Chapter 5

Retrofit for the Housing Stock of the Urban Poor

Contents

LIST OF TABLES

LIST OF BOXES

Chapter 5

Retrofit for the Housing Stock of the Urban Poor

Like other buildings, those buildings housing the poor can be retrofit to use far less energy than they now use, at low or moderate capital cost compared to the energy that is saved. The prospect that such retrofit will actually occur, however, depends on an interaction between private means and public purpose that is quite different from the real-estate decisionmaking described in chapter 4. The likelihood of retrofit is affected, on the one hand, by the poorer non-dition of housing and higher proportion of renters among the housing of the poor and, on the other hand, by the strong public tradition of providing cash and in-kind assistance to low-income households. Much of the focus of Federal energy policy, as well as part of the focus of State and local energy policy has been on assistance to low-income people in coping with escalating energy costs.

It should be remembered that low-income households range from elderly widows to households with children headed by a single working parent. Large proportions of the poor are not on welfare, do not receive food stamps, are not over 65, and live in the South or West rather than the Northeast or North Central. Table 46 is a useful reminder of *Who* Are the

Table 46.—Who Are the Poor: Number of Poor Households According to Two Different Federal Standards (in millions)

	Households with incomes below 125 percent of poverty guidelines[a]	Households with incomes below lower living standard[b] or 125 percent of poverty guidelines
All households[c]	12.3	16.2
Public assistance recipiency[d]		
aid to families with dependent children (AFDC) or supplemental security Income (SSI)	3.5	4.1
Food stamps only	1.5	1.8
Not receiving AFDC, SSI, or food stamps	7.3	10.3
Family type:[d]		
Married couple with children	2.0	3.8
Single-parent female with children	2.6	3.3
Single-parent male with children	0.1	0.2
Single persons and couples without children	7.6	8.9
Age of householder:[e]		
65 or older	4.6	5.5
Less than 65	7.7	10,7
Race of householder:		
White	9.1	12,3
Black	2.9	3.6
Other	0.2	0.3
Census region:[f]		
Northeast	2,5	3.5
North Central	2.9	3.8
South	4,8	6.0
West	2.1	2.9

[a]As established by the Office of Management and Budget
[b]As established by the Bureau Of Labor Statistics
[c]Based on a total of 79.4 million households in the United States
[d]AFDC and SSI recipiency and family type are based on the primary family only
[e]The householder is defined as the person in whose name the housing unit is owned or rented or if there is no such person. any adult member excluding roomers boarders or paid employees If the house is owned or rented jointly by a married couple the householder may be either the husband or wife
[f]*Northeast* Maine Vermont New Hampshire Massachusetts. Connecticut Rhode Island New York Pennsylvania New Jersey *North Central* Ohio. Michigan, Indiana, Illinois Wisconsin Minnesota Iowa Missouri Kansas. Nebraska South Dakota North Dakota *South* Maryland Delaware District of Columbia Virginia West Virginia, North Carolina, South Carolina Georgia, Florida Kentucky Tennessee Alabama Mississippi Louisiana, Arkansas Oklahoma Texas *West* Montana Wyoming Colorado New Mexico Arizona, Utah, Idaho Washington Oregon Nevada California Alaska Hawaii

SOURCES: Census Bureau's March 1980 Current Population Survey and the Congressional Budget Office

Poor whose numbers range from about 12 million to about 16 million households depending on which definition of poverty is being used. [1]

Because of limitations of data this chapter presents primarily information on energy retrofit of low-income housing in the country as a whole and very little information on low-income housing in central cities per se. This does not in any way imply that energy efficiency in low-income housing is not an important concern in cities. All of the case study cities visited by OTA (see ch. 9) had developed policies to deal in some way with energy conservation for low-income people.

From the Federal perspective the most important consideration in energy policy for the poor is how to design sensible low-income assistance programs. In addition, however, buildings occupied by the poor do consume a significant amount of energy, an estimated 2.2 Quads or about 8 percent of total building energy use.

This chapter first describes what is known about the impact of rising energy prices on the poor and what is known about the condition of their housing. It then discusses the private prospects for retrofit and finally the many public programs for retrofit and energy assistance, including those that deal with public housing.

[1] For a complete treatment of the impact of energy costs on the poor and government options for dealing with this problem see Hans H. Lansberg and Joseph M, Dukert, *High Energy Costs: Uneven, Unfair, Unavoidable?* Johns Hopkins University Press for Resources for the Future, Inc., 1981.

IMPACT OF RESIDENTIAL ENERGY COSTS ON LOW-INCOME HOUSEHOLDS

On average, low-income families spend a greater proportion of their income on residential energy expenses than do households in higher income brackets. The latest data, assembled by the Congressional Budget Office (CBO) and updated to 1981 from the Department of Energy (DOE) 1978-79 National Interim Energy Consumption Survey (NIECS), show that households earning less than $7,400 spend 15.2 percent of their income on residential energy. This percentage is almost twice that of the next income group[2] (see table 47). However, there is a sharp variation in what households pay for energy, depending on where they live and the type of fuel they use (see table 48). In 1981, average home energy expenses (for all income classes) varied from $680 for those heating with natural gas in the West to $1,690 for those heating with fuel oil or kerosene in the Northeast or North Central.

A study prepared for the city manager's office in Hartford, Corm., gives some sense of the impact of energy prices in a community that relies on oil as its heating source.[3] More than half of the households in Hartford are on fixed incomes averaging $3,700 per year. Year round, a household with an average fixed monthly income of about $312 ($3,700 per year) would pay an average of $96 a month for energy–fuel oil for heat, gas for cooking, and electricity—for a four- to five-room apartment typical of the two- and three-family houses in the Hartford area. During the 5-month winter season the average utility cost of utilities and heat would increase to about $145 per month. Combined with the average rent of $150 for such an apartment the total cost of shelter is calculated to use up virtually all ($295) of the monthly income of a household living on a fixed income. According to the study, the situation would be only a little easier for fixed income households living in apartments of one to three rooms. Exacerbating the strain on low-income households from high energy costs in Hartford are the cash demands from oil heat dealers who are themselves caught in a cash squeeze (see box G).

[2] Congressional Budget Office, *Low-Income Energy Assistance: Issues and Options,* June 1981, p. 6. Much of the information in this chapter is drawn from this study.

