



**ComfortChoice**

**Itron**

***Saving Energy and the Environment***



- ◆ 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.





- ◆ 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

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

# Past and Current Projects



**Connecticut  
Light & Power**

The Northeast Utilities System



**NewPower<sup>TM</sup>**  
*Power to run your life<sup>®</sup>*

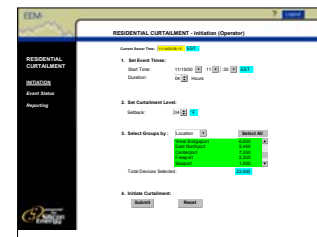
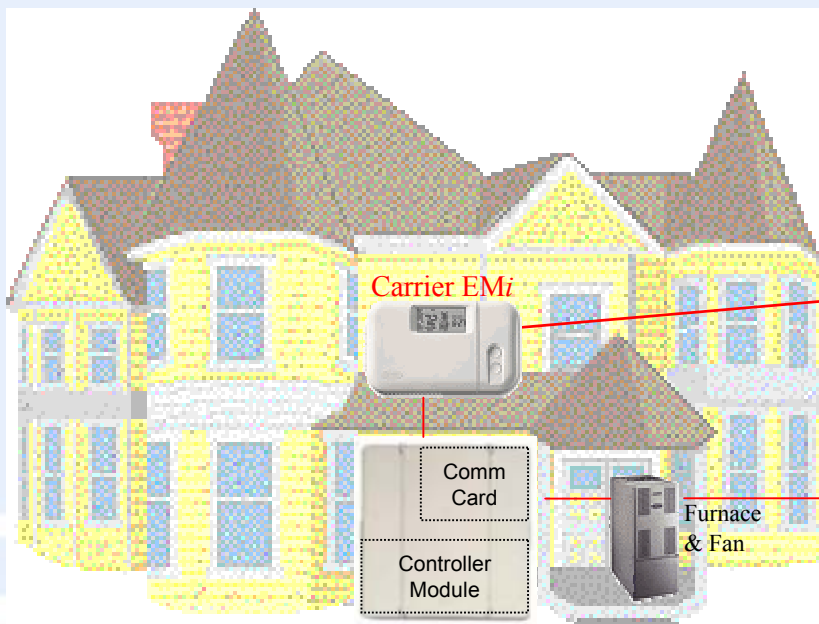


**Northeast  
Utilities System**





Enduser's  
Web Interface



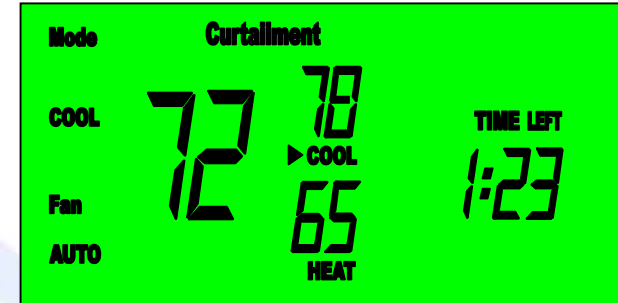
Operator  
Web Interface

Utility



Initiates a Setback or Cycling Curtailment

EMi responds acknowledging Curtailment command



Monitors EMi responses

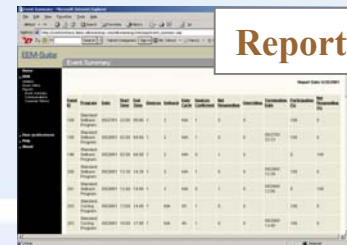
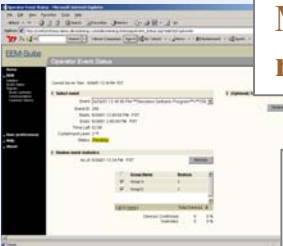
Monitors customer overrides

