



E+Sd Energy & Store Development Conference

September 23 - 26, 2018
Sheraton Atlanta Hotel | Atlanta, GA



Anti-Sweat Heater Controls – What Works, and What Works Best?

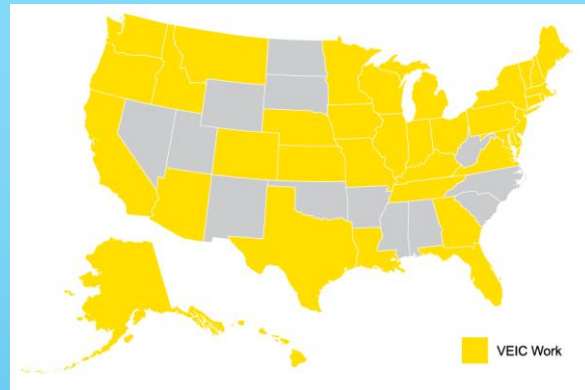
Ethan Bellavance - VEIC

Ali White – VEIC



About VEIC

- Nonprofit founded in 1986
- 300+ Employees
- Locations: VT, DC, OH, NY
- Design, deliver, and evaluate programs nationwide:
 - Energy efficiency
 - Transportation
 - Renewable energy



Our Customers:

- Utilities
- Businesses
- Government
- Foundations
- Environmental &

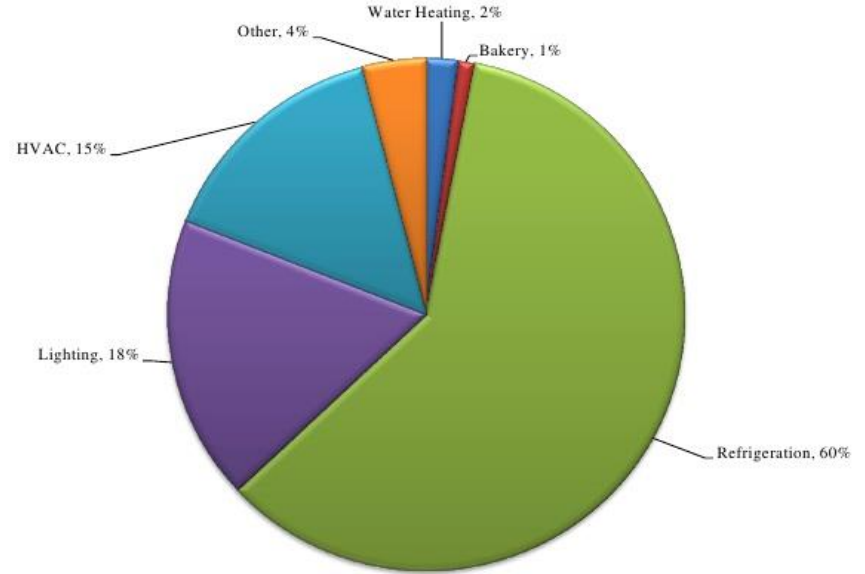
Consumer Groups



- First Energy Efficiency Utility (EEU) in the nation
- VEIC is contracted by the state of Vermont to utilize electric ratepayer funds to provide technical and financial assistance to Residential, Commercial, and Industrial customers looking to save energy

Refrigeration.....	60%
Lighting.....	18%
HVAC.....	15%
Other.....	4%
Water Heating.....	2%
Bakery.....	1%