[3] Christopher Merrow, "The Impact of Rising Energy Costs on the City of Hartford," August 1979 (unpublished report prepared for greater Hartford Process, Inc., and the Hartford City Manager's Office).

Table 47.—Estimated Annual Household Expenditures on Home Energy by Income Class, 1981

	Estimated average expenditures on home energy (in dollars)[a]	Percent of income[b]
Estimated household income:		
Less than $7,400	$ 740	15.20/o
$7,400 to $14,799	880	7.9
$14,800 to $22,099	910	4.9
$22,100 to $36,899	1,090	3.8
$36,900 or more	1,290	2.5
Average, all households' (not just poor)	$1,000	4.20/o

aHome energy expenditures include fuel 011, kerosene, electricity, natural gas, and liquid petroleum 9as expenditures These expenditures are adjusted from the survey year to 1981 on the basis of estimated energy price changes The quantity of energy purchased IS assumed to decrease by 0.15 percent for each 1 percent Increase in the price of energy

bIncome5 are adjusted t. 1981 on the basis of CBO economic assumptions Households with negative total incomes because of self. employment losses are excluded when calculating average Incomes.

cThe NIECS only collected data on a household's income class, such as less than $3,001), or between $3,000 and $5,000 In order to determine a household's poverty status, each household was assumed to have income equal to the midpoint of its income class For example, a household report ing income between $3,000 and $5,000 would be assumed to have income of *$4,000* in order to calculate the ratio of household income *to* the poverty guideline

dSee footnote (f) t. table 46 for a list of the States in each region Table excludes residents of Alaska and Hawaii

SOURCES Congressional Budget Off Ice estimates, based on the Department of Energy's National Interim Energy Consumption Survey (N IECS) which covers the 12-month period from April 1978 to March 1979 Income data derived from the Census Bureau's March 1978 Current Population Survey, updated using Congressional Budget Off Ice economic assumptions

Table 48.—Estimated Average Household Home Energy Expenditures, by Type of Fuel Used for Heating and Region, Fiscal Year 1981 (in dollars)

	All regions[a]	Northeast	North Central	South	West
Estimated average home energy expenditure for households heating with:[b]					
Natural gas	$ 890	$1,080	$ 970	$ 840	$ 680
Fuel oil or kerosene	1,560	1,690	1,690	1,240	1,160
Electricity	830	770	1,130	860	660
Liquid petroleum gas (LPG)	1,030	1,250	1,360	890	1,080
Other	570	560	710	580	440
Percent of households heating principally with:[c]					
Natural gas	55	41	77	38	68
Fuel oil or kerosene	19	43	13	15	5
Electricity	17	10	4	30	18
Liquid petroleum gas (LPG)	5			9	3
Other	$ 5	$ 5	$ 5	$ 7	$ 5

aTable excludes residents Of Alaska and Hawaii, See footnote (f) to table 46 for a list Of States in each region.

bThese expenditures are adjusted from the survey year to 1981 on the basis of estimated energy price changes The quantity of energy purchased is assumed to decrease by 0.15 percent for each 1 percent increase in the price of energy.

cAs of November 1979.

NOTE. Details may not sum to totals because of rounding

SOURCE. Congressional Budget Off Ice estimates, based on the Department of Energy's National Interim Energy Consumption Survey, and DOE's 1979 Household Screener Survey.

Box G.—Oil Heat: No Cash, No Fuel

Many low-income families in the [illegible] and Midwest rely on oil as their main heating fuel. But its cost, which has risen faster than other fuels in recent years, is only part of the problem. Just as important are cash constraints on low-income families who depend on oil heat. In many cases, dealers require either cash on delivery or total payment within 10 days. Many also require storage tanks with minimum capacities as high as 200 gal. To fill such a tank could run as high as [illegible], and payment is often on demand.[1] In other cases, dealers will deliver below the minimum, but only with a surcharge.[2]

The oil dealers—like their customers—are caught in a cost squeeze. Most independent dealers have to pay cash on demand to their suppliers and many have difficulty obtaining credit lines. Others have extremely limited lines of credit, often 10 days or less. To stay in business, these dealers have to set tough credit terms for their customers.[3]

This has been a difficult situation for the low-income residents. Many [illegible] unable to meet dealer terms. Others are eligible to receive Federal assistance for home heating. However, because of the delays in receiving payments under Federal low-income energy assistance programs, many oil dealers refuse to participate in these programs.[4]

[1]Grier, op. cit., p. [illegible].
[2]Morrow, op. cit., p. 14.
[3]See Jersey City case study and [illegible], op. cit.
[4]Morrow, op. cit., p. 14, also Jersey City and Tampa case studies.

Thus far, communities such as Hartford that are dependent on oil heat have borne a heavy share of the burden of rising energy costs. The variations between regions may be evening out, however. Controls on most natural gas prices are scheduled to be lifted by January 1, 1985, and households relying on natural gas may experience sharp price increases similar to those of households relying on oil heat.

Poor households already use less energy on average than higher income households, as is shown in table 49, so it is theoretically difficult for them to cut back further as energy costs increase. Evidence from survey data is mixed. Nationwide, the poor closed off rooms (26 percent) a little less frequently than did other households (31 percent) in the winter of 1978-79.[4] In St. Paul, in the winter of 1979-80, poor households closed off rooms slightly more (63 percent) than average households (58 percent), but they turned down the thermostat slightly less (85 percent of poor households compared to 87 percent of all households.) In a 1975 survey of five communities in the Southwest, poor families were substantially more likely than high-income families to take steps to conserve energy—such as using less hot water, hanging clothes out to dry, or turning off the thermostat when away from home—that required greater effort or inconveniences

Table 49.—Total Residential Energy Consumption for All Fuels–April 1978 Through March 1979

Income	Average amount consumed per household (millions of Btu)
Less than $5,000	108
$5,000 -$9,999	124
$10,000-$14,999	122
$15,000 -$19,999	141
$20,000 -$24,999	153
$25,000 or more.	176
Total poor	119

SOURCE: Residential Energy Consumption Survey: Consumption and Expenditures April 1978 through March 1979. Department of Energy, July 1980.

Anecdotal evidence from various studies of energy and the poor, and conversations with housing officials in the case study cities of Buffalo and Jersey City indicate that high heating costs have brought about a "heat or eat" choice for poor families in cold climates, but OTA could find no survey data on changing households' budgets in response to higher energy prices.[6] Another response of poor households

[4]**Energy Information Administration,** Residential Energy Consumption Survey: *Conservation,* February 1980, p. 35.

