



# 2nd Annual Colorado Utility Efficiency Exchange

Integrating Carbon Footprint and  
Demand Response with Energy Efficiency  
October 15-17, 2008

**CONVECTAIR**

**Focus on Residential Energy Efficiency**

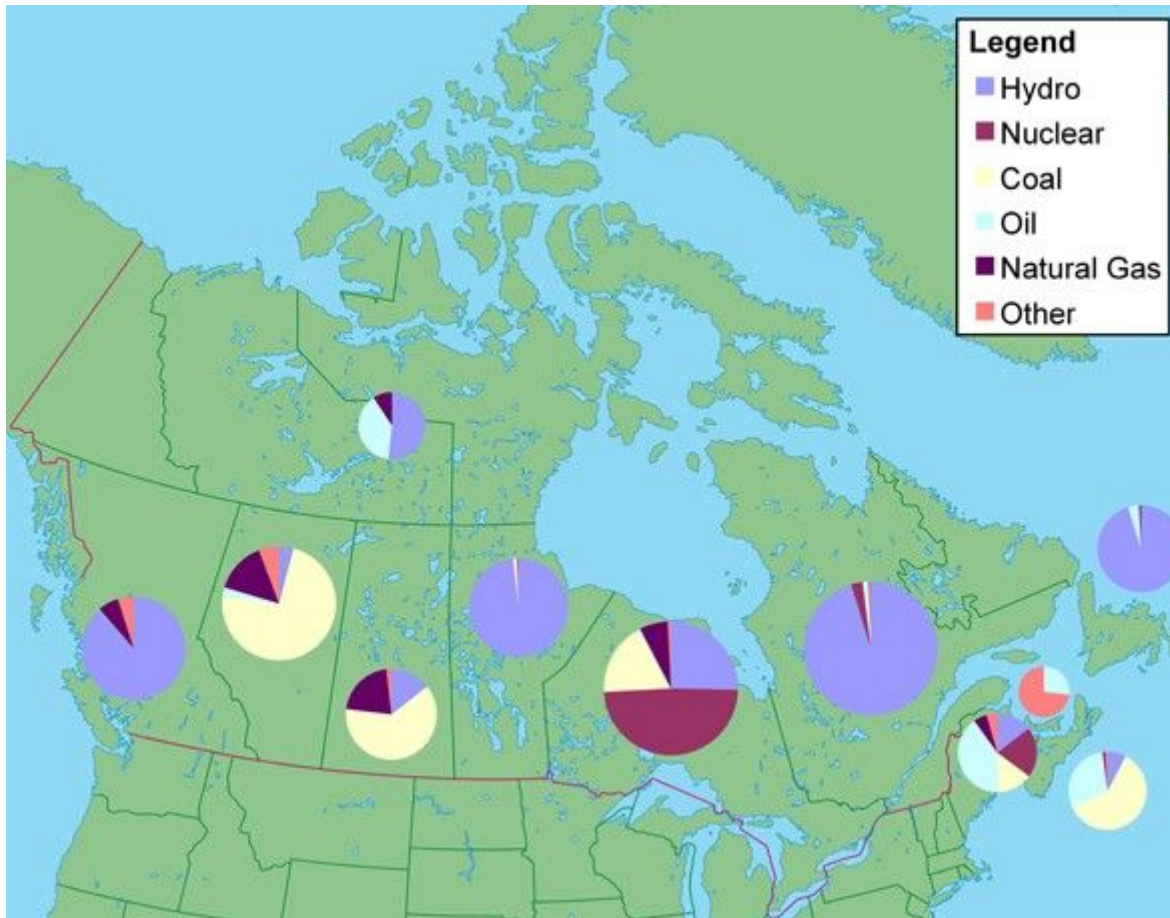
**Electric Space Heating in Canada :  
Efficiency programs, performance standards and  
the perils of field testing...**

Jean-Marie Falquet  
[jmf@convectair.com](mailto:jmf@convectair.com)

# ELECTRIC UTILITIES

- 17 major public electric utilities :
  - 8 Provincially owned : New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, British Columbia & 2 territories.
  - 2 major municipals : Calgary ENMAX, Toronto Hydro
  - 7 investor owned.
- 14 Energy Boards regulate the industry
  - 10 provincial boards
  - 3 territorial boards
  - National Energy Board (international and interptovincial issues)

