

# **LIPAEdge**

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## **ABSTRACT**

The Long Island Power Authority's (LIPA's) LIPAEdge Program is a voluntary demand response program designed to support LIPA's ability to deliver power on constrained days. The Program also assists LIPA's residential and small commercial customers in their efforts to conserve energy while protecting the environment and is an important component of the conservation mix of LIPA products and services. Participants allow LIPA to install a Carrier programmable thermostat for their central air conditioning and a communication board which provides unique two-way, wireless communication allowing control of their central air conditioning system. This communication system permits LIPA to curtail the customer's air conditioning systems through their thermostats and customers themselves are able to control their thermostat remotely over the Internet. Unlike one-way devices, LIPAEdge thermostats confirm the receipt of the broadcast curtailment, ensuring that LIPA knows exactly how many thermostats are participating. The thermostats also provide run-time data which is used to calculate kW impacts therefore giving LIPA accurate capacity savings at the time of peak load shed.

## **Introduction**

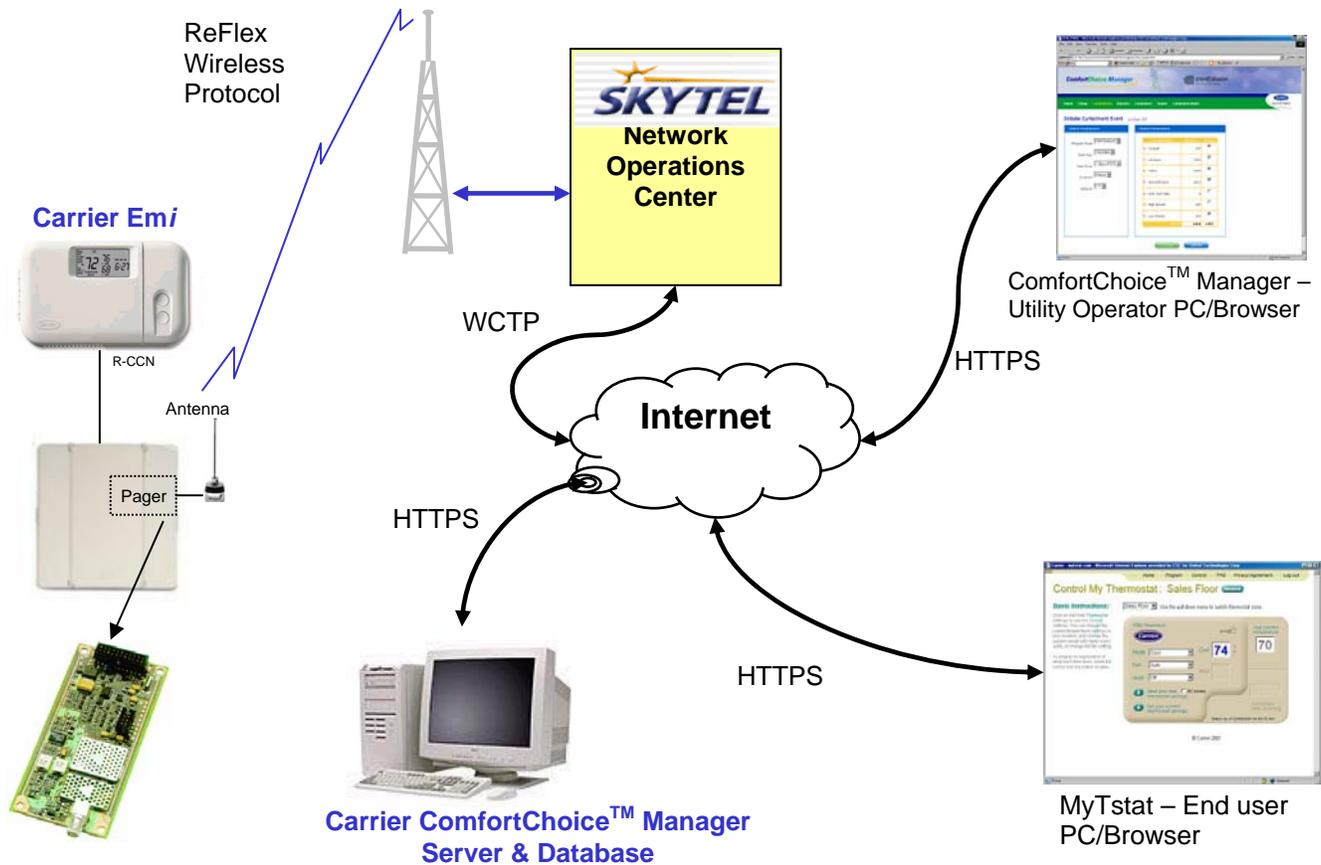
This paper will discuss the unique features of this program, event day activities and cross marketing with other LIPA programs.