[5]These two surveys are described in Bernard J. Frieden, "Household Energy Consumption: The Record and The Prospect," MIT Program on Neighborhood and Regional Change, Cambridge, Mass., 1981. One survey is from Cunningham and Lopreato, *Energy Use and Conservation Incentives;* the other survey is from the St. Paul Energy Office, Energy Mobilization Survey, February 1980.

[6]Adaptations by low-income households to rising energy costs are summarized in, among other sources: Consumer Federation of America, "Low Income Consumer Energy Problems and the Federal Government's Response: A Discussion Paper, " in *Residential Energy Conservation* (vol. II), OTA, Washington, D. C., 1979; Eunice S. Grier, and George Grier, *Too Cold... Too Dark* (Washington, D. C.: U.S. Community Services Administration, 1979).

(as well as all households) to higher energy bills from utilities is to not pay them. There is considerable evidence of increasing bad debts reported by utility companies (see box H).

Box H.-Bad Debts

At least one response by consumers-and not just low-income customers-to rising energy costs is to let their accounts go into arrears. Data from utilities in three of the case studies shows that arrearages have increased substantially since 1978:

- **National Fuel Gas Distribution Corp., which serves the Buffalo area, reports that residential accounts in arrears for the New York and Pennsylvania markets jumped from** 65,737 **in** 1978 to 91,294 in 1981.
- City Public Service of San Antonio shows $26.7 million worth of accounts receivable for 1979. For the year ending 1981, **this had grown to $32.3 million.**
- **The most dramatic rise was shown by Iowa power & tight, which serves Des Moines, Here bad debt writeoffs grew from $582,000 in 1978 to $1.2 million in 1980. This was 0.3 percent of revenues in 1978 and 0.4 percent of revenues in 1980.**

Ironically, shutoffs for these utilities did not show a dramatic rise. This is because most utilities are limited in their shutoff actions so as not to impose undue hardship on their low-income customers. Some utility officials feel that restrictions on shutoffs have contributed to the increase in bad debts. An Iowa Power & Light executive notes:

> **In 1978 the Iowa State Commerce Commission instituted new rules forbidding shutoffs on any day in which the temperature for that day or the day following was forecast to be below 20° F. However, with the passage of the new rules and attendant publicity, more and more people let bills lapse and bad debt writeoffs were accelerated. Knowing that disconnects were forbidden convinced larger numbers of customers to withhold payment during the colder months and then to simply terminate service and change addresses.**

Note.-The material in this box is drawn from unpublished data supplied by low Power& Light (Des Moines, Iowa), City Public Service Board (San Antonio, Tex.) and National Fuel Gas Distribution Corp. (Buffalo, N.Y.)

ENERGY EFFICIENCY OF LOW-INCOME HOUSING

The housing stock occupied by lower income households is not universally less energy efficient than the housing stock occupied by households with moderate or upper incomes. Rather, the energy efficiency of the housing of low-income households differs from the housing of other income groups in a few important respects that are significant for the formation of public policy.

The best data are available on the energy efficiency of single-family houses. Using data from the 1977 annual housing survey, the Urban institute classified the single-family housing stock into those with three specific energy-saving features present—attic insulation, storm windows, and storm doors—and those with one or more of these energy saving features absent.[7] Table 50 shows how the characteristics of single-family houses occuped by low-income people (defined as those with less than $8,000 annual income) compare to the general characteristics of single-family houses. More than 4 million of these low-income households own houses that have all three energy-saving features present. Another 4 million own houses that have only one or two energy features missing. For these two categories the housing stock of the poor is not dramatically less energy efficient than the housing occupied by other income groups.

In two other respects, however, the housing stock of the poor is less energy efficient than the housing stock in general. Poor households occupy about half of the more than 3 million owner-occupied houses with all three energy-saving features absent. Poor households who rent their houses occupy about two-thirds of all rental houses with all three energy-saving features

[7] Michael Andreassi, Lorene Yap, and Olson Lee, *The Impact of Residential Energy Consumption on Households* (Washington, D.C.: The Urban Institute, June 1980), HUD contract No. H-2882.

Table 50.—Energy Efficiency Characteristics of Single-Family Houses Occupied by Low-Income People Compared to All Single. Family Houses

	All households (millions)	Households with less than $8,000 annual income in 1977 (millions)	Low-income households as a percent of all households (percent)
Owner-occupied single. family houses			
All three energy saving features present	**23.0**	**4.3**	**19%**
One or two features missing . . .	**16.0**	**4.2**	**28**
All three features missing	**3.2**	**1.6**	**49**
Renter-occupied single-family houses			
All three energy saving features present	1.9	.6	33
One or two features missing . . .	4.7	2.4	51
All three features missing	1.8	1.2	64
Total households.	50.6	14.3	

SOURCE: 1976 *Annual Housing Survey,* as analyzed by the Urban Institute in Andreassi, Yap, and Lee, op. cit.; and the Office of Technology Assessment.

missing and about half of all rental houses with one or two features missing. The large fraction of renters among low-income occupants of energy-inefficient single-family houses creates special problems for public policy, which will be discussed below.

In all, about 2.8 million of the 5 million single-family houses lacking all three energy-savng features, are occupied by poor households. These 5 million houses pose a special challenge to prospects for retrofit because almost half of them (45 percent) were built before 1940 and more than half of them (53 percent) are structurally inadequate, s as well as energy inefficient. That means that they have one or more of the defects, listed in table 51, such as no kitchen or a shared kitchen, or at least two maintenance problems such as a leaking roof, open cracks or holes in interior walls or ceiling, or exposed wiring. Some of these defects, especially leaking roofs or holes in walls or floor, would have to be fixed before the house could be made energy efficient. (Some defects such as no heating system, on the other hand, mean that the house doesn't waste heating energy because it doesn't use any.) Other defects, such as the absense of plumbing, are not directly linked to the prospects of retrofitting a house but they enter into

[8] Andreassi, et al., op. cit.