# Canada Generation by Fuel



**2006**

Hydro	<b>59%</b>
Nuclear	<b>16%</b>
Coal	<b>15%</b>
Other steam	<b>4%</b>
Combustion	<b>5%</b>
Wind & tidal	<b>1%</b>

# ENERGY EFFICIENCY PROGRAMS

- About 70 residential, financial incentive programs
  - Home improvements (windows, furnaces, thermostats...)
- Canada Energy Efficiency Act (1995)
  - Baseline requirements
  - Nothing on electric heating
- Provincial Energy Efficiency Acts :
  - Ontario (2006)
  - B.C. (2007)
- Utility Energy Efficiency Programs

# ONTARIO

## Ontario Energy Efficiency Act Guide – Furnaces, Boilers and Room Heaters

### Appliances and products, efficiency standards

3. (1) No person shall offer for sale, sell or lease an appliance or product to which this Act applies unless,
- (a) the appliance or product meets the prescribed efficiency standard with respect to the appliance or product; and
  - (b) a prescribed label that sets out the efficiency standard of the appliance or product is affixed to the appliance or product.

#### APPLIES TO

thermostats used for line-voltage (120-240V) switching of a controlled resistive heating load including wall-mounted, built-in (up to 1,500 W), and two component thermostats.

#### TEST STANDARD

CAN/CSA C828-99, Performance Requirements for Thermostats Used with Individual Room Electric Space Heating Devices

#### COMPLIANCE DATE

January 1, 2007

#### Thermostats <sup>(56)</sup>

The thermostat droop in temperature shall be no more than 2.0° C, in absolute value, when measured at the centre of the test room.

The thermostat differential in temperature shall be no more than 0.5° C when measured at the centre of the test room.

Between 20% and 80% duty cycle, the average temperature in the centre of the room shall be within 0.5° C., plus the allowed droop specified, of the original thermostat set point of 20° C., which means that the average temperature in the centre of the room shall never vary more than 2.5° C from the original thermostat set point of 20° C.

Source : [http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_90e17\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90e17_e.htm)

# BC

## Energy Efficiency Act Energy Efficiency Standards Regulation

### Efficiency standards of energy devices

2 (1) A person must not manufacture, offer for sale, sell, lease or otherwise dispose of an energy device to which this Act applies unless

- (a) the energy device meets the prescribed efficiency standard for that energy device, and
- (b) a prescribed label is affixed to the energy device.

<i>Item #</i>	<i>Energy device</i>	<i>Relevant standard</i>	<i>Prescribed efficiency standard</i>	<i>Prescribed date</i>
38	Thermostats used for line-voltage (120-240V) switching of a controlled resistive heating load including wall-mounted, built-in and two component thermostats.	CSA C828-06 Performance Requirements for Thermostats Used with Individual Room Electric Space Heating Devices	Maximum Differential = 0.5° C Maximum droop = 2° C	Jan 1, 2007

For full text : [http://www.qp.gov.bc.ca/statreg/\\_vti\\_bin/shtml.dll/search.htm](http://www.qp.gov.bc.ca/statreg/_vti_bin/shtml.dll/search.htm)  
- type : "Energy Efficiency Act", and search.

**CONVECTAIR**

# HYDRO-QUEBEC



## Residential Customers



Residential Customers

Hydro-Québec's Home Page

Residential Customers Home Page

### Electronic Thermostats Mail-in Rebate

#### Electronic Thermostats

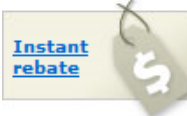
[Comfort and savings](#)

[Programmable thermostats](#)

[Tips and advice](#)

[Eligible thermostats](#)

[Our ENERGY WISE partners](#)



#### Important

Before making a purchase and filling in the coupon, see the [List of Eligible Thermostats](#).

#### Single-family dwelling, condo or business establishment

##### ON PURCHASE

Purchase electronic thermostats\* for electric baseboards and receive

\$45 for five thermostats  
\$10 for the sixth thermostat  
\$10 for the seventh thermostat

**\$65**  
maximum

##### ON INSTALLATION

Have electronic thermostats\* for electric baseboards installed by a [master electrician](#) (CMEQ member) and receive

\$45 for five thermostats  
\$10 for the sixth thermostat  
\$10 for the seventh thermostat

**\$65**  
maximum

**Mail-in coupon worth up to \$130**

This offer applies to a minimum of five and a maximum of seven electronic thermostats\* per single-family home, condo or business establishment.

