Knowledge Saves Power

Temperature data serves as an energy conservation tool.

BY TROY M. HULL

In an effort to continue to reduce energy costs, property and facility managers struggle to find new tools to help conserve our precious resources. Structural improvements, energy-efficient appliances, low flow water fixtures, etc., have all returned significantly on the investments made to put them in place. The addition of sub-metering systems helps to complete the loop by measuring usage to actually see the savings from the improvements. However, even more components can be added to an energy conservation program.

The relationship between outdoor air temperature and indoor temperature for space heating or cooling often goes overlooked in developing energy conservation plans. Many residents who live in multi-family properties where utilities are included in rent do not understand that the greater the temperature difference between outside air and their indoor comfort zone, the more extreme the cost to provide that level of comfort. Add that 60 to 70 percent of energy costs in residential and commercial office buildings is used for space heating and cooling, and you have a tremendous opportunity for energy savings. Following are a few examples that demonstrate the significant impact temperature can play.

Table 1
Heating Example
Assume that an average residence uses about 540 CCF of gas for heating in an average month. Outside Air Temperature Average is 40° F

	Unit #1	Unit #2	
Indoor Air Temperature	68° F	74° F	
Delta from Outside Temp	28° F	34° F	
CCF Gas Used	70 CCF	85 CCF	
Cost Per CCF	$ .70	$. .70	
Cost Per Unit	$49.00	$59.50	
Temp Differences in Units			6° F
% Difference			21%
Savings Per Month			$10.50

Table 2
Cooling Example
Assume that an average residence uses about 540 kilowatt hours (KWHR) for cooling in an average month. Outside Air Temperature Average is 90° F

	Unit #1	Unit #2	
Indoor Air Temperature	78° F	72° F	
Delta from Outside Temp	12° F	18° F	
KWHR Electricity Used	540	810	
Cost Per KWHR	$ .06	$. .06	
Cost Per Unit	$32.40	$48.60	
Temp Differences in Units			6° F
% Difference			50%
Savings Per Month			$16.20

Heating and Cooling Examples

Based on Table 1 and Table 2, it is clear that relatively minor changes in comfort level can have a significant impact on energy costs. The problem is that in order to have an impact on resident/user behavior, it is important to have data available to support conclusions. Energy management service providers in the multi-family industry have collected outside air temperature data for use in substantiating energy costs, particularly when extremes of weather occur. However, until recently, the ability to collect indoor air temperature data and integrate it into the overall scheme of energy conservation efforts has not been readily available.

Recently, the commercial multi-family industry has implemented this type of capability to manage vacant units, common areas, etc. The owner/manager has an incentive to keep costs low in common areas because he foots the bill. It has not been implemented in residential units because the resident retains the incentive to conserve.

This capability has an enormous fit for military base quarters/housing managers because they retain the financial responsibility for energy costs. Having temperature data available for housing units helps to normalize data and adds credibility to behavior modification interactions with residents.

Privatized military family housing managers could see this capability as a tremendous resource for three reasons: First, the bulk of energy costs for their projects will be paid from a fixed basic allowance for housing (BAH) income stream. Second, the culture shock that will be associated with family housing resident responsibility for utilities can be averted somewhat if managers have solid data to back up commodity usage, particularly in extreme cases. Third, if implemented during the baseline development process, managers can assess the credibility of collected utility consumption data with respect to temperature information to arrive at more reliable figures. There is also evidence to support that there will be some conservation based simply on the fact that someone is monitoring use.

This type of capability is now being offered to development partners in the Residential Communities Initiative Program in conjunction with automated utility metering systems. Individual dwellings can be fitted with indoor temperature sensors that report readings to the building meter interface module. Each module also has an outdoor temperature sensor recording outdoor air temperatures. The constant temperature inputs are then averaged to arrive at a daily average temperature for a given residence, as well as a baseline delta from outside air daily average temperatures. This capability should not be limited to residential use. Base operators can benefit significantly from integrating this type of capability into their overall energy conservation plans.

Installation of temperature sensing equipment normally can be accomplished by using existing data or telephone wiring in existing housing/quarters during the course of sub-metering equipment installations. Costs to do such in conjunction with sub-metering are minimal. The added credibility of such a tool will pay many dividends as managers/operators continue to streamline housing operations. ■

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