Energy Desk Book
for HUD Programs

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Preface

Energy efficiency is essential to help the Department achieve its goals of expanding affordable housing, increasing homeownership, and creating jobs and economic opportunity.
The Energy Desk Book spotlights the heavy burden utility costs can place on affordable housing and economic development. It reviews the important energy mandates for HUD programs and discusses the resources available to reduce these costs for American families and communities. By improving energy efficiency, HUD can help families save money they otherwise would need to spend on energy—freeing up precious dollars for food, shelter, and other necessities. Lower utility costs also can help communities by helping business and industry and contributing to economic growth.

The Energy Desk Book is a useful tool that can help HUD staff and others involved with HUD programs identify opportunities to integrate energy efficiency into HUD programs—and help more Americans realize the dream of affordable housing.

This guide was prepared with material drawn from two sources. Chapters one through six were developed by Robert Groberg, Director, HUD Energy Division, for training Community Planning and Development staff in the Department's energy requirements and technical assistance activities.

The 14 studies in the last chapter are taken from the report of the U.S. Department of Energy-HUD 1990–95 Initiative. This interagency partnership produced materials and demonstrations requested by HUD program staff, such as a training video for energy efficiency in property rehabilitation, a guide for public housing authorities undertaking energy performance contracting, and pilot demonstrations in multifamily buildings in Mount Vernon, New York, and Chelsea, Massachusetts. The initiative involved DOE headquarters and support offices, laboratories, and HUD field staff. It established the basis for continuing partnership activities that affect a wide range of housing assisted by HUD programs.

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Energy Efficiency and Renewable Energy in HUD's Programs

Goal

The goal of this guide is to familiarize U.S. Department of Housing and Urban Development (HUD) staff with requirements and opportunities for improving energy efficiency and installing renewable energy measures in housing assisted by HUD programs. It is also useful to provide to those who work with the recipients of HUD programs.

Objectives

This guide should enable you to:

- Explain why energy efficiency and renewable energy are important to the HUD mission, including affordable housing and economic development.
- Cite the relevant legislative mandates, including those for energy codes and standards, and explain how they fit into the new HUD structure.
- Explain the special energy mandate in the Community Development Block Grant (CDBG) program and identify eligible energy activities.
- Cite sources of information on energy and indicate where to turn for answers to commonly asked questions, including latest State building energy codes.
- Consider the use of advanced technologies and design techniques to improve energy efficiency in housing programs assisted by HUD, especially in HOPE VI construction and public housing modernization.

The material provided in this guide can serve as a desk book. It will be supplemented from time to time on the Web site and hard copy will be updated annually.

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Energy Challenges

Utility Bills Burden the Poor and Can Cause Homelessness

Although the definition of "affordability" includes both rent and utilities, people do not usually think of the impact of utility bills on low-income households. Utilities impose a disproportionate burden on the poor. For single, elderly poor and disabled persons living on Social Security Income (SSI), the average energy burden was 19 percent of SSI. In selected States—Delaware, Illinois, and Vermont—it was nearly 25 percent.[1]

For Aid to Families with Dependent Children (AFDC), the energy burden was, on average, seven times greater than for families at median income. AFDC families paid an average of 26 percent of their income toward energy, while median income families spent an average of less than 4 percent of their income on energy.

Income Level	Percent of Income for Utilities
U.S. median	4 percent
SSI elderly	19 percent
SSI (DE, IL, VT)	25 percent
AFDC	26 percent

See "The Cold Facts: The First Annual Report on the Effect of Home Energy Costs on Low-Income Americans" at **www.nliec.org/cold.**

The National Energy Assistance Directors' Association released on April 15, 2001, the results of a study showing that as many as 3.6 million families in 18 states, plus the District of Columbia, risk having their energy cut off because of the effects of rapidly increasing energy costs. Some states have moratoria on utility cutoffs during the cold months; some do not. Table 1 of the study has a summary of arrearage and shutoff information.

For more information on the National Energy Assistance Directors' Association, see: **www.neada.org/communications/press/pr010403.htm.**

Utility cutoffs cause homelessness. You can document this in your own communities by following the example of Greg Copeland of the Energy Cents Coalition in St. Paul, Minnesota. "FROM HEATLESS TO HOMELESS" is a study based on research of 1997 St. Paul municipal records on evictions due to condemnation. Energy Cents' analysis revealed:

- 26 percent of evictions were due to electric and gas termination.
- 40 percent of evictions were due to water cutoffs.[2]

[1] National Consumer Law Center, 11 Beacon Street, Suite 821, Boston, MA 02108 (617) 523–8010
[2] Greg Copeland, Energy Cents Coalition, St. Paul, MN (612) 776–7894

The termination of service can threaten the home, health, safety, and perhaps even the life of household members. The extent of the problem can be documented in other communities and can be added to the data on needs in a city's Consolidated Plan.

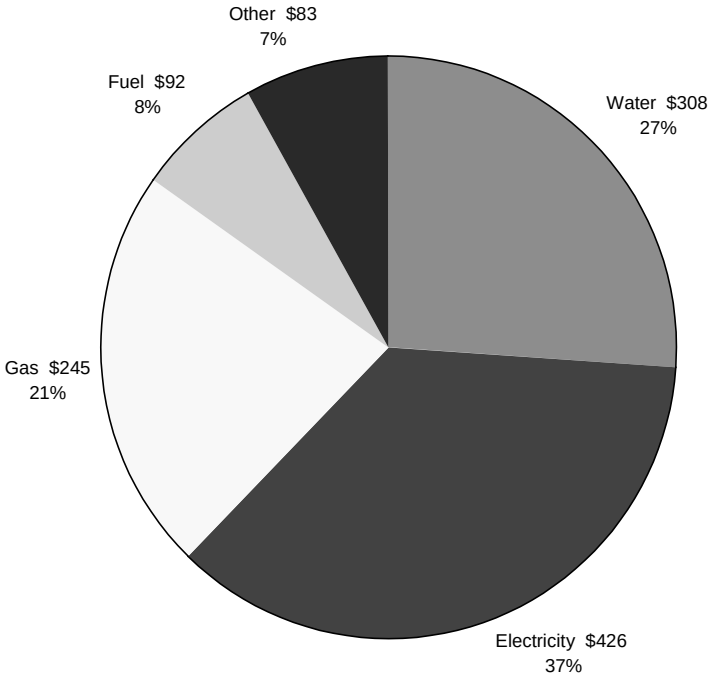
HUD Programs Are Affected by Energy Costs

Not only does the cost of energy burden the poor, it affects the whole Department and its ability to administer its programs.

Public Housing Utilities Cost More Than $1 Billion per Year

Total HUD outlays for energy costs for fuels in 1,276,000 public housing units were approximately $1,154 billion in 1999. Of that amount, $308 million was spent on water costs.

Total Utility Expenditures for Four Quarters Ended 12/99
Total Expenditures $1,154 Billion (all dollar amounts in millions)



Source: 12/99 SORE Summary as of 4/27/2000

Section 8 Rental Support Includes More Than $2 Billion per Year for Utilities

Section 8 certificate and voucher programs now serve 1.6 million households. The program is administered by more than 2,500 State and local housing agencies. Another 1.4 million households that live in HUD-assisted, privately owned housing also receive Section 8 assistance allocated directly to that housing.

Families are responsible for finding their own housing, where the rent must be comparable to rents of similar, modest, unsubsidized housing units in the area. Families generally pay 30 percent of their adjusted income toward rent. Section 8 assistance makes up the difference

between their contribution and the actual cost of the unit. HUD has interpreted "rent" to include costs for reasonable utility consumption. When a household pays a utility company directly, the household receives a reduction in rent, called the utility allowance, to cover the expected cost of reasonable utility consumption.

Based on utility costs in public housing, we can estimate that the total utility cost for Section 8 units is approximately $2.5 billion.

Energy Costs Affect Economic Development

"Importing fuel drains millions from local economies. In Nebraska 80 cents of each dollar spent for energy leaves the state; only 34 cents of other consumer spending is exported."

In 1987 HUD commissioned The Energy Task Force of Public Technology, Inc. (PTI) to prepare reports on how energy expenditures influence community economic development. PTI prepared two volumes entitled **The Hidden Link: Energy and Economic Development.** Volume one deals with strategic planning and volume two is subtitled **Marketing and Financing Strategies for Community Energy Projects, A Guidebook for Local Governments.**

The following excerpt from the preface of volume two outlines the problem and approaches taken to deal with it. These strategies, prepared in 1987, are appropriate today for Empowerment Zones and Enterprise Communities:

> Cities and counties must continue to focus on making homes, businesses, and industries energy efficient despite the low-to-moderate fuel prices currently prevalent in many areas of the country. The reasoning behind the continued focus may be found at two levels: the impact of increasing energy consumption on the nation as a whole and on most local economies....
>
> On a local level, millions of dollars are being exported out of U.S. cities and counties to pay for energy. This exodus of dollars has very real effects on local economic vitality. City and county leaders across the U.S. often fail to realize that the dollars being spent on energy by their residents, businesses, and industries drain their local economies and would be better spent on public works, consumer goods, industrial site development, and new plants and machinery. These are dollar expenditures that keep an economy strong and vital.…
>
> Some states and local governments, however, have already begun to study the multiplier effect of energy versus non-energy dollars. The Nebraska Energy Office has estimated that for each dollar spent on energy by the residential, commercial, and industrial sectors, $.80 will leave the state; for typical consumer purchases, only $.34 leaves the state economy.…
>
> Once the hidden links between energy and community/economic development become apparent, the question becomes, how can local government officials develop energy programs to halt the drain of energy dollars from their cities and counties? Also, how can

local government officials use lowered energy costs as an economic development tool to retain and attract industry and commerce?…

To identify and support similar efforts in other localities, HUD and the Department of Energy (DOE) provided financial assistance to PTI for the provision of financial assistance to a group of localities on marketing techniques and establishment of public/private partnerships. The technical assistance was focused on ways to support energy projects related to community and economic development which were being conducted by the localities….

The work presented in this guidebook combines USHUD's interest in providing technical assistance to mitigate the impact of energy costs and consumption on community and economic development activities with the Energy Task Force's interest in supporting innovative approaches for community energy management.

Public Technology, Inc.
1301 Pennsylvania Avenue, NW
Washington, DC 20004
(202) 626–2400

"Energy is the single largest expense for the retailer after payroll. . . . Even a one-percent reduction can have a significant impact on a corporation's bottom line. Every dollar saved on energy is pure profit."

Bill Lyon, Vice President for Energy, Federated Department Stores
E News March/April 1999

Energy Mandates and Program Activities

HUD's 5-Year Plan for Energy Efficiency

Section 945 of the 1990 Affordable Housing Act instructed HUD to prepare a 5-year plan "for the activities to be undertaken and policies to be adopted by the Secretary to provide for, encourage, and improve energy efficiency in housing." The first plan was issued in 1992 and updated in 1994. The latest version was sent to Congress in June 1999. You can read it on the HUD Web site at **http://www.hud.gov:80/cpd/energy/5yrplan.html.**

The plan was accompanied by a progress report, also on the HUD Web site, which identifies accomplishments during the past 5 years, including:

- Adopting the model energy code for new construction and providing computer software to assist builders in complying.
- Completing a pilot Federal Housing Administration energy-efficient mortgage demonstration and beginning a nationwide program.
- Providing guides and training in energy performance contracting.
- Funding the National Center for Appropriate Technology clearinghouse to reduce energy and resource consumption in multifamily housing.

Here are some of the key items described in the latest plan:

- Advancing the DOE-HUD partnership.
- Carrying out the action plan for reducing outlays for utilities in public housing.
- Coping with restructuring the utility industries.
- Purchasing high-efficiency appliances.
- Emphasizing energy efficiency in the HOPE VI program.
- Increasing use of the HUD rehabilitation energy guidelines.
- Expanding use of energy-efficient mortgages (EEMs).
- Improving financing for energy improvements in manufactured housing.
- Increasing emphasis on sustainable development.

Energy Requirements for HUD-Assisted New Construction

Background

New construction assisted by HUD must meet energy-efficiency standards (see Section 101 of the Energy Policy Act of 1992; P.L. 102–486, Oct 24, 1992, which amended Section 109 of the 1990 Affordable Housing Act). This covers public and assisted housing and single-family and multifamily residential housing, other than manufactured housing, subject to mortgages insured under the National Housing Act. It also includes the HOME program (see 24 CFR 92.251). HUD implemented the requirement of Section 101 by amending the minimum property standards for housing (see 24 CFR 200.926(e)).

- **For one- and two-family and multifamily dwellings three stories or less,** the provision of the Council of American Building Officials (CABO) 1992 Model Energy Code (MEC) apply.
- **For multifamily highrise** buildings, the requirement is Standard 90.1–1989 of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)/Illuminating Engineering Society of North America (IES).

As the standards in these codes are revised by the organizations that create them, HUD is required to meet or exceed the new requirements unless it is determined that compliance would not result in a significant increase in energy efficiency or would not be technologically feasible or economically justified. HUD published a notice in the April 27, 1998, *Federal Register* referencing 24 CFR 200, HUD Minimum Property Standards, proposing the 1995 MEC, but the higher standard was not adopted.

The Model Energy Code—A Layman's Summary

MEC establishes minimum requirements for energy-related features of *new* buildings and *additions* to existing buildings. It covers lowrise buildings three stories or less as well as one- and two-family buildings. It does not apply to existing buildings, including those being rehabilitated, unless there is a change in use that increases the building's energy use.

MEC is applicable to all types of residential and nonresidential buildings; it is not applicable to historic structures specifically designated as historically significant by the State or local governing body, listed in the National Register of Historic Places, or eligible for listing. HUD has other energy standards for manufactured housing. (See Manufactured Home Construction and Safety Standards, 24 CFR 3280 Subpart F–Thermal Protection.)

MEC emphasizes flexibility to suit local needs and conditions by offering three means of achieving compliance:

- An approach based on each separate building component or system.
- A systems approach that determines compliance based on the building's total energy use.
- Specified acceptable practice. This approach can be used only for buildings 5,000 square feet or less and three stories or less.

Each of the three approaches takes into account:

- The resistance of the building envelope, walls, roof/ceiling, and floors to heat loss or gain through the materials and as a result of air infiltration.
- The efficiency of the mechanical systems for heating and cooling.
- The efficiency of the system for providing hot water.
- The efficiency of the electrical and lighting systems.