Table 51 .—Structural Adequacy[a] of Occupied Single-Family Houses by Presence of Energy *Saving Features, 1976 (percentage distribution)

	Units containing all three features	Units lacking one or more features: Total	Units lacking one or more features: Lacking all three features
Structurally adequate	96.9%	79.8%	47.770
Structurally inadequate	3.1	20.2	52.6
Total.	100.0	100.0 [b]	100.0[b]

aA unit is defined as inadequate if it has one or more o? the following defects: unit lacks or shares complete plumbing facilities; lacks or shares a complete kitchen; lacks a septic tank, cesspool, or hookup to a public sewer system; does not have any means of heating or heating is from unvented room heaters burning gas, oil, kerosene, or from fireplaces, stoves, or portable room heaters; suffers from any Iwo maintenance problems consisting of a leaking roof, open cracks or plaster or peeling paint on Interior walls or ceiling; or has exposed wiring and lacks a working wall outlet in one or more rooms. This definition is a modification of the definition used in the HUD series, "How Well Are We Housed?"

bThe distribution in this column is significantly different (at the 5-percent level or better) from the distribution in the first column.

SOURCE: 1976 *Annual Housing Survey,* data analyzed in Andreassi, et al. (see footnote ?).

the calculations of the owner, tenant, or public agency about the value of making any investment in the house, even an investment to save energy expenses.

Given an older building and one with other deficiencies, it is also likely that there are other energy wasteful features of such buildings such as lack of wall insulation or very inefficient heating systems. For such buildings it should be technically possible to reduce energy use by a large fraction (at least 50 percent) through retrofits of low and moderate capital cost (as described in ch. 3).

There is some evidence that energy-inefficient single-family houses are somewhat more concentrated in central cities than in suburbs. According to a 1976 Housing and Urban Development (HUD) study, single-family houses in the central city are more likely to lack storm windows and doors (about two-thirds) than are single-family houses in the suburbs (about half), and are more likely to lack insulation (20 percent) than houses in the suburbs (12 percent).[9]

Unfortunately very little data is available on the energy efficiency and condition of multifamily buildings occupied by low-income households. overall, multifamily buildings with two to four units are less likely to lack one or more energy saving features (32 percent) than are single-family houses (51 percent). There is no data at all on energy saving features in multifamily buildings of five or more units.[10]

The poor structural condition of the low-income housing stock has important ramifications for the prospects of retrofit. Most low-income units will require basic structural repairs before conservation measures can be effective. Many city rehabilitation programs do address energy conservation indirectly. If a roof must be replaced, for example, insulation is usually added. But public rehabilitation programs, by far the largest resource for dealing with substandard units in cities place correction of code violations above energy conservation. In some cities, energy conservation is well down a list of priorities, below both code correction and exterior improvements. Local weatherization officials are conscious that their work treats only part of the overall structural condition of the unit, but they are constrained by limitations on what can be spent per unit under the weatheri-

Photo credit: Office of Technology Assessment

Housing that is both energy inefficient and structurally inadequate is a big problem in San Antonio and other U.S. cities

zation program. A Texas weatherization official notes that in his State there is a $100 limitation on repairs, beyond basic weatherization activities. "For $100 you can patch but not replace a roof and that could be a problem in a place like San Antonio."[11]

OTA has found no documentation of the extent of repairs required beyond weatherization in most urban units. However, interviews with housing and weatherization officials in the case study cities, as well as with those involved in these programs nationally, indicates that extensive structural repairs in low-income housing is an important factor in the rate of retrofit of such units. In San Antonio, for example, the city estimates that 27 percent of its housing is substandard (the largest fraction in any case study city). Of the total of about 69,000 substandard units, more than 17,000 (or 39 percent) are not suitable for rehabilitation. A local human services official observes: "In San Antonio, the only homes that could really be weatherized under the program are middle-class homes."[13]

[9] David R. Karol risky, "Shelter and Neighborhoods: Indicators of Physical Deterioration in Cities," pp. 136-138, in *Occasional Papers in Housing and Community Affairs*, vol. 4, Department of Housing and Urban Development, July 1979.
[10] Andreassi, et al., op. cit., pp. 16-17.

[11] See San Antonio case study.
[12] City of San Antonio, Community Development Block Grant, Three Year Plan, as amended, February 1980.
[13] See San Antonio case study.

PROSPECTS FOR ENERGY RETROFIT OF LOW-INCOME HOUSING–PRIVATE EFFORTS

The prospects for the retrofit of low-income housing are limited but they are much better for owner-occupied housing than for renter-occupied housing. The discussion of energy investment in rental housing in this section is a brief summary of a much longer section in chapter 4 (Will Building Owners Retrofit Their Buildings?).

Owner-Occupied Low-Income Housing. Before discussing the prospects for the retrofit of owner-occupied low-income housing it is useful to remember that almost one half (45 percent) of low-income homeowners are elderly.[14] Not surprisingly, people over 65 also own a large fraction (37 percent) of the owner-occupied single-family houses with three or more energy-saving features missing.[15] It is also useful to remember that about 2 million small multifamily buildings of less than five apartments (or duplexes) are owner occupied.[16] These buildings are treated like owner-occupied single-family buildings in such public programs as weatherization and many housing rehabilitation programs funded with community development block grants (CDBG). The prospects for retrofit of these buildings are similar to those of the single family owner occupied. There is no data on how many of these are occupied by low-income people.

Survey data on the willingness of low-income households to invest in energy retrofit show that such households are as willing or almost as willing as higher income households to invest in less expensive retrofits such as inexpensive insulation, calking, or weatherstripping but are much less willing to invest in more expensive insulation. Data from the 1975 survey of communities in the Southwest showed that low-income families required that investments in insulation pay for themselves in less than 2 years while higher income families would consider investments that paid for themselves in 3 or 4 years.[17]

According to a national survey of energy conservation (NIECS), households with incomes less than **$5,000** per year were almost as likely as higher income households to purchase inexpensive insulation (17 percent of the lower income households in contrast to **25** percent or more of the higher income households) but were much less likely to buy expensive insulation or any form of equipment to improve efficiency. Less than 1 percent of households with less than **$5,000** annual income made the latter kinds of energy conservation investments compared to **6 to 8 percent** or more of higher income households.[18]

Low-income households appear to respond to the availability of free utility audits in much lower numbers than do higher income households. The Tennessee Valley Authority (TVA) visited 270,000 homes, in probably the largest single audit program in the country. In the TVA service area, more than 20 percent of the families have incomes below $5,000 and 15 percent of all the homes in the service area lack insulation. Yet in a recent survey made by TVA to evaluate the audit program, the analysts found that only 5.2 percent of homeowners below $5,000 had **been** audited and only 2.6 percent of renters. This was in comparison to 18.7 percent of families earning above $25,000 who took advantage of the audit.[19]

Few low-income families (quite predictably since they have low tax liability in the first place), take advantage of the residential energy tax credit (described in ch. 9). Of the **40** million households with taxable incomes of less than $10,000 per year, only 1.2 percent took the resi-

[14] School of Engineering and Applied Sciences, George washington University, Energy *Implications of an Aging Population*, prepared for USDOE, contract No. ACOI-79ER1OO4I, August 1980, pp. 36-49.