Annual Supermarket Electricity Consumption

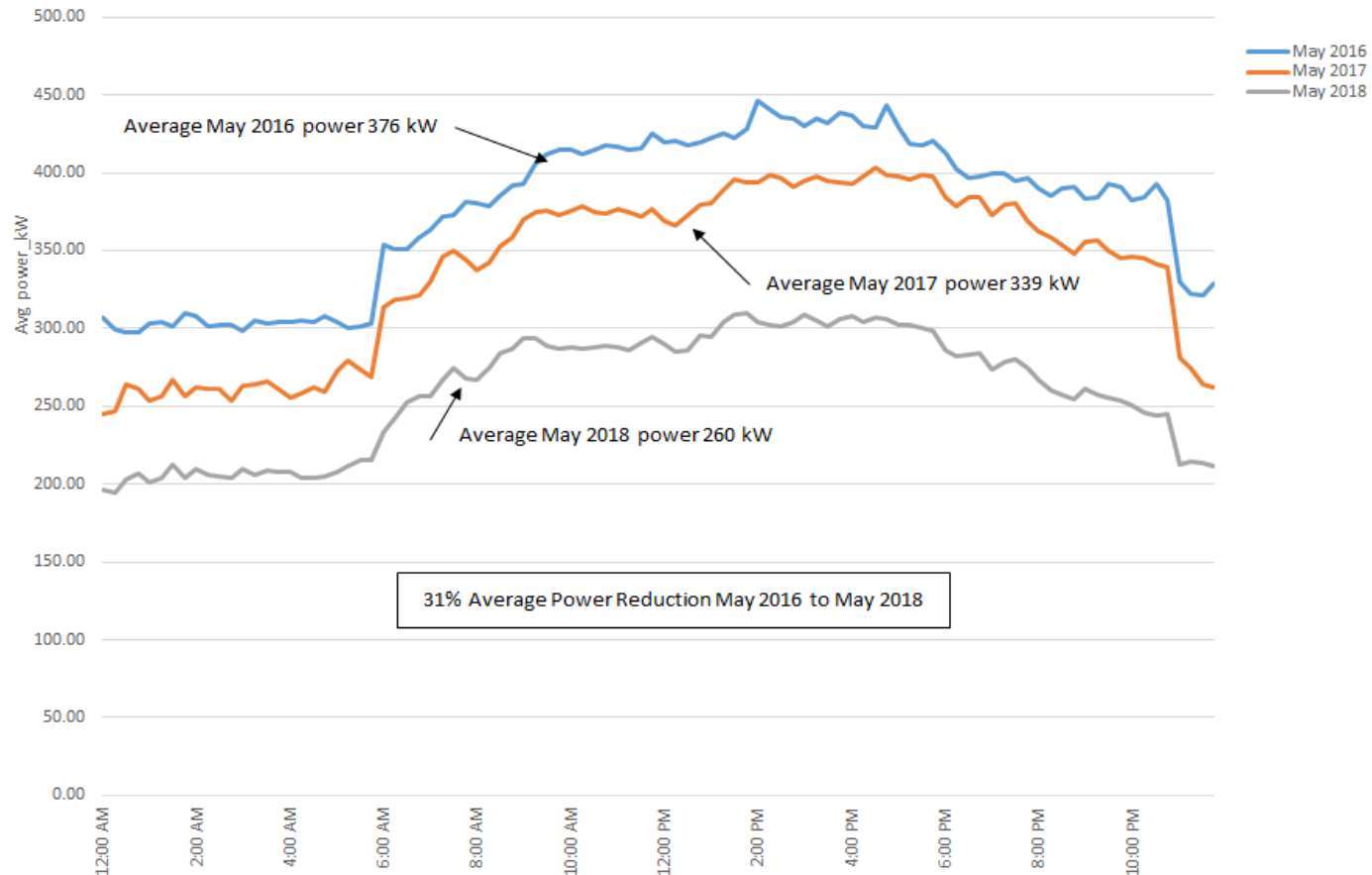


Source: EPA 2007

Total Annual Electricity Consumption = ~ 3,000,000 kWh (Site Energy)¹
Or ~ 31,215 Million Btu (Primary Energy)²

Annual Electricity Consumption Breakdown for Typical Supermarket (33,000 ft² selling area)

Grocery Store Typical Day Power Comparison May 2016 - May 2018



Why Use Anti-Sweat Heaters?

- Keep glass clear for customers
- Prevent water/mold in cases
- Ensure longevity of door frames and mullions
- Store safety



Where's the Heat?

Door Components

- Case Frame - heated
- Door Glass - often heated
- Door Frame - often heated
- All of the above = “door assembly”



Anti-Sweat Heater Energy Use: Why Do We Care?

- Typical grocery store contains 75 -150 freezer doors
- With no controls these heaters cost \$15,000 - \$30,000 / store / year
- \$185 / door at \$0.12/kWh



Anti-Sweat Heater Basics

- Power is typically run off of one panel to all controllers
- Power either micro-pulses or turns on / off via contactor
- Power either pulses or turns on / off via different stimuli



Newer Doors vs. Legacy Doors

- New doors use 0.5-1.0 amps / door + case frame
- Older doors can use > 2 amps / door + case frame



Energy-Free Freezer Doors

- No power on doors or door frames
- Films can be added as well to prevent fog
- Savings = \$133 / door / year



Control Strategies

- Scheduling via timeclock
- Cycling via Outdoor Air
- Cycling via Store Humidity
- Cycling via case-specific dew point



Anti-Sweat Savings via Scheduling

- Scheduling anti-sweat heaters provides inexpensive savings
- Simply pulsing the anti-sweat controls with an adjustable timer works well for engaged store managers



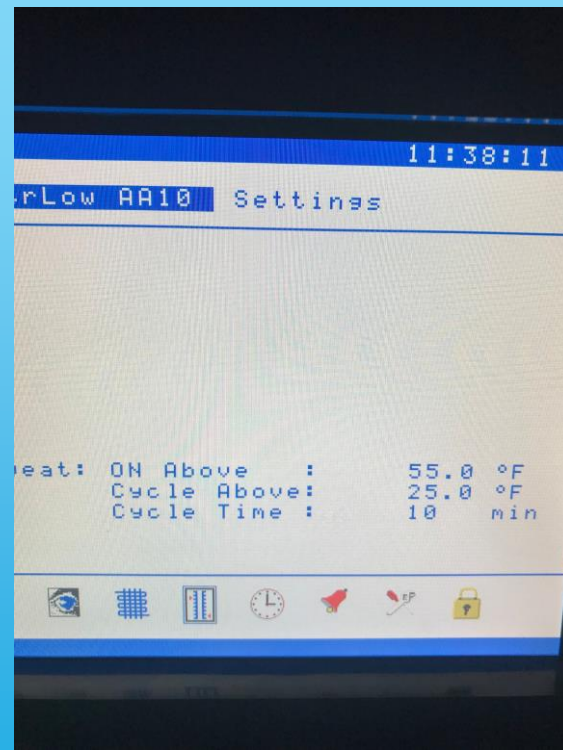
Anti-Sweat Heater Cycling

- Installing an anti-sweat heater timer cost this local market < \$300
- Winter operation: 15 minutes on, 45 minutes off
- Summer operation: 15 minutes on, 15 minutes off