The component approach calls for meeting energy conservation standards for each of the above areas. MEC states detailed criteria that the builder must satisfy. Tables are provided that specify the thermal resistance required for each part of the building envelope, considering the climate (as expressed in degree days), required coefficients of performance are specified for various types of heating and cooling equipment, and illumination level criteria are established for the lighting system. MEC, of course, includes considerable technical details relevant to these and many other aspects of construction.

The systems approach provides that the building as a whole must be as energy efficient as one constructed under the component approach. This is based on annual use.

The acceptable practice approach is designed to offer a somewhat simplified way of complying with the code, although there is a considerable relationship with the standards spelled out in the component approach. Generally, MEC states one or more acceptable practices, and using it is deemed to satisfy the code. As mentioned above, this approach is limited to 5,000-square-foot buildings three stories or less. It is further limited to residential or nonresidential buildings that are heated but not mechanically cooled.

The 1998 MEC, now renamed the International Energy Conservation Code (IECC), was developed by the International Codes Council (ICC) as part of its family of codes. In developing the energy chapter of the new International Residential Code, the ICC leadership stated that its standards needed to be equivalent to the IECC.

The Building Codes Assistance Project (BCAP) tracks energy code developments in each State. For updates see **www.crest.org/efficiency/bcap** or call (202) 530–2200. HUD's Energy Division secures updates from BCAP to share with HUD field offices. A summary of the status of State

energy codes in relation to CABO MEC 92 for single-family and ASHRAE 90.1 for multifamily properties follows below. Additional information on developments in each State will be provided from time to time by the Energy Division.

State Code Requirements

Thirty-four States and the District of Columbia have adopted energy codes that exceed HUD's requirements. For construction that HUD assists, the higher standard will apply, so it is important for Community Builders to be able to determine what applies. You will find a summary of the status of State energy codes in the following tables.

Sources of Information on Codes

For information on ordering copies of the 1992 MEC, the ASHRAE Standard, and guides to fulfilling compliance requirements for these codes, see the Publications List on page 39. DOE provides technical assistance to help States meet both of these standards. It maintains a hotline [(800) 270–CODE (2633)] for information on building energy codes and standards. DOE Building Standards & Guidelines Program (BSGP) is guided and funded by the DOE Office of Building Technology Assistance. BSGP maintains a Web site with downloadable residential codes and products, news, and information: **http://www.energycodes.org/.** DOE also supports BCAP, whose mission is to accelerate the implementation of building energy codes.

RESIDENTIAL ENERGY CODE ADOPTION
Winter 2002

MEC Version or Equivalent State Code	States Adopted or Adopting
2000 IECC or IRC, Under review or in rulemaking for statewide adoption/equivalence	14 States (AZ, CA, FL, GA, ID, KY, MD, NC, NY, PA, SC, TX, UT, WI)
95 MEC, Mandatory statewide adoption/equivalence	10 States and DC (CT, MA, MN, NH, NJ OH, OR, RI, VA, VT)
95 MEC, Partial adoption/equivalence	5 States (AK,[1] HI,[2,3] ID,[6] LA,[2] OK, WA[4])
93 MEC, Mandatory statewide adoption/equivalence	5 States (AL,[3] DE, KS, MT,[3] ND[3])
92 MEC, Mandatory statewide adoption/equivalence	5 States (AR, IA, IN, NM, TN)
No statewide residential code or residential code is not EPAct compliant[5]	11 States (CO, IL, ME, MI, MO, MS, NE,[5] NV, SD, WV, WY)

NOTE: 2000 & 1998 IECC, 95 MEC, & 93 MEC reference ASHRAE/IES 90.1 for commercial and residential highrise buildings. IECC also contains user-friendly language that addresses simple commercial buildings directly.

1 State-funded residential buildings only.
2 LA & HI have adopted 95 MEC for multifamily residential only.
3 Code implementation depends upon the voluntary adoption of the code by local jurisdictions.
4 WA's mandatory statewide code exceeds 95 MEC for electrically heated buildings but is less stringent for nonelectrically heated buildings. Over the last few years demand for nonelectric heating in WA has grown immensely.
5 98 IECC required for State-owned and -funded buildings only.
6 95 MEC required for State-owned and -funded buildings only.

COMMERCIAL ENERGY CODE ADOPTION
Winter 2002

ASHRAE/IESNA Standard or Equivalent State Code	States Adopted
ASHRAE/IESNA 90.1–1999, Statewide adoption or equivalent state code	7 States (AZ, CA, FL, MA, ME, NJ, NY)
ASHRAE/IESNA 90.1–1989, Mandatory statewide adoption/equivalence	25 States and DC (AR, CO,[1] CT, DE, GA, HI,[1,2] IA, KS, LA, MD, MN, MT,[1] NC, ND,[1] NH, OH, OK, OR, PA, RI, SC, UT, VA, WA, WI)
ASHRAE/IESNA 90.1–1989, State-owned or -funded buildings only	9 States (AL, IL, IN, MO, NE, NV, NM, TX, VT[3])
No commercial code or commercial code is not EPAct compliant[6]	9 States (AK, ID,[4] KY, MI, MS, SD, TN, WV, WY)

To date, 41 states and D.C. have adopted mandatory statewide EPAct-compliant commercial codes.

1 ASHRAE 90.1–1989 or an equivalent State code is voluntarily adopted by local jurisdictions.
2 Modified version of ASHRAE 90.1–1989 adopted by all counties except Maui. The county is currently reviewing the code for adoption.
3 Vermont's commercial code for State-owned buildings exceeds ASHRAE 90.1–1989. The State is developing a private commercial energy code that will exceed ASHRAE 90.1–1989.
4 Idaho Commercial Building Energy Code (ICBEC) based on ASHRAE 90.1–1989, voluntary statewide.

HUD Rehabilitation Energy Guidelines

HUD has published energy guidelines that will help owners and remodelers of single-family and multifamily housing save energy and money. Guidebooks and pamphlets defining the *HUD Rehabilitation Energy Guidelines* cut through technical language to explain how property owners using HUD's popular Section 203(k) rehabilitation mortgage insurance, as well as other HUD programs, can increase the energy efficiency of residential properties. The guidelines can also be used for rehabilitation not assisted by HUD, a practice that should be encouraged. See page 40 for information on how to order the guidelines.

HUD first issued Cost-Effective Energy Conservation Standards for Rehabilitation in 1979. Since then, home construction and energy technologies have advanced, while construction costs and energy prices have increased. The Secretary's guidelines for cost-effective energy conservation recommend energy-efficiency improvements to meet the 1992 CABO Model Energy Code, which is required for all HUD-assisted new construction and is now recognized as a goal for rehabilitated properties. The guidelines incorporate many recent technological changes and performance standards and apply them to particular climate zones.

Both the guidebooks and pamphlets explain recommended energy measures, conservation terms, and how energy conservation can be cost-effective. The pamphlets provide brief overviews of energy conservation terms and recommended measures by climate zone. The guidebooks offer more detailed information, as well as cost-effectiveness worksheets and software that can help property owners and remodelers determine the savings from proposed building envelope and equipment measures.

Of particular interest is information on qualifying for EEMs offered on one- and two-unit houses by participating Federal Housing Administration (FHA) lenders nationwide. As many as four units can be insured, but under the same cost limits as those for two units. Recognizing that energy conservation measures can lower utility bills and other operating costs significantly for building owners, EEMs enable lenders to liberalize underwriting terms so that borrowers can finance 100 percent of the cost of energy improvements that are deemed cost effective under the new guidelines.

CDBG Program's Congressional Energy Mandate

Congress gave the Community Development Block Grant (CDBG) Program Act of 1974, as Amended (P.L. 93–383), a special energy mandate in 1980 that still supports use of CDBG funds for such eligible activities as improving energy efficiency in property rehabilitation and helping neighborhood groups carry out energy conservation projects.

Legislative History:

House Committee Report
To make explicit a community's ability to use CDBG funds for the development and implementation of individual activities designed to conserve energy, as well as for community energy conservation strategies.

Conference Report
A community may receive funds for alternative activities identified by the community as being necessary to the development of a comprehensive communitywide energy use strategy.

Following are highlighted excerpts dealing with energy efficiency:

Findings and Purpose: Section 101

(a) The Congress finds and declares that the Nation's cities, towns, and smaller urban communities face critical social, economic, and environmental problems arising in significant measure from . . .

(3) **increasing energy costs which have seriously undermined the quality and overall effectiveness of local community and housing development activities.**

(b) The Congress further finds and declares that the future welfare of the Nation and the well-being of its citizens depend on the establishment and maintenance of viable urban communities as social, economic, and political entities, and require...

(4) **concerted action by Federal, State, and local governments to address the economic and social hardships borne by communities as a consequence of scarce fuel supplies.**

(c) The primary objective of this title is the development of viable urban communities, by providing decent housing and suitable living environment and expanding economic opportunities, principally for persons of low and moderate income. Consistent with this primary objective, the Federal assistance provided in this title is for the support of community development activities which are directed toward the following specific objectives:

(1) the elimination of slums and blight…

(2) the elimination of conditions which are detrimental to health, safety and public welfare…

(3) the conservation and expansion of the Nation's housing stock…

(9) **the conservation of the Nation's scarce energy resources, improvement of energy efficiency, and the provision of alternative and renewable energy sources of supply.**

Eligible Activities: Section 105

(a) Activities assisted under this title may include only:

(1) the acquisition or real property…which is

(A) blighted…

(B) appropriate for rehabilitation…

(C) preservation or restoration of historic sites…

(D) to be used for the provision of public works;

(E) to be used for other public purposes;

(2) the acquisition, construction, reconstruction, or installation **(including design features and improvements with respect to such construction, or installation which promote energy efficiency)** of public works and site or other improvements—including**…utilities (including power generation and distribution facilities using renewable resource energy systems)…**

(4) clearance, demolition, removal, and rehabilitation **(including rehabilitation which promotes energy efficiency)** of buildings and improvements…

(8) provisions of public services, including but not limited to those concerned with employment, crime prevention, child care, health, drug abuse, education, **energy conservation**…

(15) grants to neighborhood-based nonprofit organizations…(etc.) to carry out a neighborhood revitalization or community economic development **or energy conservation** project in furtherance of the objectives of Section 101(c)

(16) activities necessary to the development of energy use strategies related to a recipient's development goals, to assure that those goals are achieved with maximum energy efficiency, including items such as:
(A) an analysis of the manner in, and the extent to, which energy conservation objectives will be integrated into local government operations, purchasing and service delivery, capital improvements, budgeting, waste management, district heating and cooling, land use planning and zoning, and traffic control, parking, and public transportation functions; and
(B) a statement of the actions the recipient will take to foster energy conservation and the use of renewable energy resources in the private sector, including the enactment and enforcement of local codes and ordinances to encourage or mandate energy conservation or use of renewable energy resources, financial and other assistance to be provided (principally for the benefit of low- and moderate-income persons) to make energy conserving improvements to residential structures and any other proposed energy conservation activities;…"

Energy Guidelines for State CDBG Programs for Small Cities

Thirty percent of CDBG funds go through the States for use by cities with populations of less than 50,000. States may want to assist them in implementing the congressional energy mandate. Some suggestions for energy activities under the CDBG Small Cities Program include:

- Preparation of comprehensive energy strategies.

- General encouragement to give special attention to energy efficiency in property rehabilitation and economic development.

- Tapping other resources, such as:
  - Utility programs.
  - Local weatherization agency services (for example, audits), technical assistance, and program funds.
  - Other State programs.
  - DOE Clearinghouse: EEREC (800) 523–2929.
  - DOE-HUD energy rehabilitation training video, "Eye on Energy," and related guidebook, available from HUD's Community Connections Clearinghouse: (800) 999–9998.
  - HUD USER energy publications: (800) 245–2691.

- Combining Home Energy Ratings and property rehabilitation with energy-efficient mortgage financing, such as for Section 203(k) rehabilitation insurance.

- Measuring before and after utility expenses to demonstrate to owners and lenders the value of investing in energy-efficiency measures.

- Helping public housing with energy performance contracting.

FHA Energy-Efficient Mortgages

Purpose

In 1992 Congress mandated a pilot demonstration of energy-efficient mortgages (EEMs) in five States. In 1995 the pilot was expanded as a national program. FHA insured 16,000 EEMs in FY1998 (1.5 percent of total FHA loans) 30,044 EEMs in FY1999 (2.3 percent of total FHA loans) and 28,578 in FY2000 (3.1 percent of total FHA loans).

EEMs recognize that reduced utility expenses can permit a homeowner to pay a higher mortgage to cover the cost of the energy improvements on top of the approved mortgage. FHA EEMs provide mortgage insurance for a person to purchase or refinance a principal residence and incorporate the cost of energy-efficient improvements into the mortgage. The borrower does not have to qualify for the additional money and does not make a downpayment on it. The mortgage loan is funded by a lending institution, such as a mortgage company, bank, or savings and loan association, and the mortgage is insured by HUD.

Eligibility Requirements

- The borrower is eligible for maximum FHA financing, using standard underwriting procedures. The borrower must make a 3-percent cash investment in the property. This 3-percent cash investment is based on the sales price. Closing costs are not included in the 3-percent calculation but may be used to satisfy the requirement. Any upfront mortgage insurance premium can be financed as part of the mortgage.

- Eligible properties are one- to four-unit existing and new construction.

- The cost of the energy-efficient improvements that may be eligible for financing into the mortgage is the greater of 5 percent of the property's value (not to exceed $8,000), or $4,000.

- To be eligible for inclusion in this mortgage, the energy-efficient improvements must be cost effective, meaning that the total cost of the improvements is less than the total present value of the energy saved over the useful life of the energy improvement.

- The cost of the energy improvements and estimate of the energy savings must be determined by a home energy rating report which is done by a home energy rating system or energy consultant. The cost of the energy rating may be financed as part of the cost-effective energy package.

- The energy improvements are installed after the loan closes. The lender will place the money in an escrow account. The money will be released to the borrower after an inspection verifies that the improvements are installed and the energy savings will be achieved.

- The maximum mortgage amount for a single-family unit depends on its location, and it is adjusted annually. As of January 1, 2001, for most parts of the country it was $132,000 for single-family homes. In high-cost areas it can be as much as $239,250. The cost of the eligible energy-efficient improvements is added to the mortgage amount. The final loan amount can exceed the maximum mortgage limit by the amount of the energy-efficient improvements.

