Review of Existing Residential Energy Efficiency Certification and Rating Programs

Paul L. Hendrickson

November 1986

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SUMMARY

This report was prepared for the Office of Buildings and Community Systems, U.S. Department of Energy (DOE). The principal objective of the report is to present information on existing Home Energy Rating Systems (HERS) and their features. Much of the information in this report updates a 1982 report (PNL-4359), also prepared by the Pacific Northwest Laboratory (PNL) for DOE. Secondary objectives of the report are to qualitatively examine the benefits and costs of HERS programs, review survey results on the attitudes of various user groups toward the programs, and discuss selected design and implementation issues.

HERS programs first began to appear about 1975. Today there are several hundred entities sponsoring a program. Many of the sponsors have introduced their program since 1982 and consequently were not reviewed in PNL-4359. The largest group of sponsors is electric utilities. A variety of other groups including federal, state, and local government agencies, home builder associations, building supplier companies, natural gas utilities and independent groups are also sponsors.

HERS programs provide an indication of the energy efficiency of housing units. The indication may be in the form of a certification that the unit meets a predetermined energy efficiency standard or a relative indication of energy efficiency on a graduated scale. Most sponsors offer a certification rather than a graduated rating. Although a graduated rating conveys more information to user groups, it is more difficult to design and implement.

The principal objective of HERS programs is to facilitate the incorporation of energy efficiency factors into a housing unit's market value. To the extent this occurs, several benefits can be achieved. The principal benefit is energy conservation resulting from more energy efficient residential housing. A HERS can act to increase the supply of energy efficient housing because both builders and homeowners should have increased confidence that incremental energy efficiency investments can be recaptured when the home is sold. The demand for energy efficient homes should also increase because a HERS can

reduce the uncertainties associated with purchasing or renting energy efficient homes. These uncertainties include whether the benefits of the energy efficiency improvements exceed their incremental cost, whether the improvements were correctly installed, and possible concerns about indoor air quality. A corollary benefit of HERS programs is that the energy conservation is achieved through voluntary actions.

Other benefits can also result from HERS programs. Consumers receive information that can aid them in selecting a home with the level of energy efficiency they desire and in negotiating a price for the home. A purchaser of an energy efficient home at the margin of qualifying for needed financing can sometimes use a rating to qualify for additional loan funds. Builders can use ratings as a marketing aid. Electric utilities and their ratepayers can benefit from deferment of new generating capacity additions.

The most common housing type eligible for HERS programs is newly constructed, single family, detached homes. A principal reason is that it is considerably easier for a HERS sponsor to market the program to builders, a much smaller target audience, than to homeowners. Also, new homes are easier to inspect than existing homes. Some programs make new multifamily and new HUD-Code manufactured (i.e., mobile) homes eligible. Relatively few programs are offered for existing housing units. Purchasers and renters of existing units, however, often have other sources of energy efficiency information such as prior utility bills, prior energy audits and the results of a home inspection or appraisal. Most natural gas and electric utilities who sponsor HERS programs limit eligibility to homes using the utilities' energy product as the principal space conditioning source.

A variety of promotional incentives are offered to program participants by sponsors of HERS programs. Incentives include up-front cash payments, reduced electricity rates, and advertising allowances for builders. The incentives are principally offered by electric utilities who in turn pass on the cost to their ratepayers.

Most HERS sponsors have one of their employees or a representative perform ratings and conduct onsite inspections to verify the presence of energy efficient features. In some programs, inspections are not performed. This

practice reduces the costs of a program, but increases the risk of liability if energy efficient features designated in a rating are not actually installed. Another area of potential liability that merits attention by sponsors is the possibility of adverse health reactions to indoor air quality degradation resulting from a sponsor's energy efficiency recommendations.

