

REPORT

SUMMARY OF THE UTILITY INTERCONNECTION ISSUES FOR A MICROTURBINE INSTALLED A WALDBAUMS SUPERMARKET IN HAUPPAUGE, NY

Revised
July 24, 2003

Submitted to:

New York State Energy Research and Development Authority
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NOTICE

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Introduction

This report describes the utility interconnection issues that had to be addressed to obtain permission to operate a Capstone 60 microturbine in parallel with the local utility (LIPA). This report describes the technical, administrative, and legal issues that had to be addressed before interconnection. It also documents the results of an “expert panel” meeting that took place on January 14, 2003.

The microturbine was installed as part of a field test of the combined heat and power (CHP) system at the Waldbaums Supermarket in Hauppauge, New York. Waldbaums is a subsidiary of The Great Atlantic and Pacific Tea Company (A&P). This field demonstration project is sponsored by NYSERDA, KeySpan Energy R&D, Oak Ridge National Laboratory (ORNL) and the National Renewable Energy Laboratory (NREL).

This project is unique in that it integrates a microturbine into a desiccant-based HVAC system at a new supermarket. This application offers a highly-effective means of using the waste heat from a microturbine to meet the desiccant dehumidification and space heating needs of a modern 57,000 sq ft supermarket.

The supermarket is one of several tenants within a strip mall. The electric distribution wiring in the facility is owned by the mall owner (hereinafter referred to as the landlord), while the two transformers located at the facility are owned by LIPA.

Facility and System Description

Facility Electric Load

The supermarket electric load varies from a recorded minimum of 200 kW that occurs in the early morning hours on a winter weekend, to a recorded peak of 700 kW that occurs in the afternoon on a hot summer weekday.

Overall CHP System

A Capstone 60 kW microturbine was integrated with a 20,000 cfm Munters air handling unit that is currently part of A&P's standard store design. The Munters unit provides cooling and heating to the main sales areas of the store. The unit also includes a gas-fired desiccant section to provide dehumidification. A Unifin heat exchanger was installed to recover heat from the microturbine exhaust so that it can be used to provide both space heating and desiccant regeneration. The glycol piping from the Unifin is directly connected to hot water/glycol coils in the Munters unit (supply heating and desiccant regeneration). The Munters unit is capable of using recovered heat when it is available or reverting back to the conventional natural gas-fired burners.

The microturbine skid, includes the Capstone turbine, Unifin heat exchanger, and natural gas compressor module. The skid is installed on the roof adjacent to the Munters desiccant unit. Glycol piping connects the heat exchanger and desiccant units.

Electrical Interconnection

The turbine was connected directly to the 480/277 Volt Main Distribution Panel (MDP) as shown in Figure 1. Per Capstone's recommendations, the turbine was installed on a 3-phase, 4-wire circuit, grounded circuit¹. The circuit was installed on a 100 amp breaker in the MDP. Two NEC fused disconnects were also installed near the turbine as well as at ground level at the back of the building (as per LIPA requirements) so that utility staff could disable the generator in the event of an emergency².

The microturbine was installed to only operate in parallel with the electric utility grid. Any loss of utility power (or grid disturbance) will cause the microturbine to shutdown. The store's conventional 40 kW engine generator will still be used to provide standby power on the segregated emergency circuits upon any loss of utility power.

¹ A 3-phase, 3-wire circuit was also permissible according to Capstone, but less desirable.

² The Ground level disconnect was not originally installed with the turbine. This ground level disconnect was added in March 2003.