For more information on EEMs:

- See FHA Mortgagee Letters 93–13 (Single Family Loan Production—Energy Efficient Mortgage Pilot Program), 95–46 (Single Family Loan Production—Expansion of the Energy Efficient Mortgage Program) and HUD Handbook 4155.1, Rev. 4, Chg.1.

- Contact Program Support staff in your local HUD office.

- See "Rehab a Home with HUD's 203(k)" on the FHA Consumer Home Page at: **www.hud.gov/homeimpr.htm.**

- See **www.swinter.com** for information on the "Guidelines for Uniformity: Voluntary Procedures for Home Energy Ratings" and the "Uniform Accreditation Procedures for Home Energy Ratings" prepared by the Home Energy Ratings Systems Council.

- Contact the National Association of State Energy Officials and/or RESNET, at: **www.natresnet.org.**

- Contact the Alliance to Save Energy, at (202) 530–2213.

- Contact EPA EnergyStar at: **www.energystar.com.**

- Contact National Home Energy Resouces (National HERO) at (888) 876–9445 or: **www.national-hero.com.**

Manufactured Housing Energy-Efficiency Standards

Manufactured housing is a major source of affordable housing, especially for many lower and moderate-income families living in rural and suburban areas. In 2000 more than 250,000 manufactured homes, or 17 percent of single-family homes built, were added to the national housing stock. The HUD Office of Consumer and Regulatory Affairs is responsible for developing, amending, and interpreting preemptive manufactured home construction and safety standards. States primarily focus on monitoring manufacturing compliance with the standards and handle consumer complaints. The costs of implementing these functions are funded by the manufactured home producers in the form of a $24 fee levied for each section of each home produced.

HUD promulgated construction standards and enforcement procedures to administer the National Manufactured Housing Construction and Safety Standards Act of 1974. The Act provides that these construction standards preempt any standard regarding construction and safety established by a State. This preemptive effect is unique; no other form of single-family housing is regulated on a national scale.

In 1993 HUD amended the standards to include preemptive standards, significantly upgrading the existing energy conservation requirements. The ventilation and indoor air quality standards were also updated.

***NextGen*: The evolution of Manufactured Housing**

NextGen is a PATH demonstration project that shows how factory-built homes will perform in the future and how they will be virtually indistinguishable from conventional, site-built properties. With its steeply pitched roof, concrete stem-wall foundation, and optional full basement, *NextGen* redefines the conventional wisdom of what a manufactured (also known as HUD-Code) home can be. These unique traits contribute to *NextGen's* increased durability, storm resistance, and visual appeal. From a design perspective, one of the project's biggest achievements has been *NextGen's* remarkable energy performance. The home not only qualifies for an ENERGY STAR® rating, but *exceeds* the program's performance requirements by nearly 20 percent. For the homeowner, this equates to a $180 reduction in annual energy costs—an important consideration in affordable housing, where monthly operating costs can influence an owner's ability to pay the mortgage. *NextGen* is also expected to produce 872 fewer pounds of carbon dioxide and 6.5 fewer pounds of sulfur oxide and nitrogen oxide each year, compared with a similar HUD-Code home. And despite its site-built appearance, the home's construction time is impressive, even by HUD-Code standards; production, delivery, and installation can be accomplished in as little as 4 weeks, as opposed to 3 to 5 months for a site-built home. Factor in *NextGen's* economical and environmentally friendly design and construction, and this house emerges as a solid investment for the next generation of value-conscious homebuyers.

A *NextGen* house was delivered to a site in Danbury, Connecticut, for the Danbury Housing Authority to manage as a rental property. It was built at the New Era Building Systems plant in Strattonville, Pennsylvania. The three-part hinge roof system was folded at the factory in preparation for transport and it was raised on the site. The joined 'half houses' became a Cape Cod-style, gable-end house with a front porch. The home's mechanical system does not include a

furnace. Instead, a Kosmo hot water heater, coupled with a fan coil unit, handles all of the home's heating needs, with air distribution provided by inside-the-envelope ductwork. This unique design feature lowers heating and cooling energy demand while reducing material and labor costs.

For further information, contact the HUD Manufactured Housing and Construction Standards Division at (202) 708–4594, or the Manufactured Housing Institute at (703) 558–0400.

Public Housing Utility Efficiency Programs

HUD's Office of Public and Indian Housing (PIH) has been working actively with local public housing authorities (PHAs) to reduce the cost of utilities. Efforts include:

- Establishing requirements and incentives to encourage lower consumption.
- Providing incentives to use innovative funding techniques and reduce utility rates.
- Providing technical assistance to PHAs to increase their application of cost-effective energy conservation.
- Launching an initiative with DOE to study PHA energy consumption, provide training materials concerning energy conservation measures (ECMs) and funding, and conduct field demonstrations.
- Establishing PHA assessment systems that include evaluation of energy-efficiency efforts.

A variety of regulatory requirements can be found, including:

- Conduct energy audits every 5 years.
- Implement all cost-effective ECMs as funds become available.
- Purchase only energy-efficient equipment.
- Individually meter resident units when feasible.
- Ensure that residents' rent burdens (which include rent and cost of utilities) be no more than 30 percent of their income; this also calls attention to the question of utility costs.

Churchill Homes—Holyoke, Massachusetts

With financial assistance from HUD, the Holyoke Housing Authority is developing a mixed-income community of energy- and resource-efficient townhouses and flats. The demonstration is known as Churchill Homes and is being produced under HUD's HOPE VI program. The project proceeded through the preliminary schematic design stages of development with assistance from Steven Winter Associates. More than 200 World War II-era public housing units that had fallen into disrepair have been demolished. In their place a stable, mixed-income community will take shape, consisting of 272 affordable, value-engineered homes. It is anticipated that approximately two-thirds of these homes will be owner-occupied, with the remainder designated as rental units. Some units will be constructed offsite to decrease population densities and allow for the inclusion of common areas. All 50 Phase I units are complete and will be occupied by September 2001. Among the sustainable and energy-conservation features in the Holyoke project are the 2x6 at 24" on-center advanced framing for exterior walls, high-efficiency unitized boiler/water heater combination, and controlled ventilation for indoor air quality. Units are designed to meet ENERGY STAR® levels of performance.

Where modernization funds or reserve funds are not available, PHAs are encouraged to employ outside capital, making use of special provisions for energy performance contracts (EPC) or direct borrowing to finance ECMs, as enacted in 1987. A guide for carrying out EPC is available from HUD USER and on the Internet. (See resources, page 35.)

For further information, see:

- Program Description, OPIH, **www.hud.gov/progdesc/pihindx.html.**
- Public Housing Energy Conservation Clearinghouse, **www.phaenergy.org.**
- HUD, Office of the Inspector General, Office of Audit, Northwest/Alaska, *Report on Review of Opportunities to Reduce Utility Costs at Public Housing Authorities.* Seattle, WA: 95–SE–101–0001.
- HUD, *Energy Expenditures in Public Housing: Current Consumption and Opportunities for Savings.* Report to Senate Appropriations Committee, June 1999.
- HUD, *Strategies for Reducing Energy Expenditures and Consumption in Public Housing.* Report to Senate Appropriations Committee, July 1999.

The Healthy Homes Initiative

In response to growing interest about health and safety in the residential environment, the Department of Housing and Urban Development launched the Healthy Homes Initiative (HHI). HUD has identified several housing-associated health and injury hazards considered key targets for intervention, including lead, mold and moisture, pesticides, and radon. The initiative is designed to build upon the Department's existing activities related to the housing environment's health and safety issues, including lead hazard control, building structural safety, weatherization and energy conservation, electrical safety, and fire protection to address multiple childhood diseases and injuries related to housing in a more coordinated fashion. Residents' health and comfort will be improved by the introduction of remedial measures for excess moisture reduction, dust control, ventilation, and control of toxins. Many of these improvements are more cost effective when made as part of energy and modernization activities.

A major goal of HHI is to identify and implement single interventions that address multiple hazards. For example, dealing with uncontrolled moisture would alleviate conditions associated with lead paint hazards (reduced paint deterioration), allergens (particularly dust mites), asthma, mold, structural safety, and others. HHI activities focus on researching and demonstrating effective assessment and intervention methods and on educating the public. HUD also works with other agencies and organizations to develop and disseminate technical assistance, guidelines, and model housing codes and standards.

HUD has developed a plan of baseline research and demonstration projects for the initiative with the assistance of a panel of nationally recognized experts from the private sector and Federal, State, and local governments. Projects are funded primarily through competitive grants and interagency agreements. Healthy Homes grantees are operating programs in over a dozen communities, and some of these leverage weatherization activities. Several Federal agencies, including the Centers for Disease Control and Prevention's National Center for Environmental Health; The National Institute for Occupational Safety and Health; the National Institute for Standards and Technology's Building and Fire Research Laboratory; and the U.S. Department of Agriculture's Cooperative Research, Education, and Extension Service partner with HUD on Healthy Homes projects.

For more information about Healthy Homes, visit HUD's Web site at:
www.hud.gov/hhchild.html and **www.hud.gov/offices/lead.**

Or contact Ellen R. Taylor, HUD Office of Lead Hazard Control at (202) 755–1785, ext. 116 or by e-mail at: Ellen_R._Taylor@HUD.gov.

Related Programs and Activities

Department of Energy Programs

Weatherization Assistance Program

Household energy needs consume a far greater percentage of income for low-income households than for non-low-income households. To reduce this burden, DOE's Weatherization Assistance Program has served as the Nation's core program for delivering energy conservation services to low-income Americans since 1976, when Congress created the program in Title IV of the Energy Conservation and Production Act. In addition, the Department of Health and Human Services Low-Income Home Energy Assistance Program (LIHEAP) permits States to use 15 percent of the funds for weatherization. It often is used in conjunction with the DOE funding.

The Weatherization Assistance Program reduces heating and cooling costs for low-income families—particularly the elderly, people with disabilities, and children. The program has weatherized more than 5 million homes since its inception.

To accomplish these goals, DOE works in partnership with State and local weatherization programs throughout the United States. DOE makes grants to States, which in turn award grants to local agencies, usually community action agencies or other nonprofit or government organizations, to perform the actual weatherization services.

For full statement of the Weatherization Assistance Program's history, mission, objectives, and process, see:
www.eren.doe.gov/buildings/weatherization_assistance.

State Energy Program (SEP)

SEP's goal is to strengthen the capabilities of States in promoting and adopting energy efficiency and renewable energy technologies and practices, thereby helping the Nation to realize a stronger economy, a cleaner environment, and a more secure future. SEP enables States to address both national energy initiatives (SEP Program Projects) and local energy priorities (SEP Special Projects). Under the program's guidelines, States implement energy efficiency and renewable energy activities through a wide range of possible projects across all the energy use sectors—buildings, industrial, utility, and transportation. Federal project funding leverages State contributions and private-sector investments.

SEP was established in 1996 (rule published in *Code of Federal Regulations* at 10 CFR Part 420) by consolidation of two energy programs—the State Energy Conservation Program (SECP) and the Institutional Conservation Program (ICP). SECP had provided State funding for a variety of energy efficiency and renewable energy activities. ICP provided schools and hospitals with a technical analysis of their buildings and the installation of energy conservation measures identified in the technical analysis.

SEP combines these program activities through an integrated focus. Additional benefits are more flexible funding mechanisms, increased local decisionmaking, and streamlined administrative procedures. DOE Regional Support Offices provide guidance, review and approve State plans and amendments to plans, award grants, and monitor SEP. Specifically, SEP will be coordinating the application of fuel cell research, distributed energy resource programs, and photovoltaic and other solar energy technologies for the residential sector.

For further information, see:
www.eren.doe.gov/buildings/state_energy.

Rebuild America

Rebuild America is a network of community partnerships that saves money by saving energy. Rebuild America partnerships, in collaboration with DOE, improve the energy efficiency of their commercial and multifamily residential buildings. Rebuild America supports partners with business and technical tools and customized assistance, and links partnerships to share resources. Throughout the Nation, Rebuild America has more than 200 partnerships at work—in 47 States, within several Native American Tribes, and in 3 U.S. Territories.

Partnerships are giving older buildings a new lease on life with the latest technology and retrofit practices, as well as helping business people, school districts, housing authorities, arts and culture organizations, and public agencies save 20 to 30 percent on their energy bills. The money saved can be put back in the community for purchasing computers for schools and books for public libraries, revitalizing America's downtowns, and lowering taxes.

Rebuild America is well on its way to completing energy retrofits in 2 billion square feet of floor space in more than 250 community partnerships by 2003. By achieving that goal, America would save $650 million in energy costs and reduce air pollution by 1.6 million tons of carbon dioxide annually.

Help spread the Rebuild word! Download the one-page program overview so others can learn more about what Rebuild America is doing across the country.

For more information about specific projects, see:
www.eren.doe.gov/buildings/rebuild/htm/Achievements/achievements.htm
or call the Energy Efficiency and Renewable Energy Clearinghouse at: (800) DOE–3732.

DOE Research and Development Programs

Building America

Building America is a private-public partnership that provides energy solutions for production housing. The Building America program combines the knowledge and resources of industry leaders with DOE's technical capabilities to act as a catalyst for change in the home building industry. America's new homes can be cost-effective to build as well as energy efficient to live in.

In fact, energy consumption in new houses can be reduced by as much as 50 percent, with little or no impact on the cost of construction, through a systems engineering approach. Building America's systems engineering approach unites segments of the building industry that have traditionally worked independently of one another. It forms teams of architects, engineers, builders, equipment manufacturers, material suppliers, community planners, mortgage lenders, and contractor trades.

Building America teams work to produce houses that incorporate energy- and material-saving strategies from the very start of the building process—the design. Initial cost-effective strategies are analyzed and selected during the predesign phase. The team then evaluates its design, business, and construction practices to identify cost savings. Cost savings can then be reinvested to improve energy performance and product quality. For example, the design might incorporate new techniques for tightening the building envelope that enable builders to install smaller, less expensive heating and cooling systems. These savings can then be reinvested in high-performance windows that further reduce energy use and costs.

For more information, including locations of Building America developments, see: **www.eren.doe.gov/buildings/building_america/.**

Million Solar Roofs Initiative

Million Solar Roofs is an initiative begun in 1997 to install solar energy systems on 1 million U.S. buildings by 2010. This effort includes two types of solar technology—photovoltaics that produce electricity from sunlight and solar thermal panels that produce heat for domestic hot water, space heating, or swimming pools.

