defined under 3.1.1, except in cases where environmental studies of cable removal indicate that leaving them in place is environmentally warranted, in which case existing cables may be retired in place. The retirement process will entail the following procedure:

- Insulating fluid will be flushed from the existing cables as defined in 3.1.1
- Starting at the –35 foot isobath in New York waters and heading northward, surface-laid submarine sections of the existing 1385 Cable to be removed will be cut and capped at designated locations. The cable will be vertically lifted to a barge, permanent caps installed onto cable ends, and lowered back to the Sound bottom.
- The existing upland cable sections at Northport Landfall to be removed will be exposed, cut, permanently capped and reburied using standard excavation procedures.
- Near-shore buried portions of the existing 1385 Cable will not be exposed. Rather the existing cables will be cut and capped at the surface-laid end at the New York – Connecticut State line and at the upland side at the Northport substation to minimize environmental disturbances in the buried area.

3.2 Evaluation of Alternative Routes for New 1385 Cable

In order to determine if environmental impacts could be minimized during the existing 1385 Cable decommissioning and the new 1385 Cable installation, alternative route evaluations included two routes (the East and West Route Corridors) that are within the existing offshore Cable Corridor and utilize existing landfalls. Four additional routes were evaluated outside of the existing Cable Corridor (Figure 3-1), for a total of six route alternatives. The preferred (East) route, as well as the alternate routes, is shown on Figure 3-1.

Extensive field studies, supplemented by literature research and agency consultations, were conducted in November 2000 through January 2001. Ocean Surveys Inc. (OSI) and ESS Group, Inc. (ESS) conducted marine geological, geotechnical, benthic, and wetlands surveys. These efforts are described more fully in Exhibit 4. Evaluations of landfall and submarine route alternatives are presented below. A preferred submarine route, as well as preferred landfall locations, is recommended in these evaluations.

3.2.1 Landfall and Upland Site Evaluations

The existing system of seven (7) cables connects the Norwalk Harbor substation with the Northport substation. An analysis of potential alternative landfalls in Connecticut and New York was conducted by reviewing available resource maps and published literature. Alternative landfalls to the immediate east and west of the Northport and Norwalk Harbor substations were studied. The existing Northport and Norwalk Landfalls were selected as the preferred landfalls for the Project based upon the following findings:

- The existing landfall sites are in close proximity to the coastline, providing ready access to the submarine Cable and minimizing the length of the upland Cable corridor;
- Infrastructure is in place at the existing landfall sites allowing easy interconnection to the New York and New England power grids with minimal modifications to existing substations;
- Both landfall sites are currently in industrial use, eliminating the need to acquire and utilize previously undeveloped land;
- The Project would cross the intertidal zones at locations that have already been modified for this purpose from the installation of the existing 1385 Cable in 1969;
- The existing landfalls are well-buffered from non-industrial land uses; and
- Existing roadways provide ready access to the Cable Corridor and existing landfalls.

3.2.2 Submarine Route Evaluations

The routing of the new 1385 Cable is limited by geologic formations in Long Island Sound (primarily the presence of bedrock) and the location of sensitive natural resource areas outside the existing Cable Corridor. Alternative routes were evaluated based on whether they were inside or outside of the existing Cable Corridor and their relationship to significant environmental features. Two routing options (East and West Routes) within the existing Cable Corridor were analyzed (Figure 3-1), in addition to four alternatives outside the existing Cable Corridor. The alternatives outside the existing Cable Corridor were not considered viable due to the presence of extensive rock outcrop formations and shellfish resources.

Findings of the evaluation of the East and West Routes were different for New York and

Connecticut waters. In New York waters, no areas of particular geologic or environmental sensitivity in the existing Cable Corridor were identified during investigations. In Connecticut waters, the new 1385 Cable route must consider potential impacts to navigational channels and environmentally sensitive areas in Sheffield Island Harbor and Long Island Sound. These include a federal channel that connects the Harbor to Long Island Sound, leased shellfish beds, and the Sheffield Island crossing.

3.2.2.1 East Route Corridor: Preferred Route

The Preferred Route for the Project (East Route Corridor) is to place the new 1385 Cable on the east side of the existing Cable Corridor. This corridor is approximately 11 miles long and is located within the existing rights-of-way for the eastern-most cables in the existing Cable Corridor (see Figure 3-1).

