

# MULTI-FAMILY

## Citizens Conservation Corporation: a Profile

by Amy Waterman

*A Boston-based energy services company is mastering the art of financing and retrofitting multi-family buildings.*

*A building owner in Lawrence, Massachusetts, was planning to install a \$176,000 replacement heating system in a 90-unit housing complex for the elderly. Instead, for \$186,000, an energy services company installed a new energy-efficient heating system, replacement chillers, and measures to reduce air leakage, including door weatherstripping and oak thresholds. The oak thresholds were not put in for their energy-saving potential alone, but because they reduce drafts, smell, noise, and light coming in from the hallway—all of which are important to these residents. The building owner paid only \$86,000 of the cost; the energy services company arranged a low-interest loan for the rest of the improvements. The loans will be paid back with energy savings due to the improvements. After the loan is paid off, the savings will go to the building owner.*

### Taking the Risks Out of Conservation?

In the multi-family building energy conservation game, there are plenty of disincentives to saving energy from the perspective of tenants, building owners, and managers. The tenants don't pay their own utility bills, building managers usually put energy improvements low on their priority lists, and most building owners do not think energy investments are worth the financial risk. (See "Building Managers: the Actors Behind the Scene," Mar/Apr '88) Even when tenants attempt to conserve energy, they don't get feedback in the form of reduced utility bills.

To overcome these disincentives, energy services companies (ESCOs) started forming in the early 1980s. Each ESCO is unique, but typically an ESCO audits buildings, plans the best combination of energy-saving retrofits, and then installs and maintains these retrofits. The ESCO often finances the whole project on the condition that it

receives a share of the energy savings as payment. It usually draws up a performance contract, which means that payment is based on the success of its conservation measures (see box on on page 13).

Citizens Conservation Corporation (CCC) is the Boston-based ESCO responsible for the Lawrence retrofit described earlier. CCC was started in 1981 by Joseph P. Kennedy II as an independent, non-profit sister company of Citizens Energy Corporation, which was founded in 1979 to offer discounted heating oil to low-income households. Citizens Energy has since expanded to include four for-profit subsidiaries that buy, sell, and trade gas and electricity, provide markets for third-world oil producers, and sell prescription medicines at low rates for groups covered by benefit or insurance plans (see box on page 11).

Most of CCC's projects involve retrofitting low-and moderate-income multi-family buildings. CCC usually chooses larger building complexes—such as high-rise apartment buildings, large townhouse complexes, and "scattered-site" row houses—because they have greater economies of scale. A single project manager is responsible for the whole process, from performing the audit to overseeing construction; this person is aided by a team of managers from other projects, who offer their expertise and advice on each project. Like other ESCOs, CCC manages energy conservation projects from beginning to end by performing the audit, designing improvements, arranging financing, managing construction, and monitoring energy use and savings. Since 1981, CCC has installed \$5 million worth of improvements in 6,000 apartments. These retrofits typically reduced energy use by 15-40% with an investment of \$750-2,000 per apartment.

### Financing: Changing the Rules

Few companies attempt to retrofit multi-family buildings and those that do rely heavily—at least in their initial phase—on funds available through government or utility programs. During CCC's initial years, 80 percent of its operating funds came from its parent corporation, Citizens Energy Corporation. Now, seven years later, it draws only 20 percent of its operating funds from Citizen's Energy.

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communities, then multi-family energy services companies can become less dependent on subsidies," explains Greg Thomas director of the Syracuse Energy Services Company, a for-profit subsidiary of a non-profit New York community action agency. (See "Is There Life After Weatherization?" on page 5 of this issue.) "Energy services for multi-family buildings are a new product. When you have a new product, you have to educate your market, and this is an expensive and time-consuming process."