DOE will work with partners in the building industry, other Federal agencies, utilities, energy service providers, the solar energy industry, financial institutions, State and local governments, and nongovernmental organizations to remove market barriers to solar energy use and develop and strengthen demand for solar energy products and applications. The initiative will not direct and control activities at State and local levels, nor will it typically pay for installation of solar energy systems. Instead, the Million Solar Roofs initiative will bring together the capabilities of the Federal Government with key businesses, State and local governments, and organizations, and focus them on building a strong market for solar energy applications on buildings.

Success of the Million Solar Roofs initiative requires participation of businesses, industries, governments, Federal agencies, utilities, energy service providers, and nongovernmental organizations. The initiative will work "bottom-up" to attract partners building by building, community by community, State by State, and business by business. It will also work "top-down" by developing financing, leveraging resources, coordinating Federal agency support, and sharing information with Million Solar Roofs partnerships.

For more information on the Million Solar Roofs initiative, see:
www.eren.doe.gov/millionroofs.

Brightfields

Brightfields is a revolutionary concept that addresses two of the Nation's biggest challenges—urban revitalization and toxic waste cleanup—by bringing pollution-free solar energy and high-technology solar manufacturing jobs to brownfields.

The Brightfields approach offers a range of opportunities to link solar energy to brownfields redevelopment and thereby transform community hazards and eyesores into productive, green ventures. This unprecedented campaign will help our Nation put its hundreds of thousands of brownfields back into productive use and at the same time create high-tech jobs in blighted urban neighborhoods, improve air quality, and reduce greenhouse gas emissions.

For more information on benefits and communities pursuing Brightfields, see:
www.eren.doe.gov/brightfields/.

DOE–HUD Initiative: Example of a Successful Partnership

DOE and HUD began a joint 5-year initiative in 1990 with the overall goal of improving the energy efficiency of public and other federally assisted housing. This partnership, the DOE–HUD Initiative on Energy Efficiency in Housing, was designed with four strategic objectives:

1. Prioritize HUD housing programs to receive energy assistance.
2. Develop public-private institutional linkages to focus on energy.
3. Revise HUD guidelines to capture opportunities for improving energy efficiency.
4. Provide technical energy information, assistance, and training to HUD staff, public and assisted housing managers, and others in the field who design and implement housing assistance programs.

Twenty-seven projects were initiated and carried out by DOE and HUD support offices, local energy and housing organizations, private and public interest organizations, and the national energy laboratories. Results from the DOE–HUD Initiative clearly demonstrated that significant energy and cost savings for both residents and the Federal Government can be realized by improving the energy efficiency of public and assisted housing. The DOE–HUD Initiative illustrated that energy efficiency can be integrated into normal management practices. HUD's

own Office of the Inspector General concurred, recommending that housing authorities practice better energy management.

Alternative sources of financial assistance for energy improvements were shown to be available. The initiative defused the myth that energy-efficient housing is expensive. Findings indicated that the opposite is true—energy efficiency is a key element in assuring the creation and maintenance of truly affordable housing for low- and moderate-income families.

To follow up the initiative, DOE and HUD formed a Partnership for Affordable Housing in 1995. The Partnership is a focused deployment effort designed to achieve an average 20- to 30-percent improvement in energy efficiency in at least 1 million low-income housing units within the next 5 years. This voluntary collaborative program between DOE, HUD, and State and local organizations throughout the country is envisioned as a significant effort to improve the energy efficiency and affordability of the Nation's homes, including public and assisted housing. The partnership provides a range of direct, onsite assistance services to housing providers from DOE's national laboratories and other organizations. It is designed to build lasting capabilities among housing managers for technical analysis, as well as project and financial management of energy-efficiency improvements.

The DOE–HUD Partnership started with intensive demonstrations of comprehensive energy analysis and implementation in Atlanta and Chicago. It has continued by building on the DOE Rebuild America program. (See page 24.)

List of DOE–HUD Project Reports
(See page 37 for a list of DOE–HUD projects and abstracts.)

EPA Programs

ENERGY STAR® Homes

An ENERGY STAR® home uses 30 percent less energy for heating, cooling, and water heating than a home based on the Model Energy Code, while protecting the environment and saving money. Features of an ENERGY STAR® home include improved insulation, advanced windows, tightly sealed ducts, high-efficiency heating and cooling, and reduced air infiltration. One can be sure a home is an ENERGY STAR® home by looking for the ENERGY STAR® label or by contacting a participating builder in the neighborhood.

Improved insulation not only keeps out excessive heat or cold, but it also leads to even temperatures between and across rooms. For insulation to work properly, it must be installed carefully with no gaps, crimping, or compression. This is especially important in areas where the insulation has to fit around obstacles such as pipes, electrical wiring, and outlets.

Advanced windows can improve the thermal performance of homes by reducing heat loss in cooler climates and solar heat gain in warmer climates. Window technologies have advanced dramatically and prices on these windows have dropped significantly.

Tightly sealed ducts are crucial for energy efficiency. In typical American homes, ducts leak 20 to 30 percent of the air forced through them. This means 20 to 30 percent of the money spent to heat or cool homes is wasted. Duct systems sealed and verified by a field test can substantially eliminate these leaks.

High-efficiency heating and cooling equipment can account for more than 50 percent of a home's total energy use. You can significantly lower your home's utility bills by choosing equipment carefully.

Reduced air infiltration combined with proper ventilation in a home not only reduces energy bills but also improves the quality of indoor air. Outdoor air that leaks indoors makes it difficult to maintain comfort and energy efficiency. In addition, air leakage accounts for 25 to 40 percent of the energy used for heating and cooling in a typical home. Today, off-the-shelf technologies such as house wraps, sealants, foams, and tapes reduce air infiltration.

For more information on proper insulation, high-performance windows, tightly sealed ducts, high-efficiency equipment, and reducing air infiltration, see:
www.epa.gov/energystar.html
or call the ENERGY STAR® Hotline, toll free, at (888) STAR–YES or (888) 782–7937.

ENERGY STAR® Residential Light Fixtures

EPA has established partnerships with more than 50 light fixture manufacturers to recognize the highest quality, most energy-efficient light fixtures for residential applications. To carry the ENERGY STAR® label, these fixtures must meet strict safety and reliability standards. Both

"hardwired" and portable fixtures are covered. They must meet energy-efficiency and quality criteria.

Most ENERGY STAR®-compliant residential light fixtures are "dedicated" fixtures, meaning that they are designed to operate only on an energy-efficient light source. The advantage of dedicated fixtures is that you do not have to buy a new ballast every time the bulb burns out—you just replace the "pin-based" efficient light bulb. They generally last as much as three times longer than typical incandescent bulbs.

Look for the ENERGY STAR® label on products. For a list of ENERGY STAR®-labeled indoor and outdoor residential light fixtures, either call the ENERGY STAR® Hotline toll free: (888) STAR–YES [(888) 782–7937] or check the ENERGY STAR® Web Site: **www.energystar.gov.**

ENERGY STAR® Purchasing Tool Kit

The ENERGY STAR® Purchasing Tool Kit is a critical part of the framework for a new joint initiative of EPA and DOE called the ENERGY STAR® Purchasing Initiative. Its goal is to assist large buyers (State and local governments, institutions, and corporations) to include energy efficiency in their purchasing policies. The Tool Kit contains purchasing guidelines and the Simple Savings Calculator as well as ideas for internal and external education and outreach activities.

EPA's Web site, **www.energystar.gov,** will soon offer an easy-to-use electronic version of the kit with links to additional resources and updates about the initiative. For further information:

EPA Contact: Jennifer Dolin
Program Manager
ENERGY STAR® Purchasing Initiative
(202) 564–9073
E-mail: dolin.jennifer@epa.gov

DOE Contact: Marc LaFrance
(202) 586–8423
E-mail: marc.lafrance@ee.doe.gov

The Consortium for Energy Efficiency, Inc. (CEE) Expanding Markets for Super-Efficient Technologies

Founded in 1991, CEE is a nonprofit, public benefit corporation that actively promotes the use of energy-efficient products and services. CEE members include electric, gas, and water utilities; research and development organizations; State energy offices; and regional energy programs. Both EPA and DOE provide major support. CEE encourages utilities and other partners to pool their market influence by voluntarily adopting common programs and efficiency specifications.

The goal is to permanently increase the supply and usage of energy-efficient products and services. CEE has used this approach successfully to increase the availability of high-efficiency

products including clothes washers, refrigerators, lighting, HVAC equipment, and motors. Its 1998 public housing refrigerator initiative arranged the purchase of 70,000 units by interagency agreement, and plans have begun for a 2000 program. For more information, call (617) 589–3948 or visit the Web site at **www.CEEforMT.org.**

EPA's Web site, **www.energystar.gov,** will soon offer an easy-to-use electronic version of the kit with links to additional resources and updates about the initiative. For further information:

EPA Contact: Jennifer Dolin
Program Manager
ENERGY STAR® Purchasing Initiative
(202) 564–9073
E-mail: dolin.jennifer@epa.gov

DOE Contact: Marc LaFrance
(202) 586–8423
E-mail: marc.lafrance@ee.doe.gov

Electric Utility Restructuring

Restructuring of the electric utility industry is proceeding in the States. By September 1999, 24 States had begun forms of competition. The pace of restructuring has been slowed significantly by the difficulties experienced in California.

The traditional monopoly status of electric utilities in generation, transmission, and service delivery to users is being changed to facilitate competition in electricity generation. Utilities are deciding whether to divest their generation facilities and to concentrate on the service end of the business. Services are being expanded to incorporate cable, the Internet, and other features in addition to electricity.

Low-Income Restructuring Principles: These changes in the electric power industry can have a special impact on low-income households and small businesses. Resolutions adopted by a dozen organizations with special interest in low-income customers. They serve as guidance for legislators, regulators, and advocates as they explore restructuring options. Many stress a commitment to universal access, affordability, and continuation or expansion of low-income energy programs. See: **www.ncat.org/liheap/dereg.htm.**

Restructuring also affects how energy conservation, environmental controls, and the use of renewable resources will work in each State. For these reasons, we have been following these developments by providing copies of the **Weekly Utilities Restructuring Update** for HUD staff.

Utility Restructuring Update: A weekly summary of national and State activities compiled by Energetics, Inc., for DOE and edited for HUD by Bob Groberg, Energy Division, robert_groberg@hud.gov. Questions or comments to the **Weekly Update** should be directed to either Patrick Mara, Energetics, pmara@energeticsinc.com, or Lawrence Mansueti, DOE, Lawrence.Mansueti@hq.doe.gov.

The **Weekly Update** is available on the Internet at:
www.eren.doe.gov/electricity_restructuring/weekly.html.

Also see:
Yahoo Utilities Company News: **biz.yahoo.com**
PMA Daily Power Report: **www.powermarketers.com**
EnergyOnline: **www.energyonline.com**
Energy Information Agency: **www.eia.doe.gov**

Other Energy Resources

National Center for Appropriate Technology (NCAT) Clearinghouse for Public and Assisted Housing

The NCAT grant was provided by Congress for the creation of a national clearinghouse to deliver technical assistance to help public housing and Federal Housing Administration- (FHA) insured multifamily housing projects to reduce their utility costs. The meaningful aspect of the program has been delivery of information, training, and technical assistance in many places around the United States. Activities began in 1995 and include the following:

- Established the clearinghouse with an 800 number, 800–ASK–NCAT.
- Set up a multifamily clearinghouse section on its Web site: **www.ncat.org**.
- Provides model documents (see list below) for energy performance contracting and other activities.
- Created a publications database and makes it available in paper form. It contains more than 600 documents focused on low-income multifamily housing and HUD-assisted multifamily housing, with abstracts, location, origin, and cost of publication, if known. It will be available via download from the Internet when NCAT's home page is completed.
- Provided information, training, and technical assistance to a large number of agencies, State governments, etc., including 106 public housing authorities (PHAs) and 55 assisted housing projects, 13 energy service companies, 2 State energy offices, 10 HUD field offices, 2 universities, 2 utilities, 2 financing companies, DOE, Oak Ridge National Laboratory, U.S. General Accounting Office, 4 associations, 12 organizations, and 14 companies.
- Made 66 presentations by 2 NCAT staff and 5 consultants at 26 training conferences and other events.
- Assembled a list of 26 energy service companies, sorted by State.

List of sample documents/guides available from NCAT:

1. Energy Analysis Report Agreement (7 pp.)
2. RFP for Professional Services to Conduct a Utility Analysis (20 pp.)
3. Energy Services Agreement (57 pp.)
4. Housing Authority Request for Proposal to Provide Natural Gas Supplies (12 pp.)
5. RFP for Energy Services Management (22 pp.)
6. The Economics and Analysis of a Fuel Conversion (12 pp.)
7. 600-Publication Database on Resource Efficiency in Multifamily Housing

8. List of Housing Authorities involved with energy performance contracting
9. Evaluation forms, spreadsheet, and instructions for ranking energy performance contracting proposals
10. RFP for energy performance contracting solicitation
11. Instructions for preparation of the technical section of the RFP
12. Fuel Bill Analysis Packet (provided to 55 PHAs and 35 housing projects)
13. PriSM (Princeton Scorekeeping Method software generated) runs for Lawrence, MA, and Peoria, IL, Housing Authorities

The National Center for Appropriate Technology (NCAT) announced a new service for Community Housing Development Organizations and builders that participate in HUDHOME programs. The "affordable sustainability technical assistance" (ASTA) Web site was launched on Tuesday, March 13, 2001.

HomeASTA is designed to provide technical assistance to recipients of HOME grants to incorporate sustainable design into affordable housing. The Web site (**www.homeasta.org**) serves the needs of the affordable housing developer by providing step-by-step recommendations on how to make single-family home construction projects more sustainable in the areas of resources, energy use, and occupant health. The site offers an overview of the principles of sustainable design to introduce their application in affordable housing. Links to additional sources of detailed information help to illustrate how actual projects are realizing the tremendous potential for creating affordable, sustainable homes. This site helps developers learn more to capture the significant environmental and social benefits of sustainable design without compromising their ability to meet project budgets.

Contact: Jim Maunder—jimm@ncat.org or call 866–367–6228.