The East Route Corridor was selected as the Preferred Route based upon the following information:

- The Corridor is located within the existing Cable Corridor. The area was previously disturbed, impacts to leased shellfish beds would be minimized, and the route would not require expansion of existing 1385 Cable rights-of-way. Mapped shellfish beds crossed by this Corridor are leased by CL&P.
- Based on findings of the geological survey conducted for this Project, of the routes surveyed, the East Route has the least amount of surface and shallow sub-surface bedrock. Survey results also indicate that the route is relatively clear of shipwrecks and other manmade obstructions.
- By replacing the existing easternmost cables first, existing cables 1, 2, 3, and/or 4 can be kept in-service during new 1385 Cable installation.
- The preferred new 1385 Cable route utilizes the existing Cable Corridor and would not require expansion of the existing right-of-way.

3.2.2.2 West Route Corridor

Similar to the East Route, the West Route is located within the established Cable Corridor and is approximately 11 miles long (see Figure 3-1). This Corridor follows the western edge of the existing Cable Corridor, within the rights-of-way presently containing existing 1385 cables 1 and 2.

Both the East and West Routes provide the benefits associated with staying within the previously disturbed right-of-way. The West Route however is less desirable than the East Route for the following reasons:

- Based on findings of the geological survey conducted for this Project, surface and shallow sub-surface bedrock expressions become more prevalent in the West Route Corridor. This will make new 1385 Cable embedment more difficult.
- Using the West Route would require taking existing 1385 cables 1, 2, and 3 off-line and relying on existing 1385 cables 4-7 to maintain a transmission interconnection until the installation of the new 1385 Cable has been completed.
- The West Route has a number of documented shipwrecks that would need to be avoided.

3.2.2.3 Alternative Route 1

Alternative Route 1 is located west of the existing Cable Corridor and is approximately 12.5 miles in length. Alternative Route 1 runs west of, and parallel to, the federal channel in Sheffield Island Harbor until it passes the entrance to the Harbor. The route then swings south at Green Can "1A" thereby avoiding a crossing of the federal channel inside of Sheffield Harbor, as well as a crossing of Sheffield Island. The route follows a southeast path through Greens Ledge and east of existing 1385 Cable and Anchor Reef to Northport Landfall.

Alternative Route 1 is less desirable than the preferred East Route for the following reasons:

- The route is outside of the existing Cable Corridor and would, therefore, be crossing previously undisturbed seabed along the entire route with the exception of the landfalls.
- The route would cross previously undisturbed shellfish beds within Sheffield Harbor that are not leased by CL&P.
- Based on findings of the geological survey conducted for this Project, the seabed condition along the entire route appears to have a significant amount of surface and shallow sub-surface bedrock, which will impede installation.
- The route crosses an area frequently used by lobster fishermen.

3.2.2.4 Alternative Route 1A

This route is a variation of Alternative Route 1, and adds approximately one mile in cable length for a total of approximately 13.5 miles. Route 1A follows a route farther west around Greens Ledge Light in order to avoid cutting through Greens Ledge.

This area appears to be slightly less rocky than Alternative Route 1, yet is still expected to pose problems for new 1385 Cable embedment due to surface and shallow subsurface bedrock.

3.2.2.5 Alternative Route 2

Based upon geophysical field reconnaissance that suggested the area between Alternative Route 1 and the existing Cable Corridor may be a feasible alternative, Alternative Route 2 was surveyed. Alternative Route 2 follows the same route out of Sheffield Island Harbor as Alternative Route 1, but it turns south earlier, passing to the east of Greens Ledge and to the west of Sheffield Island. Similar to the other western Alternative routes, the findings of the geological survey conducted for this Project suggest that Alternative Route 2 passes through significant amounts of surface and shallow sub-surface bedrock, which will make new 1385 Cable embedment impractical.

3.2.2.6 Alternative Route 3

Alternative Route 3 is a variation of the preferred East Route, differing only in the Norwalk and Sheffield Island nearshore portion of the route. Alternative Route 3 leaves the Norwalk Landfall and heads southeast around Sheffield and Shea Islands. The route then heads south, rejoining the East Route offshore.

Based on findings of the geological survey conducted for this Project, the sub-surface area along this route may be conducive for new 1385 Cable embedment, and the route also avoids the crossing of Sheffield Island. However, the route was determined to be less desirable than the East Route for the following reasons:

- The route is outside of the existing Cable Corridor throughout the entire Norwalk nearshore area. Installation of the new 1385 Cable along this route would impact previously undisturbed areas of seabed.
- The route would require a crossing of the federal channel in Sheffield Island Harbor, outside of the existing Cable Corridor.
- The route would cross previously undisturbed shellfish beds within Sheffield Island Harbor that are not leased by CL&P.

