EPA ENERGY STAR Connected Thermostats

Stakeholder working meeting
Connected Thermostat Field Savings Metric
11/06/2015

Agenda

- Introduction – anyone new joining the call?
- Software module update

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Attendees

- Abigail Daken, EPA
- Doug Frazee, ICF International on behalf of EPA
- Alan Meier, Lawrence Berkeley National Laboratories
- Ethan Goldman, VEIC
- Michael Blasnik, Nest Labs
- Dave Cassano, Nest Labs
- Phil Ngo, Impact Labs
- Brent Huchuck, Ecobee
- Ed Pike, Energy Solutions on behalf CA IOUs
- Ram Soma, Ecofactor
- Jennifer Kulp, ICF International on behalf of EPA
- Chris Smith, IRCO (Trane)

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Software modules (recent release)

- v0.2.4-alpha

- https://github.com/impactlab/thermostat/ (source, issues)

- http://thermostat.readthedocs.org/en/latest/ (documentation)

  - refresh to make sure you're not seeing an old cached version

- Install using "pip install thermostat"

- Note changes in input file format.

Next - statistics on many thermostats

- Review of proposed features

- What the module won't do

- Support

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Current vs. Proposed Architecture

- Sequential Architecture

- Parallel architecture

thermostat_metadata.csv
 - thermostat_1_interval_data.csv
 - thermostat_2_interval_data.csv
 - thermostat_3_interval_data.csv
 - thermostat_4_interval_data.csv
 - thermostat_5_interval_data.csv
 - thermostat_6_interval_data.csv
 - thermostat_7_interval_data.csv
 - thermostat_8_interval_data.csv
 - thermostat_9_interval_data.csv

thermostat_metadata_1.csv
 - thermostat_1_interval_data.csv
 - thermostat_2_interval_data.csv
 - thermostat_3_interval_data.csv

thermostat_metadata_2.csv
 - thermostat_4_interval_data.csv
 - thermostat_5_interval_data.csv
 - thermostat_6_interval_data.csv

thermostat_metadata_3.csv
 - thermostat_7_interval_data.csv
 - thermostat_8_interval_data.csv
 - thermostat_9_interval_data.csv

Module features for bulk processing

- Does not constrain architecture decisions - sequential or parallel both possible

- Low memory profile for sequential processing

- Optimizes batching by grouping accounts with the same outdoor temperature sources.

- Creates batches and packages that data for distribution to parallel architectures.

- Compiles batch results into single output

Other module features for bulk processing

- Statistical power calculation

  - Lets you use a minimum sample size

- Example:

  - Start with a small number of thermostats (e.g. 100)

  - Module computes statistics for these, and gives an estimate of how many more you'll need to include in the sample to get below acceptable standard error limits.

  - Compute again with a larger number of thermostats (e.g. 3000)

Module specifically will not

- Provision architecture (e.g. AWS, GCE)

- Provide scripts for installation or setup on specific architecture

Discussion of modules for large data sets

- Discussion of whether statistical power calculation is useful/needed
- Advocacy for picking a sample size that would be required from each vendor, with no variation between vendors
- End result: keep it for now, may not be useful later
- ~1000 devices provides 1% detectable difference in mean savings with 90% power (95% confidence), even in the climates with most marginal signal to noise (cooling in cool climates, heating in hot climates)
- Also a question of when there would be an opportunity for stakeholders to have feedback into level of certainty required for metric results – EPA intends to publish test method/spec drafts with proposed certainty requirements in Nov.

Support

- Impact lab will provide debugging and usage support

  - phil@theimpactlab.co or

  - by phone (email me and I will be happy to send my number)

Expected Process

- Software testing – OEE to address how they expect this to proceed
  - Tested version aiming for the end of November
  - Hoping to start testing next week with batching and stats calculation
  - Seek to work closely with a few vendors to test in earliest version ASAP
  - Look for email from Impact Labs to get in touch with testers Monday or Tuesday next week (11/9 – 11/10)
  - Start testing beginning of following week (11/16 – 11/17)
- EPA will ask for data in the next month
  - Would like to have large data set data back by around January 1
  - How realistic that is will depend on how fast the new modules are up and running

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Expected Process

- Specification Draft 2 released in November will not include numbers for metric score requirement either

- Levels will be proposed in Draft 3; goal is to release in January 2016
  - As previously discussed, will primarily be set so that average consumer saves enough to justify purchase of product
  - Hopefully also informed by your data for your products from modules that OEE is now working on

- May also include distribution requirements, e.g. at least 80% of homes must score above a particular level

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Discussion of expected process

- Regional or National?
  - Possibly both
  - Still on the table to calculate by region and do a weighted average
  - Format of output file will allow groupings by zip codes
- Still doing all three calculation methods
- With the group of homes (~1000) has run it with and without filtering for goodness of fit. Thinks results shared above was without filtering
  - Std deviations on savings are on the order of 10-11%
- Negative results b/c average indoor temp can exceed 90th percentile of set point
- Plus or minus about half the savings at the quartile boundaries
- People purchase these thermostats for many reasons that are not energy savings, so we would expect there to be some broadness to the energy savings distribution
- Discussion of how EPA uses general information about market cost to set levels in specifications

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Contact Information

Web site for these notes and all public discussion/comments:

http://www.energystar.gov/products/spec/connected_thermostats_specification_v1_0_pd

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