Customer can view Curtailment event through web interface or at EMi

EMi begins curtailment event

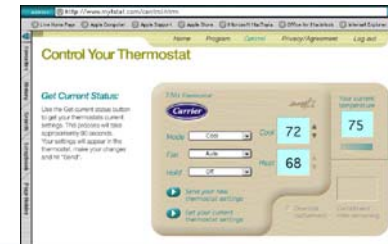
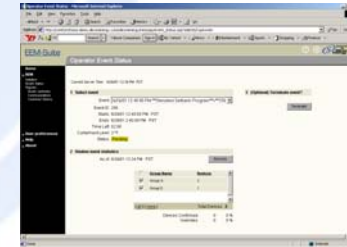
Report on Events

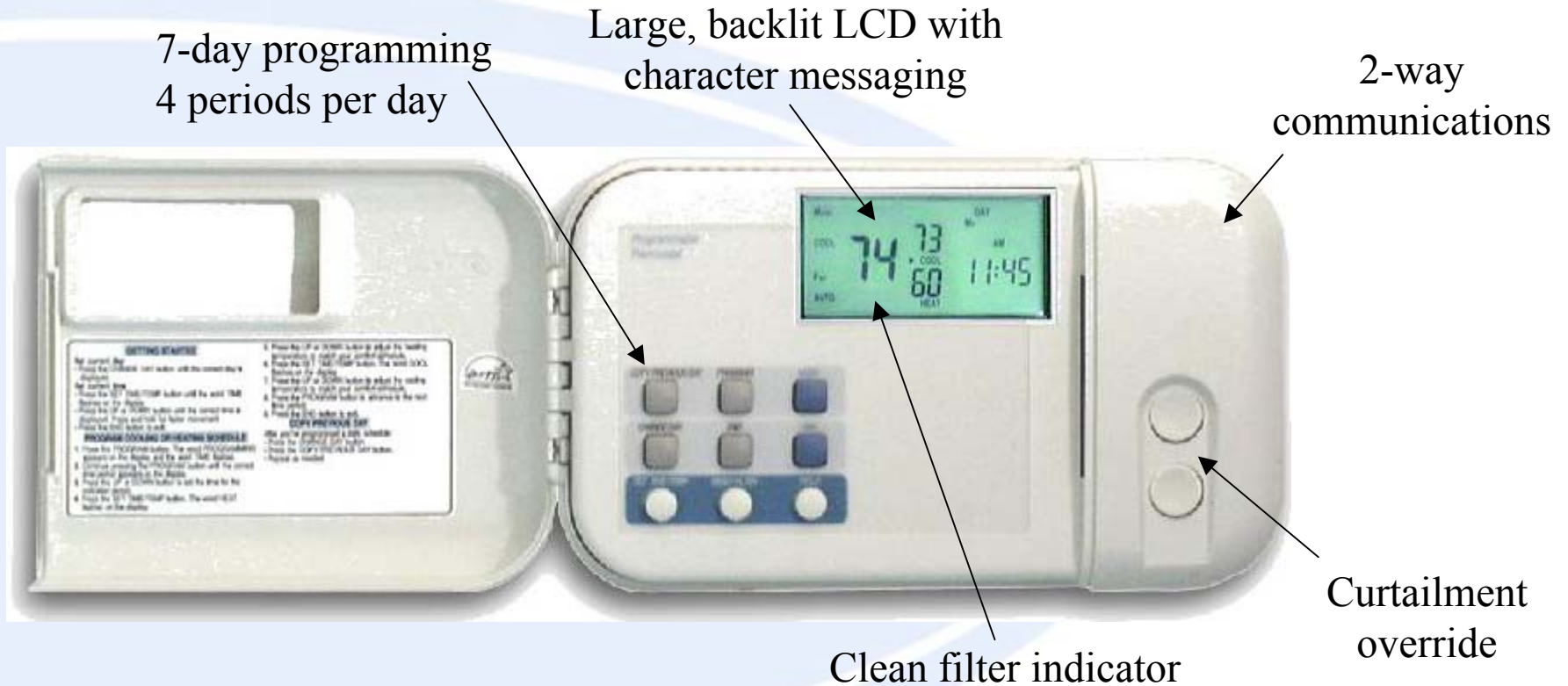
Customer can override event through EMi





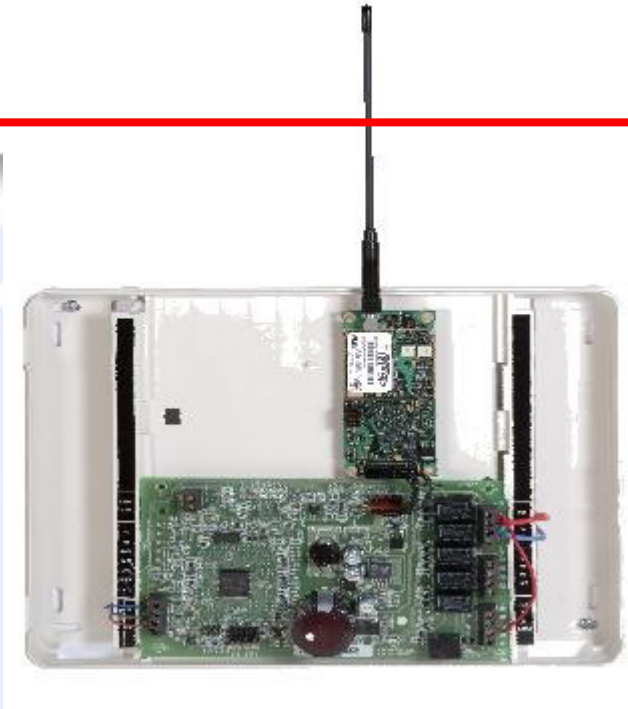
- ◆ EMI thermostat
- ◆ Two Way Paging Radio
- ◆ Itron's software
- ◆ Mytstat web interface





Battery-Free





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



*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

## Utility Initiates *REM* Event

The screenshot shows the Itron EEM Suite web application interface. The browser title is "Initiation - Microsoft Internet Explorer". The page has a navigation menu on the left with options like Home, REM, Administration, Group Types, Groups, Programs, Run-Time Tracking, Initiation, Event Status, Reports, Program Summary, Event Summary, Customer Participation, Thermostat Snapshot, Customer Event Limit, Customer History, Communications, and Device Registration. The main content area is titled "Initiation" and contains five sections: 1. Select program (with a dropdown menu set to "Standard Setback" and a "Program summary" button), 2. Set event times (with fields for Start time: 9/5/2003 12:00 EDT and Duration: 06:00), 3. Set curtailment level (with a dropdown menu set to 3 degF), 4. Select groups (a table of groups with checkboxes), and 5. Initiate curtailment (with