[15] Andreassi, et al., op. cit., P. 26.

[16] U.S. Census, *General* Housing Character/sties, United States and Regions 1977 and 1978.

[17] Frieden, Op. cit., p. 27, referring to the Lopreato and Cunningham survey cited above.

[18] Frieden, op. cit., p. 25.

[19] Robert F. Hemphill, and Ronald L. Owens, "Burden Allocation and Electric Utility Rate Structures: Issues and Options in the TVA Region," Tennessee Valley Authority, Oct. 9, 1980.

dential energy tax credit in 1978, compared to 16.5 percent of the 22 million households with, taxable incomes of more than $20,000 per year. Low-income households often don't have sufficient tax liability to use the tax credit in a single year; a quarter of those taking the credit carried the amount foward into subsequent tax years.[20]

In summary, there is some evidence that low-income homeowners will partially retrofit their houses in response to rising energy costs but there is further evidence that they are unlikely to do any extensive retrofit without outside assistance.

Renter-Occupied Low-Income Housing. Although tenants may occasionally perform low-cost retrofits such as calking and weatherstripping, the prospects for any extensive retrofit of low-income rental housing depend on decisions of landlords to retrofit their buildings. The influences on building owners' decisions to retrofit are described at length in ch. 4, "Will Building Owners Invest in City Buildings?" This section summarizes the prospects for retrofit by owners of low-income buildings, and some of the impacts on low-income tenants.

Low-income rental buildings vary, from the small building with two or three apartments owned by a low-income retired couple to the high-rise with **40** to **50** apartments owned by a real estate partnership. For all this variation, the most important influence on the prospects for retrofit of such buildings is whether the tenants or the owner pay for fuel and electricity.

Master-Metered Buildings: Where the Owner Pays for Utilities. There is no doubt that rising energy costs are a burden to owners of master-metered buildings. While financing and tax costs on these buildings are low, the rents are relatively lower and there is little margin to raise rents to accommodate increases in operating costs due to higher fuel and electricity bills. On the other hand, there are few incentives for the owner of a master-metered building occupied primarily by low-income families to engage in retrofit. Many of these buildings are located in marginal neighborhoods and the future resale value of these properties, even if they were more energy efficient, is limited. Only if buildings are located in potentially revitalizing areas are the owners likely to even consider investing in retrofit. At this point owners must reckon with the lack of access to financing for building improvements especially for low-rent buildings in locations that banks regard as uncertain. Without access to relatively long-term financing at less than exorbitant interest rates, it is impossible to pay for a retrofit out of the buildings' cash flow (by offsetting financing costs by reductions in energy costs).

OTA's analysis in chapter 4 of a hypothetical low-rent building drawn from St. Louis data illustrates the dilemma for a building owner very clearly. With longer term (1 O year) financing and moderate (1 3 percent per year) interest rates the building owner would be able to substantially improve the building's cash flow with a retrofit. With a loan of shorter term (5 years) and high interest rate (1 6 percent per year) there is a sharp reduction in the building's cash flow for at least 5 years. Since loan terms and interest rates available to owners of low-income buildings tend to be respectively much shorter and higher than those analyzed for this hypothetical building it is clear that building owners can only retrofit if they are willing to accept a sharp reduction in cash flow.

Rather than invest in retrofit, owners of master-metered buildings are likely to cut back on services or maintenance or go into arrears on their fuel bills. In jersey City, for example, heating complaints rose from 2,400 in 1980 to almost 3,400 for 1981, an increase that is almost entirely attributable, according to the city's chief building inspector, to a cutback in heating service by multifamily building owners. Typically, he says, "landlords turn the heat off from 1 to 4 in the afternoon when they think no one is home, as a way to conserve."[21] In New York City, with its enormous housing stock, heating complaints increased from 225,000 in 1978-79 to 320,000 in 1980-81.22

[20] Internal Revenue Service Preliminary Report Statistics of Income— 1979 Individual Tax Returns, Washington, D. C., 1980.

[21] Interview with chief building inspector, Jersey City, N. J. See jersey City case study.

[22] Telephone interview with Joseph M. White, Director of Operations, Division of Code Enforcement, New York City Department of Preservation and Development.

Officials in several cities attribute the rise in abandonment i n part to the multifamily owner's inability to cope with rising energy costs. A Jersey City housing official notes: "Taxes and energy are the keys to abandonment in this city. What happens is that increased taxes and rising energy costs come at the same time that these older buildings are due for major repairs. But landlords cannot jack the rents up because people are too poor. The smaller landlords are usually well in over their heads already and they do not know how to cope. They sell to the large absentee owners who cut services and the good tenants move out."

There is, in fact, no consensus among observers of real estate on the linkage between energy and abandonment. The best guess is that rapidly rising energy costs are the "last straw" for buildings unable to continue covering their expenses with adequate rents. Two analyses of abandonment in Rochester, N. Y., serve to illustrate the controversy. one analysis, by the former director of Rochester's neighborhood rehabilitation program relates a striking increase in abandoned buildings from 1970 to 1978 **to the rapid increases** in the costs of oil, gas and electricity over the same period. [23] (See table 52). A somewhat earlier analysis of Rochester's abandonment problem by a real estate analysis firm had, however, uncovered a much deeper reason for significant abandonment of older housing stock in the Rochester area—Rochester suffered from an excess supply of new housing in the early 1970's. Although there was an increase in population of only about 8,300 persons between 1970 and 1975 in the Rochester metropolitan area, a total of almost 40,000 new units of housing were built, enough to accommodate (after allowing for replacement of lost housing inventory) a population increase of 88,500 or about 10 times what actually occurred. This new housing encouraged a series of "trading up" moves into better housing and resulted in an excess supply of the oldest housing stock in the central city, which in turn

Photo credit: Office of Technology Assessment

Housing oversupply is often the general **cause** and rapidly increasing energy prices the immediate cause of housing abandonment in cities like Buffalo

[23] Eugene Kramer and Linda Berger, "The High Cost Of Heat: A New Threat to City Neighborhoods, " papers for the Energy in the Cities symposium, American Planning Association Report No. 349.