Resources Available To Answer the Energy Questions Most Frequently Asked

1.	HUD Energy staff	(202) 708–1201, ext. 4642
2.	Energy Publications from HUD USER	(800) 685–8470
3.	DOE Energy Efficiency and Renewable Energy Clearinghouse	(800) DOE–EREC or (800) 363–3732
4.	DOE Rebuild America	**www.eren.doe.gov**
5.	Million Solar Roofs Initiative	**www.MillionSolarRoofs.org**
6.	Model Energy Code DOE Building Codes Assistance Project	(202) 530–2200 or (800) 270–CODE (2633) **www.crest.org/efficiency/bcap**
	MECcheck three-part video: State and Model Energy Codes:	from HUD USER (800) 270–CODE
7.	National Center for Appropriate Technology (NCAT)	(800) ASK–NCAT **www.ncat.org**
	HOME ASTA (Affordable Sustainability Technical Assistance	**www.homeasta.org**
	Public Housing Energy Conservation Clearinghouse	**www.phaenergy.org**
8.	"Eye on Energy…" Rehab-Energy Video Community Connections	(800) 998–9999
9.	Electric Utility Restructuring weekly update Patrick Mara, Energetics	pmara@energeticsinc.com
10.	Alliance to Save Energy "Consumer and Lender Resources for Energy Efficiency Financing and Home Energy Ratings"	**www.ase.org**
11.	National Consumer Law Center "Energy and the Poor—The Crisis Continues" A State-by-State analysis of the energy burden carried by the Nation's low-income households	**www.nclc.org**
12.	"The Cold Facts: Report on the Effect of Home Energy Costs on Low-Income Americans"	**www.nliec.org/cold**

Space for adding other resources:

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Publications List

Energy Codes

Copies of the **1992 Model Energy Code (MEC)** cost $10 and can be obtained from the Building Officials and Code Administrators International: BOCA International, 4051 Flossmore Road, Country Club Hills, IL 60478.

The ASHRAE Standard is available from ASHRAE, 1791 Tullie Circle, Atlanta, GA 30329–2305, (800) 527–4723. Cost is $98 ($65 for members); it is available on 5.25-inch disk (86237) or 3.5-inch disk (86238).

Energy Code Compliance

To guide architects, builders, and others in making homes more energy efficient for consumers, HUD USER is now distributing three resources developed by DOE in compliance with the Council of American Building Officials' 1992 Model Energy Code (MEC). Loan guarantee programs in HUD and the Rural Housing and Community Development Service (formerly the Farmers Home Administration) require compliance with the MEC, and several States have also adopted it. Consumers purchasing a new one- or two-family home that meets the climate-specific energy conservation requirements of the code can benefit from long-term savings in their utility costs and qualify for higher loan amounts from several lenders.

1. The **MECcheck™ Manual** is a clear and comprehensive compliance guide that describes the basic requirements of the code for building envelopes, heating and cooling, electrical systems, materials, and equipment. Included are three approaches for attaining compliance, guidance for plan checkers and field inspectors, and several forms and checklists.

2. By using the **MECcheck™ Prescriptive Packages,** design and construction professionals can select a package of insulation and window requirements suitable for the specific climate zone in which their building is located. Each climate zone package lists all compliance standards for insulation, glazing areas, glazing U-values, and heating and cooling efficiency.

3. The **MECcheck™ Software** offers the most flexible approach to determining code compliance. The software calculates tradeoffs between all building envelope components and heating and cooling equipment efficiencies. MECcheck can be run on most DOS-based computers and is capable of generating reports that can be used to document code compliance. The *MECcheck™ Software User's Guide* takes users step by step from software installation to report generation.

Up-to-date knowledge of the MEC is critical for building professionals working with several Federal housing loan guarantee programs and many State and local governments, where MEC compliance is required. These valuable tools are now available from HUD USER. The software and user's guide are $10 per set; the other materials are $5 each. Call HUD USER at (800) 245–2691.

Guides To Improve Energy Efficiency. These publications are available from HUD USER unless otherwise indicated.

1. HUD Rehabilitation Energy Guidelines (November 1996) contains guidelines for both single-family and multifamily structures, with computer software for completing the worksheets. These guidebooks help owners and remodelers aim for improvements that will meet the 1992 Council of American Building Officials MEC. They recommend energy measures and help to determine the savings from proposed building envelope and equipment measures. They also provide information on qualifying for energy-efficient mortgages (EEMs) offered by FHA. The guidebooks also have a 30-page explanatory pamphlet, "Are You Rehabilitating a Multifamily [or Single-Family] Building?" The books, pamphlets, and software are available from HUD USER [(800) 245–2691]. Please specify single-family (1–4 units) or multifamily version.

2. An Owner's Guide to Energy Efficiency in Single Family Rental Housing (ACCN–HUD6764). This pamphlet explains the benefits of energy-efficiency improvements for owners of rental housing, including: lower fuel bills, higher property values, increased tenant satisfaction, and fewer maintenance problems. It also includes a list of recommended energy-efficiency measures.

3. Energy Conservation in Housing for the Homeless: A Guide for Providers (ACCN–HUD6767). Designed to help shelter providers reduce their energy costs—and, as a consequence, devote more funds to basic operations—this guide includes a four-step strategy for carrying out energy-efficiency improvements. A list of national resources gives homeless assistance providers access to additional sources of information on energy efficiency.

4. "Making Rental Housing Energy Efficient: Guide to Performing Energy Retrofit During Multifamily Property Rehabilitation" (HUD–CPD1269, October 1990) (ACCN–HUD5650) is designed to help prospective owners or rehabilitators of rental housing save money and improve long-term values of residential property by increasing energy efficiency. It provides a checklist and brief descriptions of energy-efficiency measures in the areas of weatherization, appliances and lighting, and heating systems. The references to Federal programs may be outdated, but the basics of the rehabilitation process for smaller multifamily properties are still useful.

5. Our Home: Buildings of the Land—Energy Efficiency Design Guide for Indian Housing (ACCN–HUD6765). This practical how-to guide discusses energy-efficiency techniques in the design and construction of Indian housing—including information on passive solar heating and natural cooling.

6. Energy Performance Contracting for Public and Indian Housing: A Guide for Participants (ACCN–HUD6771). Energy performance contracting is an innovative financing technique that uses cost savings from reduced energy consumption to repay the cost of installing energy conservation measures. This informative guide provides Public Housing Agencies and Indian Housing Authorities with step-by-step guidance on HUD procurement requirements, contractor selection options, and monitoring procedures.

7. Five-Year Plan for Energy Efficiency: 1999 Report to Congress. A related publication, this plan describes HUD's proposed energy-efficiency activities for the fiscal years 1999 to 2003.

8. A related HUD publication, **Eye on Energy: Rehab for All Seasons,** is available exclusively through HUD's Community Connections information center. This two-part package, which includes a videotape and accompanying Video Companion Guide, discusses energy-efficient procedures that can be used during the housing rehabilitation process. Items can be ordered as a two-part package for $10 or separately for $5 each. To order, call Community Connections at (800) 998–9999.

9. Energy Conservation for Housing: A Workbook, September 1998. This workbook is the updated version of a 1982 energy audit guide by Abt Associates with Citizens Conservation Corporation. It provides public housing authorities (PHAs) with essential background information about energy conservation. It guides in surveying a development's energy-related systems/equipment and current energy use. It offers a checklist for proper operations and maintenance to save energy and ensure long life of equipment and provides step-by-step guidance in assessing the cost-effectiveness of energy conservation options. It is available from the Public and Indian Housing Information and Resource Center (800) 955–2232.

10. Utility Allowance Guidebook, September 1998, Abt Associates and Citizens Conservation Corporation. This guidebook assists PHAs in establishing utility allowances for residents. It focuses on utility allowances for federally subsidized public housing units where residents pay bills directly to the gas or electric company or where the PHA provides utilities but also has checkmeters to identify excess consumption. It is available from the Public and Indian Housing Information and Resource Center (800) 955–2232.

Project Studies

Abstracts from studies done as part of the DOE–HUD Initiative follow. They demonstrate that significant energy and cost savings for both residents and the Federal Government can be realized by improving the energy efficiency of public and assisted housing. For further information, see contacts listed for each study.

1. Weatherization and Housing Rehabilitation Demonstration Program, Spokane, WA

2. Energy-Efficient Rehabilitation of Single-Family Homes, Knoxville, TN

3. Energy Conservation Retrofit Program for Transitional Housing, Chicago, IL

4. Homeless Interagency Cooperative Partnership, Philadelphia, PA

5. Energy-Efficient Home Design (“Straw Bale”) for Navajo People, San Francisco, CA

6. Multifamily Rehabilitation in the Midwest

7. Utility Retrofit of Section 202 Housing, Worcester, MA, and HUD 221(d)(3) Housing, Burlington, VT

8. Energy-Efficiency Financing and Modifications, Mount Vernon, NY

9. Guidelines for the HUD Capital Improvements Loan Program

10. Multifamily Property Disposition Handbook, Energy Guidelines for HUD

11. Technical Assistance Program in the Midwest

12. Utility Retrofit of Public Housing (Chelsea Project), Chelsea, MA

13. Improving Energy Efficiency in Public Housing: A Colorado Field Experiment, Denver, CO

14. Low-Cost/No-Cost Energy Conservation in Public Housing, Atlanta, GA

1. Weatherization and Housing Rehabilitation Demonstration Program, Spokane, WA

Project Period: 1992–1993

Goals and Objectives: This project was one of four demonstration projects designed to improve the energy efficiency of low-income housing. The goal of these projects was to illustrate the manner in which energy retrofits can and should be completed during housing rehabilitation to improve housing comfort and affordability. The other three projects, in Boston, Chicago, and Kansas City, dealt with public, multifamily, and homeless shelter housing.

The project undertaken by the U.S. Department of Energy (DOE) Seattle Support Office was designed to show Community Development Block Grant (CDBG) and Residential Retrofit Program officials that program efficiency and energy savings could be the result of scheduling housing rehabilitation and energy-efficient improvements at the same time. The goal of this effort was to leverage Federal, State, and local funding to rehabilitate and weatherize 80 low-income homes in the Spokane, Washington, area. A further goal of the project was to evaluate the efficiency of this process and its energy use impacts.

Accomplishments: The Spokane Neighborhood Action Program (SNAP) combined funding from Washington Water Power (a local utility), DOE, U.S. Department of Health and Human Services, CDBG, and the Farmer's Home Administration to weatherize, rehabilitate, and provide conservation education to 80 low-income, single-family households in Spokane County, Washington. SNAP developed a database that tracks financial, demographic, and energy usage data. This database allows projects with varying sources of funding to be tracked adequately.

Each participating dwelling was audited for both weatherization and rehabilitation improvements. Work orders for both aspects of the job were prepared simultaneously. Typical weatherization measures included insulation, furnace repair and replacement, and infiltration improvements. Typical rehabilitation measures included new roofs, septic and drain field work, sheetrock installation on interior walls, and sheeting on exterior walls.

SNAP gained "first-hand" experience in combining funds, procedures, and goals of weatherization and rehabilitation programs. Both the positive and negative aspects of combining funding programs with different mandates and requirements were examined and experienced. This project allowed SNAP to develop software for tracking projects that can be replicated by other community organizations. SNAP has presented project results to numerous national and regional conferences.

Project Partners: DOE Seattle Regional Support Office; SNAP; Washington State Department of Community, Trade, and Economic Development; Spokane County Development Department; Washington Water Power; Farmer's Home Administration; and U.S. Department of Health and Human Services.

Publication:

Quaid, M. and Don Andre, *Evaluation Report, Spokane Neighborhood Action Program, DOE/HUD Comprehensive Rehabilitation Program,* Spokane Neighborhood Action Program, Spokane, Washington, October 1994.

Continuing or Spinoff Activities:

SNAP continues to receive funding from several sources to complete rehabilitation on homes being weatherized. Rehabilitation funding sources include HOME, Farmer's Home Administration Housing Preservation Grants, and the Washington State Housing Trust Fund. The agency has 54 new clients for the combined weatherization and rehabilitation program, with another 350 on a waiting list. Two more agencies have combined their weatherization and rehabilitation programs, and eight more are beginning the process. SNAP is also continuing to present project results to interested parties, advocate for reconciliation of weatherization and rehabilitation eligibility and work standards, and make available the tracking database to weatherization and rehabilitation providers.

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2. Energy-Efficient Rehabilitation of Single-Family Homes, Knoxville, TN

Project Period: 1994–1996

Goals and Objectives: The goal of this project was to provide technical assistance to the Knox Housing Partnership (KHP) and to the city of Knoxville, Tennessee, on energy-efficient housing rehabilitation, ensuring that residents have affordable utility bills in addition to affordable rents. An approach was developed to identify the level of energy efficiency that should be achieved during rehabilitation and to inspect the quality of completed work. The project was designed to serve the immediate needs of the partnership and the city of Knoxville and to serve as a model for fostering collaboration between local organizations and addressing energy efficiency during rehabilitation.

Accomplishments: KHP and the city of Knoxville are addressing the problems of substandard housing conditions and lack of affordable housing opportunities for low-income households in Knox County, Tennessee. They revitalize purchased housing for subsequent ownership or rental by low-income families. Similar organizations are performing comparable work in other States, such as Maryland and Texas.

Southface Energy Institute, Inc., and Oak Ridge National Laboratory (ORNL) provided a 1-day workshop for KHP and city of Knoxville personnel on energy-efficiency rehabilitation tailored to the Southeast. The workshop provided general information on energy efficiency and corrected some myths and misconceptions about repairs targeted at energy conservation. The workshop addressed diagnostic and installation techniques related to insulation, air sealing, and equipment and discussed how to prioritize the expenditure of energy rehabilitation dollars.

Project Partners: ORNL; Southface Energy Institute, Inc.; KHP; and city of Knoxville, Tennessee.

Publications: None

Continuing or Spinoff Activities: The University of Tennessee Municipal Technical Advisory Service has expressed interest in broadcasting a condensed version of the workshop to other Tennessee municipalities over its videoconferencing system.

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3. Energy Conservation Retrofit Program for Transitional Housing, Chicago, IL

Project Period: 1991–1992

Goals and Objectives: This project was designed as a pilot project to provide funding and technical assistance for energy retrofits of homes obtained by homeless service providers through the U.S. Department of Housing and Urban Development (HUD) Property Disposition Program. These HUD-repossessed, single-family properties were to be used as transitional housing.

Accomplishments: With funding provided by the Department of Energy– (DOE–) HUD Initiative, the Illinois Department of Energy and Natural Resources (ENR) offered transitional housing providers in the Chicago area the opportunity to participate in the retrofit program. After considerable evaluation and interviews, the following five housing providers were selected: Calumet City Housing Authority; Chicago Youth and Community Service Organization; Willfeed Community Organization; the city of Urbana; and Inner Voice. Together, these organizations operated 19 living units. HUD provided the structures for a $1-per-year lease. Homeless providers were to fund general rehab of the structures, after which grants up to $5,000 would be made for cost-effective energy retrofits.