3.3 Evaluation of Technological Alternatives

This section discusses the alternate methods that could fulfill the environmental, reliability and power supply requirements with comparable costs, comparative advantages and disadvantages. The four basic methods can be considered:

- New generation
- Alternate transmission line technology
- Alternate installation technology
- No action

Each of these is discussed below.

3.3.1 New Generation

Additional Long Island generation would be an alternative for providing the environmental, reliability and energy and capacity benefits of the new 1385 Cable. The new 1385 Cable, however, as a part of a diverse portfolio of system resources (consisting of new off-Island interconnections, new efficient combined-cycle generation units, energy efficiency, renewables, conservation and enhancing existing power supplies) provides a greater system benefit in terms of flexibility, reliability and access to power markets. LIPA's Energy Plan 2004-2013 that was approved by the LIPA Trustees on June 23, 2004 presents and documents this approach. The new 1385 Cable is also economically favorable relative to the generation alternatives. New generation would not resolve the environmental issues identified in the consent orders and would not fulfill the terms of the CSC Settlement Agreements. The benefits that will result from approval of the new 1385 Cable are discussed in Exhibit E-4.

A number of smaller scale renewable technologies are in the demonstration phase on Long Island, including wind turbines, photovoltaics, fuel cells and micro turbines. (A list of LIPA renewable technology projects is contained in Exhibit 3-A.) Collectively, they will likely contribute less than 5 MW over the next two to three years, largely in demonstration projects. These technologies, which presently have installed costs that typically range from $2,000/kW to $20,000/kW, are typically four to ten times more expensive than gas-fired simple cycle or combined cycle combustion turbine units, and more than ten times more expensive than replacement of the existing 1385 Cable. Beyond cost and operational characteristics, these technologies are simply not of a scale sufficient to offer a feasible alternative to the new 1385 Cable. However, these technologies hold promise for the future and LIPA will continue to pursue their development.

3.3.2 Alternate Transmission Line Technology

LIPA reviewed the use of alternate transmission line technologies and determined that the proposed type of technology is most appropriate. In general, there are two forms of alternative technologies for underground or submarine cables that are based on the type of construction and electric design. With respect to type of construction, the alternative to the proposed use of a solid-dielectric cable would be a pipe-type construction or use of a dielectric filled self-contained cable similar to what is currently installed. Besides the operational complexity and cable distances involved, LIPA determined that use of solid-dielectric type cable is the most desirable alternative. Use of that cable type avoids the continual need to maintain fluid pumping facilities in Northport and Norwalk and the use of dielectric fluid to insulate/cool the cables.

With respect to design technology, the alternative technology that would be considered is the use of high voltage direct current ("HVDC") technology. Since the new 1385 Cable is a replacement for the existing 1385 Cable, and is already part of the existing 138 kV alternating current ("AC") type of system, the AC system was deemed more economically efficient and appropriate. The use of HVDC would require extensive analysis of the new design and integrating that design into the existing 138kV system as well as potential substation design changes and additions to convert the energy back to alternating current, all of which would cause significant additions to the cost of the Project. In addition, construction of a large converter station would be required to convert DC energy to AC power. This would require the acquisition of additional land which may or may not be available and may also result in additional land disturbance and environmental impacts.

3.3.3 Alternate Installation Technology

Alternative cable installation technologies applicable to this type of project are described below. Please refer to Exhibit E-3 for discussions of the typical cable installation methodologies proposed for use on this Project.

3.3.3.1 Hydraulic Jet-Plow Methods – Preferred Method

Installing the type of submarine cable required for this Project is primarily carried out by (1) a cable laying ship, and (2) a burial tool. Other accessory equipment is also required, including:

- A smaller shallow-draft cable laying vessel, capable of operating in the area just off the Northport landfall;
- An ROV-remote operating vehicle, a small self-positioning subsurface vehicle that monitors the cable touchdown point on the seabed and performs pre- and post- lay surveys;
- Excavation equipment for on-land trenches;
- Various rollers and winches for pulling and directing cable out of the water and over land; and
- Other incidental craft to direct the operations and control traffic.

The principal types of submarine burial techniques are as follows:

- **Dredging** Sediment is excavated by bucket or other dredge type and either side cast or lifted to a barge. Cables are then laid in trench and backfilled. This was the technique utilized in burying portions of the existing 1385 Cable. Except to the extent described herein, this method will not be used for construction or installation of the new 1385 Cable.
- **Mechanical Plowing**. A plow is dragged by the cable-laying vessel whose forward movement forces the sediment apart, as the cable is fed in the resulting cavity. This technique is not well adapted for electric cable installation and, consequently, will not be used for construction or installation of the new 1385 Cable.
- **Hydraulic Jet-plowing.** In principle, a hydraulic jet-plow either consists of:
  - ➢ Solely a jetting device that travels along the cable placed on the sea bed with diver assistance or remote operation, which hydraulically fluidizes the cable below the seabed. The cable settles to the desired depth based upon the degree of jetting utilized.
  - ➢ A jetting device equipped with a mechanical plow in which the jetting device is utilized to fluidize hardened sediment that the plow has difficulty penetrating to allow the cable to settle to the desired depth.