Submit and Reset buttons). Callouts highlight specific features: "Select Program", "Select specific groups of customers", "Specify event time and duration", "Select setback degrees or cycling on/off time", and "Issue direct load control event".

**Select Program**

**Select specific groups of customers**

**Specify event time and duration**

**Select setback degrees or cycling on/off time**

**Issue direct load control event**

Group	ID	Count	Description
<input checked="" type="checkbox"/> Group A-Hewlett	1	2417	LIPA Location-based Groups
<input checked="" type="checkbox"/> Group B-Hicksville	2	3700	LIPA Location-based Groups
<input checked="" type="checkbox"/> Group C-Roslyn	3	2655	LIPA Location-based Groups
<input checked="" type="checkbox"/> Group D-Melville	4	2410	LIPA Location-based Groups
			LIPA Location-based Groups
[ All ] [ None ]			Total devices: 23741





# 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)

The screenshot displays the EEM-Suite software interface. The top window shows the 'Customer Event Limit Report' for the date 12/13/2002. It lists records with columns for Last Name, First Name, Account Number, Device ID, Group, and Participation. The bottom window shows the 'Customer Thermostat Snapshot Report' for the date 12/12/2002. It lists records with columns for Group, Last Name, First Name, Account Number, Device ID, Time Message Sent, Message, Heat Set Point, Cool Set Point, Mode, Room Temp, and Fan mode.

