Comments from Home Energy Analytics on Docket # 12-HERS-01 (Whole-House Home Energy Rating OII)

HEA strongly supports CEC efforts to improve the accuracy and reduce the cost of California's Whole-House Home Energy Rating System. In particular, we applaud the emphasis on utilizing newly available AMI data. AMI data analysis offers a low cost and highly accurate method to evaluate certain aspects of building energy use. While it will never fully replace the need for expert onsite audits, there are clear opportunities for widespread application to help California achieve its GHG and energy efficiency goals.

Specific comments follow, organized by June 17 2015 Webinar Agenda items.

1. Uniform Energy Asset Ratings to Compare Building Properties.

From the Agenda (emphasis added):
*"[HERS] is an energy asset rating, which rates the energy efficiency of a home's energy assets... **It is not a rating of the energy used by the occupants** of the home as reported on energy bills, which will be referred to as a building performance assessment… At least initially, the expectation is that **asset ratings will primarily remain in the domain of new construction**."*

We fully support this distinction: modeling and simulation tools will always be needed to analyze new buildings due to the lack of historical performance data. This is where modeling belongs. But whenever actual performance data exists for a building, especially in the form of detailed smart meter data, it should be leveraged as the basis of more accurate – and often less costly – analysis.

We know of one specific case where AMI data analysis could be useful for new buildings: early measurement of a home's continuous electric load due to built-in electronic devices.

Specifically: Many new homes include electronic infrastructure systems that can significantly add to the base or continuous energy consumption of a home. This includes simple items (like "smart" or wireless switches, built-in heated towel racks & heated bathroom floors) to more complex systems like whole-house lighting or whole-house audio systems. Combined, we have found (as described in a new NRDC report on "Home Idle Load") these devices can add over a kilowatt of continuous energy use and the associated shocking energy bills to some California homes. These loads should be included as a home "asset", in that they are not easily disabled or removed.

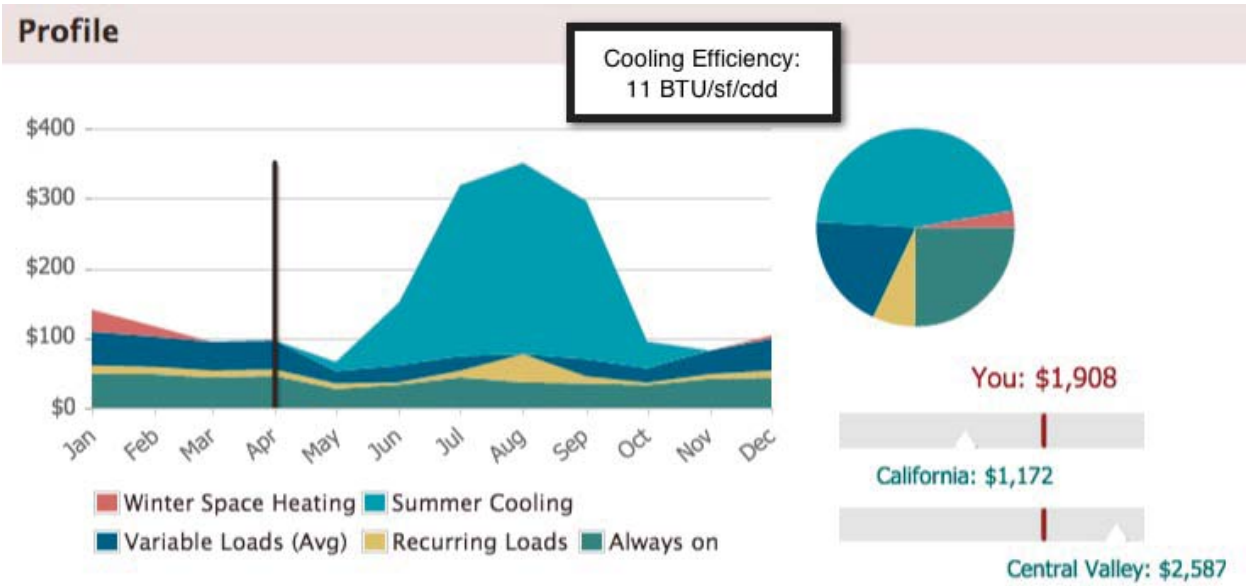
While tedious to **model**, the **actual measured** impact of these devices is simple to test before final inspection using a smart meter's display or AMI data analysis. Alan Meier from LBNL spoke of this at the June 18th CEC workshop on plug loads. To address this growing problem, a "maximum permitted electric idle load" (e.g. 250 watts) could be defined for new California homes.