#### Don't forget!

- Keep the original UPCs (bar codes) from packaging
- Follow all the instructions and rules on the mail-in rebate coupon

Source : <http://www.hydroquebec.com/residential/thermostats/index.html>

# CONVECTAIR

# HYDRO-QUEBEC

## Eligible thermostats, heaters



Electronic thermostats eligible for Hydro-Québec's rebate  
Residential Market (Valid in Québec only)

Brands and models are listed in alphabetical order. This list is updated on a regular basis, to incorporate new applications from manufacturers. Consequently, it is subject to change without prior notice.

### UPDATED AUGUST 29, 2008 - ELECTRONIC THERMOSTATS

BRAND	MODEL	UPC	REMARKS
AUBE	TH102-3		
AUBE	TH104		
AUBE	TH104-P5		
AUBE	TH104PLUS		
AUBE	TH104PLUS-P5		
AUBE	TH104PLUS-P7		
AUBE	TH106		
AUBE	TH108		
AUBE	TH108PLUS		
AUBE	TH108PLUS-P10		
AUBE	TH109		
AUBE	TH109-P5		
AUBE	TH109-P7		
AUBE	TH109PLUS		
AUBE	TH109PLUS-P5		
AUBE	TH109PLUS-P7		
AUBE	TH110-SP-P		
AUBE	TH110-SP-P-COM		



Electronic thermostats eligible for Hydro-Québec's rebate  
Residential Market (Valid in Québec only)

Brands and models are listed in alphabetical order. This list is updated on a regular basis, to incorporate new applications from manufacturers. Consequently, it is subject to change without prior notice.

### UPDATED SEPTEMBER 10, 2007 - CONVECTION HEATERS

(Convection heaters controlled with a built-in thermostat or with a wall thermostat packaged with the heater)

BRAND	MODEL	UPC	REMARKS
CONVECTAIR	7300-C07BB	774725003287	
CONVECTAIR	7300-C07BM	774725003461	
CONVECTAIR	7300-C10BB	774725003294	
CONVECTAIR	7300-C10BM	774725003478	

Source : <http://www.hydroquebec.com/residential/thermostats/index.html>



# CSA 828

## Thermostat performance standard

1999, rev'd 2006

- **Line-voltage thermostats (120 to 240 V)**  
(designed for resistive heating loads, including single- and double-pole thermostats)
- **(a) wall-mounted line-voltage thermostats;**  
**(b) built-in line-voltage thermostats (up to 1500 W);**  
**(c) two-component thermostats.**
- Covering **thermal regulation and power line quality.**
- Thermal regulation requirements tested in **a dual-climate test chamber.**