Last Name	First Name	Account Number	Device ID	Group	Participation
1st Evangelical Church	Chen	C08-42-	1457644	Group C - Valley	30
Advanced Project Research		J00-03-	1457326	Group J - LV Office Park	31
Advanced Project Research		J00-04-	1457277	Group J - LV Office Park	31
Advanced Project Research		J00-03-	1457629	Group J - LV Office Park	30
Advanced Project Research		J00-05-	1298546	Group J - LV Office Park	30
Advanced Project Research		J00-05-	1457151	Group J - LV Office Park	30

Group	Last Name	First Name	Account Number	Device ID	Time Message Sent	Message	Heat Set Point	Cool Set Point	Mode	Room Temp	Fan mode
Group A - Coastal	Blue Bird Motel	Boydjian	A06-03-	1457674	10/30/2002 1:48:00 PM	ACK	68	72	Off	74	Auto
Group A - Coastal	Blue Bird Motel	Boydjian	A06-03-	1296488	10/30/2002 1:56:40 PM	ACK	70	88	Off	75	On
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1836316	10/30/2002 2:23:13 PM	ACK	50	90	Cool	73	Auto
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1010079	10/30/2002 2:17:50 PM	ACK	66	76	Auto	76	Auto
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1817947	10/30/2002 2:15:08 PM	ACK	66	74	Auto	74	Auto
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1220813	10/30/2002 2:12:53 PM	ACK	68	74	Eheat	78	Auto
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1219930	10/30/2002 2:31:00 PM	ACK	66	74	Auto	74	Auto
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1090094	10/30/2002 2:17:38 PM	ACK	60	70	Auto	70	Auto
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1080883	10/30/2002 2:15:21 PM	ACK	50	90	Auto	73	Auto
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1090758	10/30/2002 1:52:04 PM	ACK	66	74	Auto	74	Auto
Group A - Coastal	Bethany Bible Fellowship	Meyer	A60-02-	1079901	10/30/2002 2:28:30 PM	ACK	60	74	Auto	74	Auto

Address : @ http://www.mytstat.com/control.htm

@ Live Home Page @ Apple Computer @ Apple Support @ Apple Store @ Microsoft MacTopia @ Office for Macintosh @ Internet Explorer


Home Program **Control** Privacy/Agreement Log out

## Control Your Thermostat

**Get Current Status:**

Use the Get current status button to get your thermostats current settings. This process will take approximately 90 seconds. Your settings will appear in the thermostat. make your changes and hit "Send".

EMi Thermostat



Mode

Cool

Fan

Auto

Hold

Off

Send your new thermostat settings

Get your current thermostat settings

Cool

72

Heat

68

Your current temperature

75

Override curtailment

Curtailment time remaining

Carrier - mytstat.com - Microsoft Internet Explorer

Home Program Control Privacy/Agreement Log out

## Program My Thermostat

**Step 1**

Select the days for which you would like to change the setting:

☒ Monday ☒ Friday  
☐ Tuesday ☐ Saturday  
☒ Wednesday ☐ Sunday  
☐ Thursday

Enter a time for each period of the day:

Wake up: 06:00 AM

☒ Do you want different temperatures during the day?

Daytime: 08:00 AM

Evening: 05:00 PM

Sleep: 10:00 PM

Cancel Next

**COOLING SCHEDULE**

Demo Cool

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Wake up	75° 06:45 AM	75° 06:45 AM	75° 06:45 AM	75° 06:45 AM	75° 06:45 AM	75° 06:45 AM	75° 06:45 AM
Daytime	60° 08:30 AM	60° 08:30 AM	60° 08:30 AM	60° 08:30 AM	60° 08:30 AM		
Evening	75° 06:00 PM	75° 06:00 PM	75° 06:00 PM	75° 06:00 PM	75° 06:00 PM		
Sleep	70° 11:00 PM	70° 11:00 PM	70° 11:00 PM	70° 11:00 PM	70° 11:00 PM		

Save Save As Delete Close

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

Carrier - mytstat.com - Microsoft Internet Explorer

Home Program Control Privacy/Agreement Log out

## Program My Thermostat

**Full Week Settings**

**Weekdays Settings**

**Weekend Settings**

Mon Tue Wed Thu Fri Sat Sun

morning

evening

Step 1: Select Days to Program  
Full Week = Mon. to Sun.  
Weekdays = Mon. to Fri.  
Weekends = Sat. and Sun.