Because some of the housing providers needed more technical assistance than anticipated, ENR contracted with the Center for Neighborhood Technology of Chicago to assist in conducting energy audits and reviewing and selecting contractors.

Each building was analyzed to determine both building rehabilitation and energy-efficiency needs. Participating organizations managed the building rehabilitations, with the assistance of State and local funding and "sweat equity," and the DOE–HUD Initiative and ENR funding paid for the energy improvements.

In all, $57,582 was expended on the project. Nineteen housing units were retrofitted, providing homes for 15 families and more than 30 individuals. The majority of houses received high-efficiency furnaces; other energy improvements included insulation, flue dampers, storm windows, caulking, and weather-stripping. Clients received explanations of the energy measures installed, as well as educational materials encouraging energy conservation. Combined energy savings for the 19 dwellings is estimated initially at more than $12,000 annually.

The project generated positive working relationships between ENR and homeless providers in the Chicago area, as well as greater coordination between State and local energy and rehabilitation programs. Community groups began to understand the importance of energy efficiency for affordable housing and realized, with the help of the Center for Neighborhood Technology, that installing energy measures in their dwellings was not difficult.

Project Partners: ENR; Center for Neighborhood Technology of Chicago; Calumet City Housing Authority; Chicago Youth and Community Service

Organization; Willfeed Community Organization; city of Urbana; and Inner Voice.

Publication: *Final Report, the Energy Conservation Retrofit Program for Transitional Housing as Part of the HUD/USDOE Initiative*, submitted by the Illinois Department of Energy and Natural Resources, Consumer Assistance Section, October 1993.

Continuing or Spinoff Activities: ENR requested additional funds from the DOE–HUD Initiative to continue this effort. That funding was denied, but funding was granted from the petroleum violation fund ("Oil Overcharge Monies") to assist two community groups with the energy retrofit of their facilities.

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4. Homeless Interagency Cooperative Partnership, Philadelphia, PA

Project Period: 1992–1994

Goals and Objectives: The objective of this project, undertaken by the DOE Philadelphia Regional Support Office (PRSO) under the umbrella of an Interagency Council of the Homeless, was to improve the energy efficiency of federally supported housing in particular dwellings used to shelter homeless persons. PRSO's goal was to design and conduct a pilot project to rehabilitate 50 selected residences used for homeless housing to make them more habitable as well as more energy efficient. The project was designed as a 2-year effort. DOE–HUD Initiative funds were used to leverage funds from the Philadelphia Housing Development Commission (PHDC) and the Pennsylvania Department of Community Affairs Weatherization Assistance program, as well as from other State and local sources.

It was hoped that nonprofit homeless assistance providers would take advantage of purchasing properties at an annual lease of $1 per property per year, extendable up to 5 years, through HUD's Lease and Sale of Acquired Single- Family Properties for the Homeless program.

Accomplishments: The following agencies signed a Memorandum of Understanding to begin this program: HUD, PRSO, city of Philadelphia, PHDC, Pennsylvania Department of Community Affairs, city of Philadelphia Office of Housing and Community Development, and Food for All, a nonprofit agency that assisted in the rehabilitation of the houses and in the selection of homeless families.

PRSO developed a set of guidelines for operation of the project and presented them to all participating agencies to ensure the installation of energy-efficient equipment and supplies in each dwelling, monitoring of energy savings, and furnishing of results to other interested parties.

In cooperation with local utilities, the nonprofit agencies, and dwelling occupants, a no-cost energy improvement and education program was developed for occupants of the renovated houses. The purpose of this program was to assist them with implementing no-cost measures that would reduce operating costs once the energy-efficiency measures were installed.

Rehabilitation of dwellings was coordinated by PHDC. Once properties were identified, an energy audit was conducted of each home to determine which energy measures to install. Following rehabilitation and retrofit, each dwelling would again be subject to an energy audit to determine the improvement in energy efficiency. The energy audits were jointly conducted with local utilities.

In the first year of this project, 12 organizations retrofitted 12 properties, at a cost of $10,000 to $12,000 each. DOE–HUD and Weatherization Assistance program funds provided $5,000 toward this cost, and HUD CDBG funds provided the remainder. Energy measures installed included insulation, furnace replacements, energy-efficient equipment, and energy-related repairs to roofs, ceilings, windows, and doors.

Project Partners:	DOE PRSO; city of Philadelphia; PHDC; Pennsylvania Department of Community Affairs; city of Philadelphia Office of Housing and Community Development; Food for All; and utility companies.
Publications:	None
Continuing or Spinoff Activities:	None
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5. Energy-Efficient Home Design ("Straw Bale") for Navajo People, San Francisco, CA

Project Period: 1992–1994

Goals and Objectives: The need for new housing is one of the most pressing issues facing the Navajo today. The goal of this project was to work together with the Navajo in finding solutions to their housing needs that would improve energy efficiency and comfort. To help reach this goal, the DOE San Francisco Support Office (SFSO), with the assistance of HUD and Lawrence Berkeley Laboratory (LBL), proposed to design and build a Navajo home that would incorporate traditional cultural values and utilize local building materials and labor.

Accomplishments: SFSO provided funds to the Navajo Nation to hold a workshop, or "design charrette," in late 1992 to explore design alternatives for new energy-efficient housing. Participants in the workshop included representatives from the Navajo, local and national architects, and two energy experts from LBL.

The workshop led to the development of several construction methods, including the use of straw bales, adobe, rammed earth, and conventional framing, as well as fibercrete. Plans for a prototype home were finalized in the spring of 1993, with construction begun in July of that year, near Ganado, AZ, on the Navajo Nation. The prototype home was a combination of adobe and straw bale construction, both materials having over a 100-year history as construction materials in this area. The home incorporates passive solar design and was constructed with local materials and labor. It has been completed and is now occupied by a Navajo family.

DOE wrote a 16-page booklet on Straw Bale Construction, *House of Straw: Straw Bale Construction Comes of Age*, for distribution to Indian Housing Authorities and Indian architects and engineers throughout the country. A technical report on this project was also prepared.

Project Partners: DOE SFSO; LBL; Navajo Housing Authority; Navajo Housing Services; and Navajo Nation, Division of Community Development.

Publications: *House of Straw: Straw Bale Construction Comes of Age*, DOE San Francisco Support Office, U.S. Department of Energy, DOE/6010094–01, April 1995.

Navahomes: A Dinelogical Study of Navajo Dwelling in Balance with the Land, The Navajo Nation, Division of Community Development, Design and Engineering Services, December 1992.

Hanford, Jim and Joe Huang, *Energy Efficient Building Technologies for the Navajo Reservation and Analysis of a Straw Bale/Adobe Dwelling Prototype*, Final Review Draft, LBL, November 1994.

Continuing or Spinoff Activities:

A workshop on Indian housing was presented at the 1995 DOE National Weatherization Conference, with representatives from the Navajo Nation as well as others working in Indian housing.

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6. Multifamily Rehabilitation in the Midwest

Project Period: 1993–1994

Goals and Objectives: The purpose of this project was to evaluate the performance of superinsulation energy-efficiency measures in multifamily moderate rehabilitation and to develop cost-effectiveness estimates for energy-saving measures through energy-efficient rehabilitation in the Midwest. Further goals of this project were to provide information dissemination on superinsulation to rehabilitation professionals and to develop an analytic method that would assist housing providers in analyzing the differences between superinsulation and conventionally insulated rehabs.

Accomplishments: The project team, Argonne National Laboratory (ANL) and the Energy Resources Center of the University of Illinois at Chicago, collected and analyzed energy and cost data on two multifamily buildings, located side by side in the same Chicago neighborhood. The team also conducted blower-door tests on the two buildings, interviewed community developers on superinsulation and conventional insulation techniques, developed architectural drawings of energy conservation measures for the two buildings, and provided technical assistance for the installation of energy conservation measures in the two buildings. Oak Ridge National Laboratory (ORNL) provided test instrumentation to measure energy savings. Lawrence Berkeley Laboratory (LBL) assisted with blower-door diagnostics.

Superinsulation measures included R–43 insulation in attics, R–19 insulation in exterior walls, low-emissivity coatings on windows, air infiltration sealing, and high-efficiency heating systems. Typical building rehabilitations did not include wall insulation, heating systems were rehabbed rather than replaced, and air infiltration sealing was done sporadically.

The two buildings were rehabbed using the conventional and the high-efficiency techniques.

The project team presented its project at the Affordable Comfort conference to share its information on energy-efficient rehabilitation—both superinsulation and conventional—with housing and rehabilitation providers. The team also used DOE–2 building simulation software to compare the energy costs and savings between the two buildings.

For an average Chicago heating season with 6,455 heating degree days, use of the superinsulating retrofit techniques was estimated to save about 710 therms of natural gas and lower gas energy costs in an 1,100-square-foot apartment by approximately $355.

Among the recommendations made by the project team were to expand super-insulation rehabilitation and retrofit techniques to multifamily building projects in which demolition of the interior structures is not required or buildings are not vacant, and to expand research into the special opportunities for incorporating energy conservation in low-income communities.

The project team established working relationships with several community development organizations to the extent that they will now

permit monitoring of their rehabbed buildings in exchange for technical assistance on the installation of energy conservation measures.

Project Partners: ANL; ORNL; LBL; Energy Resources Center of the University of Illinois at Chicago; Domas Plus, Inc.; Kenwood-Oakland Development Corporation; and the Illinois Department of Energy and Natural Resources.

Publication: *Energy-Efficient Rehabilitation of Multifamily Buildings in the Midwest*, An Argonne National Laboratory Technical Memorandum (ANL/DIS/TM–16). Report on the World Wide Web: **www.eren.doe.gov./ee/cgi-bin/rehab_doc/ rehab_title.html**

Conference Presentation at Affordable Comfort 1994, by John Katrakis.

Continuing or Spinoff Activities: The ANL team developed a new project as a result of the findings of this project, to look at the incorporation of energy conservation measures in moderate rehabilitation. This new project is part of a larger partnership with a community development corporation. The partnership will examine how DOE technologies can assist in the economic development of a distressed urban community.

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7. Utility Retrofit of Section 202 Housing, Worcester, MA, and HUD 221(d)(3) Housing, Burlington, VT

Project Period:	1990–1992
Goals and Objectives:	The goal of both of these projects was to demonstrate the effectiveness of utility housing partnerships for energy retrofit of HUD multifamily housing, specifically Section 202 (elderly and disabled) and 221(d)(3) (low income). A further goal of these projects was to evaluate energy savings and demonstrate their replicability elsewhere.
Accomplishments:	The Worcester demonstration was a comprehensive retrofit of multifamily housing for the elderly. The New England Electric System (NEES) included this retrofit as part of its multifamily retrofit program. After reviewing more than 100 sites in Massachusetts, NEES selected Colony Retirement Homes IV, a 70-unit all-electric housing project in Worcester. A technical walkthrough audit was completed by Rhode Islanders Saving Energy in May 1991 and reviewed by DOE and Lawrence Berkeley Laboratory (LBL). Selected retrofits, including lighting measures and heating controls, were installed in October 1991. They were found to be successful and cost effective, although some heating controls were consistently overridden by the building manager. NEES estimated that the retrofits would save over 150,000 kWh/year, at a cost of $38,312. The Northgate project in Burlington, Vermont, involved the total rehabilitation of 350 low-income units with extensive energy retrofits and fuel switching from electricity to gas. Both shell and equipment modifications were made, resulting in a 50-percent reduction in energy costs for tenants and a 99-percent tenant-reported satisfaction rate with the retrofits, a nearly unprecedented level of success. LBL provided technical assistance in the design and evaluation of both projects. Both projects had high visibility, and the findings have been reported widely in energy publications and at energy conferences and meetings. A videotape of the Northgate experience was also produced and shown at numerous energy and housing meetings.
Project Partners:	Colony Retirement Homes; NEES; Northgate Housing, Inc.; Burlington Electric Department; Rhode Islanders Savings Energy; and LBL.
Publications:	Patullo, Chip, "Making Low Income Housing Affordable: The Northgate Retrofits," *Home Energy*, Volume 10, Number 2, March/April 1993, pp. 13–16. Patullo, Chip, *The Northgate Miracle: Energy Efficiency and Affordable Housing*, Northgate Housing Inc., Burlington, VT, 1992. *The Northgate Miracle*, 15-minute videotape, Northgate Housing, Inc., Burlington, VT, 1993.

R.C. Diamond et al., "Affordable Housing Rehabilitation in Vermont: Energy Savings, Cost-Effectiveness, and Resident Satisfaction," published in the *Proceedings of the Thermal Performance of the Exterior Envelopes of Buildings V*, Clearwater, FL, December 1992.

Continuing or Spinoff Activities:

One spinoff activity was the development of a case study based on the Northgate work, which was included in the curriculum of two architecture schools, the Graduate School of Design, Harvard University, and the California College of Arts and Crafts (1992–1994).

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8. Energy-Efficiency Financing and Modifications, Mount Vernon, NY

Project Period: 1993–1994

Goals and Objectives: The New York Regional Support Office (NYRSO) coordinated two projects in the multifamily area.

The first project was designed to obtain financing, both public and private, for energy-efficiency improvements on a 131-unit retirement building (Petrillo Homes) owned by a nonprofit organization. Saving Federal dollars through energy conservation and rehabilitation was the primary goal; using financing from a variety of sources was the secondary goal.

The second project was designed to develop and demonstrate electric submetering of HUD-assisted multifamily buildings through bank financing provided, in part, by electric utilities incorporating submetering in their DSM programs. A secondary goal of this effort was to identify major institutional barriers to electric submetering in multifamily buildings.

Accomplishments: The New York Regional Support Office secured a total of $267,651, a $105,000 grant for window retrofits and $162,651 in loans and loan subsidies to pay for HVAC and lighting retrofits. The grant came from the New York Department of State. The loans came from Community Mutual Savings Bank, White Plains, New York. The interest subsidy and 75 percent of the loan were guaranteed by the New York State Energy Office's Investment Loan Program. The remaining 25 percent was secured with a HUD-mandated reserve fund maintained and controlled by Petrillo's owners.

Energy-efficiency measures installed included low-E glass windows; two new dual-fuel burners on existing boilers; a super-high-efficiency gas-fired, semi-instantaneous modulating water heater; a custom motorized fuel valve system; and upgraded exterior lighting.