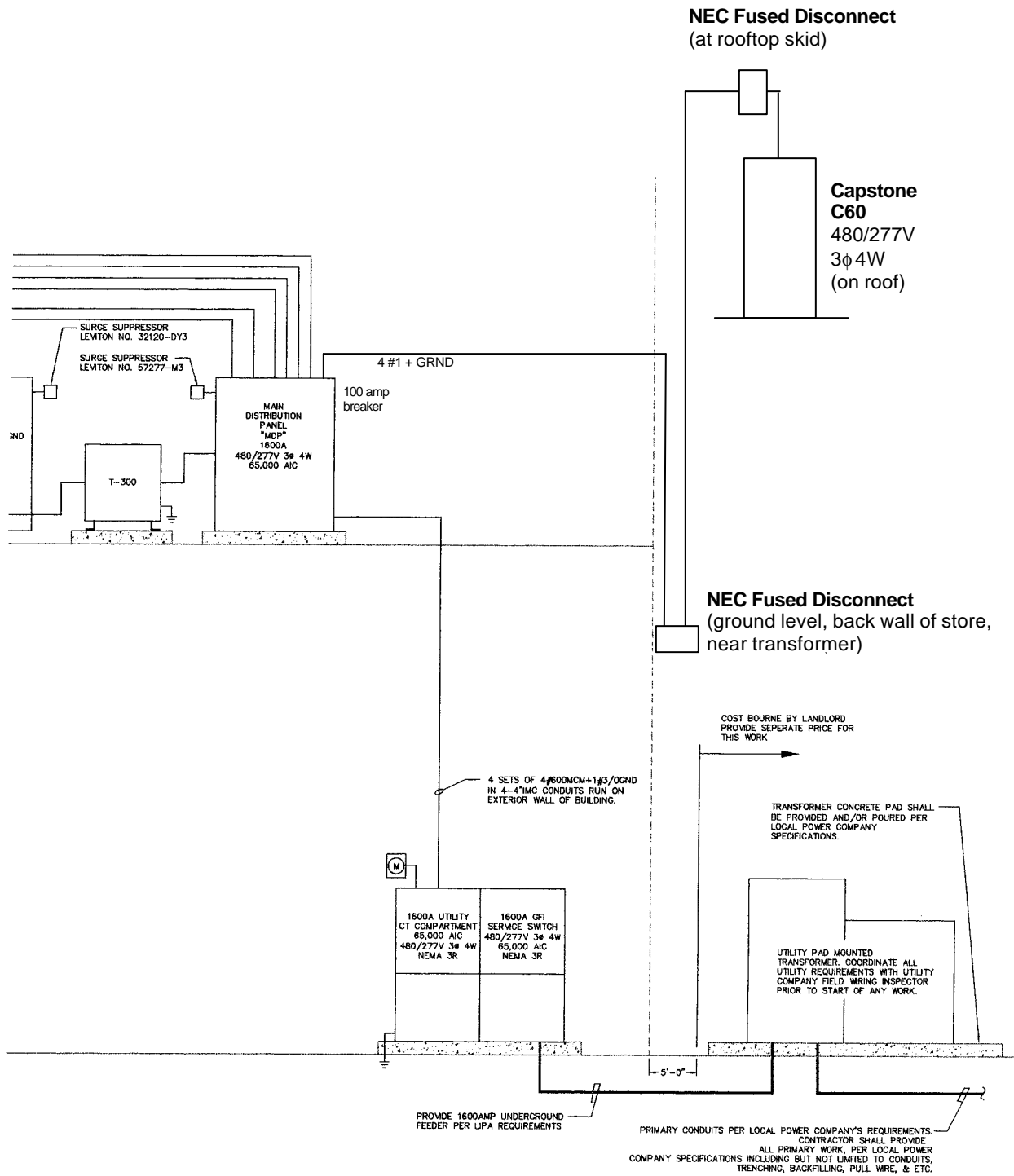


Figure 1. Electrical System at Waldbaums Supermarket in Hauppauge



*Store Main Distribution Panel
(480/277V, 1600 amp)*



Ground-Level Disconnect at Rear of Store



*Standby Generator with Automatic Transfer Switch
for Emergency Circuits*



Microturbine with Disconnects at Roof

Utility Interconnection Process

Standard Interconnection Requirements

In December 1999 the New York State Public Service Commission issued Opinion 99-13, *Opinion and Order Adopting Standard Interconnection Requirements for DG Units* (Case 94-E-0952) that delineated the Standard Interconnection Requirements (SIRs) that New York State public utilities must use for customers with Distributed Generation (DG) units. The PSC Opinion provided the technical requirements that DG equipment must meet as well as the details of how systems could be interconnected to the utility grid. A standardized application form and process was also developed for two classes of DG equipment:

- DG units under 300 kVA operating in parallel with the utility,
- Photovoltaic systems under 10 kVA,

The central concept of this PSC order was the idea of “Type-Testing” DG equipment. This allowed equipment manufacturers to have their products tested by an independent laboratory (such as UL) in order to prove compliance with appropriate IEEE standards (such as IEEE P1547). Then this equipment could be applied within the territory of any New York Utility.

The NY Department of Public Service maintains a current list of type-tested equipment approved for use in NY on their web site (www.dps.state.ny.us/distgen.htm). The Capstone 60 was type-tested and approved for use in New York State in February 2002.

LIPA Interconnection Requirements

The Long Island Power Authority (LIPA) is a New York State Authority that owns the electric utility grid on Long Island that was formerly owned by the Long Island Lighting Company. LIPA has contracted with KeySpan Electric Services LLC to operate the utility grid. Since LIPA is not a public utility company, it is not subject to PSC orders and options. However, LIPA did choose to incorporate most of the interconnection requirements from the PSC Opinion into their own interconnection requirements. Their Parallel Generation Agreement (PGA) application is also similar to the form suggested by the PSC.

As of January 2003, LIPA had around 300 sites with DG equipment installed on their system³

LIPA Application Process

In the September 2002, the project team informally submitted the SIR application to LIPA for technical review. At that time, LIPA indicated that if Waldbaums (the utility customer) were to sign the SIR agreement that LIPA would require that primary-side over-current protection be added to the 500 kVA transformer. The estimated cost to add this additional protection was \$40,000. This cost would have to be borne by the utility customer (i.e., Waldbaums). If the landlord were to sign the interconnection agreement, then LIPA would not require the primary

³ According to Andris Garsils, Manager Distributed Resource Management, LIPA, January 2003.

side breaker be installed. At that time, the landlord had declined Waldbaums initial request that he sign the interconnection agreement.

Results of Expert Panel Meeting on Interconnection Issues

Expert Panel

After a few weeks of dialog between the project team and LIPA, NYSERDA asked CDH Energy Corp. to form an “expert panel” to help resolve the interconnection issue at the site. The goal of the panel was to understand the technical, administrative and legal issues with the interconnection and determine if other lower cost options might address LIPA’s safety and legal concerns.

A meeting was convened on January 14, 2003 at NYSERDA’s New York City offices. The meeting was attended by the following people:

<u>Person</u>	<u>Role or Association</u>
Dana Levy, Project Manager – NYSERDA	NYSERDA Representative
Jignesh Patel, Research Engineer – KeySpan Energy	Gas Utility
David Tomicki, Director of Engineering – A&P	Supermarket Operator/Customer
Andris Garsils, Manager Distributed Generation – LIPA	Electric Utility
John Ventresca, Senior Engineer – LIPA	Electric Utility
John Pifer, Applications Engineer – Capstone	Equipment Manufacturer
Alfred Baker, P.E. – Electrical Consulting	Representing Capstone ⁴
Hugh Henderson, Principal – CDH Energy	Overall Project Manager
Richard Sweetser, President – Exergy Partners	DOE/AGA Liaison

Technical Interconnection Issues

The landlord had not been receptive to Waldbaums’ initial request that he sign the interconnection agreement. Therefore, the following discussion is based on the premise that Waldbaums would be the signatory of the interconnection agreement, and as such, the point of interconnection would be defined as the connection of Waldbaums to the 500 KVA transformer.

