HUWP Calibration Procedure

# Background

The work paper team obtained program participant home characteristics and billing data for more than 1,000 past program participants from the years 2009-2010. They then adjusted DEER 2011’s eQUEST home prototypes to reflect the participant characteristics. Following that adjustment the prototypes were calibrated to the billed energy usage data of the same set of homes. The document describes the procedure for that calibration.

# Procedure

1. Adjust 48 prototypes to represent distinct participant home groups. There are eight prototypes for each of six climate regions (1 & 2 story, AC & no-AC, crawlspace & slab-on-grade). Note that vintage is also represented, but as a collection of simulation parameters rather than distinct simulation prototypes.
2. Collect utility data for the participants and eliminate data where analysis of the baseline electricity consumption suggested a swimming pool or self-generation may be present. Swimming pools were indicated by elevated electric base loads during summer months and self-generation (solar PV) by electric consumption inversely correlated with solar radiation.
3. Find year-long periods (e.g. Jan 2009 – Dec 2009) in each of the six climate regions for which most (at least half) of the participants have pre-upgrade billing data
4. Calculate the weighted average monthly pre-upgrade energy consumption for the AC and no-AC categories in each of the six climate regions (see Figure 1)
5. Create six weather data files based on actual weather data for each of the year-long periods in the six climate regions
6. Calibrate prototypes to billed usage:
   1. Disaggregate billed energy usage into heating, cooling and other:
      1. Take usage during months with few HDD/CDD (spring/fall) as base load
      2. Adjust base load for longer/shorter lighting hours in summer/winter
      3. Calculate heating as: winter usage – adjusted winter base load
      4. Calculate cooling as: summer usage – adjusted summer base load
         1. Note that both heating and cooling are fuel-specific calculations
   2. Run eQuest simulation using adjusted prototype and corresponding weather file
   3. Adjust heating and cooling setpoints and schedules (within reason) to get model performance within +/- 15% of disaggregated heating, cooling and other end uses.

*Vintages:*

*pre78*

*78-92*

*93-01*

Calc.

Weighted

Average

Usage

Calibration level

Figure 1. Calibration level, showing calibration to weighted average energy usage multiple strata

# Potential Issues

As with any analysis of this sort, there were limitations. Chief among these were:

1. The quality and consistency of the home audit data varied considerably among PAs and the interpretation and cleaning of that data required considerable judgement
2. Limited data and resources precluded calibration of all home variations leading to calibration to the weighted average energy usage 1- and 2-story homes and crawlspace and slab-on-grade constructions
3. It is possible that the characteristics of program participants will shift over time, and the group used for calibration will become less representative of the participant population

Despite these limitations, the energy usage and characteristics of the newly calibrated prototypes better represent the Home Upgrade program participants than the original DEER 2011 models.