



ENERGY STAR Connected Thermostats

Stakeholder Working Meeting Field Savings Metric

January 15, 2016



Agenda

- Feedback from data request
 - Some bugs flushed out, and addressed
 - Others?
- Savings claims



Attendees

Abigail Daken, EPA

Doug Frazee, ICF International, for EPA

Jennifer Kulp, ICF International, for EPA

Dan Baldewicz, ICF International, for EPA

Alan Meier, Lawrence Berkeley National Laboratories

Ethan Goldman, VEIC

Nick Lange, VEIC

Michael Blasnik, Nest Labs

Dave Cassano, Nest Labs

Raj Shah, Carrier

Phil Ngo, Impact Labs

Brent Huchuck, Ecobee

Wade Ferkey, AprilAire

Jack Callahan, BPA

Michael Siemann, Weatherbug Home

Wendell Miyaji, Comverge

Laurie Sobczak, Comverge

Alex Bosenberg, NEMA

Matt Golden, Open EE

Ed Pike, Energy Solutions, for CA IOUs

Ford Garberson, Ecofactor

Ram Soma, Ecofactor

Chris Smith, IRCO (Trane)

Roy Crawford, IRCO (Trane)

Kurt Mease, Lux Products

John Sartain, Emerson



Data request – issues and questions

- Have received two data sets, expect at least one more
- However, cooling metric results calculated with the ΔT method are invalid due to a bug
- Once other bugs (if any) are resolved, will need to re-issue request



Data request – discussion

- Seems like there are three sets of results for each thermostat
 - two partial winter seasons, each analyzed separately
 - In addition, only the delta T model ran for some thermostats for one partial season
 - Delta T values also are sometimes in the millions or negative millions – problem with the optimization for delta T?
- We intended for the heating season to bridge calendar years
- Could help this by asking for data spring to spring and fall to fall – but would that work for all climates given that some have very long heating and cooling seasons



Data request – discussion

- Would be helpful to understand the weather data, so can reproduce results and check to see how it compares to the temperatures the thermostat is using
 - Phil can work with individuals to do that
- The search for delta T is done with a black box optimizer – we don't know how it is really doing it
- There are also a significant fraction of thermostats for which the ratio estimators are just returning zeros



Data request – discussion

- How long to run?
 - Complete day on the computer for the run
 - For some vendors, taking only hours
- Building the appropriate data set took much longer
- Also had some problem with versions of dependencies, which trashed other Python code that was in use
 - Very hard to package everything all together
 - Also might want fix which version of EEmeter this software calls, so there is no future uncontrolled change
 - Please use a Python virtual environment to keep this software from trashing your whole environment
- Could also have every vendor include test cases in their file, to detect that the software is basically working



Savings claims

- Performed a back of the envelope calculation with RECS data, to get a general sense of the savings associated with “ordinary thermostat behavior”
- The “average” set backs and set ups from the RECS data are quite modest
- In addition, across all climate regions, about 57% of RECS survey respondents said that someone was home all day in their house.
- Between these two, the estimated savings due to set back and set up from the RECS schedule is modest – from 0 to 2% of annual heating and cooling expenditures.
- Used the 3%/°F heating, 6%/°F cooling savings SWAG