LIPA required that additional primary-side breakers be installed because Waldbaums was not on simple “radial distribution lines” as required by the SIR. A radial distribution system means that one set of pole-mounted primary-side fuses serves a single transformer. Instead, Waldbaums and the other stores are served by a “looped primary system” with two transformers fed from a single set of load break fuses at the pole, as shown in Figure 2.

The looped distribution system at the site was apparently installed as the least cost option by the mall developer, who was responsible for the underground 13 kV distribution wiring, vaults and

⁴ Mr. Baker is a former LILCO employee and also acts as an electrical engineering consultant to LIPA/KeySpan.

pad from the pole to the transformer. When the Waldbaums space was gutted and renovated, primary wiring from the existing 300 kVA transformer was “looped” to the new 500 kVA transformer pad at the back of the store. This approach eliminated the need to run new wire all the way back to the LIPA pole. Installing the electrical wiring this way was quite rational from the mall owners point of view, since he saved significant wiring costs and only took on a modest amount of liability (i.e., he might be responsible for any problems with the distribution wiring).

As a result of the looped primary wiring, LIPA had required that PMF3 switchgear be installed on the primary side of 500 kVA transformer serving Waldbaums, in order to prevent any electrical fault due to the generator at Waldbaums from tripping the fuses at the utility pole. The new breakers would be intended to protect the other customers at the Mall (on the 300 kVA transformer) from having their power interrupted by a generator fault. The cost for LIPA to install this additional over-current protection would be \$40,000.

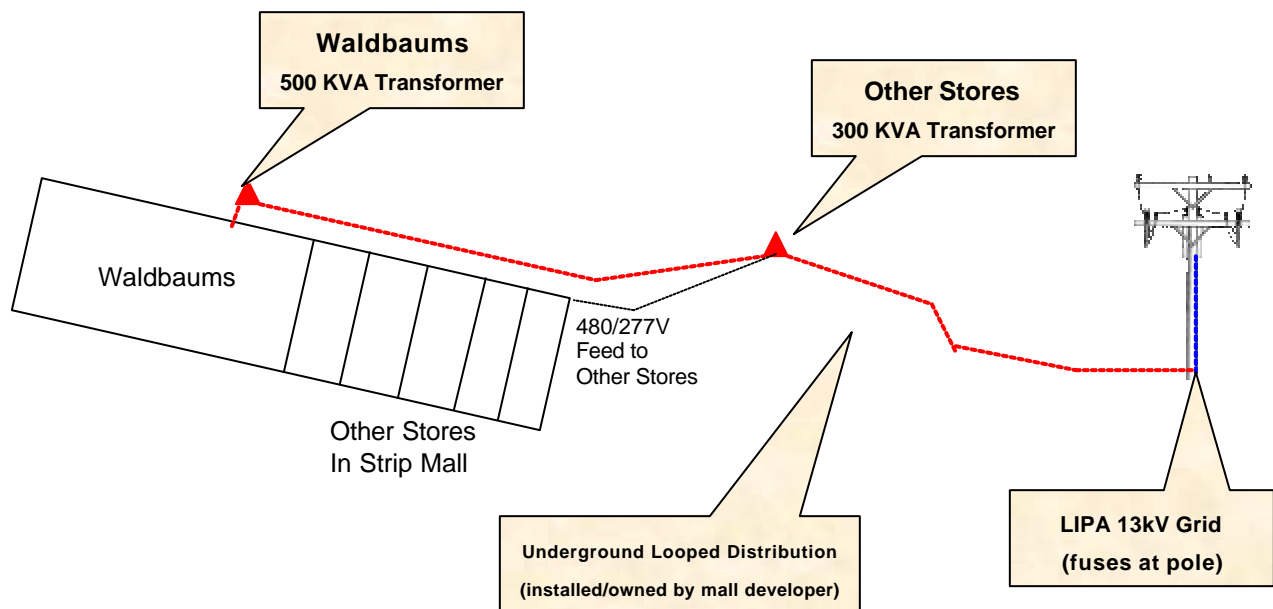


Figure 2. Electrical Distribution to Tenants at Veterans Highway Mall in Hauppauge