Both jet plow processes allow a cable to be buried without removing all the sediment from the trench. Water is injected below the surface of the sediment, which fluidizes the sediment but ultimately leaves most of it in place. Depending on the equipment model, the cable is then either forced down or allowed to drop down into the fluidized sediment. Then, when the water pressure is removed, the sediment settles over the installed cables and in the near vicinity. The end result is similar to a conventional trench with a narrow area of disturbed sediment above the length of the cable and undisturbed sediment to the sides. The hydraulic jet-plow makes a relatively narrow trench suspending a relatively small amount of sediment within the water column, the majority of which is expected to settle over the installed cables and cable trenches soon after disturbance (Attachment 4-C). Hydraulic jet-plows can either be towed or be self-propelled, depending upon the type. Also, depending on the type of jet-plow and how it is used, the cable is either buried simultaneously as it is being laid; or first laid down on the bottom and then buried.

The jet-plow process is designed to minimize the area of seabed disturbance and sediment displacement. In contrast to mechanical trenching or cut and fill techniques which typically side cast materials to open a trench, place the cable, and then backfill, the jet-plow minimizes the potential for far-field sediment dispersion. As the jet-plow moves through the seabed, sediments are fluidized allowing the cable to settle to the bottom of the fluidized column. With the hydraulic jet-plow passage, fluidization ends, and the sediments quickly begin settling back and consolidating around and near the cable. Any changes in suspended material concentrations caused by the placement operation are temporary and localized and rapidly dissipate as re-suspended materials return to the seafloor.

Seabed contours within the limits of the narrow jet-plow and cable trench are expected to return to preexisting conditions after the existing 1385 Cable replacement. Restoration of the seabed's benthic profile within the limits of the new 1385 Cable trench will occur over time and will depend on the type and extent of sediment transport and depositional processes along the new 1385 Cable route. Submarine cable segments within areas of high sediment transport regions will restore more rapidly (generally on the order of months after embedment). Segments within relatively low sediment transport regions will gradually restore its benthic profile (generally on the order of months to a few years). No long-term impacts to seabed resources are anticipated as a result of this Project.

Cable installation using typical hydraulic jet-plows (see other sections of this Exhibit and Exhibit E-3) produce a short-term localized change in the water content of the sediment column in the immediate vicinity of the cable trench. The extent of this change will vary as a function of sediment type, with maxima occurring in areas dominated by fine-grained silts and clays. This contrast in water content between Project-affected sediments and adjacent materials will progressively decrease with time due to gravitational consolidation exponentially approaching pre-Project values (Bohlen, 2001).

Cable laying vessels equipped with Dynamic Positioning (DP) systems will allow cable laying and trenching without anchoring. DP systems will be used to the greatest extent practicable given water depths in the Corridor and equipment operational constraints. A description of the cable laying and trenching equipment and operation can be found in Exhibit E-3.

The Applicant anticipates using the hydraulic jet-plow for all submarine and near shore installations. However, if water depths or equipment operational constraints do not allow jetting up to the shoreline, mechanical excavation may be required during which material would be temporarily side cast while the cable is laid and then backfilled. Conventional trenching equipment may also be required at the near shore area where mats or slabs exist to protect the existing 1385 Cable. If conventional trenching is necessary, the applicant expects this to be limited to the shallowest areas at the Northport Landfall, a previously disturbed area absent of significant biological resources. Due to the dynamically active surf zone at the Northport Landfall, limited sheeting and/or coffer dams may be used, but only as necessary, to stabilize trenches during the new 1385 Cable installation. In general, the operations will be as follows:

- Existing 1385 cable will be decommissioned as described herein. On land, in areas where trenches were opened to remove the existing 1385 cable, it is expected these trenching operations may be also used for installing the new 1385 cable. New trenches will be made for the new 1385 cable, where necessary, and any remaining existing trenches will be refilled.
- Having prepared the on-land trenches, the cable burial vessel will anchor south of Sheffield Island in Connecticut. A segment of new 1385 cable will be floated out, and a tender will assist in bringing the floating new 1385 cable to the Connecticut shore. Rollers will be installed on the island, and the new 1385 cable will be winched across, and then floated out a short way on the north side of the Island. From there it will be picked up by support equipment which will continue the pull to the Norwalk Harbor substation in Connecticut.
- The cable-laying vessel will then head towards Northport from Connecticut waters. It will lay the new 1385 cable below the seabed by using the jetting/jet-plow approach identified earlier. Conventional trenching techniques may be necessary at near shore locations in Northport to prepare for the cable laying process.