Table 52.—Comparison of Increases in Abandoned Buildings With Increases in Energy Costs in Rochester, N.Y.

Year	Vacant buildings	Average annual home heating costs (in dollars)		
		Oil	Gas	Electric
1970	**300-400**	**$199**	**$184**	**$310**
1974	370	321	224	415
1975	821	332	229	404
1976	1,125	406	290	533
1977	1,500	416	308	511
1978	1,900	$503	$369	$646

SOURCE: **E**. Kramer and **L. Berger**, "The High Cost of Heat: A New Threat to City Neighborhoods," papers for the *Energy in the Cities*, Symposium, American Planning Association, report No. 349.

became candidates for abandonment.[24] Rapid increases in energy costs are likely to have made it difficult for owners of this excess housing to hang on to their buildings until the era of housing oversupply came to an end. In this sense, energy costs can be accused of being the trigger for the actual abandonment.

Tenant-Metered Buildings: Where Tenants Pay for Utilities. Once a building is tenant metered, there are no further incentives for an owner to invest in energy retrofit. Under current market conditions there is no evidence that owners charge higher rents for an energy efficient building, all other things being equal. (Ch. **4** has an extensive discussion of tenant metering.) There is evidence that conversion from master to tenant metering does lead to behavioral efforts by tenants to conserve energy. These are much more pronounced for electricity than for fuel.[25]

There is no data on the extent of conversions from master to tenant metering in low-income buildings. For multifamily buildings in general, conversion to tenant metering is believed to be common although there is also no data.

For all the potential benefits of inducing energy conserving behavior, however, conversion to tenant metering will, under the most common utility pricing practices, cause financial hardship for low-income tenants.[26] A master-metered (and submetered) building is generally served under a commercial rate structure, which results in a lower per unit cost than a residential rate. Individually metered apartments, however, are subject to the higher individual rate schedules. Commercial users often can elect interruptible service and time-of-day rate schedules, which further reduce rates. And the majority of States still maintain declining block or promotional rate structures, which make energy less expensive per unit consumed the larger the quantity consumed through a single meter per billing period. While this may provide a disincentive to conserve, it does provide a significant cost advantage for master-metered over tenant-metered units.[27]

There is only anecdotal evidence on the extent of higher cost for tenant-metered utilities. Calculations on multifamily meter conversions for Detroit, Atlantic City, and St. Paul for example, show that the same amount of power will cost 33 percent more in individually metered apartments than in a master-metered building. The manager of a Philadelphia apartment house that may convert to tenant metering found that the total price of gas for apartments would double for the same quantity after the conversion.[28]

There are other costs as well. Tenants that are converted to individual meters are normally required to post a security deposit with utility suppliers. This can be $75 to $100 or the equivalent of 2 months usage, and can pose a substantial financial obligation, particularly for low-income tenants without a prior credit history. Individually metered tenants are more likely to pay penalties for late payments.[29]

[24] M. Leanne Lachman and Maxine V. Mitchell, "New Construction and Abandonment: Musical Chairs in the Housing Stock," Nation's Cities, September 1977,

[25] Lou McLelland, op. cit., in footnote 4 to ch. 4.

[26] There are three basic metering types for multifamily rental housing:

- a master meter, which serves the entire building or a series of units in the building. The owner is the customer of the utility and rental payments include utilities. There is no recordation of individual unit or common area usage. This may be combined with allocations of energy costs. Bills are based on commercial rate structure.
- a submeter system, which combines a master utility meter with a separate set of privately owned and installed meters for each apartment. The buildings owner is still the customer of the utility, at commercial rates, but can bill tenants separately for individual consumption.
- individual meters, which use a separate utility meter for each unit. The tenant is the direct consumer of the utility, and is billed at individual rates. Rent only includes utility services for common areas of the building.

[27] Steven Ferrey & Associates, "Fostering Equity in Urban Conservation: Utility Metering and Utility Financing," see working papers, pp. 24-25.

[28] Ferrey, op. cit., p. 25.

[29] Ibid., p. 26.

PROSPECTS FOR RETROFIT: PUBLIC HOUSING

Public housing provides about one-fifth of the low-income rental housing in this country. There are at present about 1.2 million units of public housing in about 9,900 projects around the country; these house more than 3.4 million tenants, a sizable portion of whom are elderly or handicapped. so Over 60 percent of these units are located in large- and medium-sized cities, Public housing represents a major capital investment for the Nation; about $20 billion has been spent to develop these projects since the program began in 1937.

Energy cost has been the most rapidly escalating operating cost for public housing managers and tenants. Like much of the private housing stock described in this chapter, public housing was built when energy was cheap and energy consciousness was low. Today, housing authorities and tenants are saddled with high energy costs—the average in 1980 dollars is $670 per dwelling unit. (See box I for a discussion of energy payments by public housing tenants.) Energy costs overall for housing authorities rose 400 percent between 1970 and 1980.[31] These cost increases have been an important factor in the growth of the Federal operating subsidy requirements to housing authorities in recent years. Operating costs virtually tripled between 1968-78, while monthly rents have increased less than 50 percent.[32]

The poor thermal quality of public housing is a matter of great concern to administrators of the program. Most of the stock was built before rigorous energy standards were instituted by HUD. There is, however, considerable potential for energy savings in the public housing stock (table 53). A recent HUD study estimates that an average investment of about $1,100 per unit (1980 dollars) will yield an average annual

Photo credit: Office of Technology Assessment

HUD modernization funds have been used to improve the energy efficiency of public housing projects (such as this one in Tampa, Fla.) as well as to make them safer and more marketable

Box I.—Metering Policy: Public Housing

Public housing tenants, like low-income tenants in other multifamily units, may have different energy expenses, depending on whether their unit is individually or master metered.

By law, public housing tenants cannot pay more than 25 percent of their adjusted gross income for shelter expenses, including utilities. A utility allowance is paid to tenants by HUD to attempt to keep tenant expenditures within these guidelines.

