Carrier

ComfortChoice

Itron

Saving Energy and the Environment

Message

- ComfortChoice is a complete solution!
- Trusted Companies with a proven record
- Differentiated from others by 2 way, informed enduser, run-time data, and snapshot.
- Two Way is technology of the future.
- Endusers have been extremely happy with our product.

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Partners in the Program

Carrier®

Itron

Who is Itron?

- Itron's mission
  - Optimize the delivery and use of energy and water.

- We are extending the value we deliver
  - **span the entire energy and water value chain.**
  - **Focused effort to move beyond**
    - **Itron the meter reading company**

Itron Capabilities

- Meter data collection
- Energy information management
- Load management and demand response
- Transmission and distribution solutions
- Load forecasting and analysis
- Workforce automation
- Customer connectivity

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Past and Current Projects

Portland General Electric

Connecticut Light & Power
The Northeast Utilities System

PSE PUGET SOUND ENERGY

LIPA Long Island Power Authority

SDGE

NewPower™ Power to run your life®

Northeast Utilities System

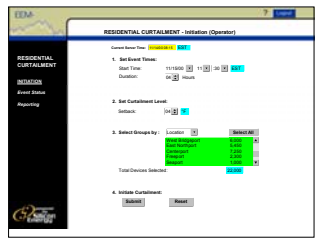
conEdison

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL℠ Company

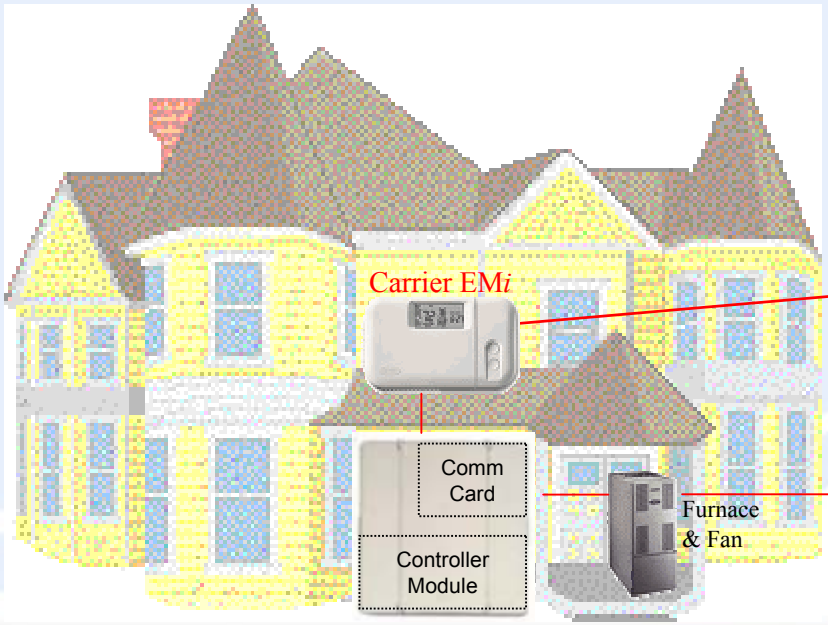
ComfortChoice Architecture

Enduser's
Web Interface

Internet



Operator
Web Interface



Furnace
& Fan

Central Air Unit or
Heat Pump

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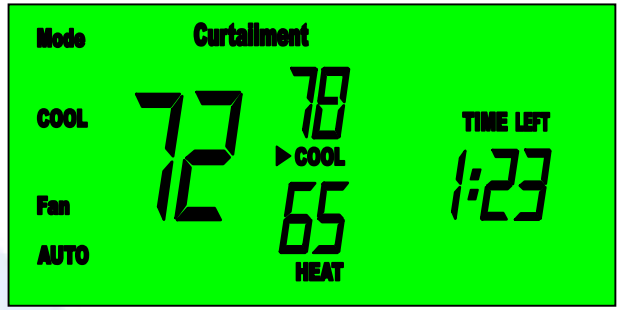
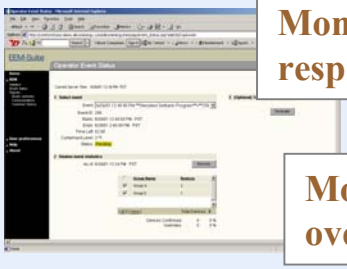
Curtailment Event Flow

Utility

Initiates a Setback or Cycling Curtailment

EM*i* responds acknowledging Curtailment command



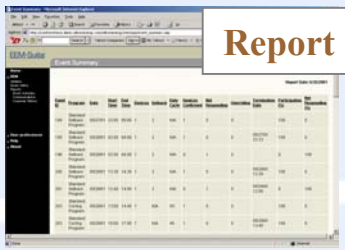


Monitors EM*i* responses

Monitors customer overrides

Customer can view Curtailment event through web interface or at EMi

EM*i* begins curtailment event

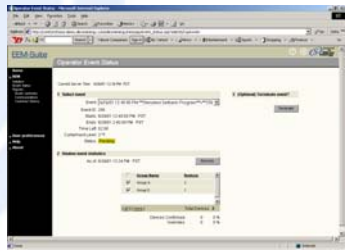


Report on Events

Customer can override event through EM*i*

Pieces of the System

- EMi thermostat
- Two Way Paging Radio
- Itron's software
- Mytstat web interface