Step 2: Select Start Time For Each Period (wake, Day, Evening, Sleep) by dragging arrows

Step 3: Specify Temperature Settings for each Period  
Type the desired temperature or click on up/down arrow to raise/lower the temperature

Step 4: Save, Copy, Close, or Delete  
Click **Save** to save schedule, **Copy** to copy as a new name, **Delete** to delete existing schedule, or **Close** to exit without saving.

Step 5: Send Schedule to thermostat

Save Save As Delete Close Send

“Step-By-Step” Programming Wizard

“All-In-One” Expert Programming



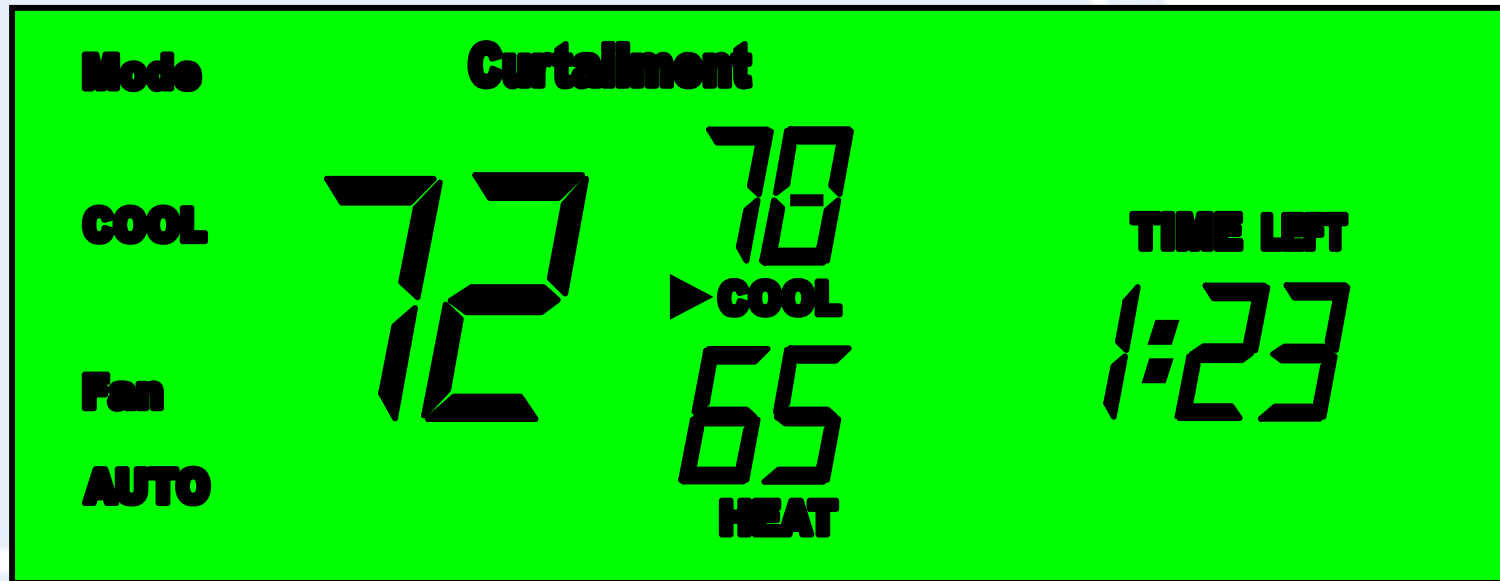


# What Makes Ours Unique?

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- ◆ 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