Energy savings from the window retrofit are estimated at 2.007 billion Btu/year, and from the HVAC and lighting upgrades, 1.038 billion Btu/year. Total dollar savings are estimated to be more than $28,000 annually.

To complete the submetering project, two task forces (Financing and Barriers) were established. Financing models were developed, with barriers and solutions identified by the respective task forces. Publication of a contractor report was the primary achievement of this project.

Project Partners: DOE NYRSO; E.I.S., Inc.; New York Department of State; New York State Energy Office; Petrillo Apartments; and Community Mutual Savings Bank. Project partners for the submetering effort included E.I.S., Inc.; building managers for a number of HUD-assisted multifamily buildings; utility companies; and lending institutions who participated in the task forces.

Publication:	E.I.S., Inc., *Regulatory Reform and Financial Incentives for Electric Submetering Conversions: A Blueprint for Achieving Energy Conservation Fairness and Personal Responsibility Through the Metering and Billing of Apartment Electric Use in Electrically Master-Metered Multifamily Buildings in New York*, July 1995.
Continuing or Spinoff Activities:	As a follow-on to the Petrillo Homes project, the New York Support Office is developing a demonstration project to further illustrate innovate financing for multifamily energy-efficiency retrofit. As a follow-on to the submetering project, the Support Office has proposed a demonstration project to test the financing models proposed by the Financing Task Force.
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9. Guidelines for the HUD Capital Improvements Loan Program

Project Period: 1990–1991

Goals and Objectives: The goal of this project was to assist HUD in rewriting the *Multifamily Asset Management and Project Servicing Handbook* to include energy audit requirements for multifamily housing, as well as conversions from master-metered to tenant-paid utilities. Energy surveys are required by HUD when building owners request rent increases. When owners apply for Capital Improvement Loans, technical energy audit results must accompany the loan application.

Accomplishments: Chapter 12 of the handbook was reviewed and rewritten to include requirements for energy surveys and technical audits for HUD multifamily housing stock. Suggested energy conservation measures were provided, as was guidance on selection of professional architects and engineers for the conduct of technical energy audits. Guidance was also written on the conversion of master-metered utilities to individual- or tenant-paid utilities.

Project Partners: Lawrence Berkeley Laboratory.

Publication: *Chapter 12, Energy Conservation, 4350.1, Rev–1, Multifamily Asset Management and Project Servicing Handbook*, HUD Office of Multifamily Housing Management.

Continuing or Spinoff Activities: None

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10. Multifamily Property Disposition-Management Handbook, Energy Guidelines for HUD

Project Period: 1990–1992

Goals and Objectives: The purpose of this project was to develop guidelines for multifamily housing projects where HUD is Mortgagee-in-Possession (MIP) or Owner. Resident involvement in improved property management was an additional objective of this project.

Accomplishments: Existing literature was reviewed. Revisions were made to various provisions of the *Multifamily Property Disposition-Management Handbook.* Appendix 10–2, *Energy-Efficient Guidelines for Projects Where HUD is Mortgagee-in-Possession or Owner* was added as a checklist. The resident initiatives revisions set out requirements for resident participation in management decisions, including energy-efficiency improvements that impact their living conditions. Building repair revisions provide policies and procedures regarding repairs to owned and MIP projects. Repairs specifically dealing with energy efficiency are highlighted for repair surveys, plans, and implementation. Appendix 10–2 addresses energy conservation measures to be considered during building repair, planning, and implementation.

The *Handbook* revisions were completed in July 1992. A total of 6,500 copies were printed and distributed to managers and staff in the field. This document impacts multifamily housing where HUD is Mortgagee-in-Possession or Owner.

Seventy field staff received training on the *Handbook* revisions, including the policies and procedures for cost-effective energy-efficiency improvements. Field staff are responsible for implementing departmental policy and monitoring procedures.

Project Partner: HUD's Multifamily Property Disposition Division.

Publication: *Handbook 4315.1 for Multifamily Property Disposition-Management* and *Appendix 10–2.*

Continuing or Spinoff Activities: HUD Energy Division staff arranged for field staff to receive information on utility programs to implement use of this material.

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11. Technical Assistance Program in the Midwest

Project Period: 1992–1994

Goals and Objectives: DOE Region V, the Chicago Regional Support Office (CRSO), undertook the task of providing technical assistance to HUD and its grantees on the incorporation of energy-efficiency techniques into HUD policies, practices, and its assisted-housing program. The goal of this effort was to educate HUD staff on energy and to provide outreach to HUD grantees as well. An additional goal was to reach the assisted-housing market—including private developers, owners, and managers who have HUD-subsidized tenants in their buildings—with education and training on cost-effective energy-efficiency improvements.

Accomplishments: DOE and HUD agreed to a Memorandum of Understanding providing that CRSO would serve as an energy clearinghouse; provide assistance for presentations, meetings, conferences, workshops, and other related events; and facilitate communication among housing and energy providers and organizations such as weatherization providers; State energy offices; housing organizations; energy and related building associations; and research, training, and consulting organizations in State and local government.

DOE contracted with the University of Illinois at Chicago's Energy Resources Center to develop a manual with slides on energy-efficient multifamily building rehabilitation. The manual was used in three training workshops in the region, targeted to the private, assisted-(Section 8) housing community.

After the workshop series, DOE continued its technical assistance program through a column on energy efficiency in the *Midwest Assisted Housing Management Association (MAHMA) Journal*.

DOE staff introduced a number of software packages to HUD audiences that could be used in the conduct of their own energy audit and retrofit projects, including ENACT, ASEAM 3.0, BLCC 4.0, ENVSTD 2.0, WINDOWS 4.0, and MECcheck™.

CRSO also conducted a series of introductory courses on energy efficiency for Chicago HUD staff and began an initial examination of HUD procedures for reviewing projects and proposals to determine the best way to institute compliance with the 1992 Model Energy Code and ASHRAE 90.1B.

Project Partners: DOE CRSO; Energy Resources Center, University of Illinois at Chicago; State and local energy and housing organizations.

Publications: Knight, Paul, *Energy Saving Opportunities in Rehabilitation Training Manual*, and Companion Slides, Energy Resources Center, University of Illinois at Chicago, 1993.

Regular series in *Midwest Assisted Housing Managers Association Magazine*.

Continuing or Spinoff Activities:	A second round of workshops will be conducted in Chicago that will center on computer software assistance tools. The tools will be for both in-house review as well as field diagnostics. Introductory and advanced workshops will be offered for the other HUD Field Offices located in the region. HUD grantees in public, assisted, multifamily, and transitional housing will be invited to participate in the educational program.
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12. Utility Retrofit of Public Housing (Chelsea Project), Chelsea, MA

Project Period: 1991–1993

Goals and Objectives: The goals of the Chelsea Project were to demonstrate energy improvement strategies in multifamily, highrise public housing using both public- and private-sector technical and financial resources; to make housing more affordable through energy-efficiency improvements; to apply existing technical energy information to HUD-assisted housing construction and retrofit activities; and to reduce Federal utility expenditures.

Accomplishments: Chelsea, Massachusetts, served by Boston Edison Company, was chosen as the site for this demonstration project. The Margolis Apartments are managed by the Chelsea Housing Authority and provide housing for elderly residents in 150 units. The building is an all-electric, 13-story, brick construction highrise with utility costs that exceeded $150,000 in 1991.

Joint funding was provided by HUD's Boston Regional Office through the HUD Comprehensive Improvement Assistance Program and from Boston Edison Company and the DOE–HUD Initiative. Energy audit and equipment installation were completed by Boston Edison's public housing program contractor, Citizen's Conservation Corporation (CCC) in Boston, with technical and monitoring support provided by Oak Ridge National Laboratory (ORNL) and Lawrence Berkeley Laboratory (LBL).

Installed measures included a direct digital control building automation system, efficient interior and exterior lighting, water tank insulation, energy-efficient windows and sliding glass balcony doors, and faucet aerators. Total project cost was $368,154, with a simple payback of just less than 10 years, saving a total of 329,160 kwh, or $37,000, per year. All work performed was completed in conjunction with HUD-funded improvements such as upgrade of sprinkler systems and fire alarms, winterization of the generator, new roofs, exterior masonry repair/waterproofing, and elevator cab and motor refurbishing.

ORNL's technical support included project management, characterization of the building, conduct of diagnostic tests, summary of energy-efficiency measures, and development and management of the energy evaluation. LBL's support included technical input on the building audit, measurement of air flows and ventilation, and evaluation of the new mechanical ventilation system after retrofit. The Massachusetts Weatherization Assistance Program also offered technical assistance with blower-door training.

Project Partners: Chelsea Housing Authority; Boston Edison Company; Commonwealth of Massachusetts, Division of Energy Resources and the Massachusetts Office of Economic and Community Development; CCC; DOE Boston Regional Support Office; HUD Boston Field Office; ORNL; and LBL.

Publications:

W.R. Mixon, "Experimental Plan for the Boston Region Demonstration of Cooperative Rehabilitation of Public Housing for Improved Energy Efficiency," Oak Ridge National Laboratory, January 1992.

M.M. Abraham, H.A. McLain, and J.M. MacDonald, *Energy Retrofits Installed in the Margolis High-Rise Apartment Building, Chelsea Housing Authority*, ORNL/CON–413, Oak Ridge National Laboratory, March 1995.

M.M. Abraham and H.A. McLain, "The Evaluation of Retrofit Measures in a Tall Residential Building," *Proceedings of the Thermal Performance of the Exterior Envelopes of Buildings VI*, December 1993.

Continuing or Spinoff Activities:

ORNL is continuing the evaluation of the Chelsea Project to assess the durability of energy savings from the completed retrofit work. LBL is assessing the success of the buildings' ventilation systems. DOE and HUD, along with the other project partners, are continuing to work together to leverage public and private funding for additional retrofit opportunities in public housing.

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13. Improving Energy Efficiency in Public Housing: A Colorado Field Experiment, Denver, CO

Project Period: 1992–1994

Goals and Objectives: The goal of this project was to determine the impact of energy improvements and tenant education in the Rocky Mountain public housing arena. Two sites 100 miles apart—Boulder and Colorado Springs—were selected. A total of 40 units in 8 buildings were involved, with 24 units (4 buildings) in Boulder and 16 units (4 buildings) in Colorado Springs. Using four different situations, energy-efficiency measures and energy education were delivered to each of these units, and energy savings were measured during a 1-year savings period. The end result was to determine which combination of energy improvements and tenant education resulted in the longest term, most effective energy savings.

Accomplishments: Audits and cost-benefit analyses were conducted on the selected measures. Pre- and posttenant interviews were conducted. Energy conservation measures were installed through funding support from the Colorado Weatherization Assistance Program and from contract funds, rather than a performance contract (as originally planned). Public housing authority maintenance personnel were trained and used to install a variety of measures.

Education was delivered one-on-one to 20 tenants. Education followup was provided in two newsletters. Early savings were determined over a partial heating season (January–April 1993) and awards were made to tenants based on the level of savings achieved. Final savings were determined over a 14-month period (January 1993–February 1994), and show the following results.

In Boulder, preliminary utility data suggest annual gas savings of $108 per year per building. Yearly electrical savings of $690 are estimated. Water savings to date have averaged about $8.50 per month per building.

In Colorado Springs, gas savings have been 702 therms, or $370 per year, per building. Yearly electrical savings have been estimated at $98 per year. Water savings have averaged about $22 per month per building.

Project Partners: DOE Denver Regional Support Office; Financial Energy Management, Inc.; Boulder and Colorado Springs Housing Authorities; Colorado Division of Housing Weatherization Program; Public Service Company of Colorado; and a Denver-area supermarket chain.

Publications: Newsletters.

Manage Utility Costs and Increase Comfort: A Handbook for Public Housing Authorities and Indian Housing, Financial Energy Management, Inc., June 1995.

Final Report, Phase I, Improving Energy Efficiency in Public Housing: A Colorado Field Experiment, Financial Energy Management, Inc., 1994.

Continuing or Spinoff Activities:

A handbook was written by Financial Energy Management, Inc., in 1995 for housing authority managers. The handbook deals with energy and water use, and contains a pullout booklet with tenant education material.

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14. Low-Cost/No-Cost Energy Conservation in Public Housing, Atlanta, GA

Project Period: 1992–1996

Goals and Objectives: The DOE Atlanta Regional Support Office received funding support for three projects: (1) production, circulation, and evaluation of the effectiveness of energy pamphlets for public housing residents and maintenance staff in the Southeast; (2) assistance to nonprofit housing developers in the Atlanta area to make their affordable housing more energy efficient, and coordinating and leveraging this with community revitalization programs in preparation for Atlanta's hosting of the 1996 Olympic Games; and (3) training and demonstration of the blower-door diagnostic technique and the National Energy Audit (NEAT) in cooperation with three Georgia Weatherization Assistance Program grantees.

Accomplishments: The Georgia Tech Economic Development Institute produced four different pamphlets for four target audiences: lowrise apartment residents, highrise apartment residents, single-family detached unit residents, and facility maintenance personnel. The pamphlets were evaluated after being distributed to facility maintenance personnel at the Atlanta Housing Authority (AHA) and to residents at three of AHA's housing communities: Palmer House highrise apartments, Clark Howell Homes, and Wildwood Homes.

A public housing project, the Techwood-Howell Homes Development, was selected for renovation. One hundred twenty building units have been torn down and new, energy-efficient dormitories built for the Olympic Games, after which they will be used by Georgia Tech students. Remaining homes in this development will be renovated or replaced with new units, with energy efficiency a primary consideration. Oak Ridge National Laboratory (ORNL) is providing technical energy support for the design of the renovations and new units.

The following three weatherization agencies were selected and trained by ORNL in the blower-door technique and NEAT to improve the efficiency of combining weatherization and rehabilitation activities: Cobb County Community Action Agency, DeKalb County Community Action Agency, and Gwinnette County Community Development Block Grant Agency. Thirty homes were analyzed using these diagnostic tools. Each agency combined weatherization and rehabilitation funds to comprehensively improve these public housing units. Each agency collected and analyzed data during the 1993–1994 heating season to determine the results of the joint effort in these dwellings.