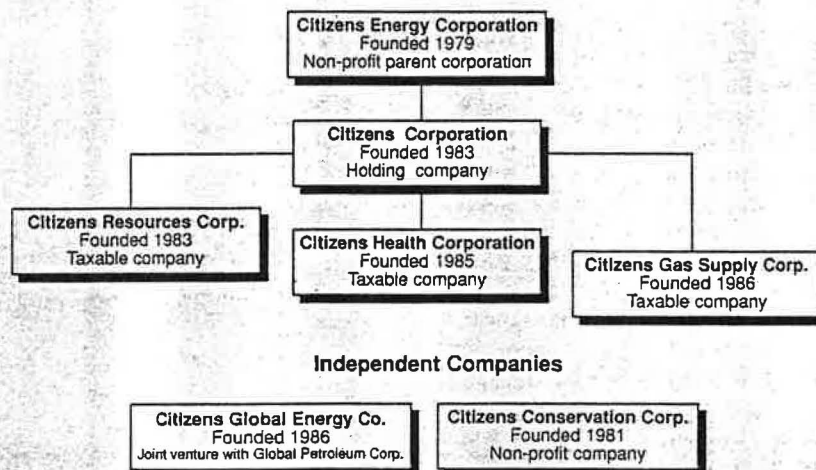
One of CCC's goals is to emphasize long-term efficiency rather than just short-term paybacks. CCC's projects sometimes have paybacks as long as 10 to 15 years. This is possible due to the subsidies that CCC receives from Citizen's Energy, government and foundation grants, and contributions from the building owner. CCC's charitable, non-profit status enables it to accept grants from a variety of organizations. The grants are used to establish loan funds, which are made available to building owners as low-interest loans. Sometimes owners choose to use their own financing.

CCC makes different types of shared-savings agreements with building owners. In one common type of agreement, CCC is responsible for the actual energy bill

each month, while the building owner pays CCC the historical energy bill, adjusted for weather, occupancy, and the cost of energy. CCC uses the difference between actual and historical bills (the energy savings) to repay the loan, which typically has a seven-to-ten-year term. Any extra energy savings, above the periodic loan payments, are divided four ways—between the residents, building owners or managers, an insurance fund that protects CCC against shortfalls in energy savings, and CCC. A typical breakdown is 50% to the tenants, 20% to the owner, 15% to the insurance fund, and 15% to CCC.

CCC asks owners to share costs, and owners contribute up to 50% of the costs in many of CCC's projects. Having the building owner chip in helps make the project financially feasible for CCC. Rolly Rouse, vice-president of operations for CCC feels that this helps get the building owner involved and feel accountable for the project. The building owners do not get something for nothing, but they get something for less.

CCC treats energy conservation as part of a whole-building planning scheme, incorporating owners' interest into its project plans. "CCC doesn't treat energy as a stand-alone issue," says Rouse. "We emphasize conservation as



## Citizens Energy Corporation

When Joseph Kennedy founded Citizens Energy in 1979, the purpose was to provide oil to low-income residents of Massachusetts. At that time the price of oil was skyrocketing. That original concept has been expanded to include direct assistance programs in natural gas, and electricity. These energy programs are all run by the non-profit parent company, Citizens Energy Corporation. There are four for-profit subsidiaries, Citizens Conservation Corporation, and a joint venture company called Citizens Global Energy Company.

In Citizens Energy's oil program, the company serves as a middleman between oil-producing nations and the refiners of the crude oil. Profits from sales help purchase low-cost heating oil for low-income residents of Massachusetts. The gas program is operated in a similar manner. Citizens also buys electricity from utilities with excess supply and sells it to utilities that need power. Profits from the resale are used to help low-income families pay their electric bills. For example, Citizens might sell cheap electricity from Utah to southern California. The profits would be used for local community

programs in Utah and to help pay off "uncollectable" bills of low-income families in Los Angeles.

Citizens Gas Supply Corporation is a for-profit company that buys and sells natural gas. It does contract carriage—where pipelines are available for transporting gas, it attempts to connect buyers and sellers to use this route. As a result, it can bring in gas cheaper than the present supplier. Like the electricity program, it uses the profit to pay off "uncollectable" gas bills of low-income families.

Citizens Conservation Corporation, a non-profit company that audits and retrofits multi-family buildings is the other energy-related company. The original funds for CCC came from a \$100,000 grant from Citizens Energy Corporation. Half of this grant was deposited in an interest-bearing account, which helped to reduce interest rates on the energy-conservation loans CCC gave to its clients. CCC has since established loan funds with support from the Massachusetts Housing Finance Agency, the Bay State Gas Company, the Massachusetts Executive Office of Energy Resources, the Massachusetts Executive Office of Communities and Development, and federal weatherization funds.

## MULTI-FAMILY

part of a longer-term, intelligent planning process, which involves caring for the building and the tenants."

CCC staff consider aesthetics, comfort, equipment, and maintenance costs, as well as methods to reduce tenant turnover and increase property value. In addition to converting heating systems, CCC downsizes older heating systems whenever feasible. Rouse emphasizes the importance of the long-term energy performance of a building. "Tweaking the present system is just putting off the pain."