The amount of survey data on the attitudes toward HERS programs by potential user groups is somewhat limited, but is growing. The groups that seem to most favor the programs are renters and prospective home buyers. Low income renters appear to be particularly interested in the programs. Prospective home sellers and real estate agents tend to favor the programs to the extent that they have an energy efficient property to sell. Owners of existing rental housing units appear to have little interest in rating programs, generally because of concerns that energy efficiency ratings could put their properties at a competitive disadvantage.

Relatively little analysis has been conducted on the extent to which HERS programs are leading to energy savings and the questions of whether the benefits exceed costs for program participants, nonparticipants, and society in general. Reported HERS program costs per rated home vary widely, from as little as \$36 to approximately \$3,000. A major difficulty in conducting the analyses is determining the amount of energy savings directly attributable to a HERS program. These types of evaluations are needed, and are likely to increase, partially in response to the evaluation requirements of state public utility commissions.

ABBREVIATIONS

AC	Air conditioning
ACEEE	American Council for an Energy Efficient Economy
AFUE	Annualized Fuel Utilization Efficiency
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
COP	Coefficient of Performance (ratio of heat delivered to energy consumed)
DOE	U.S. Department of Energy
EER	Energy Efficiency Ratio
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
FTC	Federal Trade Commission
HERS	Home Energy Rating System(s)
HUD	Heating Degree Days
HUD	U.S. Department of Housing and Urban Development
HVAC	Heating, ventilating and air conditioning
IAQ	Indoor air quality
IOU	Investor-owned utility
kW	Kilowatt
kWh	Kilowatt-hour
LBL	Lawrence Berkeley Laboratory
MW	Megawatt
MHCSS	Manufactured Home Construction and Safety Standards (issued by HUD)
NTIS	National Technical Information Service
ORNL	Oak Ridge National Laboratory
PNL	Pacific Northwest Laboratory
PUD	Public utility district
RCS	Residential Conservation Service
SEER	Seasonal Energy Efficiency Rating (Btu/Watt hr)
SEI	Southern Electric International
TVA	Tennessee Valley Authority
U.S.C.	United States Code

GLOSSARY

ENERGY EFFICIENCY RATING	A certification of a home's energy efficiency or a relative indication of its energy efficiency on a graduated scale.
HERS PROGRAM	A program that provides a certification for homes meeting an energy efficiency standard or a rating of a home's relative energy efficiency.
HUD-CODE MANUFACTURED HOMES	Homes built to the MHCSS; commonly known as mobile homes.
PERFORMANCE STANDARD	An energy efficiency standard that requires a building to meet a specified level of energy consumption, but does not require specific energy efficiency features.
PRESCRIPTIVE STANDARD	An energy efficiency standard that specifies the energy efficiency features that must be included in a building.
SITE-BUILT HOME	Homes built onsite including modular, sectional, panelized, and precut homes.

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CONTENTS

SUMMARY	iii
ABBREVIATIONS	vii
GLOSSARY	ix
ACKNOWLEDGMENTS	xi
1.0 INTRODUCTION	1.1
2.0 BENEFITS AND COSTS OF HERS PROGRAMS	2.1
2.1 BENEFITS FOR SOCIETY	2.1
2.2 BENEFITS FOR HOUSING CONSUMERS	2.4
2.3 BENEFITS FOR UTILITIES	2.7
2.4 BENEFITS FOR OTHER HOUSING INDUSTRY GROUPS	2.9
2.5 HERS COSTS	2.10
3.0 CHARACTERISTICS OF EXISTING HERS PROGRAMS	3.1
3.1 SPONSORING ORGANIZATIONS	3.1
3.2 TECHNICAL BASIS	3.2
3.3 INFORMATION INCLUDED IN THE RATING OR CERTIFICATE	3.4
3.4 TYPES OF QUALIFYING HOUSING	3.6
3.5 QUALIFYING ENERGY SOURCES	3.6
3.6 RATING AND INSPECTION PROCEDURES	3.6
3.7 FINANCIAL AND PROMOTIONAL INCENTIVES FOR PROGRAM PARTICIPATION	3.8
4.0 ATTITUDES TOWARD HERS	4.1
4.1 HOME BUYERS	4.1
4.2 HOME SELLERS	4.3
4.3 RENTERS	4.3