Cobb County appears to have been the most successful in utilizing the DOE–HUD Initiative funds to combine weatherization and rehabilitation activities to achieve energy savings. Program managers in this agency regularly analyze housing improvements from a "whole house" perspective and do whatever is necessary to completely rehabilitate and retrofit homes so that they are both rehabbed and energy efficient. The Cobb County agency uses the NEAT audit developed by ORNL and the blower-door equipment and testing

	techniques taught to them by ORNL for their rehabilitation/retrofit work.
Project Partners:	DOE Atlanta Regional Support Office; HUD Atlanta Field Office; Georgia Tech Economic Development Institute; Georgia Office of Energy Resources; ORNL; Atlanta Gas and Light; City of Buford Utilities; Georgia Power Company; Jackson Electric Member Cooperative; City of Lawrenceville Utilities; the three weatherization grantee agencies; and AHA.
Publication:	*Preparation of Public Housing Efficiency Publications for the Atlanta Housing Authority*, Georgia Tech Economic Development Institute, Atlanta, Georgia, August 1995.
Continuing or Spinoff Activities:	The blower-door training and technical assistance have proven useful for the three community action/development agencies targeted in Georgia.
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Glossary

Additional Subsidy or Add-On Subsidy: An incentive for public housing authorities established by the Housing and Community Development Act of 1987 to encourage resource efficiency improvements in housing agencies. The housing agency obtains non-HUD financing to pay for retrofit work, and HUD provides an additional operational operating subsidy in an amount sufficient to amortize payments for the loan. The term of the loan is limited to 12 years (24 CFR 990.110).

Allowable Expense Level: The per unit per month dollar amount of public housing expenses (excluding utilities and expenses allowed under 24 CFR 990.108, "Other Costs") used in the computation of the amount of operating subsidy (24 CFR 990.105).

Allowable Utilities Expense Level: The per unit per month dollar amount of estimated public housing utility expenses, based on a 3-year average consumption level and current rates, used in the computation of the amount of operating subsidy (24 CFR 990.107).

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE): An international organization of 50,000 people with chapters throughout the world. The society is organized for the sole purpose of advancing the arts and sciences of heating, ventilation, air conditioning, and refrigeration for the public's benefit through research, standards writing, continuing education, and publications.

Btu: British Thermal Unit. The quantity of heat required to raise the temperature of 1 pound of water from 60°F to 61°F at a constant pressure of one atmosphere.

Building Envelope: The exterior surface of a building's construction, including walls, windows, doors, roof, and floor. Envelope energy conservation measures are used to prevent heating and cooling losses.

CDD: See Cooling Degree Days.

Checkmeters: Also called submeters. See Meters.

Climate Zone: Climatically distinct areas, defined by long-term weather conditions affecting the heating and cooling loads in buildings. The zones were determined according to the 45-year average (1931–1975) of the annual heating and cooling degree days (base 65 degrees Fahrenheit). A list of U.S. counties showing 19 climate zones is included in appendix A of the *HUD Rehabilitation Energy Guidelines.*

Combined Heat and Power (CHP): Also known as "cogeneration," a method for tapping the waste heat produced in the generation of power. When transmitted to buildings, it also is known as "district heating (and cooling)."

Community Development Block Grant (CDBG): Energy-efficiency measures are eligible activities under the Community Development Block Grant Program. In 1980 Congress added emphasis on community energy planning, energy efficiency, and renewable energy to the Findings, Purposes, and Objectives of CDBG.

Comprehensive Grant Program (CGP): Modernization funds awarded by HUD to be used by larger (250 or more units) public housing agencies (PHAs) to make physical improvements to public housing units and improve the management and operation of the PHA. CGP provides funds, based on a formula, that can be used for capital improvement, major repairs, management improvements, and planning costs.

Comprehensive Improvement Assistance Program (CIAP): Modernization funds awarded by HUD to be used by smaller (fewer than 250 units) public housing agencies to correct physical, management, and operating deficiencies and keep units in the housing stock as safe and desirable homes for low-income families. It provides funding for capital improvements, major repairs, management improvements, and planning costs.

Control Logic: A mechanical or software operation that controls the functions of certain devices, including temperature controls, boiler water controls, humidity controls, etc. Control logic can be used to integrate the systems of a whole building and allow temperature changes to be made according to time, need, and power availability and rates.

Cooling Degree Days: A unit for estimating the energy needed for cooling a building; one unit is given for each degree Fahrenheit that the daily mean temperature exceeds 65°F.

DOE–2: A software program developed for the Department of Energy by Lawrence Berkeley National Laboratory that simulates energy consumption in a building.

DOE–HUD Initiative on Energy Efficiency in Housing: A 5-year initiative, launched in 1990, with the overall goal of improving the energy efficiency of public and other federally assisted housing. DOE provided support from its national laboratories and consultants for 27 projects requested by HUD programs and field offices. The projects included training, field demonstrations, guidebooks, aggregation of smaller public housing agencies to achieve lower utility rates, and a series of studies, including studies on the persistence of energy-efficiency measures and overcoming obstacles to performance contracting. (See page 26.)

Energy Audit: A procedure whereby the energy use characteristics of a building are documented to locate excessive energy consumption and identify relevant ECMs to lower energy consumption. HUD regulations require energy audits for each PHA-owned project not less than once every 5 years. (See: 24 CFR 965.302.) FHA prescribes a walkthrough energy survey (Form HUD–9614) for multifamily properties. *HUD Rehabilitation Energy Guidelines* contains computer software for calculating the cost-effectiveness of measures identified in the walkthrough.

Energy Conservation Measure (ECM): A measure designed to lower energy consumption. ECMs include upgrades to energy-efficient equipment, weatherization, and change in behavioral patterns.

Energy-Efficient Mortgage (EEM): A way of financing energy improvements by taking into account the additional purchasing ability to be achieved by reducing utility expenses. An FHA program begun in 1995. (See page 16.)

Energy Information Administration (EIA): A statistical agency in the U.S. Department of Energy created by Congress in 1977. EIA's mission is to develop energy data and analyses that help enhance the understanding of energy issues on the part of business, government, and the public. To ensure EIA's objectivity about issues that often have great national importance, Congress mandated that EIA's information be developed independently of the policy objectives of the Department of Energy and other parts of government.

Energy Management System (EMS): A control system capable of monitoring environmental and system loads and adjusting HVAC operations accordingly to conserve energy while maintaining comfort. It may also be used for other control and monitoring, such as lighting and security.

Energy Performance Contract (EPC): A mechanism to implement resource efficiency improvements with minimal upfront costs to the building owner. A portion of the savings generated from the resource efficiency improvements pay for the work.

Energy Services Company (ESCo): A company that specializes in managing energy and water conservation retrofit projects. The ESCo may perform any or all of the following services: auditing; recommending ECMs; arranging financing; installing or overseeing installation of the ECM; maintenance; and measuring, verifying, and guaranteeing savings.

Excess Utilities: Utility consumption beyond the utility allowance. See Utility Allowance.

Federal Energy Management Program (FEMP): A DOE program directed by Presidential Executive Order and legislation for reducing energy consumption in Federal buildings. FEMP provides training around the country that is available to HUD staff.

Frozen Base: An incentive established by the Housing and Community Development Act of 1987 to encourage resource efficiency improvements in housing agencies. This incentive freezes the Rolling Base, which is a 3-year average of actual utility consumption. The Rolling Base is used in the calculation of the Allowable Utilities Expense Level, a component of the calculation of a public housing authority's operating subsidy.

Heating Degree Days (HDD): Used as an indication of fuel consumption, one heating degree day is given for each degree that the daily mean temperature falls below 65°F.

HOPE VI: A HUD program designed to revitalize the Nation's most distressed public housing by providing grants and regulatory flexibility to address housing and social service needs. Funds may cover the capital costs of demolition, construction, rehabilitation, and other physical improvements; development of replacement housing; planning and technical assistance; and planning and implementation of self-sufficiency programs.

Housing Quality Standards (HQS): The health and safety standards used by HUD in qualifying housing for use by holders of Section 8 certificates and for judging soundness of housing inspected by the Real Estate Assessment Center. HQS are designed to meet the need for "decent, safe, and sanitary" housing "at affordable cost to lower income families." HQS do not measure energy efficiency (24 CFR 882.109).

HUD–PIH Integrated Business Systems Database (IBS): A relational database that houses financial information about subsidized housing. Data sources include the Statement of Operating Receipts and Expenditures (Form HUD–52559).

HVAC: Heating, Ventilation, and Air Conditioning.

Individual Meters: Also called retail meters. See Meters.

Interruptible Rates: An optional utility rate schedule for customers who are willing to have their energy supply disconnected for identified periods of time. Generally used by customers that have sufficient backup capability to meet a minimum facility energy requirement. The rates are therefore less expensive than other schedules.

Kilowatt (kW): Unit of demand (power) equal to 1,000 watts.

Kilowatt-hour (kWh): A unit of electric energy equal to the energy consumed by a 1-kilowatt load operated for 1 hour.

kWh/unit: Kilowatt hours per unit.

Load: The demand for energy at a particular time.

Load Limiter: Control device used in commercial and industrial applications where preprogrammed devices limit power use during peak demand periods. The result is the reduction of demand charges.

Low-Income Home Energy Assistance Program (LIHEAP): A Federal block grant program administered by the Department of Health and Human Services to assist low-income households in meeting their home energy needs. Includes payments for heating and cooling. Fifteen percent may be used for weatherization. (See page 30.)

Mastermetering: See Meters.

MBtu/unit: One million Btus per unit. See Btu.

Meters: Three main types of meters are used to monitor energy consumption: master meters, checkmeters (or submeters), and individual meters (or retail meters). Master-metered buildings have one meter; the owner pays the utility bill. Checkmetered buildings have one master meter, but the individual units are also metered. The owner pays the utility bill but may collect a surcharge when a unit exceeds the utility allowance. Individually metered buildings have individual meters for each unit. The resident pays the utility bill.

Million Solar Roofs (MSR): A Presidential Initiative to install solar energy systems on 1 million U.S. buildings by 2010. (See page 25.)

Municipal Energy Management Program (MEMP): DOE program that demonstrates innovative and realistic technologies, strategies, and management techniques in the area of local energy services.

National Center for Appropriate Technology (NCAT): A nonprofit research and education foundation that serves as a bridge between government, industry, and academia. In recent years, it has focused on affordability issues. (See page 31.)

National Laboratories: DOE provides funds for laboratory research and demonstrations of the effectiveness of energy efficiency, nuclear, and other scientific matters. The four laboratories most involved with HUD programs are Argonne, Lawrence Berkeley, Oak Ridge, and the National Renewable Energy Laboratory.

Performance Funding System (PFS): A mechanism by which HUD provides operating subsidy to public housing agencies (PHAs), including utilities. Under the PFS, each PHA's subsidy is equal to the difference between a formula-determined allowable expense level (plus an allowable utilities expense level and independent audit costs) and the PHA's projected income (rents, interest on investments, and other locally generated income).

Persistence of Savings: A determination of the degradation in energy performance of the equipment as measured in the dollar value in energy savings. Lack of persistence may jeopardize the ability to repay performance contracting loans, unless the energy services company guarantees the savings.

Programmable Thermostat: A control device for HVAC systems that allows the user to program in different temperature and fan settings for various times.

Public Housing Assessment System (PHAS): A mechanism required by Congress to evaluate the operations and management of public housing agencies, including utility consumption. PHAS, which will be fully in effect beginning in October 1999, will replace the Public Housing Management and Assessment Program. Under PHAS, HUD will conduct its own inspections of housing agency projects. Each public housing authority will receive a score determined by factoring in four components: (1) the physical condition of properties, (2) financial condition, (3) management operations, and (4) residents' assessments.

Rate Reduction Method (RRM): An incentive, established by The Housing and Community Development Act of 1987, to encourage PHAs to negotiate with utilities for lower rates. This incentive allows PHAs to keep 50 percent of the cost savings realized by successfully negotiating lower rates.

Real Estate Assessment Center (REAC): A HUD organization that evaluates the overall condition of its housing portfolio. REAC is sole determiner of what level of scrutiny a property or public housing agency receives from the department. REAC uses the Housing Quality Standards as the basis for its inspections.

Rebuild America: A network of community partnerships that, in collaboration with the Department of Energy, improve the energy efficiency of their commercial and multifamily residential buildings. (See page 24.)

Regression: The process of finding a mathematical model that best fits a set of data.

Residential Energy Consumption Survey (RECS): A national sample survey that collects data on the residential sector. RECS was first conducted in 1978 and then triennially since 1984. In the 1993 RECS, data were collected from a sample of 7,000 households statistically selected to represent the 97 million households in the United States. The 1993 data are available for the nine Census Divisions and for the four most populous States—California, Florida, New York, and Texas.

Retail Meters: Also called individual meters. See Meters.

Rolling Base: The 3-year average of actual utility consumption, which HUD uses to calculate reimbursement to a particular public housing authority for utility expenses.

Setback: Setting a thermostat to a lower temperature when the building is unoccupied to reduce heating energy consumption.

Simple Payback: The initial cost of an investment divided by the estimated investment return per period. For example, an energy conservation measure that costs $1,000 but generates savings of $200 annually has a simple payback of 5 years.

Site Energy Use: The energy consumed at the site. Site energy is often less than source energy because of transmission loss.

Source Energy Use: Also called primary energy, source energy is a measure of the energy expended to obtain usable energy at the end use; it incorporates into the analysis the overall efficiency of the generation and distribution system.

Statement of Operating Receipts and Expenditures (SORES): A form that public housing authorities submit to HUD annually that provides operational receipts and expenditures, compares those amounts with approved operating budgets, and determines the amount of net income/deficit to be added to/deducted from operating reserves for the year.

Steam to hydronic conversion: Replacing old steam boilers with more efficient hot water boilers. In steam to hydronic conversions, all the piping remains the same. Hot water boilers are more efficient and safer than steam boilers.

Submeters: Also called checkmeters. See Meters.

Therm: A unit of thermal measurement that is the equivalent of 100,000 Btus.

Thermal Storage: Refers to any of several techniques for the off-peak production of a low-temperature medium (usually ice or chilled water), which is then stored for later use in air conditioning systems during on-peak periods (when electricity is more expensive).

Utility Allowance: Per-unit allowance for resident-paid or checkmetered utility expenses that are set annually by the housing agency using a variety of means.

Weatherization Assistance Program (WAP): A DOE program that provides funds to State and local agencies to provide conservation services and weatherization assistance to low-income households. (See page 23.)

Weather Normalized: To estimate energy consumption or use intensity for a year considering historical average weather characteristics. Typically weather normalization involves estimating the relationship between energy use and one or more temperature variables. It is these variables that are converted to their historic mean values.

Zone Values: Values that control the heating and cooling of different parts of a building. They can be either mechanical or electronic.