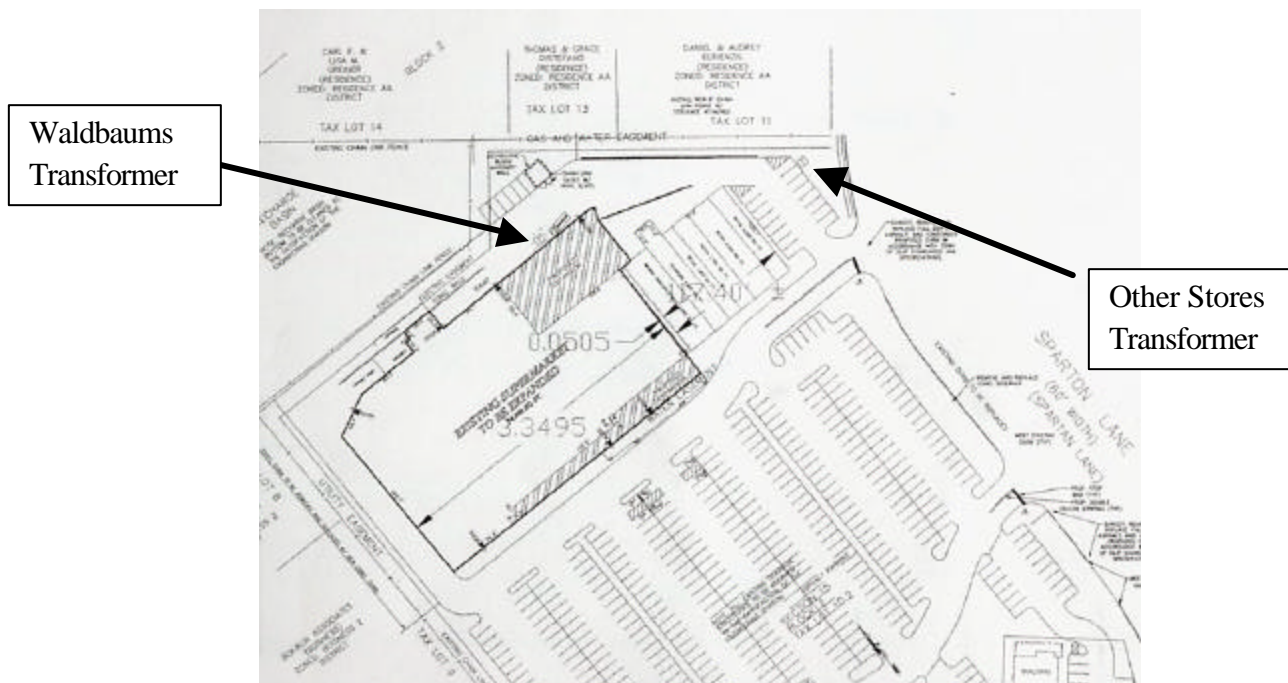


Figure 3. Site Layout at Veterans Highway Mall in Hauppauge

In the January 14 meeting, the technical need for the additional breakers was discussed. The project team point out that in order for the microturbine to cause a fault at the pole, and thereby interfere with power supply to the other stores in the strip mall, the following customer-owned protective devices in the Waldbaums store would have to all fail at the same time:

- the internal protection features inside the (type-tested) Capstone unit,
- two 100 amp fused disconnects,
- the 100 amp breaker for the microturbine at the MDP,
- the 1600 amp main breaker in the MDP.

Figure 4 shows the configuration of the electrical system and over-current protection devices.

The LIPA engineers conceded that likelihood of all these protective devices failing simultaneously was very remote. However, they said that it was LIPA policy not to rely on customer-side protective equipment to protect other customers on their system. What was not clear was why adding a type-tested microturbine generator into the facility would increase the risk of an electrical fault that could affect the other LIPA customers. In fact, the several 20-40 HP refrigeration compressors already in the Waldbaums store would be the more likely cause of a significant electrical fault. Mr. Baker, the electrical consultant at the meeting commented: that “the Capstone microturbine was the safest piece of [electrical] equipment on the property”.

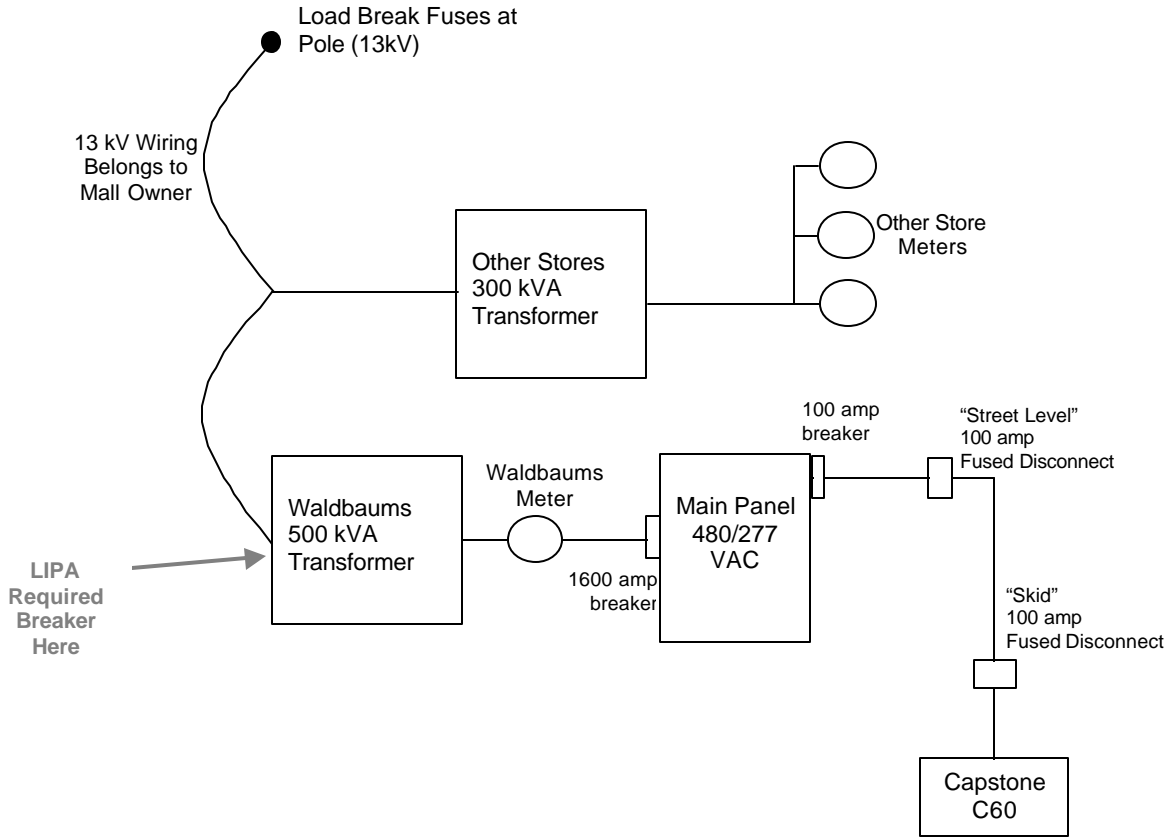


Figure 4. One-Line Drawing of Electrical Distribution and Over-Current Protection

Other technical options were discussed at the meeting such as the addition of protective relays⁵ at the microturbine or at the store's 480 Volt service entrance. LIPA indicated that this approach was not acceptable since it was LIPA's policy not to take responsibility for or rely on any 480 Volt equipment. Their crews are only trained to work on the primary side of the system.