Cycling via Outdoor Air Temp

- Reduced Annual Run Hours
 - 38% in Burlington, VT
 - 17% in Atlanta, GA
 - 6% in Los Angeles, CA
- Savings = \$10-70 / door
- Outdoor Air temp not always an accurate indicator of condensation potential



Cycling via Store Humidistat

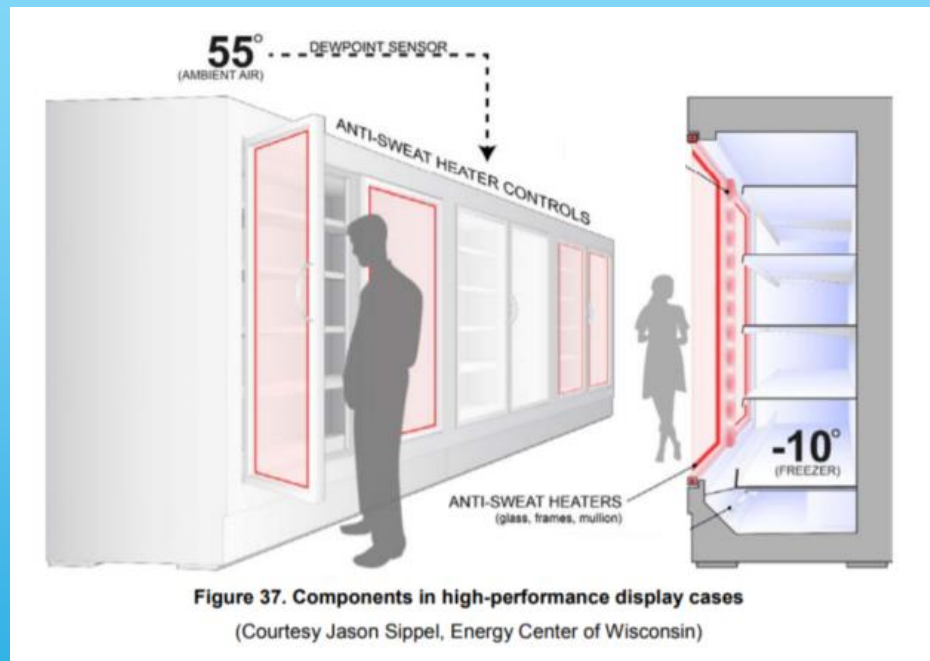
- Indoor humidistat is a better indicator of condensation potential than outside air temperature
- Savings are highly dependent on dehumidification control from the HVAC system
 - 45% savings in Northeast
 - Savings = \$85 / door



Store
Humidistat

Cycling via Case Dew Point

- Computer analyzes
 - Frame temperature
 - Store Dew Point
- Determines required temperature of doors and frame to prevent condensation
- Controlled per case rather than store-wide
- Savings = \$110/door