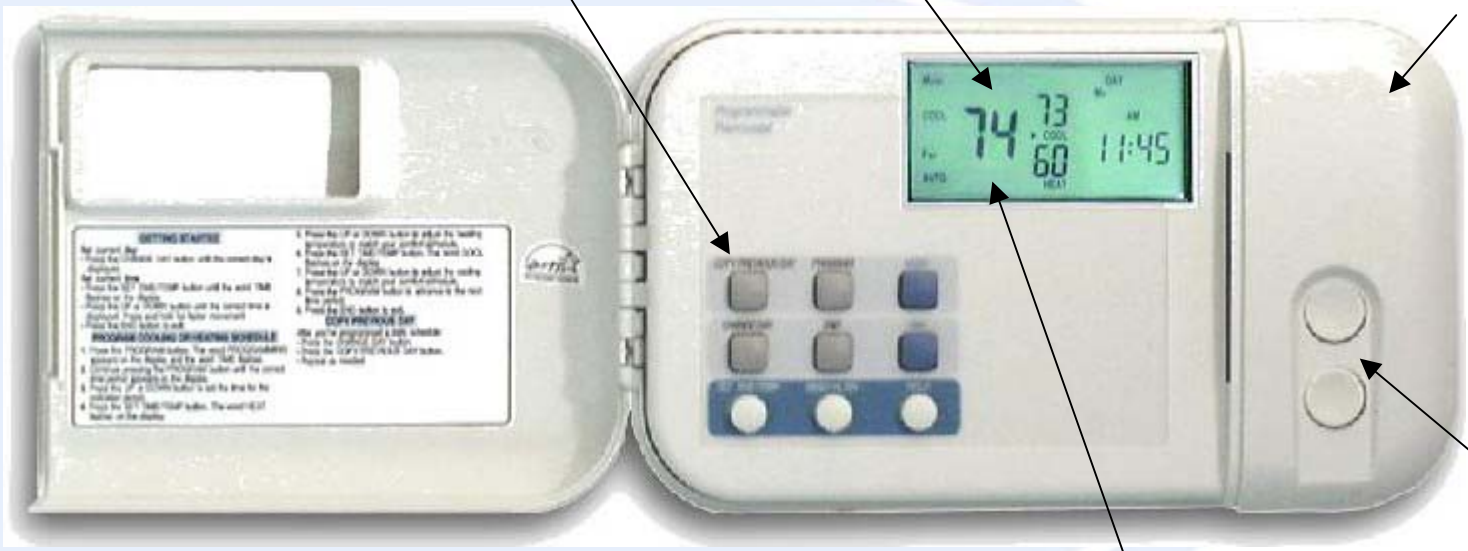


Energy Management Interface (EM*i*)

7-day programming
4 periods per day

Large, backlit LCD with
character messaging

2-way
communications



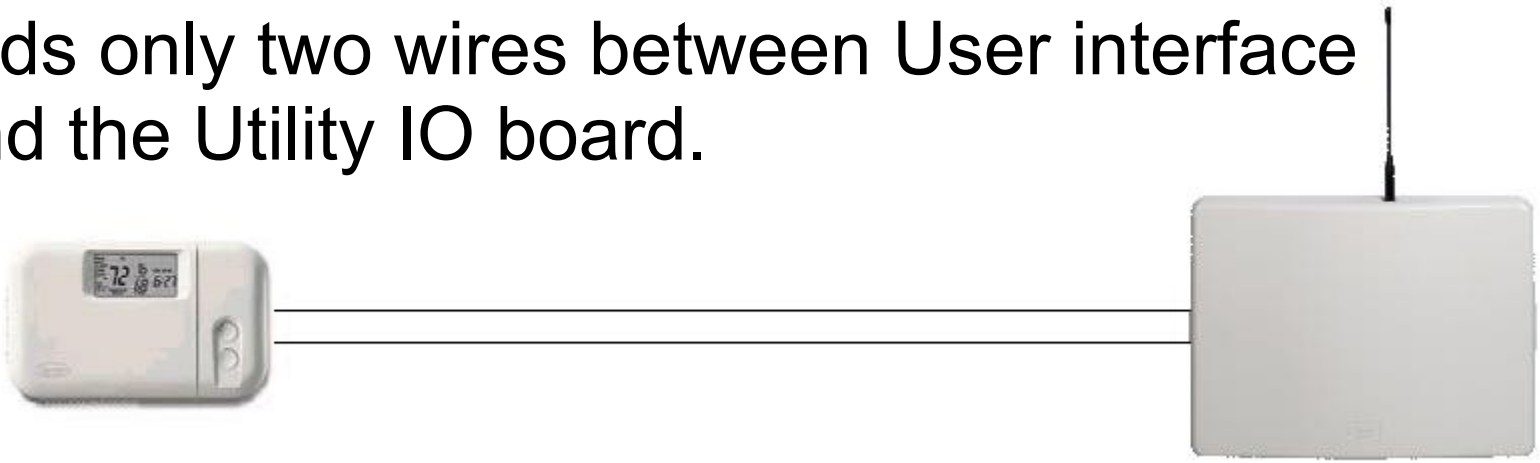
Curtailment
override

Clean filter indicator

Battery-Free

Utility IO Board

Needs only two wires between User interface and the Utility IO board.