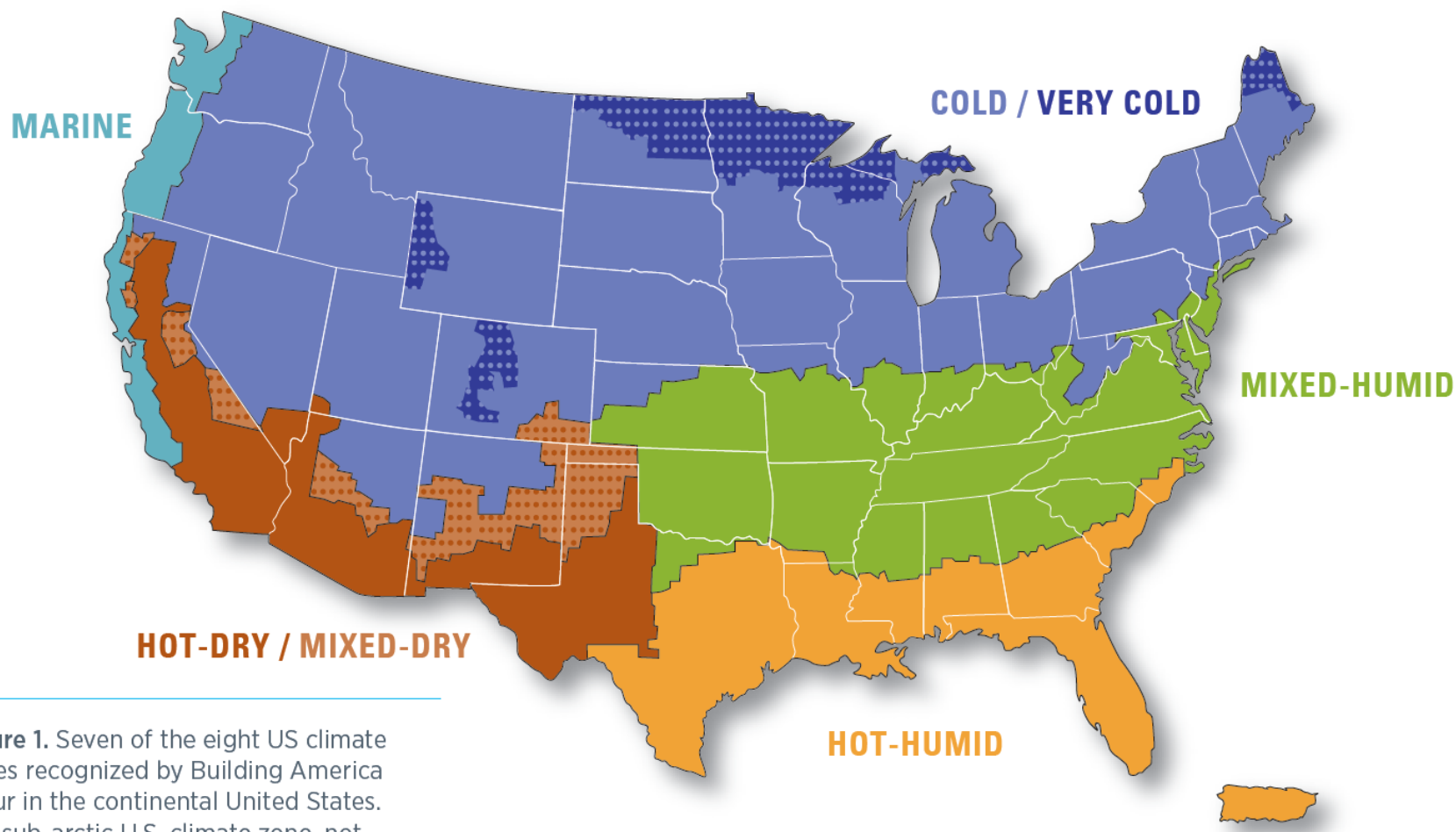
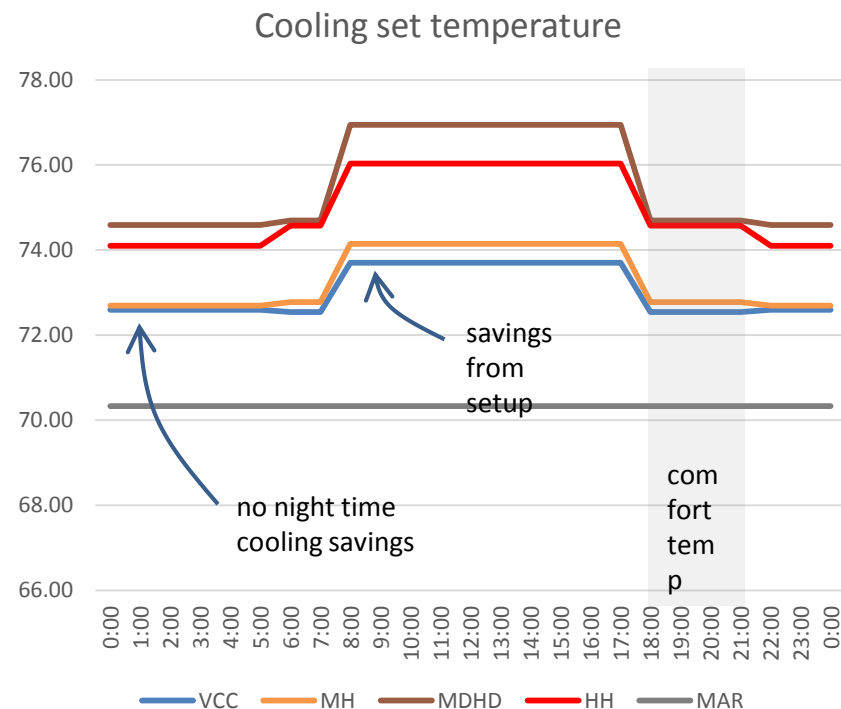
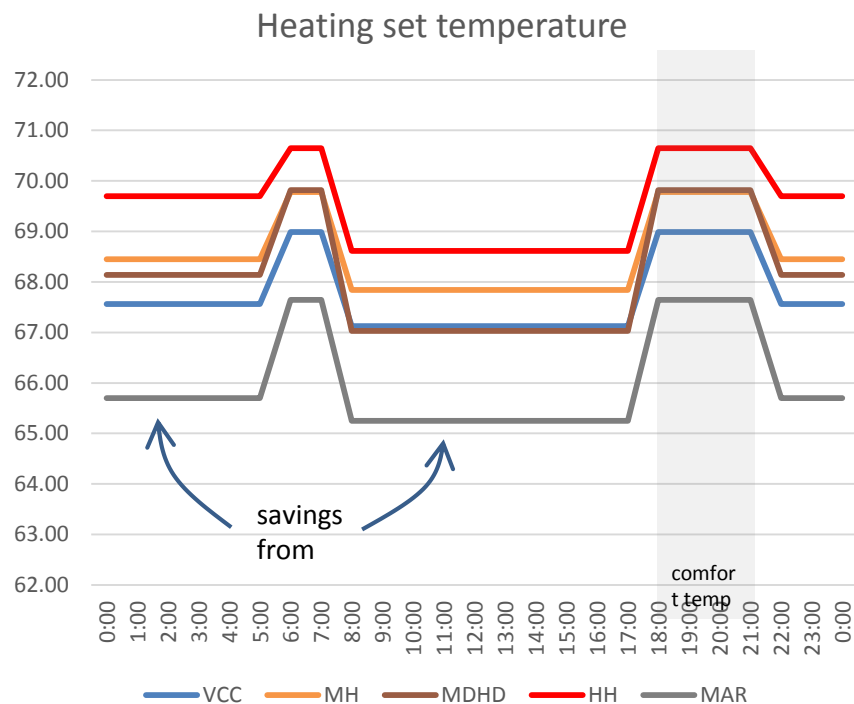