Legal and Administrative Issues

While LIPA agreed that the addition of the primary-side breakers would not provide any additional protection from an electrical point of view, it was required because it was perceived to provide legal protection to LIPA.

The only way to eliminate the need for the primary-side breakers would be for the landlord – who already owns the 13 kV distribution wiring to Waldbaums and the other tenants – to sign the interconnection agreement. This would be acceptable to LIPA because, under such a scenario, the point of interconnection would be defined as the 13 kV breakers at the LIPA pole. In this scenario, a single entity (i.e., the landlord) becomes a radial branch on the LIPA grid and he

⁵ For instance a device such as Beckwith Model 3410a External Protective Relay, similar to what is typically installed on power generation equipment that has not been type tested in NYS. These microprocessor devices sense disturbances on the line and open the circuit (either microturbine-to-building or building-to-transformer) if any fault is detected.

would essentially assume the liability to all of the tenants for any failure on this loop feeder. In other words, if a fault occurs at one of the stores in the strip mall that shuts down the feeder at the utility pole, then the landlord would potentially be liable to Waldbaums and/or the other tenants for this service interruption.

So while interconnecting the microturbine to the Waldbaums store did not greatly change the risk of an electrical fault, it served to bring this already-existing liability issue with the looped feeder to surface⁶.

From an administrative point of view, LIPA's suggestion that the landlord sign the agreement brought a reluctant third party into the interconnection process. In this particular case, a good relationship between the landlord and his anchor tenant eventually solved the problem at this site (the landlord signed the interconnection agreement in March 2003). However, in a general sense the question to be asked is: "What is in it for the landlord?"

Meeting Summary and Result

After some discussion of the other options at the meeting, it became clear that the two options were to:

1. Install the PMF3 breakers on the transformer at a cost of \$40,000 to Waldbaums, or
2. Convince the landlord to sign the interconnection agreement.

In further discussions it became apparent that the scenario of installing additional over-current protection device would not only be expensive but would also cause considerable inconvenience at the store. If the new equipment were installed by LIPA, it would require about a 6 to 8 hour period of no power to the store in the middle of a weekday. A power outage of this duration would be a large problem for a supermarket since it would require significant action to protect frozen and refrigerated foods.

As a result, Waldbaums pursued further discussions with the landlord about the interconnection agreement. In order to alleviate some of the landlord's concerns and uncertainty, KeySpan Gas R&D offered to co-sign the agreement. LIPA agreed that this approach of co-signing the agreement would be acceptable.

One final administrative issue discussed at the meeting was the confusing relationship between LIPA and KeySpan Electric Services LLC. The LIPA Parallel Generation Agreement (PGA) for Interconnection of New Distributed Generation Units is signed by KeySpan Electric Services LLC on behalf of LIPA. Yet, there is no language within the Agreement providing documentation that KeySpan Electric Services LLC has the right to act on LIPA's behalf (see the agreement in Appendix A). In fact, a search of both the LIPA and KeySpan web sites⁷ revealed

⁶ It is not clear whether the landlord fully understood his liability when he installed the loop feeder. In the future, it might be more prudent for LIPA to recommend radial feeders in shopping malls, at least to large power users such as supermarkets.

⁷ LIPA's web site is www.lipa.org. KeySpan's web site is www.keyspanenergy.com

no definitive document to demonstrate that KeySpan was able to act on behalf of LIPA (although many available documents do allude to that contention).

Lessons for Other DG Installations

Looking forward, an important lesson-learned from the experiences at this site is the difficulty of installing DG systems in multi-tenant or leased properties. The likelihood of having a looped primary system in a multi-tenant retail mall is high. Dave Tomicki of A&P (Waldbaums' parent company) stated that he thought many of their stores located throughout the country would have similar distribution wiring in most malls. The current standardized interconnection requirements used by NY utilities only apply for radial feed systems with dedicated primary-side over-current protection.

During the meeting, Andris Garsils of LIPA indicated that they would require similar primary-side over-current protection for even a 2 kW photovoltaic array on a 500 kW supermarket. More research is required in order for utilities to understand the ramifications of DG equipment in electrical systems that are not radially fed. Perhaps additional safety testing as part of the type testing process could address the potential types of electrical faults in this configuration. Alternatively, field tests could be of value to demonstrate that equipment like the 60 kW Capstone microturbine are no more likely to cause an electrical fault than the 40 kW refrigeration compressor at a supermarket. These types of activities could address the engineering, safety, and liability concerns of LIPA and other NY utilities.

It would also be desirable to review the standard language associated with interconnection agreements to ensure it is clear and does not cause undue concern among end users. In this case the interconnect agreement delineated the owner's liability of operating a DG system, but did not accurately communicate that the mall owner already had similar liability issues with the existing looped primary distribution system. There appears to be a need for technology transfer materials to help building owners understand and assess the impact that a DG system has on their liability exposure. Some type of legal DG primer for the layman would be especially helpful when third parties such as landlords are dragged into the interconnection process.

Appendix A
Interconnection Agreement Submitted to
LIPA for Waldbaums, Hauppauge, NY

**LONG ISLAND LIGHTING COMPANY d/b/a LIPA
PARALLEL GENERATION AGREEMENT (PGA)
FOR INTERCONNECTION OF NEW DISTRIBUTED GENERATION UNITS
WITH CAPACITY OF 300 kVA OR LESS TO BE OPERATED IN PARALLEL
WITH RADIAL DISTRIBUTION LINES**

Customer/Owner Information:

Name:	<u>Mr. Dave Tomicki (customer)</u>	<u>Robert Steinberg (owner)</u>
Address:	<u>Waldbaums/A&P</u>	<u>Vets and Sparton, LLC</u>
	<u>1235 Veterans Memorial Highway</u>	<u>1328 Motor Parkway</u>
	<u>Hauppauge, NY 11749</u>	<u>Hauppauge, NY 11749</u>

Telephone: (201) 571-4860

LIPA Information:

LIPA
175 East Old Country Road
Hicksville, New York 11801
Attn: Distributed Resource Management

DEFINITIONS

Dedicated Facilities- means the equipment and facilities on LIPA's system necessary to permit operation of the Unit in parallel with LIPA's system.