Residential Curtailment

Residential Curtailment Manager streamlines the process of initiating curtailments, monitoring participation, and reporting results.

◆Key Features

- ✓ Web-based
- ✓ Day-ahead or Day-of curtailment events
- ✓ Target flexible groups of customers
- ✓ Monitor performance in real-time
- ✓ Report customer participation

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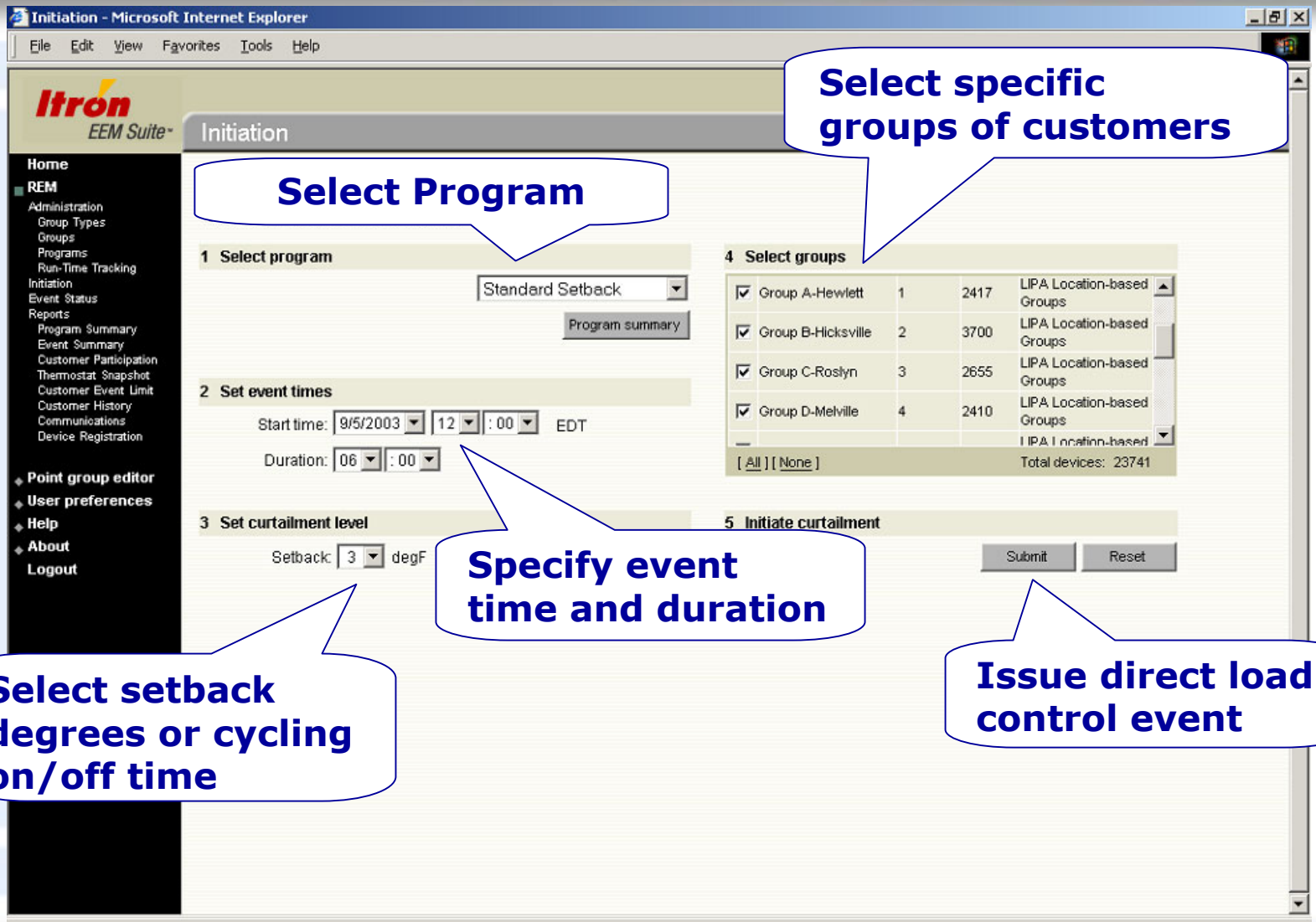
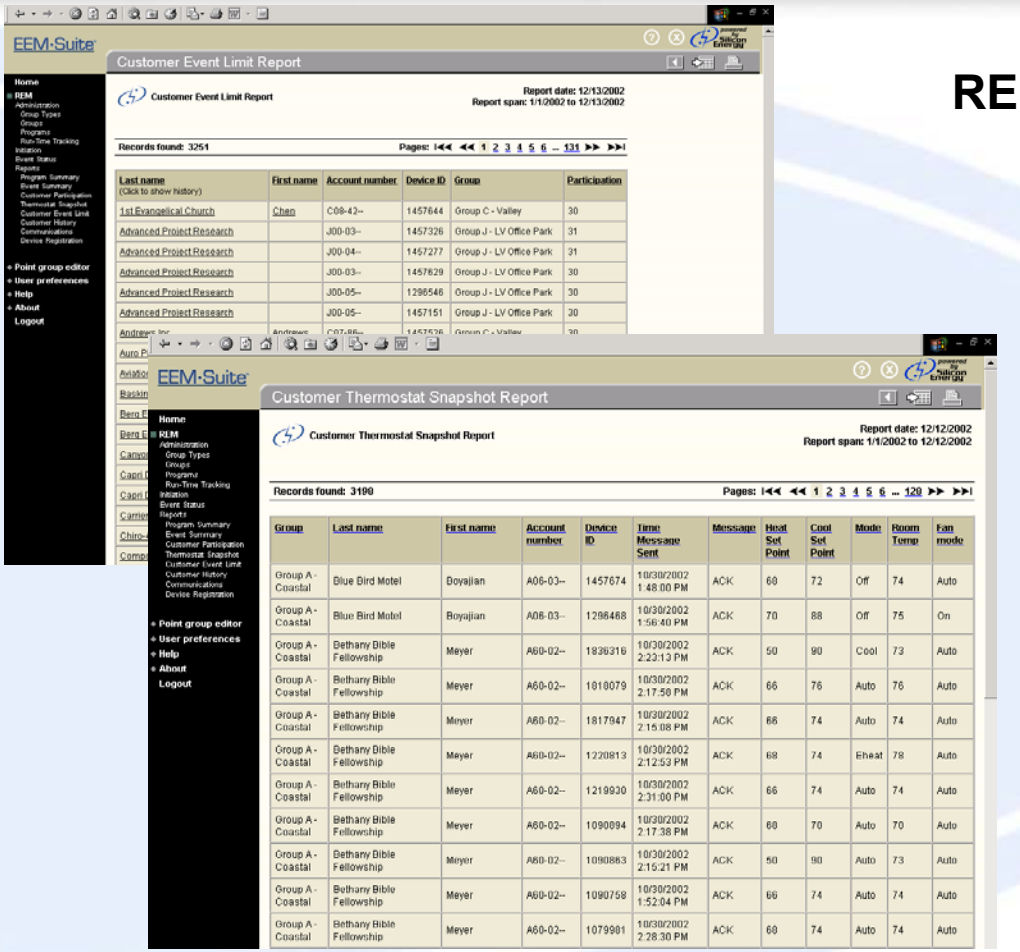
Utility Initiates *REM* Event