Master-metered tenants in public housing receive no utility allowance and do not pay directly for utility consumption. However, they are assessed a flat charge for owning appliances (e.g., air-conditioners, window fans, portable heaters) which the local housing authorities deem [illegible]. Individually metered tenants (42 percent of electric and [illegible] percent of gas) receive an allowance established to fully cover the utility expenses of [illegible] percent of the dwellings of each size in the project. The other 10 percent [illegible] based on [illegible] and actual distributional

—————

[30] National Association of Housing and Redevelopment Officials, "Profile of the Public Housing Program, " memo to Large Housing Authority Working Group, Washington, D. C., Feb. 12, 1981.

[31] Ibid.; Perkins & Will, the Ehrenkrantz Group, "An Evaluation of the Physical Condition of the Public Housing Stock" (executive summary-draft), HUD, Office of Policy Development and Research, March 1980.

[32] National Association of Housing and Redevelopment Officials, op. cit.

data of PHA consumption.[1] Individually metered tenants receive a utility allowance based on the historic average consumption of similarly sized units for similar construction. The allowance is a cash deduction from monthly rent and tenants can basically do with the money what they please.

This system appears to penalize the individually metered tenant. Tenant-metered units receive an allowance for utilities that can be 35 to sO percent less than that received by identically situated submetered tenants,[2] even though the per unit cost of energy may be higher in States with declining block or commercial multifamily rates. Furthermore, individually metered tenants are subject to security deposits, late payment fees, and other charges, similar to their counterparts in the private market. Perhaps most serious "the simplistic allowance formula makes no provision for units which because of their location within a building or because of poor thermal quality, are inherent energy wasters beyond tenant controL"[3]

[1] Ferrey, op. cit., pp. 40-41.
[2] Ibid., p. 42.
[3] Ibid., p. 42.

savings of about $300, and would reduce average energy consumption from the current 145 million Btu per unit to about 80 million Btu.[33]

33 Perkins & Wi l l, op. cit

Table 53.—Energy Conservation Potential of Public Housing

Energy conservation category	Potential cost savings
Operation and maintenance	11 "/0
Windows and door improvements	13
Wall/ceiling/roof insulation	6
Mechanical equipment improvements	13
Electrical	2
Other	4
National Average	480/o

NOTE: The above averages were based on an analysis of 58 energy conservation opportunities in a randomly selected representative sample of public housing projects

SOURCE. Energy Conservation Handbook, VOI 3 (draft), U S Department of Housing and Urban Development Apr 15, 1981, prepared by Perkins and WI II, The Ehrenkrantz Group

HUD has already begun to act on a program of retrofitting public housing projects, within the agency's constrained budget. In September 1980, HUD awarded $23 miilion to **47** public housing authorities for modernization of oil heating systems. These funds are being used to upgrade existing oil heat systems and to convert to dual-fuel systems. HUD has also awarded $5 million to 61 public housing authorities to install and test new energy-conserving devices. OTA found that in the case study cities, HUD modernization money is being used by housing authorities in part for energy conservation measures, such as replacing windows, installing storm doors, and insulation .34 (See box J.)

34 Department of Housing and Urban Development, "HUD finds PHA test to cut energy costs," HUD release of Sept. 23, 1980): HUD awards paid energy efficiency" (HUD release of Sept. 29, 1980); also see case studies.

Box J.-Energy Consciousness in Public Housing: Case Study Cities

The seriousness with which housing authorities are taking energy conservation was clearly observed in several of the case study cities. Among the retrofit activities were the following:

- **The Buffalo Housing Authority has spent several million dollars to insulate, retrofit windows, install energy controls, replace entrance doors, and upgrade heating plants in three large projects. The authority recently received $200,000 under HUD's conservation demonstration program which it will use to install a trifuel heating system in a 900-unit project.**
- **The Jersey City Housing Authority has received $4.6 million in energy conservation grants from HUD. The majority of this money will be used to replace windows in existing projects and to replace steam lines with new insulated piping. The authority has also upgraded and improved the efficiency of oil burners in its projects.**

- **The San Antonio Housing Authority has received $260,000 under HUD's Solar Demonstration Program to test various solar applications on a 27-building complex. The housing authority had already installed a solar dotmestic hot water system on a 65-unit project for the elderly in 1978 and retrofitted hot water heaters to solar on several other projects.**
- **The Tampa** Housing Authority was he first in the Nation to install **solar hot water heating–some 30 years ago. The authority is upgrading these solar units and experimenting with more advanced panels under a $30,000 grant from HUD. The authority is also retrofitting several projects by installing storm windows and doors and some insulation, and upgrading gas burners. A new project has been built with a central heating system that can convert easily to solar. The authority is also considering the use of heat pumps for some projects.**

FEDERAL PROGRAMS THAT ADDRESS THE ENERGY NEEDS OF LOW-INCOME HOUSEHOLDS

The Federal Government has tried to help low-income households cope with rising energy prices through two approaches: One provides direct cash assistance for payment of utility bills on an emergency or short-term basis. The other takes a longer term approach and provides resources for making the structure more energy efficient. The first approach is exemplified by the Low-Income Energy Assistance program; the second by the Weatherization program.

Direct Cash Assistance

Since 1977, the Federal Government has sponsored a series of cash assistance programs designed to help low-income families deal with rising energy prices (see table 54). Federal funding has grown from **$200** million in 1977 to $1.85 billion appropriated in 1981. In 1981, it is estimated that about 10 million households will be aided by the direct cash assistance approach, the highest activity level thus far.

The basic purpose of all of these programs has been to help low-income families supplement their income so they can pay their utility bills. in some cases, this is done on an emergency or one-shot basis, in others as a supplement for a defined period (usually a year). Beyond this, however, the programs have differed substantially in terms of benefits, allocations, eligibility, and other factors.[35]

Until 1980, these programs served households whose income fell below 125 percent of the Office of Management and Budget (OMB) poverty guideline—about 8.5 million households.[36] In 1980, the eligibility ceiling was expanded to cover all those households whose income fell below the Bureau of Labor Statistics lower living standard, which added an additional 6.5 million eligible families.[37] States may apply more restrictive income eligibility standards under the current programs, but they must give priority to the most needy families, regardless of their source of income. States must also provide special outreach activities for the elderly and disabled. Preliminary State plans analyzed by CBO indicate that about 10 million households, out of a potential 17.2 million, will be served under the 1981 program. Benefits will average $160 per household, or 19 percent of the average home energy expenditure of eligible families.[38]

---

[35] Congressional Budget Office, op. cit., pp. 45-55; contains an excellent summary of the program.
[36] Ibid., p. 27.
[37] Ibid., p. 27.
[38] 1 bid., p. 20.