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



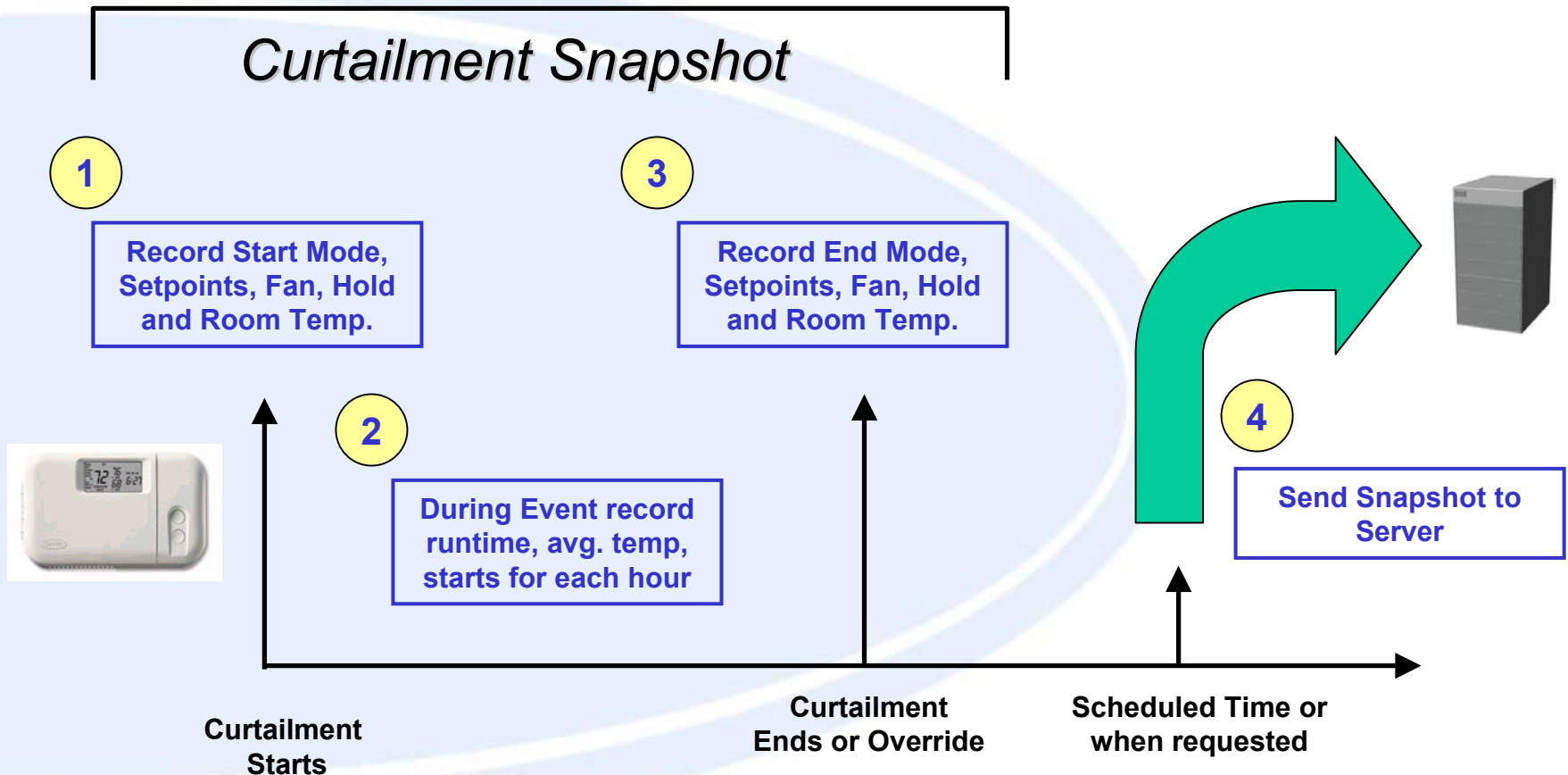
## ◆ What it does?