2. Consider alternative asset rating approaches for existing buildings.

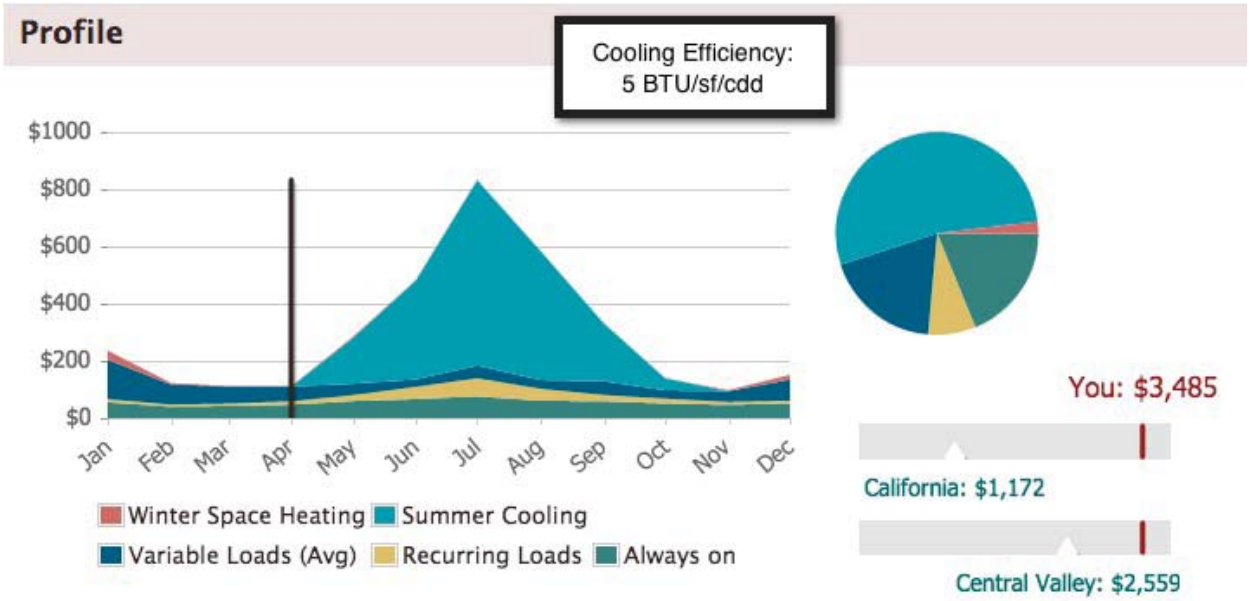
Over the past few years HEA and others have demonstrated the accuracy of remote audits to characterize "asset" based loads (i.e. the actual heating efficiency, cooling efficiency and idle load of existing homes). This has only become possible due to California's smart meter investment.

Costing only a few dollars per home, this analysis could provide a fast and effective way to pinpoint the portion of our existing building stock most in need of professional help. Existing programs in Alameda and Fresno counties are already utilizing this approach, offering residents a free online energy analysis of their homes and then automatically sorting them, based on their energy characteristics, into different treatment groups, rebate categories, etc.

As an example, see the energy profiles below of two homes in the Central Valley, both with cooling loads making up about 50% of their total annual energy bill. Using smart meter analysis – no onsite visit required – HEA analyzed the cooling efficiency of each:



The home above has a cooling efficiency of 11 BTU/sf/cdd, which is quite poor. The home below spends more on cooling but is more than twice as efficient, so upgrades will not be as effective.



Beyond identifying homes like these with high cooling loads, remote AMI analysis can further compare the cooling (or heating) efficiencies of each, allowing state agencies, utilities and contractors to target the most inefficient. Of course, remote analysis can't always diagnose the root cause (a leaky duct looks the same as an open window to AMI data) but it can help prioritize which homes deserve the first home visit.

3. Establish minimum standards for Building Performance Assessment Tools.

Given the high rate of innovation in this area, a "light touch" certification process founded on ground truth data and deployed rapidly will be critical to moving the industry forward.

Light Touch Certification Process

Tools leveraging AMI data analysis do not necessarily mesh with traditional energy use categories. For example, using AMI data it is easier to measure the continuous electric load of a home than to analyze the lighting load. This is the opposite of a traditional home audit. As a result, any restriction on “acceptable analysis types” will be detrimental to innovation in this area, so the certification process must be designed to test whether the tool does what it is purported to do, rather than test against a specific set of predefined questions and answers.

HEA has pioneered this area of smart meter data analysis since 2010, and few other tools exist. Even the new tool testing services CalTEST and CalTRACK are unable to support this method of analysis: they appear to have been designed to test model-based software tools like Energy Pro, and do not yet even support smart meter data.

Based on Ground Truth data

The inaccuracy of current model-based tools on specific homes excludes them from being useful to certify a new class of tools. Instead, the goal should be to compare new tool results to a published dataset of “ground truth” data: actual energy characteristics from instrumented & monitored homes.

Several efforts have been made in this area, including the Pecan Street project in Texas, Stanford’s REDD, the RBSA dataset by NEEA, and a more recent PG&E effort lead by SBW Consulting. Thus far, these attempts at disaggregated whole-house data sets have been incomplete, inaccurate, expensive, unpublished, or some combination.

This is a difficult problem. HEA recommends a more incremental approach: collect specific types of ground truth data as needed, in partnership with those who wish to be certified and/or could help build the data set.

Deployed Rapidly

The sooner the certification process can be deployed the sooner the market can evolve effective new tools. We recommend an incremental approach, starting with a method for certifying AMI-based analysis tools with the ability to measure a home’s “idle load” because it addresses one of the fastest growing load categories which can only be measured at a reasonable cost using AMI data.

Since 2010 we have used the term “idle load” to describe the continuous electric base load of a home, in watts. This figure is useful for profiling a home’s energy use and easy to obtain from AMI data. But there are many possible algorithms, providing an opportunity for the marketplace to innovate.

The commission can and should develop methods to certify tools that characterize this useful new load type to foster deeper understanding of the growing impact of plug loads. After using a simple electric load like idle load to develop a new tool certification process, the commission could then turn to evaluation methods for more complex cooling efficiency analysis (which involves only electricity analysis) and then heating efficiency (which involves multiple fuel types).

In summary, we encourage the commission to provide regulations and processes that will support the increased use of AMI data analysis to characterize and compare energy use in existing homes.

Respectfully submitted,

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