SIR or Interconnection Requirements means the LIPA Interconnection Requirements for New Distributed Generation Units with a Capacity of 300 kVA or Less to be Operated in Parallel with Radial Distribution Lines.

Unit- means the distributed generation unit with a nameplate capacity of 300 kVA or less located on the Customer's premises at the time LIPA approves such unit for operation in parallel with LIPA's system. This Agreement relates only to such Unit, but a new agreement shall not be required if the Customer makes physical alterations to the Unit that do not result in (1) an increase in its nameplate generating capacity or (2) noncompliance with Interconnection Requirements. The nameplate generating capacity of the Unit shall not exceed 300 kVA.

I. TERM AND TERMINATION

- 1.1 Term:** This Agreement shall become effective when executed by both Parties and shall continue in effect until terminated.
- 1.2 Termination:** This Agreement may be terminated as follows:
- a. The Customer may terminate this Agreement at any time, by giving LIPA sixty (60) days written notice.
 - b. Failure by the Customer to seek final acceptance by LIPA within twelve (12) months after the execution of this Agreement unless LIPA consents in writing to an extension. LIPA's consent to such extension shall not be unreasonably withheld or delayed.
 - c. Either Party may, by giving the other Party at least sixty (60) days prior written notice, terminate this Agreement in the event that the other Party is in default of any of the material terms and conditions of this Agreement. The terminating Party shall specify in the notice the basis for the termination and shall provide a reasonable opportunity to cure the default.
 - d. LIPA may, by giving the Customer at least sixty (60) days prior written notice, terminate this Agreement for cause. The Customer's noncompliance with an upgrade to the SIR shall constitute good cause.
- 1.3 Disconnection and Survival of Obligations:** Upon termination of this Agreement the Unit will be disconnected from LIPA's system. The termination of this Agreement shall not relieve either Party of its liabilities and obligations, owed or continuing at the time of the termination.
- 1.4 Suspension:** This Agreement will be suspended during any period in which the Customer is not eligible for delivery service from LIPA.

II. SCOPE OF AGREEMENT

2.1 Scope of Agreement: This Agreement relates solely to the conditions under which LIPA and the Customer agree that the Unit may be interconnected to and operated in parallel with LIPA's system. This Agreement is subject in all respects to the applicable provisions of LIPA's Tariff for Electric Service (Tariff) and any amendments thereof, and to the rates, charges, rules, regulations, and conditions therein set forth, as the same may be in effect from time to time, all of which are hereby referenced and made a part hereof. LIPA's Tariff for Electric Service may be examined by the Customer at any business office of LIPA. The furnishing of service to the Customer will be subject in all respects to lawful orders, rules, or regulations of the Long Island Power Authority or of any other governmental body having jurisdiction, and LIPA will not be liable for any inconvenience or damage to the Customer from the discontinuance or change of any of LIPA's facilities or the service therewith if such discontinuance or change be required by law or by lawful order, rule, or regulation of any governmental body, by any amendments to the Tariff for Electric Service or to maintain the safety or reliability of LIPA's system. The provisions of LIPA's Tariff for Electric Service pertaining to its liability for any loss, injury, casualty or damage of any kind are specifically incorporated by reference into this Agreement and are made a part hereof. All disputes arising out of this Agreement will be presented to the Long Island Power Authority for resolution in accordance with the complaint procedures set forth in LIPA's Tariff for Electric Service.

2.2 Electricity Not Covered: LIPA shall have no duty under this Agreement to account for, pay for, deliver, or return in kind any electricity produced by the Unit and delivered into LIPA's System.

III INSTALLATION, OPERATION AND MAINTENANCE OF UNIT

3.1 Compliance with SIR: Subject to the provisions of this Agreement, LIPA shall be required to interconnect the Unit to LIPA's system, for purposes of parallel operation, if LIPA accepts the Unit as in compliance with the SIR. The Customer shall have a continuing obligation to maintain and operate the Unit in compliance with the SIR, as modified or amended.

3.2 Observation of the Unit - Construction Phase: LIPA may, in its discretion and upon reasonable notice, conduct reasonable on-site verifications during the construction of the Unit. Whenever LIPA chooses to exercise its right to conduct observations herein it shall specify to the Customer its reasons for its decision to conduct the observation.

3.3 Observation of the Unit - Fourteen-day Period: LIPA may conduct onsite verifications of the Unit or observe the performance of verification testing within a reasonable period of time, not exceeding fourteen days, after receiving a written request from the Customer to begin producing energy in parallel with LIPA's system. LIPA may accept or reject the request to begin producing energy in parallel with LIPA's system, consistent with the SIR, based upon the verification test results.

3.4 Observation of the Unit - Post-Fourteen-day Period: If LIPA does not perform an on-site verification of the Unit or observe the performance of verification testing within the fourteen-day period, the Customer may begin to produce energy in parallel with LIPA's system after certifying to LIPA that the Unit has been tested in accordance with the verification testing requirements of the SIR and has successfully completed such tests. After receiving the certification, LIPA may conduct an on-site verification of the Unit and make reasonable inquiries of the Customer, but only for purposes of determining whether the verification tests were properly performed. The Customer shall not be required to perform the verification tests a second time, unless irregularities appear in the verification test report or there are other objective indications that the tests were not properly performed in the first instance.