### CCC's Energy Services

#### *The Audit*

CCC performs a detailed audit using software specifically developed by CCC staff. The project manager in charge of a particular building—with help from a team of other project managers—analyzes the building structure, mechanical systems, and historical energy use. The audit report includes costs, energy savings, and methods of financing proposed improvements.

While CCC's audit resembles that of other ESCOs, it has unique features. For example, CCC bases the audit on daily weather data and a building balance point that is individually determined for each building. (A building balance point is the outside temperature at which the energy from bodies, lights, and appliances is no longer adequate to heat the building. The heating system must switch on at this temperature to maintain the thermostat setting. The balance point is used to calculate heating degree-days.)

Using this type of building balance point makes quite a difference in CCC's estimates of energy use and energy savings. The 65° balance point upon which the U.S. Weather Service bases its degree-day reports is appropriate for single-family buildings with no attic or wall insulation, single-pane windows, and roughly one-fifteenth of the current per capita electricity consumption. Typically, especially in multi-family buildings, the actual building balance point is lower. When the 65° balance point is used to calculate degree-days, the buildings' energy use for space heating can be overestimated, sometimes by as much as two-fold. This is one of the causes of inflated estimates of energy savings in some audits. (Individually determining the balance point will be less important in mild climates, where the average indoor-outdoor temperature difference is lower.)

Most multi-family audits are still based on the 65° balance point. However, the trend is toward the use of individually determined balance points, says Jim Halpern, of Residential Energy Efficiency People (REEP), a for-profit ESCO that does some residential retrofit projects. "Anybody in business now who does not use this type of balance point and hourly weather data is crazy."

#### *The Retrofit*

Citizens Conservation details energy improvements in the construction specifications and drawings, puts the

work out for competitive bid, and manages all work done by its subcontractors. In most cases, it charges a fixed fee for its work and bills the owner directly for subcontractor costs, with no mark-up.

CCC often retrofits older apartment buildings that have antiquated heating systems. Project managers often recommend converting electrically-heated buildings to gas-fired heating or converting steam heating systems to forced hot water (see "Steam to Hot Water Conversion" on page 23 of this issue). Such conversions are more expensive and generally have a longer payback than retrofitting the existing system. When the distribution piping needs replacing, the owner can save money by installing smaller diameter piping and fewer baseboard panels. The savings are used to pay for higher quality baseboard and heating equipment.

Most for-profit ESCOs cannot recommend replacing the heating plant without significant outside financing. "Replacing the heating system is a great deal for the building owners" says Richard Esteves of Sentinel Energy Savings Corp., a Massachusetts firm. "However, most ESCOs cannot afford a wholesale replacement because the payback period is very long."

But CCC can afford to choose more extensive—and expensive—conservation measures than most other



This wall is being repaired because it was tested with a blower door and an infrared camera and found to have no top plate.



## More About ESCOs

Most ESCOs operate on the principle of *performance contracting*, where the payment to the ESCO depends on the success of energy conservation measures. The ESCO arranges the financing and assumes all risks for the investment. There are *equipment contracts*, where specific energy-saving equipment is leased to the client, and there are *service contracts* that are more complex arrangements involving services, equipment, and control measures. Performance contracting is appropriate when the building owner does not have the time and expertise to evaluate conservation options, or the money to pay for the project up-front.

In an energy services contract, the savings are calculated each month based on the difference between actual energy consumption and the historical energy use, which is agreed upon beforehand by both parties. The energy services firm installs improvements and pays the utility bills for a set time period. The customer pays a percentage, say 80%, of the historical utility bill. In both types of service contracts, the energy services firm or a third-party investor finances the improvements, which are then installed by the energy services firm or a subcontractor.

In a shared savings agreement—the type of contract the CCC uses—the energy-savings are shared between the contractor and the owner in a agreed-upon formula. If there are no savings, the customer pays nothing beyond the historical energy bill.

The typical arrangement that CCC makes is slightly different than a shared savings contract as defined above. First, the customer often pays part of the retrofit costs. Second, the savings are generally shared four ways—between CCC, the building owner/manager, the tenants, and an insurance fund for CCC.

*Home Energy* spoke with Jim Halpern of REEP, Inc., a large, Washington D.C.-based, for-profit ESCO that does some shared savings work. "Shared savings is the most expensive type of contract. However, it relieves the end user of the risks and hassles of contracting conservation work," says Halpern. About half of REEP's work is paid for up-front by the customer or someone else (e.g., the utility), and about half is done on a shared-savings basis, according to Halpern. REEP offers a variety of energy services, including lighting, energy management systems, thermal energy storage, and cogeneration. When

REEP undertakes multi-family projects, the utility—rather than the individual building owner—usually guarantees REEP a fee based on the amount of reduced electric load.