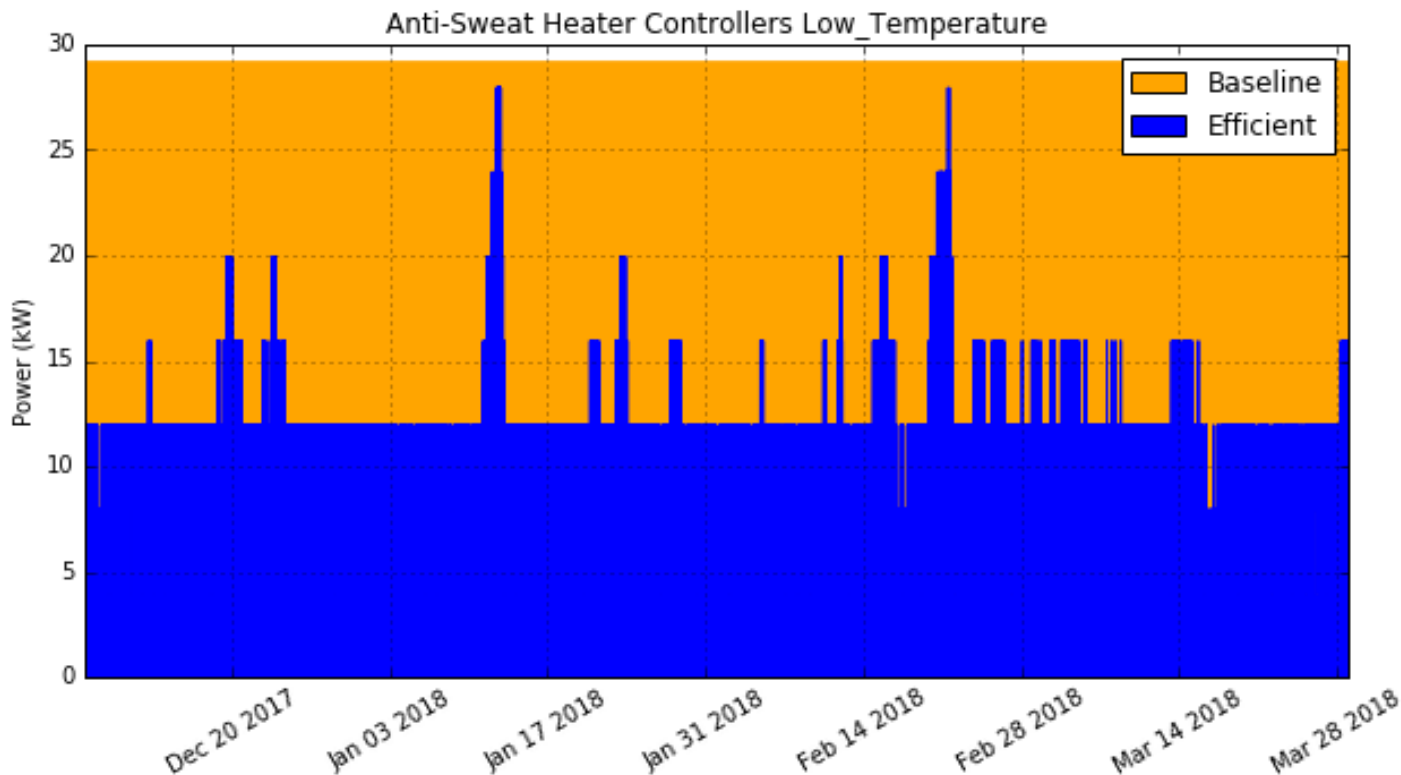


Anti-Sweat Heater Savings Persistence

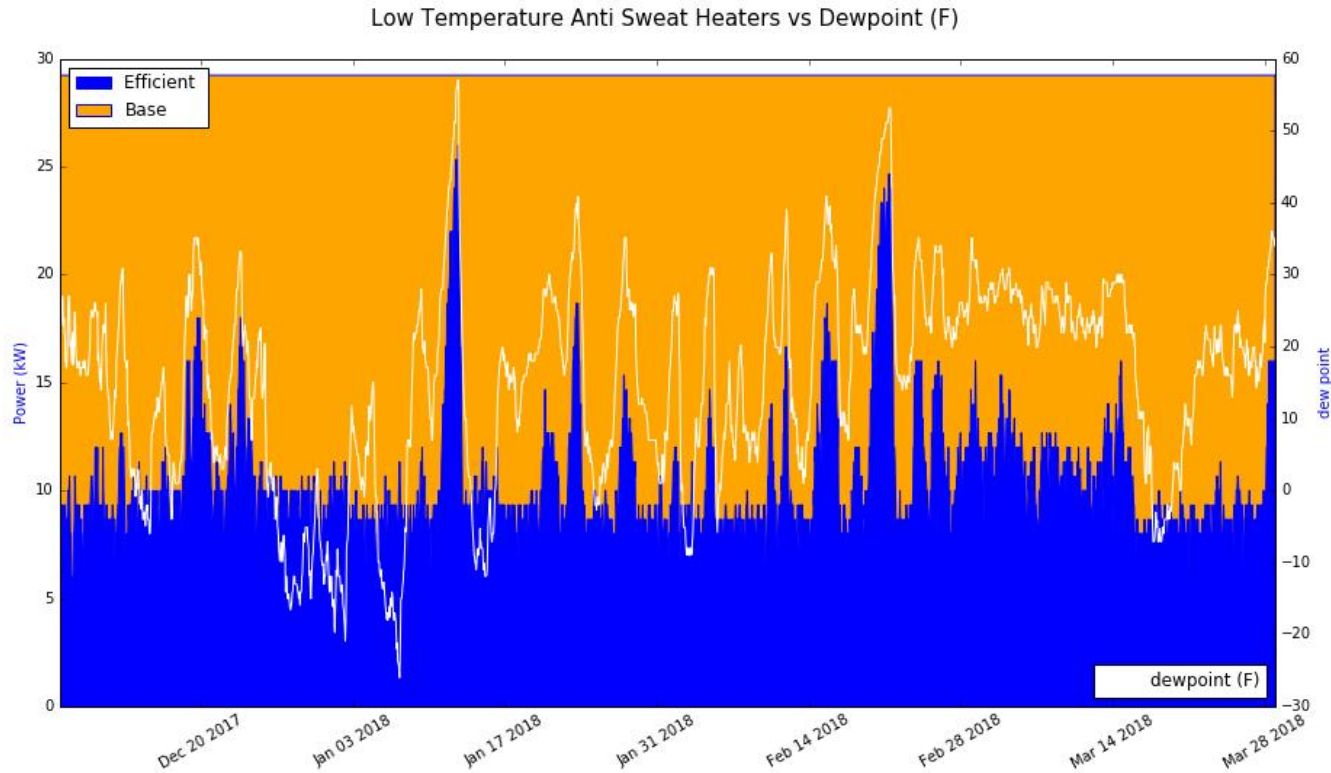
- Typical persistence of savings is low
- No easy way to tell if controls have been overridden