- Much the same will be done by the cable-laying barge on the north side of Northport as identified for the cable laying process at Sheffield Island, Connecticut. The new 1385 cable will be floated, pulled ashore and placed into the trench until reaching the terminal in the Northport substation. Once installed, any extra cable will be trimmed and the pothead connection will be made.
- The final step in the operation will be to backfill the on-land trenches, which will also contain a warning tape above the new 1385 cable to protect and warn against accidental digging.
- The same process will then be repeated for the second and the third new 1385 cable.

In upland areas (between the substation and shoreline), trenches will be excavated to a design depth of 4 feet below grade. The width of these trenches is expected to be approximately 8 feet at grade level tapering down to approximately 4 feet at the trench bottom. New 1385 cable separation will be approximately 10 feet on centerline. Figure 5-2 shows typical trench cross-sections and spacing, although actual trenches may vary slightly to accommodate conditions discovered during construction. These dimensions may vary depending on soil conditions discovered during construction. Following the existing 1385 Cable decommissioning and installation of the new 1385 Cable, the beach and upland area along the Cable Route will be returned to pre-existing elevations and condition. Areas disturbed during construction will be stabilized and restored to their previous and continued use. These measures will be fully described in the Erosion and Sediment Control and Storm water Management Plan, which will be provided as part of the EM&CP.

In submarine areas (both near shore and offshore), new 1385 cables will be installed at a depth of approximately 6 feet below the seabed surface (Figure 5-2). The depth and width of these installation trenches can vary depending on sediment conditions. Typical widths are, however, slightly larger than the diameter of the new 1385 cable. No new or foreign sediments will be introduced as fill along the Cable Route. Cable protection barriers such as concrete mats may be used on the seabed directly over the new 1385 cables to protect them from dropped anchors and dredging activities wherever the required burial depth cannot be achieved.

3.3.3.2 Mechanical Plow Methods

Mechanical plow systems are another potential technology alternative for the Project. Mechanical plows would be towed by a cable and service vessel using large towing forces and the skids would be required to be as heavy as possible to mechanically displace the sediment column to the proposed burial depths.

Employment of the mechanical plow technology would leave a trench depression after new 1385 cable installation. To restore benthic profiles and to provide protecting sediment cover for the new 1385 Cable, large volumes of imported backfill material may potentially have to be placed in the trench to restore the seabed profile. These operations may require that this fill material be dropped from a bottom-dumping scow or bucket dredge, thus resulting in increased suspended sediment concentrations and a potentially greater area of seabed disturbance along the entire new 1385 Cable Route than the hydraulic jetting operation discussed about in Section 3.3.3.1.

3.3.3.3 Mechanical Dredging Methods

The only other submarine cable installation technology considered to be feasible for the Project was determined to be mechanical dredging and its associated dredged material disposal. This methodology would require a large-scale dredge plant operation, would significantly increase the areas and volume of disturbed sea bottom, and would significantly increase suspended sediment concentrations and turbidity in the water column throughout the long duration of using this methodology (months) compared to jetting/jet-plowing (weeks). Not only would this type of installation operation significantly increase the period of in-water construction activities, but would also result in significantly greater direct impacts to the Long Island Sound bottom compared to the use of jetting/jet-plow technology. It would also have a significantly greater impact on navigation restrictions in Long Island Sound compared to a jetting/jet-plow installation methodology since construction periods would extend from several weeks to several months.

3.3.4 No Action Alternative

The no action alternative is considered unacceptable. As described herein, since being energized in 1969, the existing 1385 Cable has experienced 36 incidents with 58 damages to existing 1385 cables that have resulted in either limited capacity operation or total electric failure. Some damage incidents have resulted in releases of dielectric fluid into the waters of the Long Island Sound. As a result, frequent and extensive maintenance and repair are required for the existing 1385 Cable. Since 1990 alone, the cost of the existing

1385 Cable repairs has exceeded $45 million. Given the fact that 80% of the existing 1385 Cable lies unprotected on the floor of the Long Island Sound, the number and severity of these incidents, as well as the costs thereof, are likely to continue under a no action alternative. If the existing 1385 Cable is not replaced, the many environmental, reliability, and economic benefits of the Project would not be realized. These benefits are discussed in detail in Exhibit E-4 of this Application.