- 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



# Sample Snapshot Data

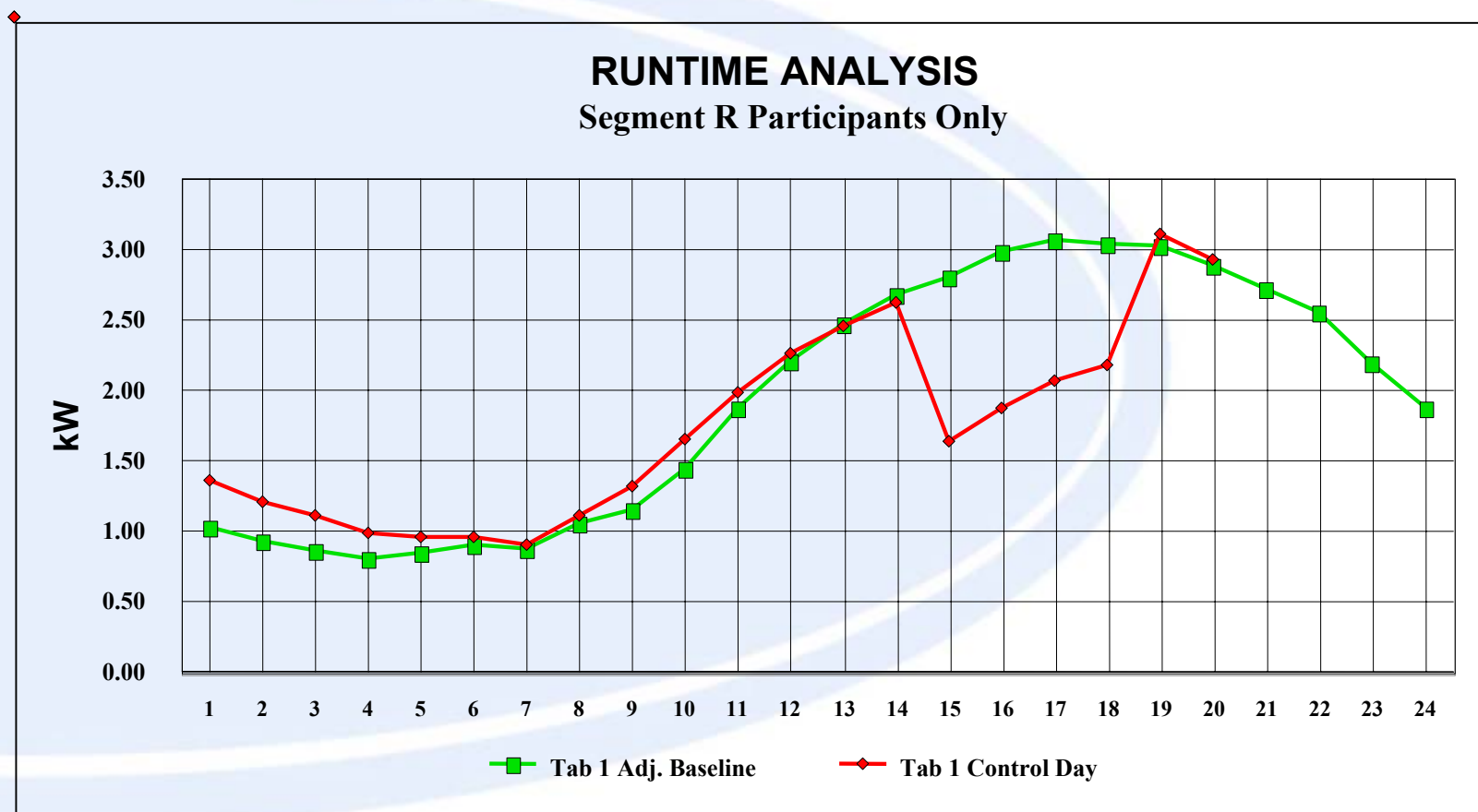
	Start	Hour 1	Hour 2	Hour 3	Hour 4	End (or at override)
Current Temp	72	74	75	76	76	76
Cool Setpoint	72	76	76	76	76	72
Mode	Cool	Cool	Cool	Cool	Cool	Cool
Fan	Auto	Auto	Auto	Auto	Auto	Auto
Hold	Off	Off	Off	Off	Off	Off
Run Time	-	0	0	17	45	-
Number of Starts	-	0	0	1	2	-

## 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 LIPAEEdge 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



# SCE's Impact Analysis

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## 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



- ◆ 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

Utility



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

Sends  
current price  
level



EMi Device



EMi automatically  
adjusts setpoint



- ◆ 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.

- ◆ 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.

*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 EMi Heartbeats.
- Provides value-added product offering.
- Brand name recognition to assist with customer recruitment.
- Verifiable and informed load control.