Pre & Post Anti-Sweat Heater Controls

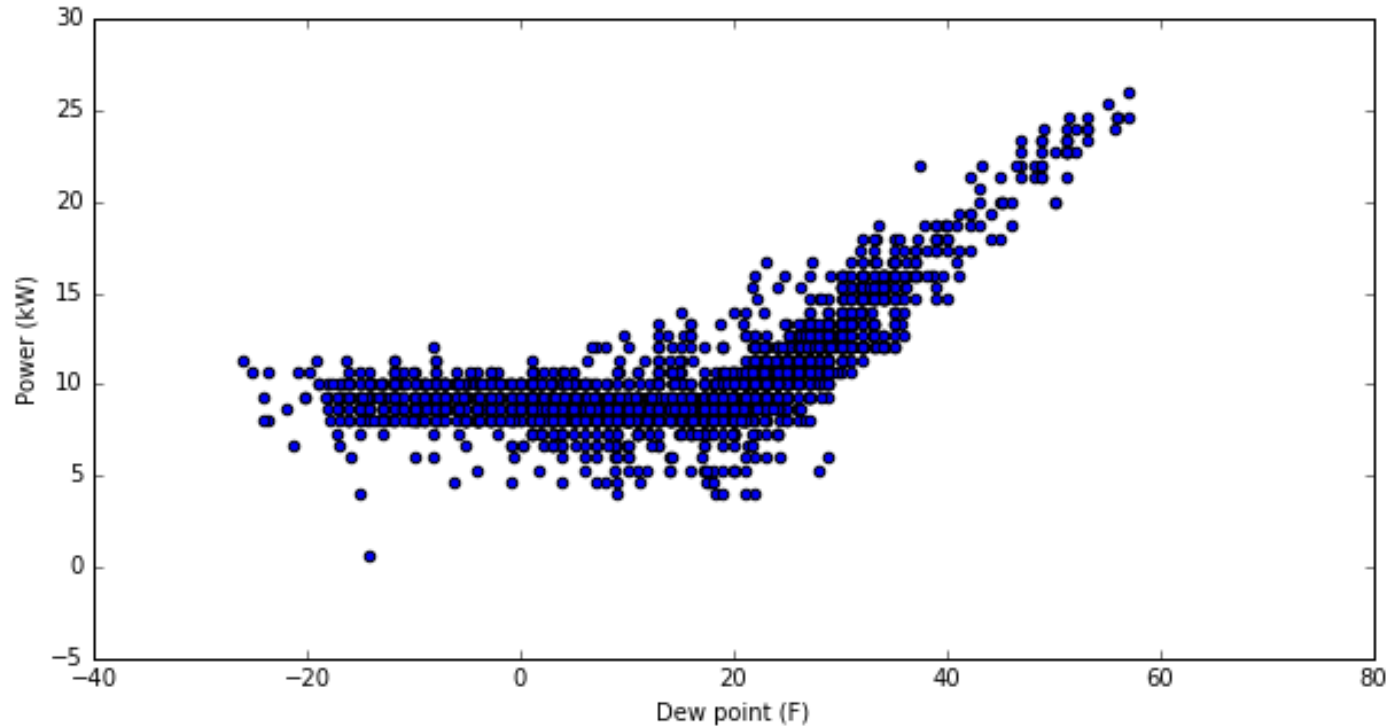


Pre & Post w/ Outdoor Air Dew Point



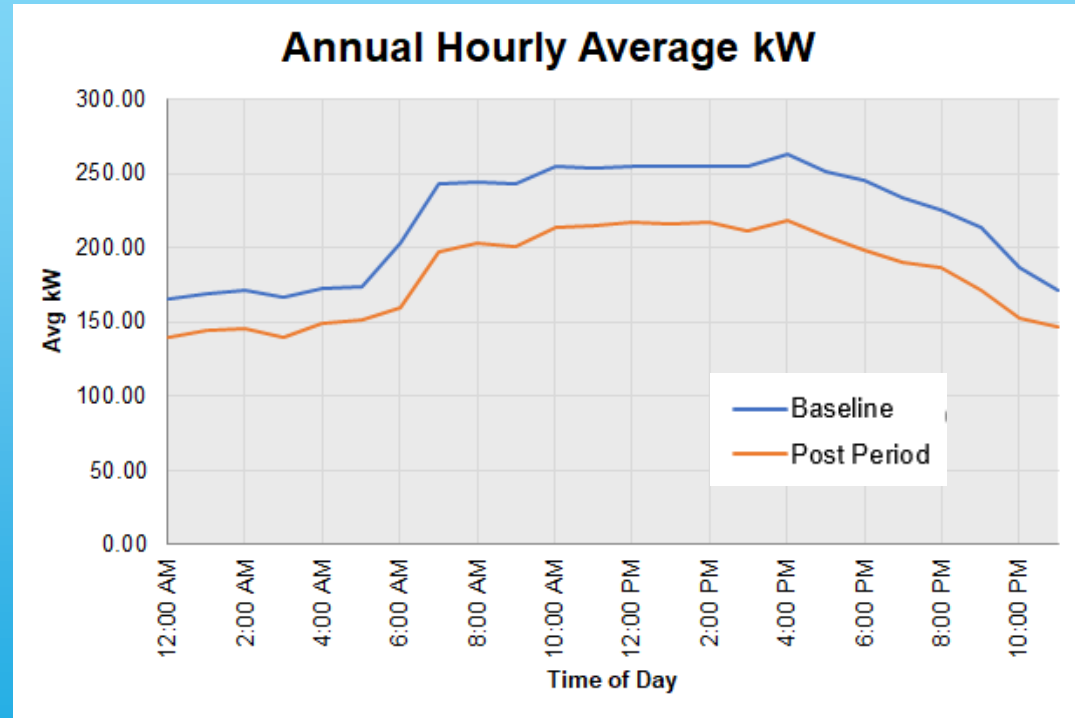
Power (kW) vs Outdoor Air Dew Point

Low Temperature Anti Sweat Heaters Dewpoint vs hourly average kW



Anti-Sweat Heater Controls Savings Verification Using AMI Data

- 334,264 kWh Total Savings
 - Lighting: 200,558 kWh
 - ASHC: 133,706 kWh
- Total Store Energy Reduction of 18%
 - Lighting: 11%
 - ASHC: 7%
- \$16,000/year