3.4 Conservation

3.4.1 Demand Side Management

An evaluation of the expected impact of LIPA's Clean Energy Initiative ("CEI"), peak reduction, and Demand Side Management ("DSM") RFP programs has demonstrated that DSM efforts would not be able to produce sustainable peak load reductions that would make a substantial contribution to the anticipated electric supply deficiency or the reliability degradation associated with the loss of the 1385 Cable. Specifically, LIPA's CEI (averaging approximately $35 million/year), is expected to yield cumulative peak reduction savings of 98 MW by the end of 2004. The CEI is a compilation of 8 "state-of-the-art" programs targeted at both residential and commercial/industrial ("C/I") Long Island electric customers. The CEI also includes a cutting-edge Research, Development & Demonstration ("RD&D") effort. These programs are focused on achieving energy efficiency, load management, and promoting the advancement of renewable energy technologies on Long Island. Specific programs are listed below:

1. Residential Lighting & Appliances
2. Residential Heating, Ventilation, & Air Conditioning ("HVAC")
3. Solar Pioneer
4. Residential Energy Affordability Partnership ("REAP")
5. Residential Information/Education
6. Residential New Construction
7. Commercial Construction
8. Customer-Driven Efficiency

The CEI includes a broad range of programs designed to transform the residential market of Long Island into energy conscious, energy efficient consumers. The CEI seeks to educate and inform residential customers about the prudent use of electricity while also providing substantial incentives for selecting and purchasing the most energy efficient products. Commercial customers can benefit from the wide array of programs designed to reward energy efficient construction and design practices when building/renovating commercial properties. Education and training are key components to the CEI's commercial program designed to help customers implement their own programs and reduce energy costs as a direct result of energy conservation. The CEI program takes advantage of some of the more cost effective energy efficiency opportunities. It would not be possible to scale the program up to two or three times the size at the same cost.

The peak reduction programs include the Peak Reduction Program and LIPA*edge* which focus on reducing customer load at the time of system peak. These programs are expected to provide 111 MW of peak reduction at a cost of $3.4 million. While these peak reduction programs are aggressive programs producing real documented benefits, the programs cannot easily be scaled up to a larger program. For instance, the Peak Reduction Program includes aggressive marketing, which resulted in a substantial increase in participation in the Peak Reduction Program over the past few years. However, participants in the Peak Reduction Program (representing approximately 92 MW included in the above) must be re-signed on an on-going annual basis, which creates an inherent associated risk. Efforts to increase this Program substantially have not been successful. It will not be possible to double or triple the size of this Program.

LIPA recently completed a DSM RFP that is expected to provide an additional 60 MW of net peak load (73 MW of displaced capacity) reduction and 127 GWh of associated energy savings. This program is expected to take 5 years to fully implement and will provide benefits that will begin to decline in the 6th year. The total cost of this program is $71 million over a 10 year period. While the RFP provided cost effective energy and capacity savings, it takes advantage of the easiest to implement and lowest cost DSM options. If LIPA were to go out for a 2nd RFP, LIPA anticipates that the cost would be much higher for the next increment.

The cumulative peak reduction savings of 282 MW identified above are the aggregate savings expected to be realized through the efforts of all CEI programs, Peak Reduction Program, and the DSM RFP. While these programs are about equal in size to the proposed replacement of the existing 1385 Cable, they cannot be readily replicated as an alternative to the new 1385 Cable. Even if it were possible to replicate the programs, the combined approximate $4 million/year cost of these programs far exceeds the projected cost of the new 1385 Cable. Furthermore, these programs will begin to decline in effectiveness in 8 to 10 years while the new 1385 Cable is expected to provide ongoing benefits for 30 years or more.

The LIPA Energy Plan and its actions on implementing DSM programs, makes clear LIPA's commitment to aggressively pursue DSM clear. LIPA intends to pursue cost effective DSM and conservation. However they clearly do not meet the load requirements of the expected annual load growth on Long Island (approximately 100 MW/year) or the compounded effect of losing the 1385 Cable.