Table 54.—Summary of Low-Income Energy Assistance Programs, Fiscal Years 1977-81

Year	Program	Funds appropriated (billions of dollars)	Households served (millions)	Average benefit per household (dollars)
1977	Special Crisis Intervention Program	$0.20	1.2	$140[a]
1978	Emergency Energy Assistance Program	0.20	0.9	165
1979	Crisis Intervention Program	0.20	b	b
1980	Energy Crisis Assistance Program	0.40	1.6[c]	188[d]
	Energy Allowance Program	0.80	4.4[c]	150[d]
	SSI-Energy Allowance Program	0.40	4.0[c]	97[d]
1981	Low-Income Energy Assistance Program	1.76	10.0[e]	161[f]
	Crisis Intervention Program	$0.09	b	b

[a]CBO estimate, assuming the percent of funds spent on administration was the same as in 1978
[b]Data not available.
[c]These figures represent preliminary estimates of the number of payments made to households rather than the number of households served. Some households received more than one benefit.
[d]Since some households received more than one benefit, the average benefit Per household is actually somewhat higher than the average listed here. Estimates are preliminary.
[e]State estimates, as of January 1981
[f]CBO estimate, assuming all available funds are spent, and States spend the maximum of 7.5 perCent Of funds On administration

SOURCE: Congressional Budget Off Ice estimates, based on published and unpublished documents

under the 1981 program, States can provide energy assistance either through direct cash payments, vendor payments, or vouchers for the household to use for energy supplies. They can also use up to 3 percent of their allocation for in-kind assistance, such as warm clothing or minor home repairs. Until 1981, cash assistance programs were designed primarily to deal with winter-related energy costs and thus were targeted primarily to home heating. As of 1981, however, States can also set aside funds for health-related cooling expenses, although only 12 have chosen to do so.[39]

About 60 percent or 9.9 million of the families eligible for cash assistance participated in the program in 1980. **Under the more lenient eligibility formula** for 1981 which includes most renters, for example, slightly more families are expected to participate. However, this will be only about **50** percent of the eligible households, if the estimates in State plans hold up.[40]

There is some uncertainty about what impact current cash assistance approaches have on the incentives to retrofit. Under the 1981 program, States allocate benefits according to general characteristics of a household's energy burden, as determined by type of fuel, income, household size, and intrastate region. The CBO report observes:[41]

> Since this approach ties benefits to factors that relate to a household's home energy burden–such as intrastate region–but not to a household's actual home energy expenditures, it likely leads to fairly small conservation disincentives in the short run. In the long run, however, it might cause households to make decisions concerning location and heating fuel that are economically inefficient.

While critics acknowledge that crisis assistance may always be needed, especially in severe winters when the energy needs of the poor may outstrip their ability to pay, such programs could increase ad infinitum unless coupled with preventive programs that address the root causes of the energy problems of the poor, especially the basic structural condition of their homes.

[39]Ibid., p. 31,
[40]Ibid., pp. 49 and 53.
[41]Ibid., p. 33.

Weatherization

The concept underlying weatherization programs is to reduce energy consumption by low-income households by making their dwelling more energy efficient. The program was administered by the Community Services Administration between 1975 **and 1978, with weatherization assistance also offered by** DOE in 1977 and 1978. **Since 1979, all weatherization activities have been administered** by DOE with funding at an approximate level of $200 million a year for 1979-81.[42]

Under the current program, DOE allocates funds to States, which in turn mete out money to local community action agencies. Households with income less than 125 percent of the OMB poverty level are eligible for the program, as are families with at least one AFDC (Aid to Families with Dependent Children) or SSI recipient. This comes to about 17.6 million households.[43]

Weatherization activities typically include calking, weatherstripping, installing storm windows, insulating attics, and in some cases, walls. The average expenditure per household in 1980 was $600, but this is expected to rise to $1,000 per household in 1981, the maximum allowed under the program in most areas.[44]

The weatherization program has been fraught with administrative, financial and managerial problems. Requirements that CETA (Concentrated Employment and Training Act) labor must be used, recently waived, hampered the program in many areas. So did the lack of effective audit procedures to determine which homes would most benefit from the program, resources for training and supervising weatherization crews, and monitoring completed weatherization work.[45]

Activity levels under the program have been quite low in proportion to need, although activity has been greatly stepped up in recent years. Between 1975 and 1979, less than 250,000 homes had been weatherized and only 21 percent of the $480.5 million in available funds had been used. By September, homes were being weatherized at about 30,000 a month, a virtual doubling of previous activity. By the end of 1981, DOE officials estimate that approximately 820,000 homes will have been weatherized. If this projection holds, about 6 percent of eligible households will have been reached by the program.[46]

The impacts of weatherization on reduced energy consumption vary, depending on climate and structure, but several recent studies indicate that this is a reasonably cost-effective program.[47] Still, weatherization is extremely limited as a retrofit tool for the most needy urban households. The reasons for this have been touched on elsewhere in this chapter. For one thing, many of the homes of the urban poor have serious structural problems which must be addressed before weatherization will really contribute to making the structure more energy efficient. In most cases, weatherization activities and rehabilitation program are not coordinated at all.[48] The basic repairs needed before weatherization can truly be effective are not eligible expenses under weatherization programs.

In addition, there are serious limitations on the application of weatherization funds to rental properties in which more than half of the urban poor live.

In cases where weatherization covers rental properties, landlords must sign a rental agreement not to raise rents for a stated period of time—a restriction few landlords are willing to accept. High tenant turnover in low-income multifamily properties makes these agreements difficult to enforce. In many cases, such properties are owned by absentee landlords who are difficult to locate and who have diminished in-

42 Congressional Budget office, Op. Cit., p. 5.5.
43 Ibid., p. 28.
44 1 bid., p. 55.
45 See General Accounting office, *Slow Progress and Uncertain Energy Savings in Programs to Weatherize Lwv-income Households*, Report to Congress EMD80-59, May 1980; also Christian Demeter *The Weatherization Assistance* Program. A *Status* Report, Urban Systems Research and Engineering, Inc., for DOE, Washington, D. C., July 1980; also case studies.
46 Congressional Budget Office, PP. 55-56.
47 1 bid., pp. 40-41.
48 Rehabilitation programs are discussed in greater detail in ch. 10, The case studies also provide ample documentation of this point.