REM Contains Many Standard Reports



REM contains eight utility reports with the following highlights:

– track events by program displaying corresponding times and devices involved

– thermostat set-back amounts or duty cycling minutes on/off

– illustrates responsiveness and sensitivity of customers (overrides vs. overall participation)

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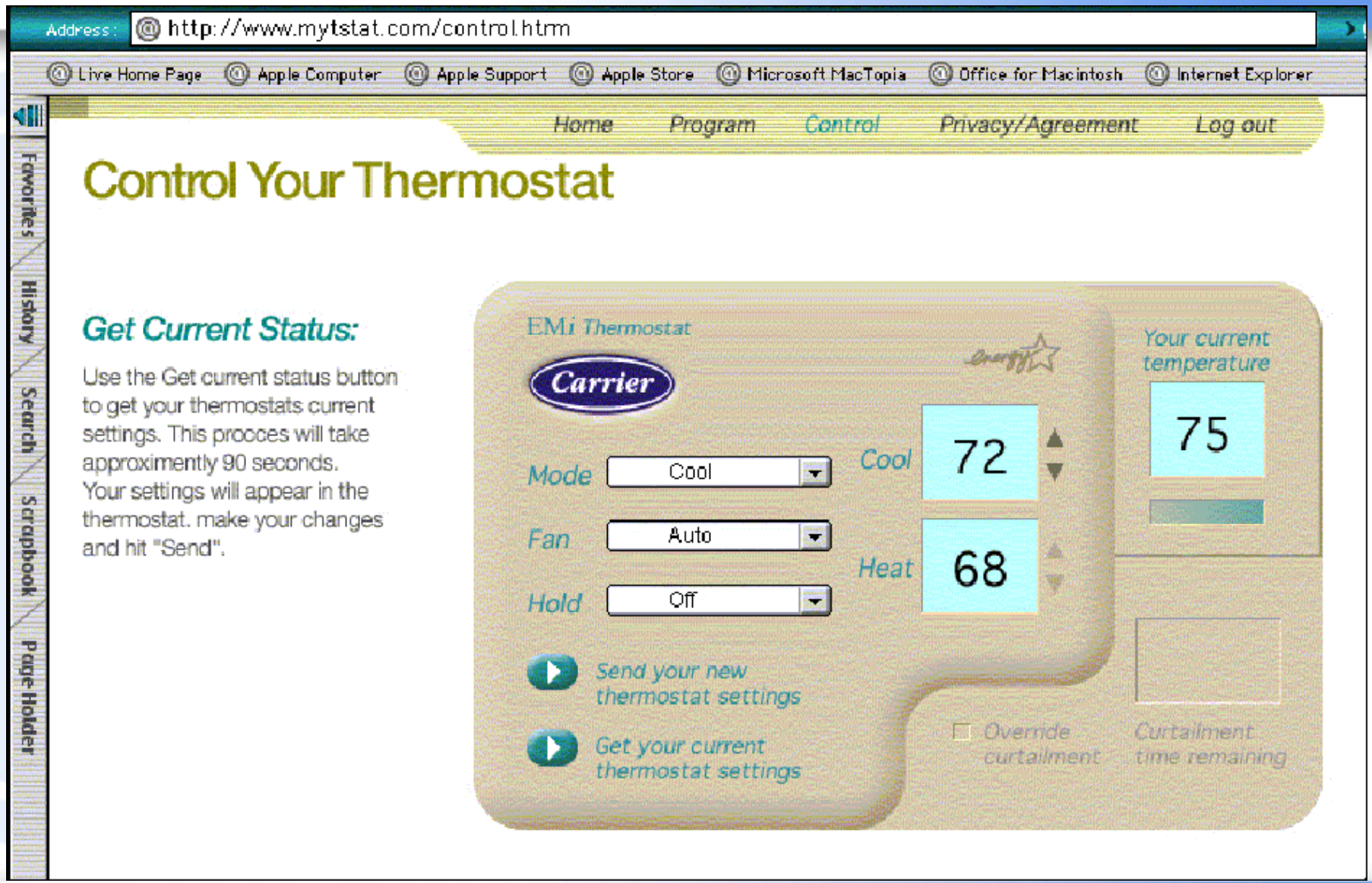
Enduser Web Browser



