

Beyond Standard Efficiency Ratings

BY DAVID YASHAR, PH.D.

One of the greatest challenges to cost-effectively reducing the energy consumption of an occupied building lies in the accuracy of the energy use predictions of the installed equipment/appliances. In residential buildings, the challenge is further complicated because the equipment's installed efficiency and total energy consumption are highly dependent on (1) the type and level of interaction it has with the occupants and (2) its installed environment.

While current rating methods provide a benchmark for equipment performance, they only provide enough information to predict how that equipment will work under a standard set of operating conditions. Furthermore, as manufacturers are required (through federal minimum standards) and encouraged (through utility rebate, state and federal tax credit programs, and other market forces) to increase equipment efficiencies at the rating condition(s), the question arises as to how well those increases translate to the installed performance in a given home.

One of the major reasons for having efficiency ratings is to assist consumers in making purchasing decisions. As we progress through the 21st century, people have increasingly more decision-assisting power at their disposal but they need access to useful information; otherwise the power is futile. Historically, detailed information on the operational modes of equipment was far too complicated for most homeowners to understand. Today, however, decision-assisting information exists in abundance and it doesn't require the homeowner to understand the complex mechanics of consumer products. A homeowner can obtain a realistic estimate of the monthly operating expense for each product under consideration simply by using a smartphone and some basic information. Unfortunately, all of the data needed to enable that type of decision making is not available with the current ratings; therefore, the consumer cannot realize the benefit.

Consider residential air conditioners, which often dominate the utility bill in a home. Their efficiencies are rated on the basis of a nation-wide Seasonal Energy Efficiency Ratio (SEER), which characterizes the efficiency over the course of the year but does not

consider many of the factors that influence the performance in the field. Manufacturers are required to run several tests and use them to calculate a small handful of parameters, but the information from these tests is generally not provided to the homeowner. Instead the

consumers are only told that it is a “SEER 14” or “SEER 16,” which means little more than a tax credit to most individuals. At a minimum, the combination of the efficiency ratings and the uncertified data from which those ratings are derived, as well as other “catalog” data

available from the manufacturer, could provide enough information to tell homeowners in New Orleans and Las Vegas that they would be better off buying products with different sensible heat ratios even though they have the same SEER value.

Thinking bigger, information embedded in a bar code could be used with local weather data, occupant preference on thermal set points, and building information (type, size, etc.) to predict a detailed schedule of energy use over the course of a year. All or part of that same schedule could also be used as a set of performance metrics for commissioning purposes, to provide information on how the unit would respond to changing utility rates, as a tool for fault detection during the unit’s lifetime, or even as a mechanism for utilities to forecast demand.

In fact, the field performance of nearly every rated product would be improved in some way if consumers could leverage more detailed information into their purchasing decisions than just published efficiency ratings. Homeowners are often unaware of how their daily routines impact a product’s energy use and additional data could help them pick the best products for their lifestyle. If we really wish to reduce overall energy consumption, increasing the level of information provided beyond efficiency ratings is not only a good idea, it is essential.

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