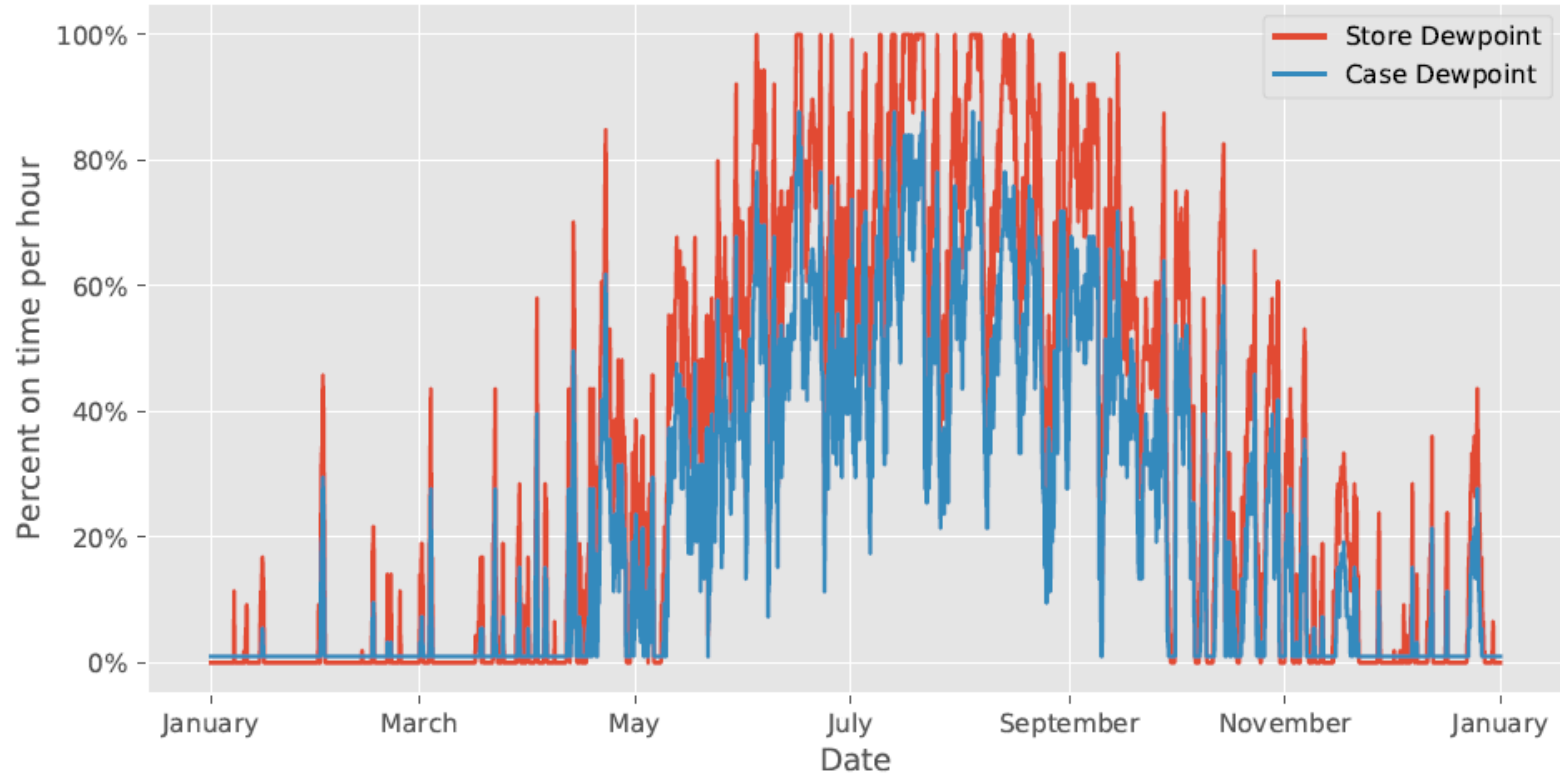


Hannaford Metered Savings Results

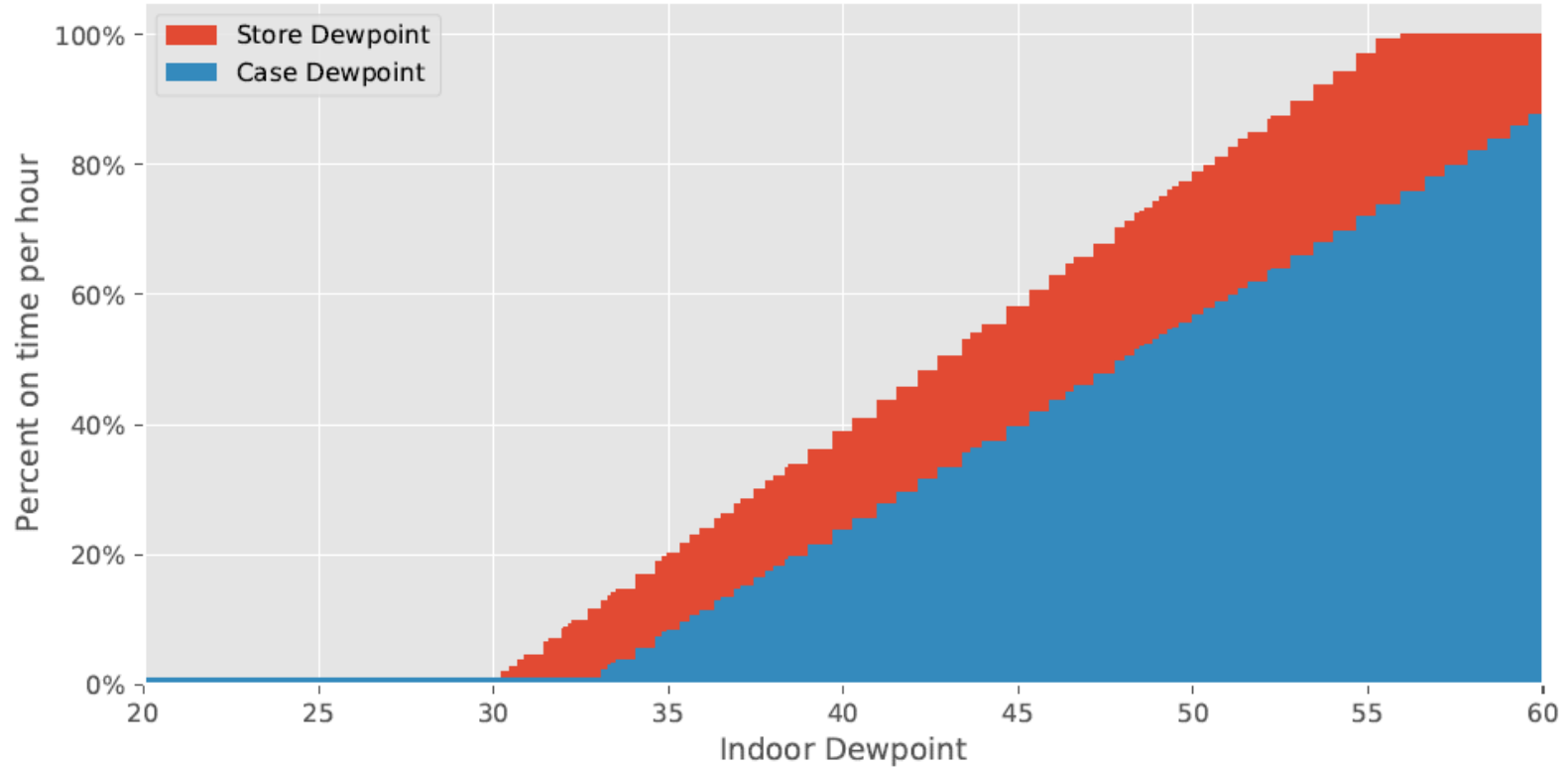
- One store
- Two different control methodologies
 - Store Humidistat
 - Case by Case