4.4	RENTAL HOUSING OWNERS	4.5
4.5	REAL ESTATE AGENTS	4.6
5.0	DESIGN AND IMPLEMENTATION ISSUES	5.1
5.1	TYPES OF HOUSING TO INCLUDE	5.3
5.1.1	Single Family Homes	5.3
5.1.2	Multifamily Buildings	5.8
5.1.3	HUD-Code Manufactured Homes	5.11
5.2	MITIGATION OF LIABILITY	5.13
5.2.1	Recent Negotiated Settlements	5.13
5.2.2	Indoor Air Quality	5.15
6.0	HAVE HERS PROGRAMS SAVED ENERGY?	6.1
APPENDIX A - SUMMARY OF EXISTING HOME ENERGY RATING PROGRAMS		A.1
A.1	GRADUATED RATING SCALE PROGRAMS	A.1
	Austin Resource Management Department	A.3
	California Energy Commission	A.5
	Conn-Save	A.7
	Denver Energy Resource Center	A.9
	Home Builders Association of Greater Kansas City	A.10
	Iowa State University Energy Extension Service	A.11
	Ministry of Urban Planning and Housing (France)	A.13
	State of Florida	A.14
	Western Resources Institute	A.16
A.2	CERTIFICATION PROGRAMS	A.19
A.2.1	Good Cents Programs	A.19
	Alabama Power Co.	A.22

Bonneville Power Administration	A.24
Central Power and Light Co.	A.28
Georgia Power Co.	A.30
Gulf Power Co.	A.31
Lee County Electric Cooperative Inc.	A.33
Mississippi Power Co.	A.34
Pacific Power	A.35
Portland General Electric Co.	A.36
Public Service Co. of Oklahoma	A.38
Wisconsin Electric Power Co.	A.40
A.2.2 Other Certification Programs	A.41
Ann Arbor Energy Office	A.42
Arkansas Power and Light Co.	A.43
British Columbia Hydro	A.45
Canadian Home Builders' Association	A.47
Carolina Power and Light Co.	A.49
Cascade Natural Gas Corp.	A.50
Cedar Falls Utilities	A.51
Cobb Electric Membership Corp.	A.52
Connecticut Light and Power Co.	A.53
Dallas Power and Light Co.	A.55
Detroit Edison Co.	A.57
Duke Power Co.	A.58
Florida Power Corp.	A.60

Greenville Utilities Commission	A.61
Iowa Power and Light Co.	A.62
Lakeland Electric and Water	A.63
Manville Corp.	A.64
Modesto Irrigation District	A.65
Nevada Power Co.	A.67
Owens-Corning Fiberglas Corp.	A.69
Philadelphia Electric Co.	A.71
Santee Cooper	A.72
Southwestern Electric Power Co.	A.73
Southwestern Public Service Co.	A.74
Suburban Maryland Building Industry Association	A.75
Tennessee Valley Authority	A.77
Texas-New Mexico Power Co.	A.79
United Illuminating Co.	A.80
Virginia Electric and Power Co.	A.82
West Texas Utilities Co.	A.84
APPENDIX B - ENERGY EFFICIENCY LABELING PROGRAMS FOR APPLIANCES AND VEHICLES	B.1
B.1 CONSUMER HOME APPLIANCES	B.1
B.2 PASSENGER VEHICLES	B.3
B.3 PASSENGER CAR TIRES	B.4
REFERENCE ABBREVIATIONS	R.1
BIBLIOGRAPHY	Bib.1

TABLES

2.1	Characteristics of First Time and Repeat Home Buyers in 1985	2.6
2.2	Expected 1986 Utility Costs for IOU Certification Programs in Texas	2.11
3.1	HERS Programs Where Ratings Are Not Performed by Employees or Representatives of the Sponsor	3.7
3.2	Financial and Promotional Incentives for Participants in HERS Programs	3.9
5.1	HERS Design Issues	5.1
5.2	HERS Implementation Issues	5.2
5.3	Heating Fuel and Payment in U.S. Renter-Occupied, Multifamily Buildings	5.9
A.1	Utilities Operating the Good Cents Program	A.20

