

Evaluation of Yale Community Carbon Fund's Low-Income Programmable Thermostat Project

The mission of the Yale Community Carbon Fund (YCCF) is twofold: to enable low income people or organizations in New Haven to become more energy efficient and 2) to promote economic security for low-income people living in New Haven. In 2010 YCCF funded a low-income PT program; approximately 100 Aube Programmable 240V Thermostats were installed in homes through a partnership with the City's Office of Sustainability and the local utility administered Home Energy Solutions-Income Eligible (HES-IE) program.

Program Evaluation:

Contacting recipients: When contacted a year after the installation, 30 of the 72 recipients had moved away with no forwarding information. Contact problems are more likely to arise in low-income populations as they are more likely to be renters and therefore more transient.

Evaluating energy savings: Evaluating any energy savings effect of PTs was challenging for a number of reasons, including 1) difficulty in accessing utility bill data, 2) difficulty in isolating the effect of the PT, 3) many recipients of PTs heat with oil, which is extremely difficult to track, and 4) changes in the price of oil and natural gas as well as variations in weather make the comparison of energy bills from one month to the next difficult to equate.

PT Specific Recommendations Include:

- Work directly with landlords to minimize administrative inefficiencies with outreach.
- Ensure that participating contractors have properly trained technicians prepared to both install PTs and train residents, and respond to follow-up calls, and that they are adequately reimbursed for related costs.
- Include a funded training component alongside any PT intervention, and possibly a follow-up call or visit at the next change of season. Training for low-income groups should take into account that they are more likely to be elderly, possibly less educated and, crucially, more preoccupied with other pressing financial concerns. Solutions might include stressing possible financial savings, providing easy to understand, laminated instructions, offering workshops at which food/a stipend is provided, and a 'call-for-advice' number clearly provided on the PT itself.
- Current trends are for more 'intelligent' PTs with features such as real time feedback on energy use and web interfaced to interact with smart phones. Such PTs are costly and may be intimidating to particular groups, such as the elderly on fixed incomes. PTs that are as simple but as effective as possible should be made available.
- Prepare thoroughly and early for program evaluation:
 - Develop project in partnership with utilities to ensure they are invested in the results and that the correct permission for data sharing is obtained from recipients from the outset.
 - Establish a control group before beginning the project to enable isolating the effect of the PT.
 - Work with landlords to maximize follow-up of buildings where PTs were installed even if residents move away
 - Survey larger sample populations and include close-ended questions in the survey to facilitate statistical analysis.

The PT Program Had Mixed Results:

Users: PT recipient responses during telephone interviews fell on the extremes; people either are very satisfied or very frustrated. Overall, the majority of recipients interviewed struggle with PT operation. Quantitative analysis, while not statistically significant, found that low-income people may struggle more than others with PT operation. The study confirms findings of previous PT studies, which have found that PTs are often not used properly and do not therefore result in energy savings.

Installation: PTs are more complex and costly to install than other energy efficiency measures, and result in more complaints from recipients. This makes it difficult to simply 'add-on' PTs to an existing package of weatherization measures.

Accessibility: Low-income people tend to rent rather than own their homes. Landlord approval is needed for PT installation, which can be challenging; landlords can be difficult to contact and may be suspicious of changes made to their properties.

Program administration: Successful implementation of energy efficiency interventions depends on successful partnerships, but initial set up, changes to and evaluation of programs can be lengthy processes when working with large, bureaucratic institutions such as universities, utilities, and city halls.

Questions for Future Research:

How can programmable thermostats be better designed to support effective consumer use?

How can programmable thermostats be effectively incorporated into existing energy-efficiency programs?

How can energy efficiency measures be designed to better support low-income families?