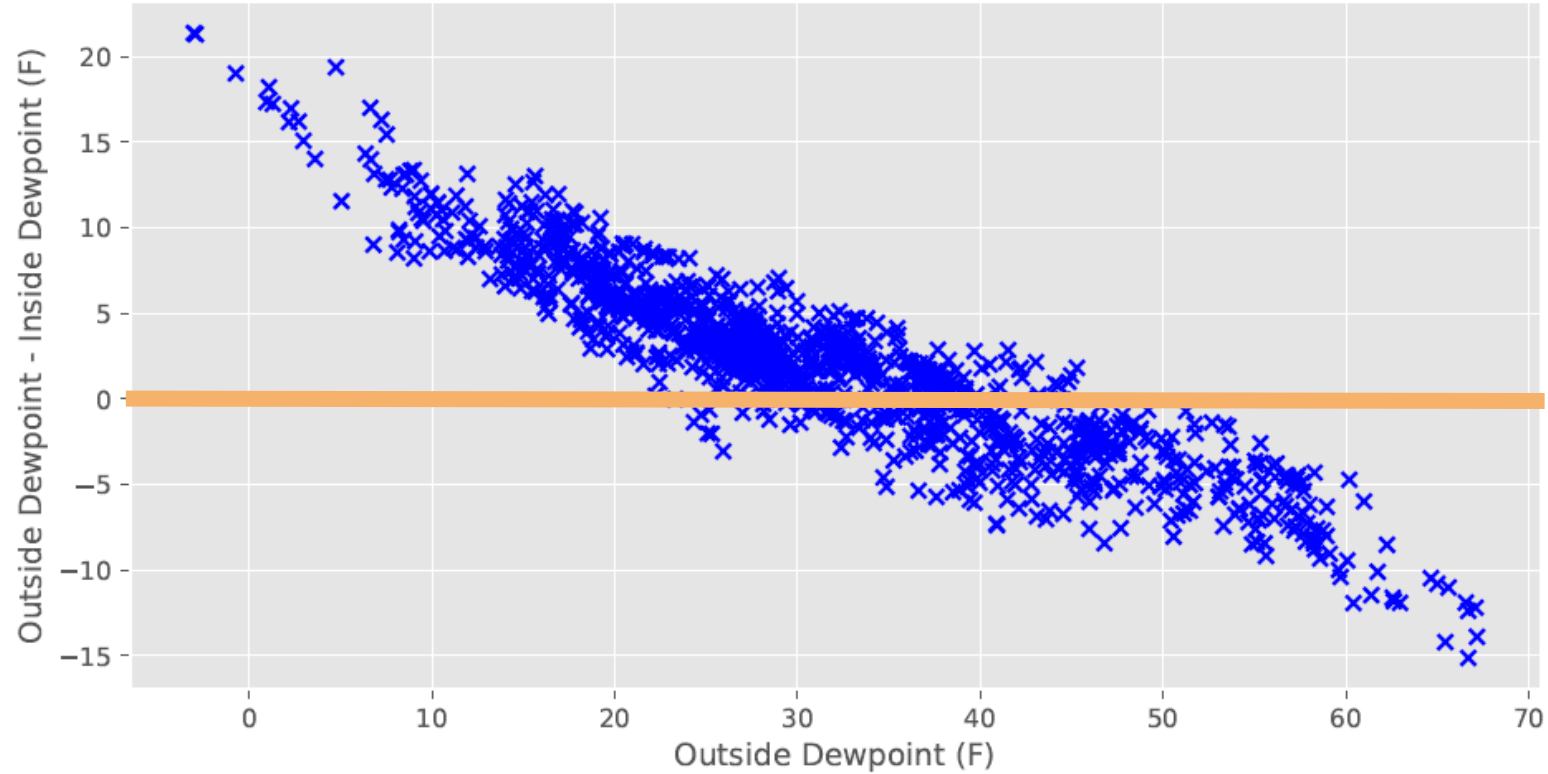
On Time per Hour



Using TMY3 - Burlington Percent On Time per Hour



Metering Hourly Average Store Dewpoint - Outside Dewpoint



Incremental Results

Case by Case vs Store Humidistat

- 32% incremental savings
- \$30 / door assembly more than Store Humidistat
- \$110 annual savings / door assembly

That is a Lot of Peaches

- Grocery margin @ 4% makes this investment equivalent to \$206,250 - \$412,500 additional sales per year



Demand Response / Stack the Benefits

- Anti-Sweat Heater Controls are a way to enter demand response (DR) markets
- Multiple DR markets to play in
 - ISO, RTO vs. DU



ISO / RTO Markets

- Enlist an aggregator to sell DR savings
- 20 store pilot
- \$95,000 in payments over 4 years

Forward Capacity Market Year	Summer KW	Winter KW	Capacity Value (\$/KW/month)	Gross Capacity Revenue (\$)	% Split	Demand Response payment (\$)
June 1st 2018- May 31st 2019	502	502	10	57483	60%	34490
June 1st 2019- May 31st 2020	502	502	7	42315	60%	25389
June 1st 2020- May 31st 2021	502	502	5	31902	60%	19141
June 1st 2021- May 31st 2022	502	502	5	27869	60%	16721

Take-Aways

1 Store

- Scheduling

10 Stores

- Store Dew Point
- Case Dew Point
- Scheduling

100+ Stores

- Store Dew Point
- Case Dew Point



What are
you going
to take
with you
from
today?

Ali White
ajwhite@veic.org
Ethan Bellavance
ebellavance@veic.org

Thank
you!