3.5 Observation of the Unit - Operations: LIPA may conduct on-site verification of the operations of the Unit after the Unit commences parallel operations with the LIPA system if LIPA has a reasonable basis for doing so based on its responsibility to provide continuous and reliable service or as authorized by the provisions of LIPA's Tariff relating to the verification of customer installations generally.

3.6 Costs of Dedicated Facilities: During the term of this Agreement, LIPA shall design, construct and install the Dedicated Facilities. The Customer shall be responsible for paying the incremental capital cost of such Dedicated Facilities attributable to operating the Customer's Unit in parallel with the LIPA system. All costs associated with the operation and maintenance of the Dedicated Facilities after the Unit first produces energy in parallel with the LIPA system shall be the responsibility of LIPA.

V. DISCONNECTION OF THE UNIT

4.1 Emergency Disconnection: LIPA may disconnect the Unit, without prior notice to the Customer (a) to eliminate conditions that constitute a potential hazard to LIPA personnel or the general public; (b) if pre-emergency or emergency conditions exist on LIPA system; (c) if a hazardous condition relating to the Unit is observed by a LIPA inspection; or (d) if the Customer has tampered with any protective device required for parallel operation under the SIR. LIPA shall notify the Customer of the emergency if circumstances permit.

4.2 Non-Emergency Disconnection: LIPA may disconnect the Unit, after notice to the Customer has been provided and a reasonable time to correct, consistent with the conditions, has elapsed, if (a) the Customer has failed to make available records of verification tests and maintenance of its protective devices; (b) the Unit interferes with LIPA system or equipment belonging to other customers of LIPA; (c) the Unit adversely affects the quality of service of adjoining LIPA customers.

4.3 Disconnection by Customer: The Customer may disconnect the Unit at any time.

V. ACCESS

5.1 Access to Premises: LIPA shall have access, at all times, to the disconnect switch of the Unit which isolates the Unit from the LIPA system. At reasonable hours and upon reasonable notice consistent with Section III of this Agreement, or at any time without notice in the event of an emergency (as defined in paragraph 4.1), LIPA shall have access to the Unit.

5.2 LIPA and Customer Representatives: LIPA shall designate, and shall provide to the Customer, the name and telephone number of a representative or representatives who can be reached at all times to allow the Customer to report an emergency. For the purpose of allowing access to the Unit, the Customer shall provide LIPA with the name and telephone number of a person or persons responsible for providing access to the Unit.

5.3 LIPA Right to Access LIPA-Owned Facilities and Equipment: If necessary for the purposes of this Agreement, the Customer shall allow LIPA access to LIPA's equipment and facilities located on Customer's property. To the extent that the Customer does not own all or any part of the property on which LIPA is required to locate its equipment or facilities to serve the Customer under this Agreement, the Customer shall secure and provide in favor of LIPA the necessary rights to obtain access to such equipment or facilities, including easements if the circumstances so require.

VI DISPUTE RESOLUTION

6.1 Good Faith Resolution of Disputes: Each Party agrees to attempt to resolve all disputes arising hereunder promptly, equitably and in a good faith manner.

6.2 Mediation: If a Customer complaint arises under this Agreement, the parties agree to comply with the Complaint Procedures of LIPA's Tariff.

6.3 Escrow: If there are amounts in dispute of more than two thousand dollars (\$2,000), the Customer shall either place such disputed amounts into an independent escrow account pending final resolution of the dispute in question, or provide to LIPA an appropriate irrevocable standby letter of credit in lieu thereof.

VII. INSURANCE

7.1 Disclosure: The Customer is not required to provide general liability insurance coverage as part of this Agreement, the SIR, or any other LIPA requirement. Due to the risk of incurring damages, LIPA recommends that every distributed generation customer protect itself with insurance, and requires insurance disclosure as a part of this Agreement. The Customer hereby discloses as follows:

(Note: Check off one of the boxes below.)

the Customer has obtained, or already has in effect under an existing policy, general liability insurance coverage for operation of the Unit and intends to maintain such coverage for the duration of this Agreement (attach Certificate of Insurance or copy of Policy); or

the Customer has not obtained general liability insurance coverage for operation of the Unit and/or is self-insured.

7.2 Effect: By not requiring the Customer to provide general liability insurance coverage for operation of the Unit in parallel with the LIPA system, LIPA does not waive any rights LIPA may have to pursue remedies at law against the Customer to recover damages.

VIII. MISCELLANEOUS PROVISIONS

8.1 Third Parties: This Agreement is intended solely for the benefit of the parties hereto. Nothing in this Agreement shall be construed to create any duty to, or standard of care with reference to, or any liability to, any person not a party to this Agreement.

8.2 Severability: If any provision or portion of this Agreement shall for any reason be held or adjudged to be invalid or illegal or unenforceable by any court of competent jurisdiction, such portion or provision shall be deemed separate and independent, and the remainder of this Agreement shall remain in full force and effect.

8.3 Entire Agreement: This Agreement constitutes the entire Agreement between the parties and supersedes all prior agreements or understandings, whether verbal or written.

8.4 Waiver: No delay or omission in the exercise of any right under this Agreement shall impair any such right or shall be taken, construed or considered as a waiver or relinquishment thereof, but any such right may be exercised from time to time and as often as may be deemed expedient. In the event that any agreement or covenant herein shall be breached and thereafter waived, such waiver shall be limited to the particular breach so waived and shall not be deemed to waive any other breach hereunder.

8.5 Applicable Law: This Agreement shall be governed by and construed in accordance with the law of the State of New York.

8.6 Amendments: This Agreement shall not be amended unless the amendments is in writing and signed by LIPA and the Customer.