## **Background**

The LIPAEdge Program not only allows customers to program their thermostats according to their lifestyle choices, but also allows LIPA to adjust their thermostats during periods of very high demand. This voluntary adjustment helps LIPA manage its electric supply during peak periods, ensuring the availability of reliable power for Long Island. Customers are allowed to override the adjustment, if necessary.

A programmable, digital Carrier ComfortChoice™ thermostat and communication board is provided and installed free of charge through the Program. Customers with room or through-the-wall air conditioning units are not eligible. Residential customers do not receive an incentive while commercial customers receive a one-time \$50 incentive. LIPAEdge participants have been grouped geographically so as to allow LIPA to be selective in the choice of whom to curtail. This flexibility gives the Program Manager the ability to control customers by location in response to specific outage occurrences, if necessary. Additionally, LIPA can select all participants for a curtailment event if it so chooses. Figure 1 shows the LIPAEdge system layout.

The technology also enables customers to remotely monitor and control their thermostat settings over the Internet with a password-encoded login on the Carrier [www.mytstat.com](http://www.mytstat.com) website. Some commercial customers with multiple electric accounts have utilized the system as an Energy Management System. There is also a pool pump component which uses a product developed by KeySpan Technologies and is based on a one-way communication system. The pool pumps are controlled during the same period as the thermostats, with power being turned off during the event period.



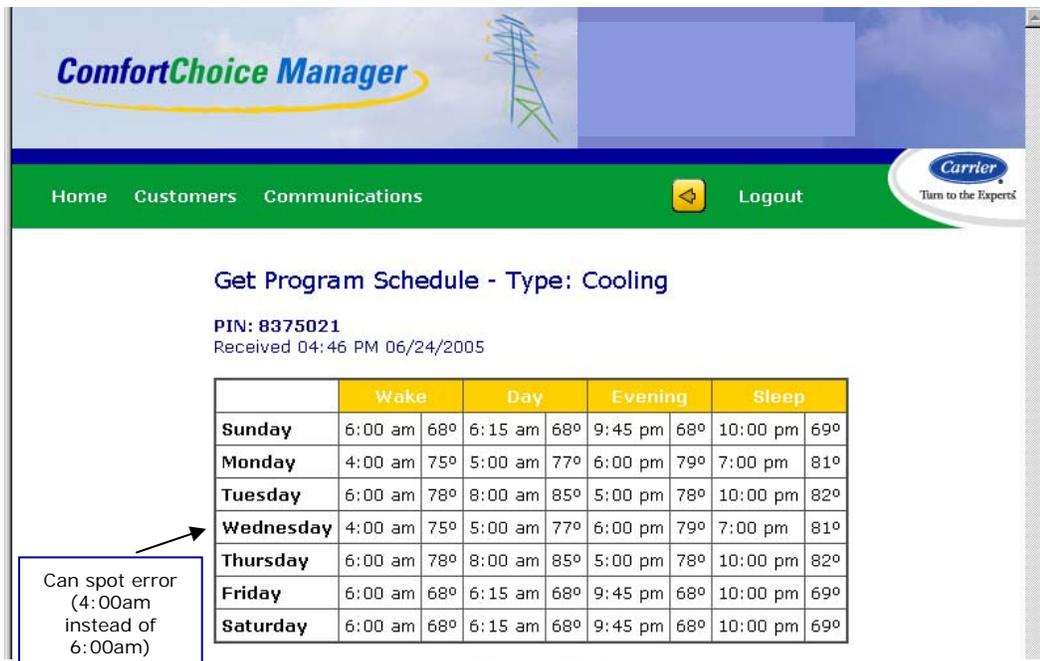
**Figure 1. LIPAEdge system layout**

The LIPAEdge thermostat is unique in the marketplace because of its two-way, verifiable load control feature. LIPA was the first utility to install and utilize two-way thermostat technology for Demand Response. Unlike one-way devices, LIPAEdge thermostats confirm the receipt of the broadcast curtailment, thereby ensuring that LIPA knows exactly how many thermostats are participating at any given time. Each of the thermostats store hourly run-time and indoor temperature data, which can be remotely downloaded via the Internet. This data, coupled with unit load information collected onsite, enables accurate impact evaluation for each curtailment event as well as providing the estimated kW impacts at any given moment during an event. The availability of real-time data over a long period of time results in less of a need for Measurement and Verification. The two-way feature provides benefits on an individual level as well as on a program level. During an event, real time savings/unit are available. On a program level, how customers approach the program can be analyzed by determining the number of overrides.