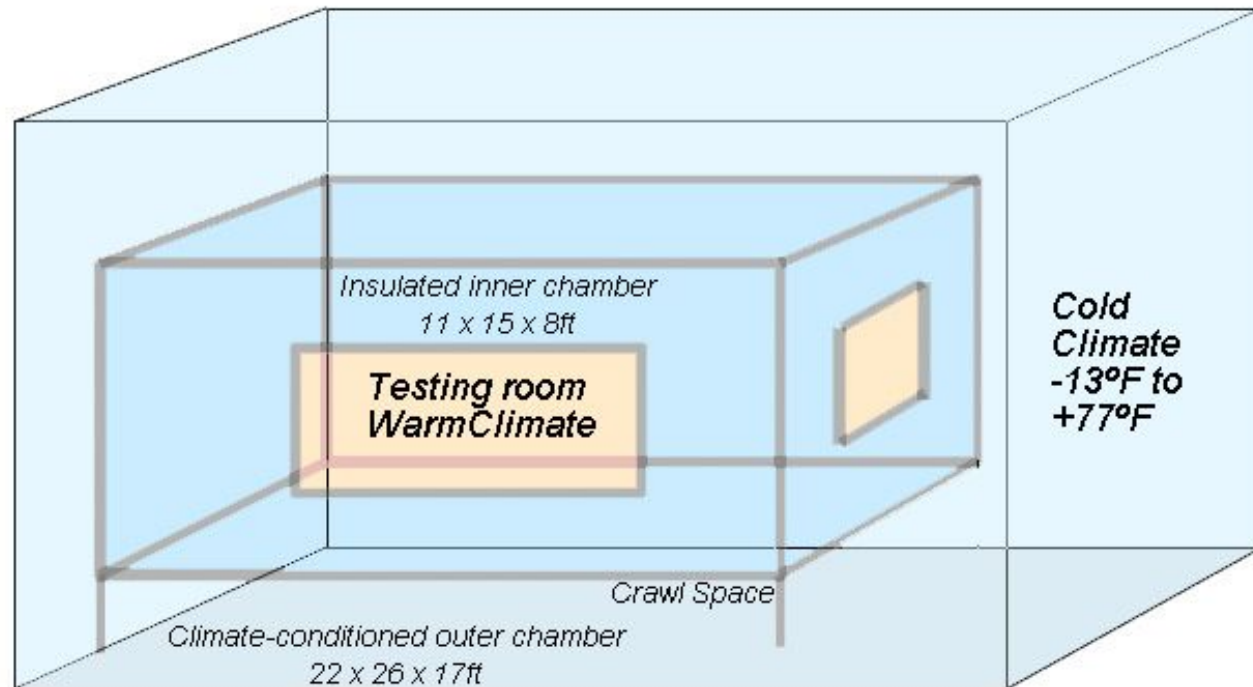
### Notes

- Applies only to local zone thermostats; not to central heating units under the control of a single thermostat or to thermostats used exclusively to control radiant heating systems.
- Power line quality requirements establish the level of emissions that may be generated by line-voltage thermostats and the extent of line-voltage thermostat susceptibility to electromagnetic disturbances that can be present on power lines.

# CSA 828

## Test method

- Heater placed under window
- Thermostat set at 22°C (71.6°F)
- Cold climate set at -25°C (-13°F)
- Increased to 25°C (77°F) at 1°F/hr
- Room temperature monitored at room center
- Heater will operate at 100% duty cycle then slow to 0% as the "outside" temperature rises



# CSA 828

## Thermostat performance

- **DIFFERENTIAL**
- **DROOP**
- **SET POINT PRECISION**

# THERMOSTAT DIFFERENTIAL

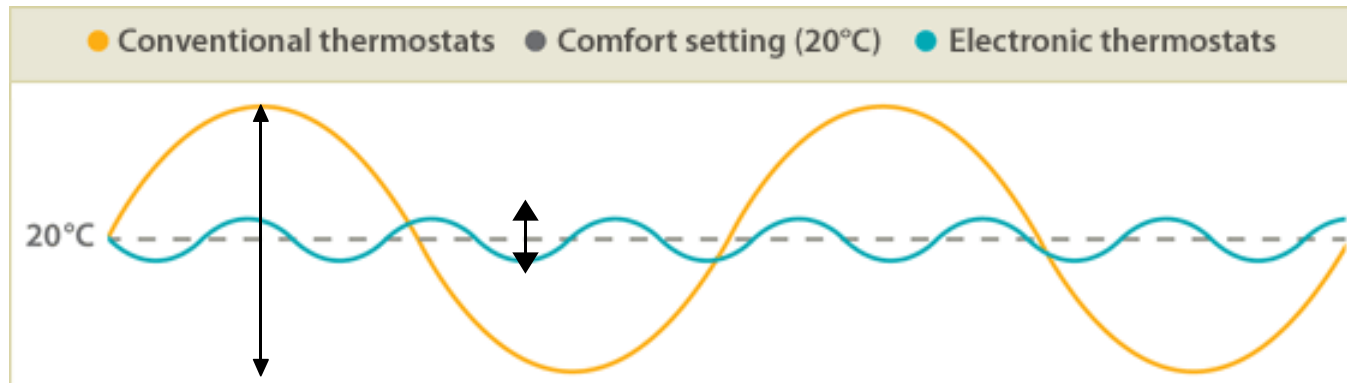


Image : Hydro-Quebec

Maximum allowed : **0.5°C (0.9°F)**

Difference between highest and lowest temperatures measured at the center of the room, at 50% duty cycle.