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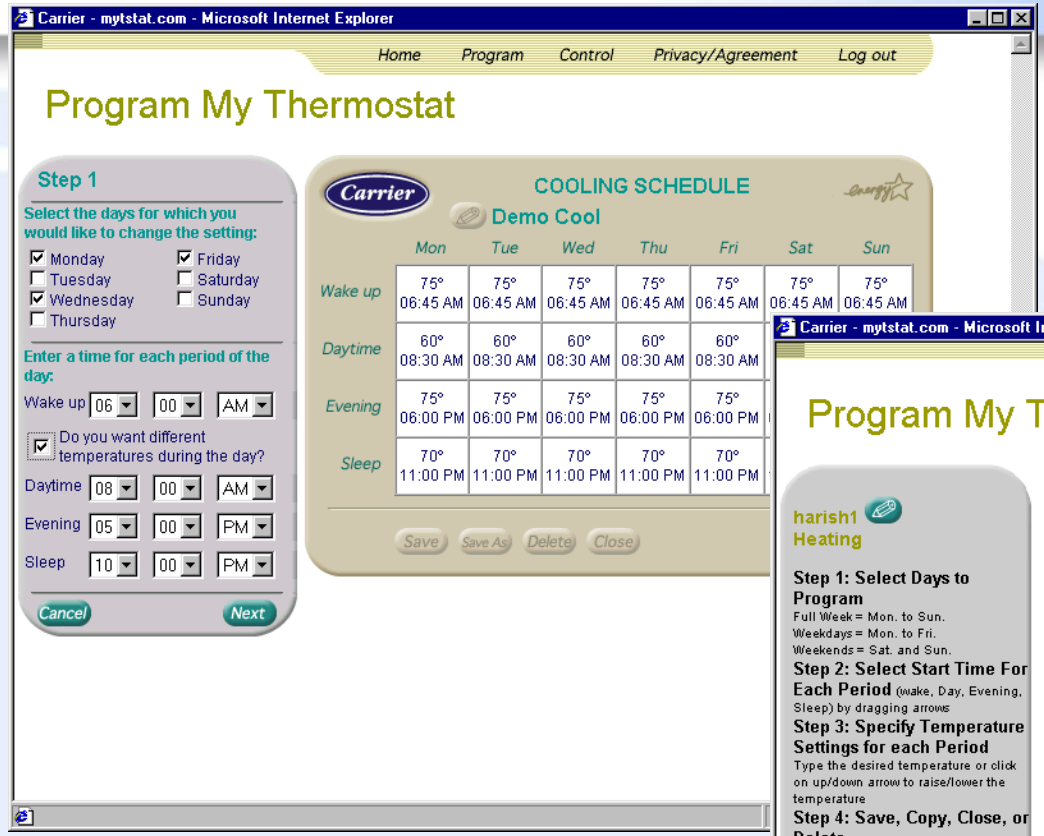
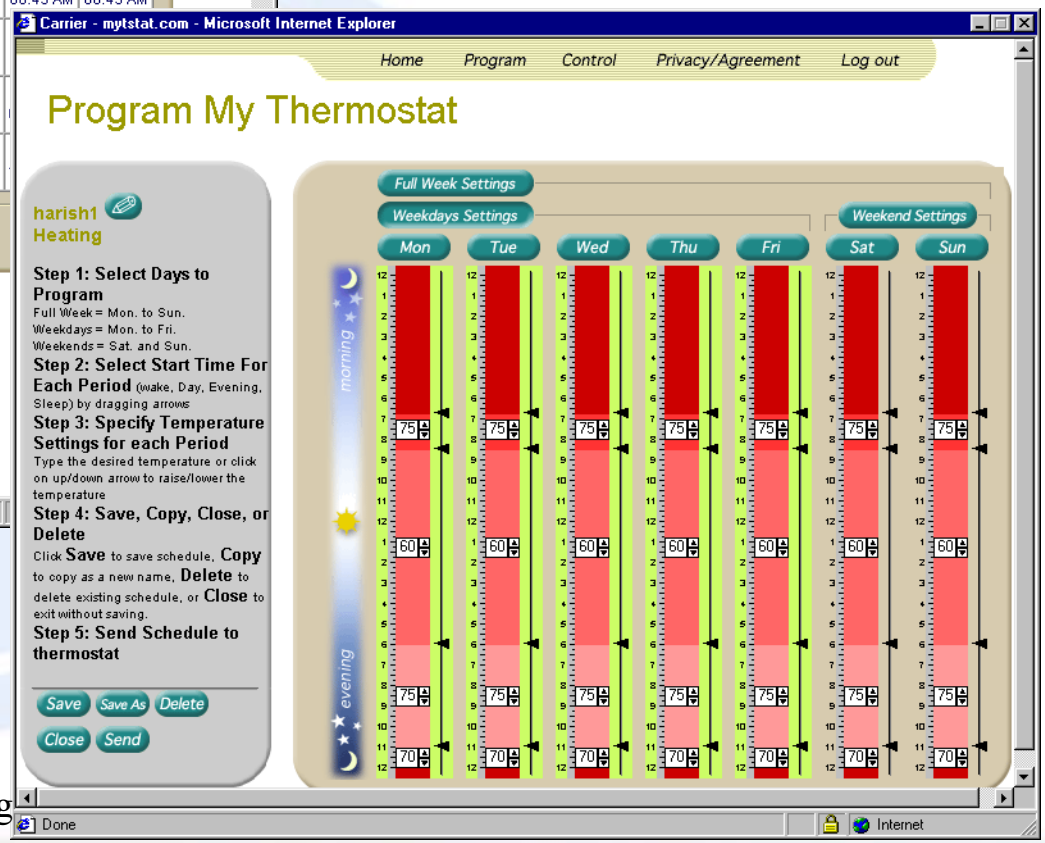
Web Programmability Interface



"Step-By-Step" Programming Wizard



"All-In-One" Expert Programming