1.0 INTRODUCTION

This report was prepared for the Building Services Division, Office of Buildings and Community Systems, Assistant Secretary for Conservation and Renewable Energy, U.S. Department of Energy (DOE). The principal objective of the report is to present an overview of existing residential energy efficiency certification and rating programs. Throughout the report these programs are referred to as HERS (Home Energy Rating System) programs. The information in the report will, hopefully, provide helpful information and ideas for those considering the adoption of a HERS program or modification of an existing program.

HERS programs are designed to provide an indication of a particular home's energy efficiency. The fundamental objective of the programs is to encourage energy conservation by providing information that will aid the incorporation of energy efficiency into a home's market value. The first HERS programs appeared about 1975. Today there are several hundred sponsors. Among the largest sponsor groups are approximately 75 utility customers of the Bonneville Power Administration (BPA) that operate the "Super Good Cents" certification program and 55 electric utilities in Florida that operate the "Five Star" program.

A substantial portion of the report's text is in Appendix A. This appendix contains descriptions of substantially all of the HERS programs that came to the author's attention during preparation of the report. Citations to written publications and a contact person are included for most of the programs to facilitate obtaining additional program information. The HERS programs in Appendix A have been categorized into programs that offer a graduated rating and programs that offer a certification. Graduated rating programs provide a relative indication of a home's energy efficiency on a variable scale selected by the sponsor. Certification programs operate on a pass-fail basis and typically award a certificate if a home meets a predetermined energy efficiency standard. Most existing HERS programs are certification programs, including the programs affiliated with the Good Cents Program, marketed nationally by Southern Electric International. The most common housing type included in the

programs is newly constructed, detached, single family homes. The most common category of sponsor is electric utilities.

This report updates a similar report prepared by the Pacific Northwest Laboratory (PNL) for DOE in 1982.^(a) Only a few of the individual rating programs discussed in the 1982 report are still operating in 1986. Some sponsors have entirely discontinued their program, others have discontinued a program and replaced it with a new program. The pace of program changes suggests that the HERS concept is still rapidly evolving. Sponsors continue to look for HERS program characteristics that best meet their objectives. One noteworthy HERS research and implementation project will be conducted by the Colorado Office of Energy Conservation. The Office has recently been authorized by Governor Richard Lamm to spend \$963,000 from the state's Exxon overcharge settlement funds to develop and implement a statewide HERS for new and existing housing units.^(b)

The DOE Office of Buildings and Community Systems has continued to sponsor a variety of HERS research since the publication of PNL-4359. Preparation of many of the reports in the Bibliography has been funded through the Office.

The body of this report contains 6 sections. Section 2 discusses the objectives and potential benefits and costs of HERS programs. Section 3 reviews various characteristics of existing programs. Section 4 discusses survey research on attitudes toward HERS programs. Section 5 discusses several issues related to design and implementation of HERS programs, including the types of housing to include and potential liability. Section 6 examines whether existing programs have resulted in energy savings. Appendix A contains HERS program descriptions. Appendix B briefly discusses the application of energy efficiency labeling to consumer appliances, passenger vehicles, and tires.

(a) P. L. Hendrickson, B. A. Garrett-Price, and T. A. Williams, Overview of Existing Residential Energy Efficiency Rating Systems and Measuring Tools, PNL-4359, October 1982. (Hereafter cited as PNL-4359.)

(b) Colorado Office of Energy Conservation, "EnergyTalk," p. 1, September 1986.

2.0 BENEFITS AND COSTS OF HERS PROGRAMS

This section discusses the potential benefits of HERS programs from the perspective of society in general, housing consumers, utilities, and other groups involved in housing such as builders, lenders, and real estate agents. A final section discusses the costs of the programs to various groups.