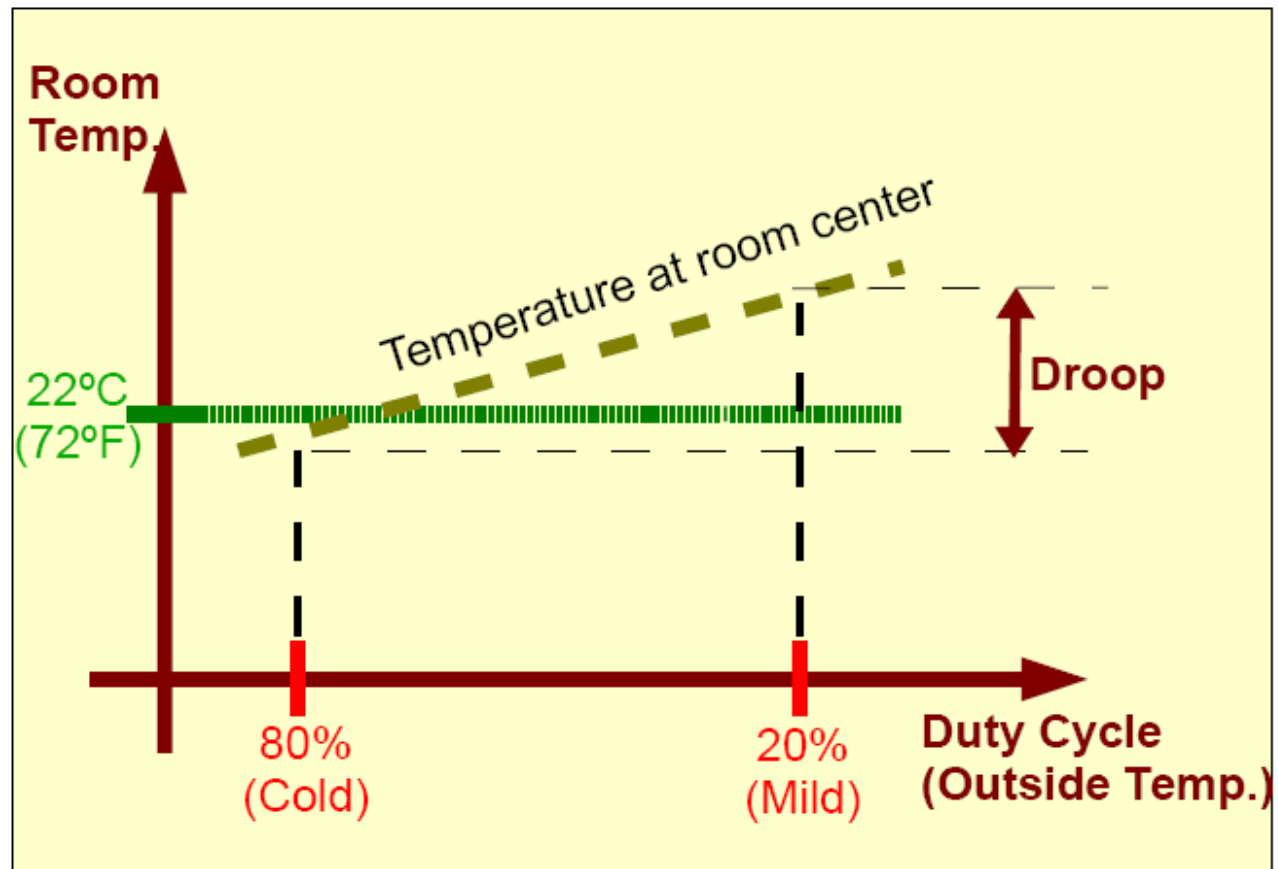
# THERMOSTAT DROOP

Maximum allowed :

**1.5°C (2.7°F)**

2.0°C (3.6°F) CSA828-99

Difference in average temperatures measured at the center of the room, at 20% and 80% duty cycle.



# THERMOSTAT SETPOINT PRECISION

Maximum difference allowed : **0.5°C (0.9°F)**

between original set point (22°C or 71.6°F) and room center temperature at the end of the test (0% duty cycle).

# LAB vs REALITY

- Dual climate room consumption comparison :
  - Baseboard (mechanical therm.) : **1.758 kWh**
  - Convectair (built-in electr. therm.) : **1.461 kWh**
  - Difference : **-17%**
- Outside T range : 28°F to 50°C
- Inside T set at 68°F
- Consumption adjusted for constant "Delta T"  
(to eliminate impact of droop)
- Test over 5 hours at each outside temperature level  
(to eliminate impact of differential)

# LAB vs REALITY

- Two identical floors of an apartment building (6 apartments each floor, 4th floor with original baseboards and thermostats, 3rd floor converted to Convectair).
  - Outside T range : 14°F to 50°C
  - Inside T set as tenants wished
  - Temperature monitored every 10 minutes
  - Amp draw of each heating circuit every 10 minutes
  - Test duration : 34 days



# REALITY check !

Third floor apartments (Convectair) : **3951 kWh**

Fourth floor apartments (baseboards) : **3895 kWh**



# Check REALITY ?

- Apartment room **temperatures varied** wildly (64 to 81°F).
- Two 4<sup>th</sup> floor **apartments were unheated** (0 consumption) for >80% of the test duration. Their room temperature did not change!
- Some apartments **changed tenants** in the middle of the test period.
- Almost identical apartments had **very different** energy consumption readings.