FIGURES

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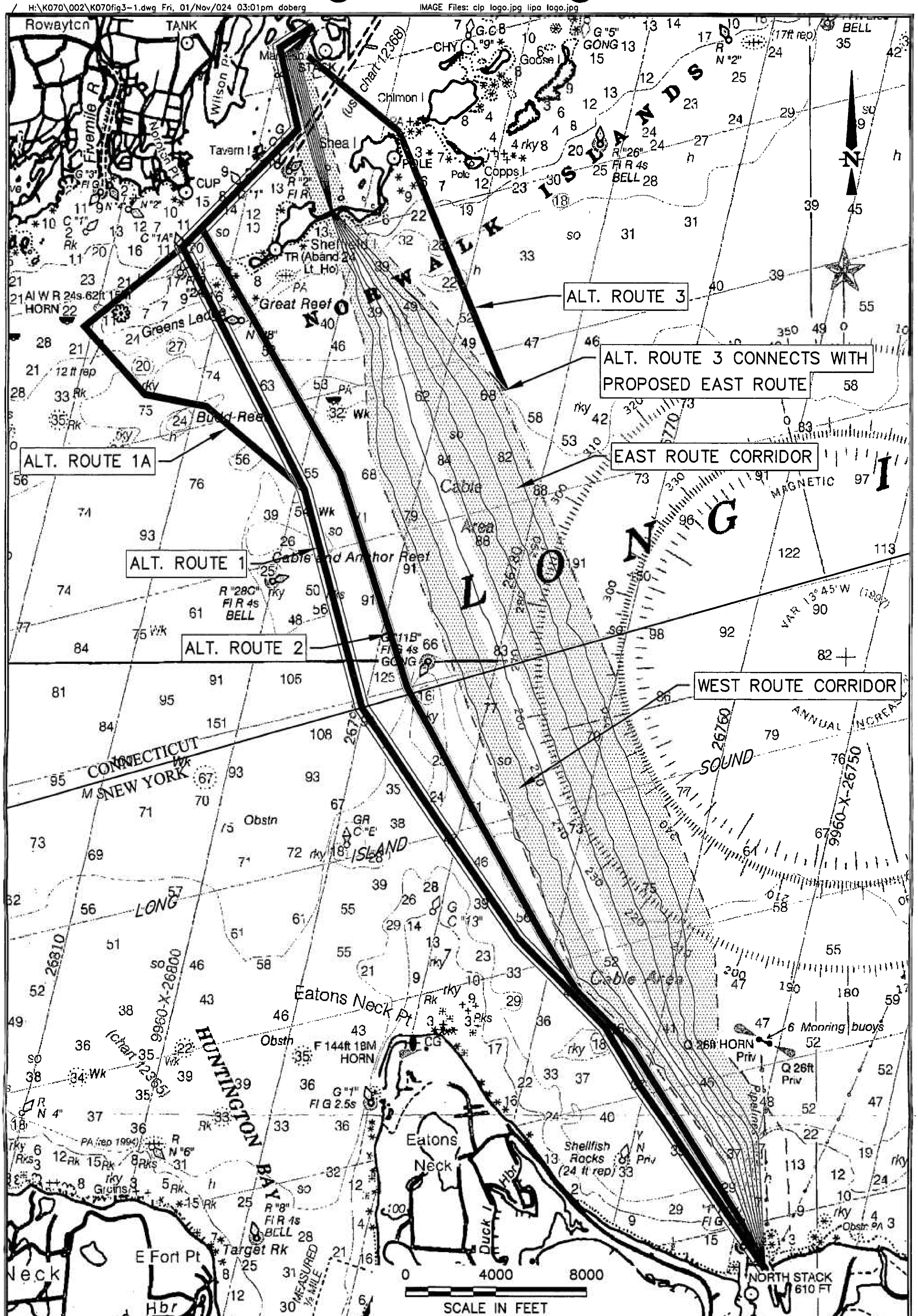

LIPA
Long Island Power Authority

Connecticut Light & Power

LIPA-CL&P
Submarine Cable Replacement Project
Norwalk, CT - Northport, NY

Alternative Routes

FIGURE NO. 3-1

PROJECT NO. K070.021.1

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ATTACHMENT 3-A

ATTACHMENT 3-A

LONG ISLAND POWER AUTHORITY
CLEAN ENERGY AND DISTRIBUTED GENERATION RESEARCH & DEVELOPMENT PROJECTS

Fuel Cell Projects:

- Plug Power Fuel Cell Demonstration – Phase I of this project entailed the installation of six Plug Power fuel cell demonstration sites on grid parallel units capable of producing up to 7kW. Phase II of this demonstration – the installation of 75 fuel cells at the West Babylon substation – was announced in June 2001. The program is intended to begin identifying and developing the measures and systems needed to facilitate the eventual use of fuel cells operating in parallel with, and contributing to the overall reliability and performance of, LIPA's electrical grid system. The fuel cells are manufactured by Plug Power of Latham, New York.
- Optimization and Fabrication of PEM Fuel Cell Bipolar Plates – The main goal of the project is to improve the overall efficiency and longevity of the PEM fuel cell by 30% to 40% and to develop a cost effective fabrication technique to mass-produce these cells competitively on a commercial basis.
- H-Power Fuel Cell – Design and assemble a 3kW PEM fuel cell with 7kW battery back-up that will operate with natural gas (thereby requiring a reformer). The system will be equipped with a 10kW inverter that will synchronize with a feed energy into the grid.