Larry Goldberg, of Sequoia Energy Services in Eureka, California agrees with Halpern that shared savings are not a panacea. "If anything, they should be the last resort. They are expensive to manage, and they lend themselves to abuse. They also require the ESCO to have access to the building site at all times. This is a big disadvantage to many building owners.

*Home Energy* also spoke with Richard Esteves of Sentinel Energy Services Company, a for-profit ESCO based in West Springfield, Mass. Sentinel typically performs shell retrofits and some water-heater improvements. Most properties are all-electric. Sentinel does performance contracting, but only where the local utility has a program to pay for avoided costs of energy conservation. "You have to have a very large project or have it guaranteed by a utility if you want to do multi-family," says Esteves. He says that third-party financing is a problem for such buildings, as the owners have to put a lien on their building—an action they are very reluctant to take.

The paybacks on Sentinel's retrofits vary from 2.1 to 4.5 years. "The utility sets the price that decides what kind of payback period our retrofits will have." The utility company pays a certain amount per kilowatt-hour that is saved. "We have just begun to work on lighting—the payback is long in residences for lighting. As we move to longer-term contracts, we can look more to lighting improvements."

Greg Thomas of the Syracuse Energy Services Company (SESCO) spoke of the difficulties of ESCOs in the multi-family market. "As building owners become more aware of the benefits of energy conservation and see the success of projects in their community, then ESCOs working in the multi-family market can become less dependent on subsidies. But this takes time, say five, six, or seven years. SESCO is in its fourth year of operation, and I am just now starting to see the results of the groundwork we've laid in the past. Until people see that there isn't a large risk associated with ESCO services, then you won't see a lot of privately-funded projects."

*Suggested further reading:* Weedall, M., R. Weisenmiller, and M. Shepard. *Financing Energy Conservation*. Washington, D.C.: American Council for an Energy-Efficient Economy. 220 pages. 1986.

ESCOs because of their secure funding. "Citizen's is a very important model for ESCOs," says Larry Goldberg of Sequoia Energy Services Co. in Eureka, Calif. "They are our mentor. But it is important to realize that they are the Maserati of energy conservation. They want to eke out every last bit of energy savings, and this is very expensive."

## CCC Experiments with Conservation Techniques

### Heating Cost Allocation

CCC experiments with various energy conservation products in order to tailor the best conservation plan for each building. One such product is a BTU meter that allocates space-heating costs for individual apartments. (See "Billing Tenants for Heat: Paying for What You Use," Jan/Feb '88) CCC installed BTU meters in one project to monitor heat and hot water in an electrically-heated 18-

story Massachusetts building with 200 apartments, which CCC had converted to central gas heat.

Monitoring results suggest that metering the heat was not effective. The distribution of costs mirrored the unequal distribution of heat in the building—energy use for space heat was highest on the first few floors of the building, lower on the middle floors, and least on the top floors. This occurred because of warm air leaking upwards through the building (the stack effect). The result was that the lower apartments were helping to heat apartments on the upper floors. Rouse is skeptical of the need to individually meter apartments in gas-heated buildings. He feels that a project can realize more energy savings if the money spent metering heat is invested in other improvements.

### Setback Thermostats

CCC is also testing a type of setback thermostat manufactured by the Clark Company of Vermont (see *Home*

## MULTI-FAMILY

*Energy*, Mar/Apr '88, p.22). The dial of the thermostat is set at a "comfort temperature," which is adjustable. (In the case of CCC's Brockton Housing Authority project, the maximum comfort temperature is 76°.) To get heat, the resident pushes the "comfort button" on the thermostat, and the room is heated to the comfort temperature. After two hours, if no one has pushed the comfort button, the thermostat sets itself back 10°, and the temperature of the room gradually declines to the setback temperature. The setback ensures that unoccupied rooms are not unnecessarily heated.

Although the concept behind the Clark thermostat is sound in theory, CCC has had some difficulties with its installation and use. "We had a big problem with a bad batch of thermostats—20% of them were defective. Luckily, we found out about it before they were installed," says Lillian Kamalay, the project manager in charge of CCC's efforts in public housing.

Henry Clark, the inventor and manufacturer of Clark thermostats, concedes that there was a high initial failure rate in this case, but notes that the thermostats were replaced immediately. "Part of the problem is that these thermostats were low-voltage electronics [used for gas and oil heat], which electricians are not very experienced at installing. The electricians also treated Clarks like conventional thermostats—which you can drive a truck over—although the Clarks are much more fragile.