Through the LIPAEdge Program, LIPA has the ability to adjust customer's units in two ways: temperature adjustment by raising the cooling set point by a few degrees or through cycling the compressor (generally 50% cycling). The Program can be initiated a maximum of 7 days from June 1 and September 30 between the hours of 2 pm – 6 pm. The LIPA system peak typically occurs at hour ending 5 pm, followed by hours ending 4 pm, 3 pm and then 6 pm during a summer month. During the typical peak period, the residential load is usually increasing while the commercial load is decreasing. Participants have the ability to override the curtailment at the thermostat, not via the Internet, if desired, while LIPA has the capability to refresh the curtailment if necessary to achieve savings goals. On average, 16-20% of the customers

override. LIPA typically refreshes when the called event lasts for several hours. LIPAE<sub>edge</sub> offers a distinct advantage in that it provides LIPA the opportunity to initiate the program up to an hour prior to the peak, thus minimizing any risk involved with unanticipated weather impacts or outage situations.

There are many components to delivering this program. LIPA provides customer service 24 hours a day, seven days a week. An InfoLine call center and an overnight emergency line support the program. Staff is required for administration (such as troubleshooting over the phone and dealing with general customer issues), website maintenance, equipment installation and service. Figure 2 shows an example of a report that can be used to troubleshoot.



**Figure 2. Example of troubleshooting**

Since the Program’s inception in February 2001, LIPA has overseen the installation of over 33,000 thermostats, of which approximately 8,000 are small commercial, 2,300 are pool pumps and the remainder is residential. The LIPAE<sub>edge</sub> Program has become an integral component to LIPA’s operating plan when addressing peak summer loads. The Program has demonstrated its usefulness, especially during the summer of 2006 when the LIPA system hit its all-time peak. LIPA activated the program five times that year, including activations during the record heat wave from August 1 through August 3.

The Program has been activated as follows:

- 2001: 4 days called
- 2002: 3 days called
- 2003: 3 days called
- 2004: 1 day called
- 2005: 1 day called
- 2006: 5 days called
- 2007: 2 days called

- 2008: 0 days called

The duration varied on the different days as did the number of participants and load shed. On average, residential participants provide peak load reductions of approximately 1.4 kW/unit and small commercial participants provide approximately 1.9 kW/unit. Pool pumps provide approximately 0.74 kW per unit.

The size and scope of *LIPAEdge* is such that it is a significant part of the LIPA system resources addressing the load requirements of its customers. The ability to implement and accurately estimate the load impact of participants makes the program a supply resource on virtually the same basis as a power plant, but much cleaner and well-distributed. The availability of hourly run-time data and the capability to process such a significant volume of data in an efficient manner is the most innovative aspect of the program evaluation effort. The methods used have been adopted by other utilities and accepted by the New York State Public Service Commission and the NY Independent System Operator.

## **Program Equipment**

The LIPA program utilizes a two-way device manufactured by Carrier Corporation. The system installed in participants' homes or businesses consists of a thermostat and a communication board.

The ComfortChoice<sup>TM</sup> Manager is Carrier's web-based load curtailment software designed to allow utilities to schedule and initiate curtailments for any group of customers, and specify start time, duration, temperature offset or duty cycle. Using ComfortChoice<sup>TM</sup> Manager software from any web browser, utilities can communicate with Carrier thermostats installed in participant's locations to adjust the temperature setting or cycle equipment during peak demand periods. ComfortChoice<sup>TM</sup>'s two-way communication provides verifiable confirmation that each thermostat has received the curtailment command. Using the software, the Program Manager can view customer information, including status and history screens which display current curtailment status, thermostat settings, and curtailment participation. The ComfortChoice<sup>TM</sup> Manager also provides the Program Manager with a helpful tool to manage installations and day-to-day customer support operations.

During normal operating periods throughout the year, the customer equipment sends a weekly message from the device to the Carrier server. This "heartbeat" allows the Program Manager to know which customers are in complete communication with our system. Devices that don't send a signal for two weeks are investigated and corrected.

When a curtailment is initiated, devices will go into curtailment for a specified duration. The message to curtail is broadcast immediately and devices receive the message within 2 minutes. Events can be planned in advance for a particular day and time or called in real-time. Confirmation replies from devices are "spread-out" so as not to overwhelm the SkyTel network and can range from 10 minutes for a small pilot up to 2 hours for 30,000 devices. During an event, the customer will see a countdown and curtailment message on their thermostat as displayed in Figure 3. The Event Participation Report, which is a unique feature of two-way communications, provides details from all customers including confirmation of the curtailment signal, whether or not the customer overrode the curtailment and participation time in minutes (Figures 4 and 5).