Wind Energy Projects:

- 10kW Wind Turbine Demo at Southampton College – Participate in the DOE small turbine wind verification program by installing and monitoring a Bergey 10kW wind turbine at LIU/Southampton College. Turbine installation is scheduled for November 2001.
- Shelter Island Wind Project – Investigate the feasibility of siting a 50kW wind turbine at the Shelter Island Recycling Center. Turbine installation is scheduled for late 2001.
- Long Island Farm Bureau Wind Project – LIPA will acquire, site, own and operate four to five small-scale wind turbines, each with a maximum rated electrical output of 50kW.
- Wind Generation and Solar/PV at Brookhaven Landfill – Through NYSERDA and shared funding, engage an expert consultant to perform a feasibility and an economic study for the use of the closed portion of the Brookhaven landfill area in Yaphank as a site for the installation of wind turbine electric generation units. In addition, incorporate within the study consideration of PV generation at the landfill or general vicinity.
- Off-Shore Wind Feasibility Study – The objective of this project is to identify off-shore areas of Long Island having favorable attributes for wind energy development.
- Town of Hempstead Wind Energy Feasibility Study – Site specific feasibility for wind generation. Initial study identified four potential wind locations; in the next phase detailed assessment will be conducted for two sites (Oceanside landfill and the Lido Beach Water Station). The Town has now decided to scale down the program to one site.

- Fosdick Wind Turbine – This project will look to validate the performance of a small (4-foot diameter) scale of the Fosdick design in accordance with the American Wind Energy Association guidelines.
- Montauk Wind Turbines – The objective of this proposed 2000 R&D project was to site three 50kW wind turbines within the Camp Hero state property at Montauk. Although generally well received by the local community, one group cited a deed restriction for the Camp Hero site, which eventually led to cancellation of the project.

Solar/Photovoltaic (PV) Projects:

- Jones Beach Nature Center Photovoltaic and Geothermal Project – Working in collaboration with New York State, LIPA has installed a 20kW Atlantis Energy Sunslate photovoltaic grid parallel system and a geothermal heat pump at the newly renovated New York State Nature Center located at Jones Beach State Park.
- Long Island Photovoltaic Performance Verification Project – The PV performance verification system consists of three components: (1) a pair of specialized devices for monitoring and recording Long Island solar resource data; (2) low-cost kWh meters for monitoring the generation of each installed PV system: and (3) an internet website where program participants enter PV meter readings on a monthly basis, review information about their systems' performance history, and where any visitor can learn about the Solar Pioneer Program.
- Photovoltaics at the Long Island Ducks Stadium – A 5kW PV system is planned for the stadium.
- Sunsine 300 ACPV Development and Demonstration at NYIT – Join an electric utility consortium for the purpose of supporting the development of a modular scale inverter to be used with a 300 W PV panel. A 15kW Ascension Technology system was installed at the New York Institute of Technology in 1999. Additional monitoring was conducted by NYIT during 2000.
- Fala Photovoltaic Project – LIPA plans to provide a rebate to support Fala's installations of an estimated total of 1.5MW peak rated solar electric generation in the form of roof-mounted PV at three of Fala's production facilities. This will provide an R&D opportunity to analyze the performance of a large-scale PV system and its interaction with the T&D system.

Miscellaneous Distributed Generation Projects:

- Town of Huntington Clean Energy Demonstration – Develop, install and demonstrate electrical generation using grid-connected microturbines fueled by solid waste landfill gas from the East Northport landfill to the Town of Huntington Animal Shelter. One 28kW microturbine with a heat recovery device will be installed.

- Electricity Generation Using Microturbines Fueled by Landfill Gas – Develop, install and demonstrate electrical generation using grid-connected microturbines fueled by solid waste landfill gas (methane) at an East Northport landfill site. Four microturbines (112kW) will be grid-connected.
- Wave Power Generation and Mitigation of Beach Erosion – Existing state-of-the-art device designs will be analyzed for application on Long Island. Approaches such as the Wells Turbine and other advanced concepts will be evaluated. Wave focusing techniques will also be evaluated and a preliminary design will be formulated. Effects on beach erosion will be analyzed with input from the U.S. Corps of Engineers.

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