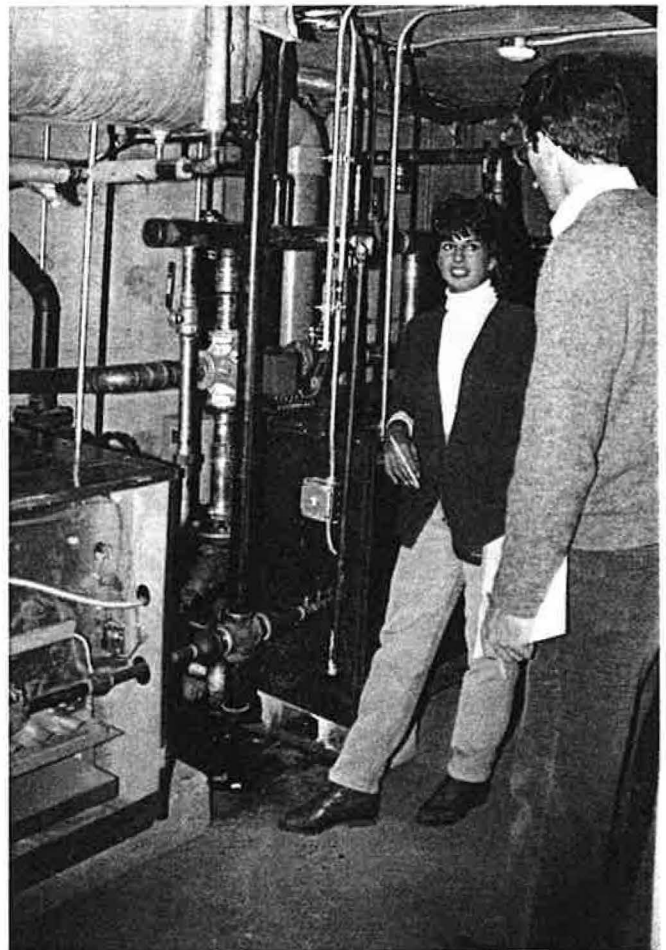
CCC reports that tenant reaction to the Clarks has not been favorable, however. Ben Clarkson, formerly with CCC, says "We installed roughly 2,000 Clarks as a test with great technical results, but tenant reaction was a real problem. It took people a while to get used to operating them."

"Residents of some housing developments are used to having unlimited heat, and it takes a lot of education for them to adjust to having to push a button to get warm," reports Kamalay. Kamalay spent much time carefully planning an education program, which included bilingual presentations, and still received complaints from tenants. The elderly especially have trouble with the Clarks. Commenting on the whole issue of tenant education, Clarkson says, "You can sink a lot of money in a building, but if tenants don't cooperate with you, you will lose a big chunk of potential energy savings."

### Tenant Incentives

CCC offers tenants about half of any excess savings as an incentive to develop better energy habits. Although much of the savings upon which the tenant rebates are based may be due to the physical improvements alone (and not behavioral changes), CCC requires that the tenants attend an energy education workshop in order to receive their share of the rebates. In this way, CCC uses the rebates to educate tenants about ways that they can save more energy through their behavior.

CCC makes no promises of rebates and has no contractual agreements with the tenants. The rebates can be no more than 15% of the tenants' rent. According to Rouse,



Lillian Kamalay, CCC's manager of public housing projects, and John Snell, a CCC project manager, in one of the boiler rooms of Crescent Court, a 124-unit public housing project in Boston. High-efficiency, state-of-the-art boilers were installed in the 14 separate boiler rooms.

roughly 90% of CCC's projects generate excess savings for rebates, but only 50% will produce rebates greater than \$20 per apartment per year. When there are funds available for tenant rebates, they are usually distributed once or twice a year. In 1988, CCC will distribute more than \$50,000 in rebates at several projects.

In buildings where the property is centrally-heated or all-electric, and utilities are included in rent, the rebates are usually equal for all apartments, or are in proportion to rent. In most cases, the cost of sub-metering individual apartments would be too high. In all-electric properties with very high historical energy bills, however, CCC installs electric sub-meters that allow them to monitor individual apartments' energy use or pinpoint energy waste from mechanical problems. For each apartment, the project team sets an "energy allowance" and distributes rebates to residents in proportion to their energy savings. For example, CCC installed kilowatt-hour meters in individual apartments in a 132-unit, all-electric property in Roxbury, Mass. The meters have been used for three years, and most residents use less than their allowance. CCC has distributed \$15,000 in rebates to the tenants of this property.