- Easy-to-view programming interface
- Simple, easy-to-use slide bars and drop-down menus

- Demo

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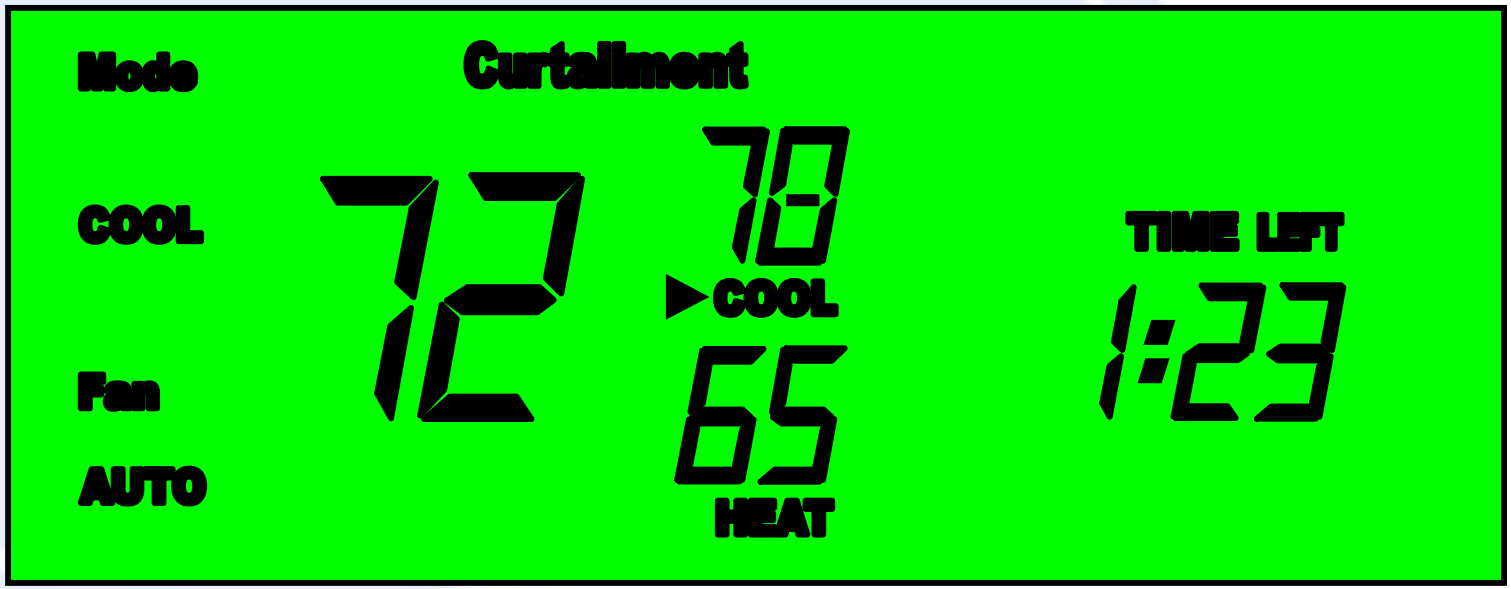
What Makes Ours Unique?