2.1 BENEFITS FOR SOCIETY

The most important benefit of HERS programs from society's perspective is energy conservation achieved through greater energy efficiency in residential buildings. When energy is conserved, society benefits as dependency on imported fuels and associated dollar outflows are reduced, U.S. energy resources are conserved, and environmental impacts associated with energy/electricity production are reduced. The energy conservation is realized because HERS programs should increase the amount of energy efficient housing. The increase results from both supply and demand impacts.

The supply of energy efficient housing should increase because builders and homeowners should have increased confidence that investments in energy efficiency will be reflected in a home's market value. Builders should therefore be encouraged to construct more energy efficient housing units because they can expect to recapture the extra cost of the installed energy efficiency measures as home buyers and renters are better able to recognize the added value of such measures. Moreover, buyers of new homes should be more willing to pay for the measures because they can expect to recapture their investment when they sell the home.^(a) Energy efficient construction should also be enhanced because builders can reasonably expect that a HERS will serve as a marketing aid.^(b) Owners of existing housing units should also be more inclined to retrofit their units with energy efficiency measures because they

(a) Further discussion of the importance of this expectation is in O. Holt, ACEEE 1984, p. F-120.

(b) In order to influence builders, the level of energy efficiency needed for certification in a HERS program for new homes must exceed minimum building energy code requirements. As code requirements change over time to require greater energy efficiency, the HERS requirements must also change.

can expect that a HERS will enable future buyers and renters of the units to better recognize and value the energy efficiency improvements.

The demand for energy efficient housing units should increase because a HERS sponsored by a reputable entity can reduce the uncertainty and risk associated with buying and renting energy efficient housing units. Prospective buyers and renters should thus be willing to pay more for a rated home than one whose energy efficiency has not been rated.^(a) Clearly, many uncertainties and risks are involved in the home purchase process. The purchase (or long-term rental) of an energy efficient house though may be viewed as especially risky in several respects. One element of perceived risk may be indoor air quality (IAQ) concerns resulting from low air infiltration.^(b) Whether a rating would act to mitigate this risk perception is not known. It seems plausible though that a rating by an entity perceived as knowledgeable in energy efficiency such as a utility would mitigate the indoor air pollution concern somewhat.^(c) Two other risk elements relate to the relative newness of highly energy efficient homes. First, the buyer may not be confident that the energy saving features will produce sufficient fuel savings to justify the incremental increase in the initial cost of the home. The great uncertainty of future fuel costs reinforces this concern. Second, the buyer may be concerned that the builder or retrofitter did not have sufficient experience to properly install the energy saving features. Both of these concerns related to the newness of the

(a) This willingness should be enhanced if the home's appraised value reflects its energy efficient features.

(b) In a telephone survey of 603 Oregon residents, for example, 15% of the respondents indicated they would not take further energy conservation actions on their home because of indoor air quality concerns. (H. M. Berg, P. K. Bodenroeder, Survey Research Center, Oregon State University, Attitudes, Opinions and Concerns about Energy - A Survey of Oregon Residents, prepared for the Oregon Department of Energy, Table 8.1, May 1984.) Similarly, in a 1983 survey of 417 California residents, 9% indicated they thought the problem of IAQ in energy efficient homes caused by reduced exchange with outside air was "very serious," and 22% thought it was "somewhat serious." (Yankelovich, Skelly and White, Inc., Northern California Gas Study No. 4017, Table 20, prepared for Pacific Gas and Electric Co., June 1983.)

(c) A HERS sponsor will want to examine its potential liability when recommending installation of energy efficient features that potentially could lead to indoor air quality problems (see Section 5.2.2).

technology were expressed, for example, by homeowners in California who were asked about their perceptions and attitudes toward solar energy.^(a)

In addition to the preceding supply-demand effects, a HERS can potentially facilitate and enhance energy efficient housing in a variety of other ways. One example might be termed the "social pressure" effect. Some builders are likely to install additional energy efficiency measures to qualify for a desired rating because they do not want the image of marketing an "inferior" housing product. This effect has been observed among builders in the Austin, Texas area, for example.^(b) Similarly, some owners may retrofit their homes to gain the status of a desired rating.