Figure 1. Seven of the eight US climate zones recognized by Building America occur in the continental United States. The subarctic US climate zone, not

“Average” weekday schedules from RECS



This is for households where no one is home during the day. On weekends for all homes, and on all days if someone is home during the day, all “away” hours shown here are assumed to be “awake” hours.

Savings back of the envelope calculation results

	heating savings					cooling savings				
	VCC	MH	MDHD	HH	MAR	VCC	MH	MDHD	HH	MAR
best estimate	1.7%	1.0%	0.8%	0.1%	1.1%	0.0%	0.5%	1.2%	0.9%	Q
if all are away 10 hours/day	2.5%	1.5%	1.2%	0.1%	1.6%	0.1%	1.2%	2.8%	2.1%	Q
if someone is home all day	1.1%	0.7%	0.5%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	Q
without accounting for float	2.1%	2.1%	2.7%	1.7%	2.9%	0.9%	1.0%	1.7%	1.1%	Q
no float and away 10 hrs/day	3.1%	3.1%	4.2%	2.8%	4.1%	2.1%	2.4%	4.0%	2.6%	Q
Factors to account for float	80%	50%	30%	5%	40%	5%	50%	70%	80%	0%

Accounted for float with estimation factors expressing what percent of heating/cooling expenditures occur when these SDH are valid.



Comments on the back of the envelope calculation

- Surprised that the savings came out so small
- BPA's RBSA data could correlate indoor temps with surveyed preferred setbacks.
 - Mean indoor temps did see gradual change to a 3 degree setback (70 degrees to 67 degrees)
 - Also see a larger % savings for winter – 8% savings per degree of change in average indoor temperature
- More recent data suggests 8-10% savings per degree of set up in cooling, and 3-10% savings in heating, with larger values in less extreme climates because a degree change is a larger percentage of the delta T. The estimates are empirical and do include accounting for float.
- In data from customers, how much of the year is the thermostat actually controlling indoor temperature? (No response)
- Do people have a pattern for how much they fool with their settings? General consensus: No, it's all over the map.



Next steps

- Re-submit some data once EPA asks for it, software is stable
- Draft 3 February, along with second draft Method to Demonstrate Savings
 - Final metric decision
 - Levels
- Draft Final April
- Finalize in May, available for immediate certification of products



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