- Homeowner is informed.
- Ability to Override
- Cycling or Temperature Setback
- Mandatory or Voluntary
- Auxiliary Device Control.
- Internet access to the thermostat.
- Run Time Data
- Snapshot Feature

Homeowner is Informed

- "Curtailment" and "Time Left" Indicators
  - The amount of time remaining in the curtailment is indicated as a countdown timer.



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Run Time Data

- What it does?
  - Thermostat tracks equipment run time cycles and minutes and average room temperature and setpoints.
  - Thermostat can store the data for 24 hours for 7 days.
  - Transmits the data on request.
  - SiE software stores the data
- What it means?
  - Allows a comparison for estimating of load savings instead of sub-metering.
  - Allows preventive diagnostics.

Proposed Snapshot Timeline

Curtailment Snapshot

1

Record Start Mode, Setpoints, Fan, Hold and Room Temp.

2

During Event record runtime, avg. temp, starts for each hour

3

Record End Mode, Setpoints, Fan, Hold and Room Temp.

4

Send Snapshot to Server

Curtailment Starts

Curtailment Ends or Override

Scheduled Time or when requested

Sample Snapshot Data

	Start	Hour 1	Hour 2	Hour 3	Hour 4	End (or at override)
Current Temp	72	74	75	76	76	76
Cool Setpoint	72	76	76	76	76	72
Mode	Cool	Cool	Cool	Cool	Cool	Cool
Fan	Auto	Auto	Auto	Auto	Auto	Auto
Hold	Off	Off	Off	Off	Off	Off
Run Time	-	0	0	17	45	-
Number of Starts	-	0	0	1	2	-