What the customer sees on their thermostat during an event



Figure 3. Customer's curtailment display

Home Setup Curtailment Reports Customers Runtime Communications Logout

### Curtailment Event Summary Report

Date	Event ID	Program	Start Time	End Time	Degrees Set-back	Duty Cycling	Override Allowed	Termination Time	Total Devices	Available Devices	Confirmed Devices	No Response	Communication Rate %	Override Customers	Override Rate %
03/05/08	450	All with Overrides	04:10 PM	07:10 PM	2	N/A	Yes		15	11	10	1	90.9%	3	27.2%
03/06/08	452	All with Overrides	07:00 AM	08:00 AM	0	N/A	Yes		15	11	11	0	100%	1	9.0%
03/12/08	457	All with Overrides	10:00 AM	12:00 PM	4	N/A	Yes	03/12/2008 10:01	15	10	6	4	60%	0	0.0%
03/12/08	458	All with Overrides	11:00 AM	01:00 PM	4	N/A	Yes		15	10	10	0	100%	3	30.0%
03/31/08	465	All with Overrides	02:00 PM	06:00 PM	4	N/A	Yes		15	9	5	4	55.5%	0	0.0%

Figure 4. Event Summary Report

Home Setup Curtailment Reports Customers Runtime Communications Logout

### Curtailment Event Detail Report

Event ID: 458 Initiated 03/12/08 for 03/12/08 11:00 AM - 01:00 PM 4 °F Setback Overrides Allowed

Group ID	Group Name	Total Devices	Available Devices	Confirmed Devices	No Response	Communication Rate %	Override Customers	Override Rate %
1	First - Res	6	4	3	1	75.0%	1	25.0%
2	Second - CML	1	1	1	0	100.0%	0	0.0%
3	EPRI	1	1	1	0	100.0%	0	0.0%
4	Commercial	1	0	0	0	0.0%	0	0.0%
5	Residential	6	4	5	0	100.0%	2	50.0%
<b>Total Devices:</b>		<b>15</b>	<b>10</b>	<b>10</b>	<b>1</b>	<b>90%</b>	<b>3</b>	<b>30%</b>

Figure 5. Event Summary Report

Ongoing Efforts

Currently, there are over 33,000 installations representing 50 MW of load shed. Overall, feedback has shown that customers are very satisfied with their participation in the program. Due to sufficient capacity, LIPAedge is presently in maintenance mode and only adding customers to make up for those leaving the program and therefore, is not actively soliciting new participants. Customers will only be added to make up for those lost to attrition. The program maintains a sufficient backlog of leads consisting of customers signing up through the LIPAedge web site. However, should the need arise, the program will jointly market with the Cool Homes Program, which provides incentives to residential customers installing high efficiency central air conditioning systems, to control costs as well as add a commercial marketer to solicit customers specifically for LIPAedge. In addition, LIPAedge is collaborating with the Cool Homes Program to raise general program awareness in the Trade Ally community. An effort is being undertaken to increase trade ally familiarity with the LIPAedge equipment and the procedure to follow for troubleshooting in order to alleviate any inconvenience on the participants' side.

As part of an ongoing effort, the installation contractor has been instructed to spend more time educating the customer at the time of installation. This includes ensuring that customers understand the LIPAedge Program and how to operate their thermostat as well as knowing the number to call for additional help. A programming guide with helpful instructions was also developed by Carrier Corporation in order to better educate the customer. This is provided to the customer at the time of installation. An InfoLine is also available to assist the customer over the phone during the day and a service technician is available for after hours calls.

Customers are sent a letter every summer with the instruction sheet on how to operate their thermostat and what to do in the event of a curtailment. The letter also lists the LIPAedge web site and Infoline as a resource. The letter also discusses the benefits of using programmable thermostats to control energy costs.

Each spring, the installing contractor, the administrative support contractor and the LIPA Infoline staff are given a refresher course on the program. The training is repeated in the fall to again review troubleshooting actions. The LIPAedge website is also updated to include a winter/summer message at the appropriate time.

All of this effort is to keep the LIPAedge customer satisfied, remain in the program, and recommend it to others.

### **Key Opportunities**

There are several areas that are key opportunities and add value to the program. The two-way communications feature that allows for the unique ability for verification of demand savings will have increased value as more stringent M&V protocols are instituted to meet year 2015 efficiency goals. There will be less of a need to spend money on M&V with the system that is currently in place.

Another area of opportunity is taking advantage of the two-way communication capability to appeal to customers who view the internet access as a prime motivator. These customers can program their thermostat remotely via the LIPAedge web site. Customers that fall into this category are customers who have second homes, customers that are away from home on an extended basis or customers who simply want new technology. To date approximately 22% of LIPAedge participants actively use the internet

feature.

Working with the residential Cool Homes Program will have several benefits. Synergies will be achieved by approaching the Trade Ally community jointly and will also provide the opportunity to cross-market should the need to increase LIP*Aedge* participation arise.

Lastly, the program currently has over 33,000 participants who can provide valuable information on appliance saturation and energy habits.