"It works when it wants to be cooler,  
not when I want to be cooler."

## Conclusion

Citizens Conservation Corporation has found a way to overcome disincentives to energy conservation in multi-family buildings. CCC should serve as a model to other ESCOs because of its comprehensive approach to providing energy savings. Initially subsidized almost entirely by its parent company, it is now nearly self-sufficient. And it has managed to survive the difficult business of multi-family energy conservation retrofits. "There are few companies doing multi-family retrofits and these are mainly non-profit. The for-profit companies that were doing it are out of business," says Rick Diamond, a staff scientist in the Energy Performance of Buildings Group at Lawrence Berkeley Laboratory in California.

CCC is a combination of an engineering firm, quasi-bank, construction management company, energy-conservation consulting firm, and an education program. In the future, other ESCOs may look to CCC to add to their knowledge of which energy conservation strategies work—and which don't—in multi-family buildings. Meanwhile, CCC is still struggling with some of the difficulties that come with large multi-family building projects—tenant reaction to change, the risks of trying new products, and the need to develop and manage creative financing arrangements. ■

## A Case in Point

In May 1986, CCC signed its first contract with a HUD-financed public housing project, Crescent Court, a 124-unit complex in Brockton, Mass. that is owned and managed by the Brockton Housing Authority. Crescent Court has 14 one- and two-story buildings. Most of the apartments are three- and four-bedroom units for low-income families. There are also some one-bedroom apartments for the elderly.

CCC audited the buildings and measured boiler efficiency in the twenty-year-old boilers that were nearing their replacement time. CCC staff used blower doors and infrared scanners to identify air leakage. As a result of the audit, they recommended replacing the boilers and "house doctoring" methods, such as sealing convective loops that connected the partition and walls to the cathedral ceiling. CCC also insulated crawl spaces and installed vapor barriers, door sweeps, and door weatherstripping. They replaced the existing conventional thermostats with automatic setback thermostats manufactured by the Clark Company.

CCC contractors removed the existing heating and hot water systems as well as asbestos pipe insulation and installed high-efficiency, gas-fired condensing boilers and insulated domestic hot water storage tanks. In addition, CCC installed versatile, weather-responsive boiler controls.

An initial energy-savings study on a pilot building in Crescent Court showed a 42% reduction in gas use from October 1986 to October 1987, adjusted for weather. Due to all of the uncertainties in monitoring energy savings, this figure is only accurate to within 10%. "We're not sure if 42% is the exact figure, but it's in the ballpark," says Bill Mara, executive director of the Brockton Housing Authority.

From Mara's perspective, the project worked out to everyone's benefit. CCC initiated the project and financed the retrofits with its own funds—the Brockton Housing Authority paid no money. HUD is paying the historical energy bill during the

seven-year term of the loan. The project was done in two phases. Phase one involved "house doctoring" and replacing the thermostats. This was followed by installation of the new, high-efficiency boilers.

Initially, there was some conflict between CCC and HUD over the tenant rebate program. It was resolved, after much negotiation, that any additional funds that would normally go directly to tenants would be distributed by CCC through resident social programs.

Bill Mara was very happy with the quality of CCC's work. "They had excellent subcontractors and they seem to be well-connected. There were people from South Dakota doing insulation and people from New Jersey doing testing. At first I was leery of people from so far away coming in here, but these people were excellent." Mara admitted they had some tenant complaints—mostly about the set-back thermostats—but he said they had been worked out.

*Home Energy* got a very different perspective when talking to the president of the Community Association, Melly Harrison. "We froze. We were cold all the time last winter. Sometimes we would go all evening without hot water and then the next day it would be hot. I've had to send my grandkids down to another unit that had hot water to take a bath." When asked how the housing authority responded to their complaints, she responded, "They said they sent someone out to look at it, but it didn't help much."

Rouse responded to these comments by explaining that there was a problem with Melly Harrison's building. The maintenance crew mistakenly turned a valve to manual, in hopes that the tenants would get more heat. This valve was supposed to be on automatic, so that the second boiler would go on as needed. As a result, the second boiler never fired during two weeks of cold weather. "This occurred despite about 100 hours of CCC staff time spent educating the maintenance people and preparing a detailed manual for operating the new heating system. I guess it wasn't enough," said Rouse.