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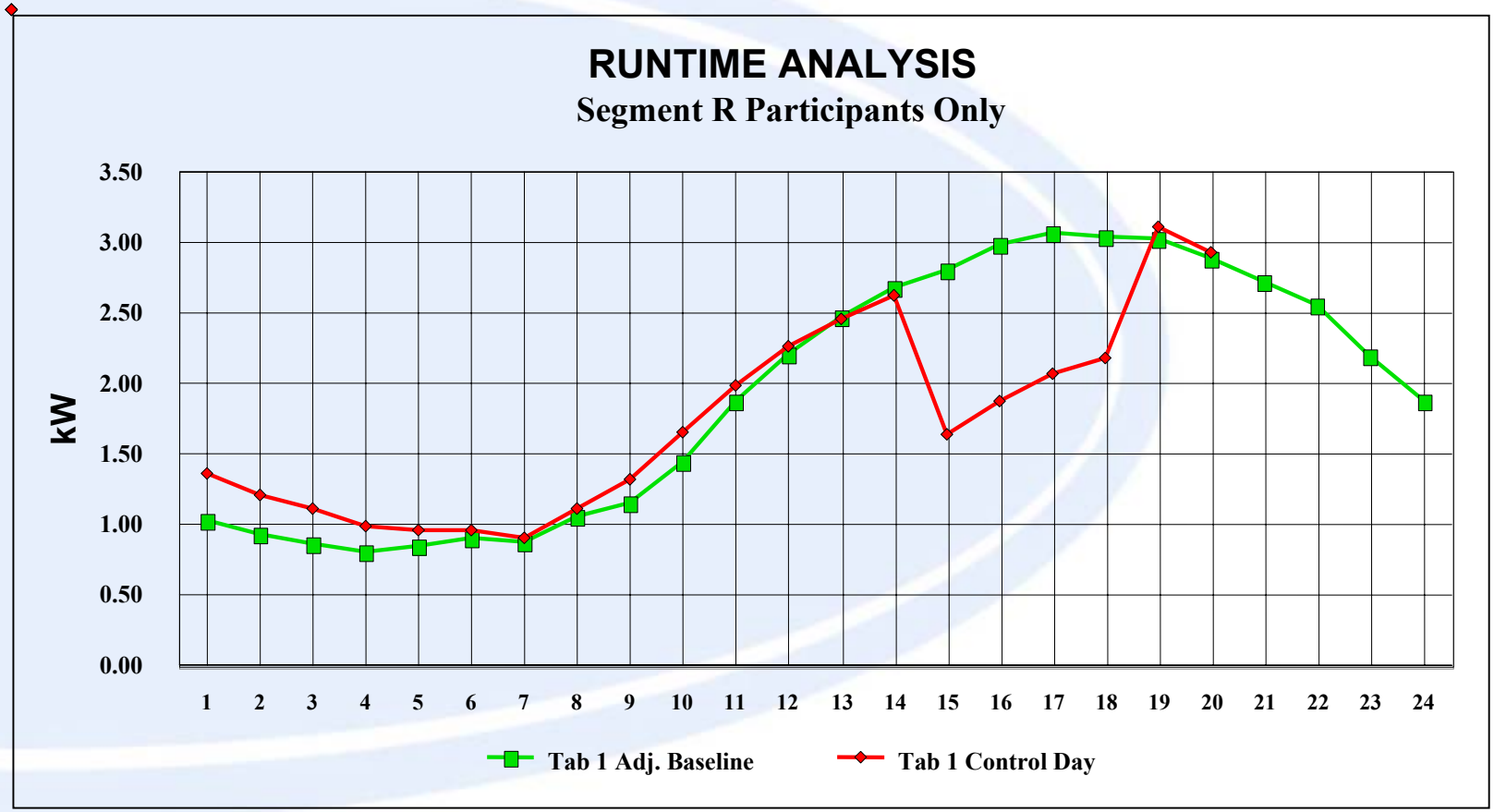
6. Conclusions and Recommendations

"Responsive load has the potential to be a more reliable and lower-cost supplier of contingency reserves, especially spinning reserve. This report provides detailed results from one example technology, the Carrier ComfortChoice responsive thermostats deployed in the LIPAEdge program to provide peak demand reduction through central control of residential and light commercial air-conditioners. Preliminary analysis indicates that these responsive loads could be excellent providers of spinning reserve. . . . "

"Spinning Reserve From Responsive Loads" – prepared by Brendan J Kirby, Oak Ridge National Laboratory, March 2003.

Curtailment Day vs. Baseline Day



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SCE's ImpactAnalysis

For a 4-Degree Curtailment:

- Peak demand reduction
  - **0.57 kW per ton**
  - 10 MW total
- First hour energy savings
  - 0.35 kW / ton
  - 6 to 7 MWh total
- Second hour energy savings
  - 0.2 kW / ton
  - 3 MWh total
- Effective duration: about 55 minutes
- Little or no snapback

•Mark Martinez (SCE) and Roger Wright (RLW consulting) at WLRA in January 2003

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Why Two-Way?

- Informed Homeowner, curtailment displayed on thermostat.
- Override capability keeps the customer in control leads to easier recruitment.
- Verification of curtailment through acknowledgement back, confidence equipment is curtailed.
- Tracking of runtime of equipment for load estimation and proof load curtailed.
- Tamper proof as heartbeats give confidence that the thermostats are working and less auditing in the future.

Real Time Pricing Event Flow

Customer

Customer has programmed EMi

Monday	Cool	Heat
6:45	76	68
9:00	78	66
4:30	76	70
10:45	80	62

Customer also programmed offset Table

Stage	Price	Ht Offset	Cl Offset	Waterl
1	2 - 6	0	0	on
2	6 -12	2	1	on
3	12 - 20	4	3	off
4	20 -30	10	6	off
5	>30	15	10	off

Utility

Sends current price level

EM*i* Device

EMi automatically adjusts setpoint

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Thoughts on the technology

- One Way paging to be phased out
- Call in to thermostat available soon.
- Thermostat to call out on warnings coming soon.
- The market demand for home automation is still several years away.
- RTP or CPP products are available, but customers are not.

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Thoughts on Demand Response Programs

- Customers are willing to participate
- Internet access is neat and cool, but used only by 20%.
- Programmable thermostats still a challenge to many.
- Installation is the crutch in many areas.
- Customers are not interested in anything but flat pricing. Will take time to change that mindset.
- Ability to override leads to easier recruiting.

Advantages of ComfortChoice℠

ComfortChoice is the only program that provides:

- Load control through temperature setback or cycling with or without override.
- Addressable peak load reduction with Grouping feature.
- Can be used in both heating and cooling.
- Increases customer participation with override capability.
- Allows customer internet access to device.
- Monitors system health with EM*i* Heartbeats.
- Provides value-added product offering.
- Brand name recognition to assist with customer recruitment.
- Verifiable and informed load control.