8.7 Force Majeure: For purposes of this Agreement, "Force Majeure Event means any event: (a) that is beyond the reasonable control of the affected Party; and (b) that the affected Party is unable to prevent or provide against by exercising reasonable diligence, including the following events or circumstances, but only to the extent they satisfy the preceding requirements: acts of war, public disorder, insurrection, or rebellion; floods, hurricanes, earthquakes, lightning, storms, and other natural calamities; explosions or fires; strikes, work stoppages, or labor disputes; embargoes; and sabotage. If a Force Majeure Event prevents a Party from fulfilling any obligations under this Agreement, such Party will promptly notify the other Party in writing, and will keep the other Party informed on a continuing basis of the scope and duration of the Force Majeure Event. The affected Party will specify in reasonable detail the circumstances of the Force Majeure Event, its expected duration, and the steps that the affected Party is taking to mitigate the effects of the event on its performance. The affected Party will be entitled to suspend or modify its performance of obligations under this Agreement, other than the obligation to make payments then due or becoming due under this Agreement, but only to the extent that the effect of the Force Majeure Event cannot be mitigated by the use of reasonable efforts. The affected Party will use reasonable efforts to resume its performance as soon as possible.

8.8 Assignment to Corporate Party: At any time during the term, the Customer may assign this Agreement to a corporation or other entity with limited liability, provided that the Customer obtains the prior written consent of LIPA and the assignee agrees in writing to be bound by the terms of this Agreement. Such consent will not be withheld unless LIPA can demonstrate that such proposed assignee is not reasonably capable of performing the obligations of the assigning Customer under this Agreement.

8.9 Assignment to Individuals: At any time during the term, upon prior written notice to LIPA, a Customer may assign this Agreement to another person, other than a corporation or other entity with limited liability, provided that the assignee is the owner, lessee, or is otherwise responsible for the Unit and agrees in writing to be bound by the terms of this Agreement.

8.10 Permits and Approvals: Customer shall obtain all environmental and other permits lawfully required by governmental authorities prior to the construction and for the operation of the Unit in parallel with the LIPA system during the term of this Agreement.

8.11 Limitation of Liability: Neither by inspection, if any, or non-rejection, nor in any other way, does LIPA give any warranty, express or implied, as to the adequacy, safety, or other characteristics of any structures, equipment, wires, appliances or devices owned, installed or maintained by the Customer or leased by the Customer from third parties, including without limitation the Unit and any structures, equipment, wires, appliances or devices appurtenant thereto.

ACCEPTED AND AGREED:

Facility Owner (Vets and Sparton, LLC)

By: _____

Name: Robert Steinberg

Title: Owner

Date: _____

**KEYSPAN ELECTRIC SERVICES LLC
on behalf of Long Island Lighting Company
d/b/a LIPA**

By:

Name:

Title:

Date:

Microturbine Owner (KeySpan Energy Delivery)

By: _____

Name: Steven A. Vitale

Title: VP and Chief Gas Engineer

Date: _____

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**LONG ISLAND POWER AUTHORITY APPLICATION
FOR ATTACHMENT OF PARALLEL DISTRIBUTED GENERATION
EQUIPMENT
GREATER THAN 15 kVA BUT NOT EXCEEDING 300 kVA**

Customer:

Name: Waldbaums/A&P Phone: (201) 571-
4860

Address: 1235 Veterans Memorial Highway Municipality:
Hauppauge

Consulting Engineer or Contractor:

Name: Hugh I. Henderson Phone: (315) 655-
1063

Address: PO Box 641, Cazenovia, NY 13035

Estimated In-Service Date: January 2003

Existing Electric Service:

Capacity: 1,600 Amperes Voltage: 480 Volts

Service Charter: () Single Phase (X) Three Phase

Location of Protective Interface Equipment on Property:
(include address if different from customer address)

Microturbine on roof of facility

Energy Producing Equipment/Inverter Information:

Manufacturer: Capstone Microturbine
Model No. C60 / 60R-HG4
() Synchronous () Induction (X) Inverter () Other

Rating: 60 kW Rating: _____ kVA
Rated Output: _____ VA Rated Voltage: 480 Volts
Rate Frequency: 60 Hertz Rated Speed: _____ RPM

Efficiency: _____ % Power Factor: 100 %
Rated Current: _____ Amps Locked Rotor Current: _____ Amps
Synchronous Speed: _____ RPM Winding Connection:

Generator Connection: () Delta () Wye (X) Wye Grounded
System Type Tested (Total System): (X) Yes () No; attach product literature

Equipment Type Tested (i.e. Inverter, Protection System):
(X) Yes () No; attach product literature

One Line Diagram attached: (X) Yes
Installation Test Plan attached: () Yes

For Synchronous Machines:

Submit copies of the Saturation Curve and the Vee Curve

() Salient () Non-Salient

Torque: _____ lb-ft Rated RPM: _____

Field Amperes: _____ at rated generator voltage and
current and _____ % PF over-exciter

Type of Exciter: _____

Output Power of Exciter: _____

Type of Voltage Regulator: _____

Direct-axis Synchronous Reactance (X_d) _____ ohms

Direct-axis Transient Reactance (X_d) _____ ohms

Direct-axis Sub-transient Reactance (X_d) _____ ohms

For Induction Machines:

Rotor Resistance (R_r) _____ ohms Exciting Current _____
Amps

Rotor Reactance (R_r) _____ ohms Reactive Power
Required:

Magnetizing Reactance (X_m) _____ ohms _____ VARs
(No Load)

Stator Resistance (R_s) _____ ohms _____ VARs
(Full Load)

Stator Reactance (X_s) _____ ohms

Shore Circuit Reactance ($X@d$) _____ ohms Phases:

Frame Size: _____ Design Letter: _____ ()
Single ()

Three-Phase
Temp. Rise: _____ ° C.

For Inverters:

Manufacturer: _____ Model: _____
Type: _____ () Forced Commutated () Line
Commutated

Rated Output: _____ Amps _____ Volts

Efficiency: _____ %

Signature:

CUSTOMER SIGNATURE TITLE DATE

CUSTOMER SIGNATURE TITLE DATE