# Which is the RIGHT answer ?

## Raw data :

- 6 apartments per floor, no temperature adjustment.

Third floor apartments  
(Convectair) : **3951 kWh**

Fourth floor apartments  
(baseboards) : **3895 kWh**

Difference : **+1%**

## Adjusted data :

- 4 apartments per floor, temperature adjusted.

Third floor apartments  
(Convectair) : **3102 kWh**

Fourth floor apartments  
(baseboards) : **3803 kWh**

Difference : **-18%**

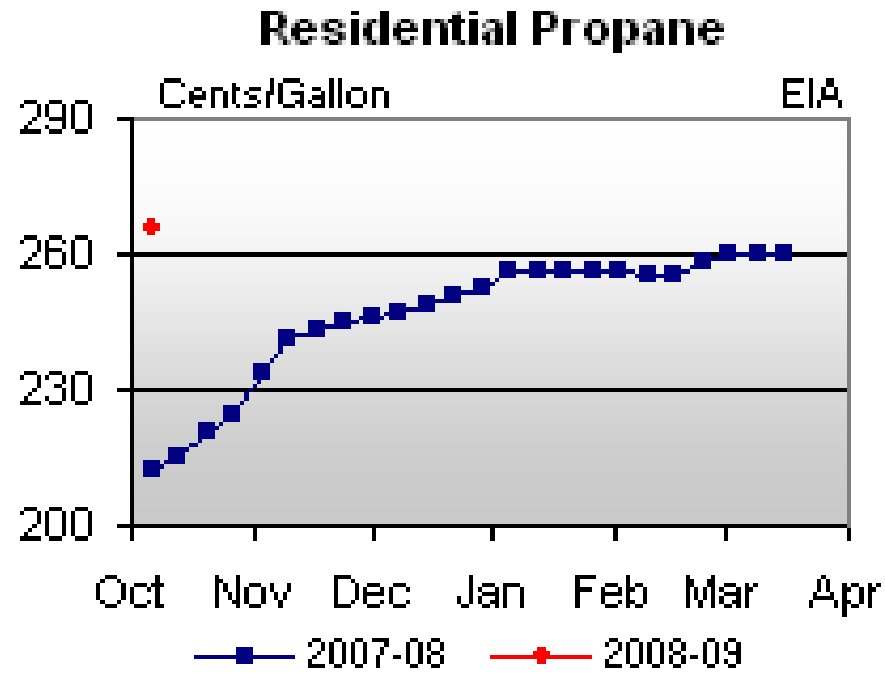
# U.S. average fuel expenditures are expected to be higher for all fuels this winter (October – March).

Average U.S. Household Winter (2008-2009) Heating Fuel Expenditures  
Percent Change from Last Winter

Fuel	Base Case	If 10% Warmer Than Forecast	If 10% Colder Than Forecast
Heating Oil	<b>23.1</b>	9.7	35.5
Natural Gas	<b>18.1</b>	3.4	29.3
Propane	<b>11.3</b>	0.6	24.6
Electricity	<b>10.4</b>	4.8	13.9
Average All Fuels	<b>15.3</b>	4.0	24.5

Winter = October 1 through March 31.

Expenditures are based on typical per household consumption adjusted for weather. Warmer and colder cases represent 10-percent decrease or 10-percent increase in heating degree-days, respectively.



U.S. Propane Prices, 10/6/2008

<http://tonto.eia.doe.gov/oog/info/hopu/hopu.asp>

# WHY ELECTRIC HEAT ?

## Members want it...

- Cost
  - ★ Prices are more stable
  - ★ Zoned heating more efficient
  - ★ Low cost, quality equipment
- Comfort
  - ★ Spot heat
  - ★ Bathrooms

## Part of the co-op mix...

- Improve existing load
  - ★ Lower wattage
  - ★ Better control
  - ★ Fewer calls
- Avoid unwanted load
  - ★ Cheap portables, "scams"
- The future
  - ★ Renewables = electric