Another example of a HERS program influencing energy efficiency is prospective home buyers or renters who apply knowledge gained from viewing a rated home and associated literature to the construction, purchase or rental of a nonrated unit.^(c) In addition, if a HERS sponsor provides alternative prescriptive paths to meet a certification or rating, the information can be used by owners having a custom home or rental housing complex built and by homeowners planning to retrofit their home with energy efficiency measures.

A final example of a HERS program enhancing energy efficient housing also comes from Austin, Texas. Austin offers a rating program for new detached homes (see Section A.1). Housing units can receive one to three stars depending on the number of energy efficiency points received. Much of the new residential development in Austin is in newly formed municipal utility districts outside of the city boundaries. Austin has agreed to provide water and sewer service to these districts provided all homes are built to receive 300 or more points on the city's energy efficiency rating scale. At this point level, the homes will exceed minimum building energy code requirements.

(a) J. B. Margolin and M. R. Misch, Behavioral Studies Group, George Washington University, California Solar Energy Study: Decision-Analysis Panel Report, prepared for the California Energy Commission, September 1979.

(b) Remarks of Douglas Seiter, City of Austin Resource Management Department, at a workshop in Austin, Texas, on "Developing an Energy Rating System," sponsored by the American Public Power Association, February 26, 27, 1986.

(c) This effect has been observed by Southwestern Electric Power Co. (Section A.2.2).

A corollary benefit of HERS programs is that the energy conservation is achieved through voluntary actions. Subject to existing building energy codes, builders, architects, homeowners, and owners of residential rental property can voluntarily add energy efficiency measures in a manner they deem to be cost-effective and can have increased confidence that housing consumers will recognize the value of the improvements.

2.2 BENEFITS FOR HOUSING CONSUMERS

The group that potentially stands to gain the most from HERS programs is housing consumers. Consumers can potentially benefit from improved information on housing energy efficiency, lower energy costs resulting from a more energy efficient housing unit, and increased comfort level within the unit. Within the broad classification of housing consumers, the group that stands to benefit the most under existing HERS programs are purchasers of newly constructed homes. Most existing HERS programs provide information on the energy efficiency of new site-built homes.^(a) This information can be used by the prospective new home buyer to make a more informed purchase decision, for comparison shopping and in price negotiation. The buyer who is especially interested in energy efficiency as a decision criterion will have more information available to aid his decision making.^(b) The rating information is especially valuable for buyers of newly constructed homes because a principal alternative source of energy efficiency information--prior utility bills--is not available.

(a) Most existing HERS programs do not, however, include new HUD-Code manufactured homes within their scope.

(b) Recent surveys of prospective buyers of newly constructed homes have consistently shown that energy efficiency is among the most important of their decision criteria. See for example:

1. "1985 Home Buyer Survey," Builder, Washington, D.C., p. 88, April 1985.
2. "1986 Home Buyer Survey," Builder, p. 72, July 1986.
3. Professional Builder, Des Plaines, Illinois, December 1985.
4. P. L. Hendrickson, Review of Survey Data on the Importance of Energy Efficiency to New Home Buyers, PNL-5297, October 1984. Pacific Northwest Laboratory, Richland, Washington 99352.

Purchasers of existing homes can also benefit from the energy efficiency information disclosed in a home energy rating. Many HERS programs include existing homes within their scope, although not as commonly as new site-built homes. Purchasers of existing homes also have the option of using prior utility bills and other information sources to assess the energy efficiency of homes they are considering (see Section 5.1).

Home buyers who are at the margin of qualifying for financing for a particular home can potentially use a rating that establishes a home as energy efficient to obtain the needed financing. Some primary lending institutions will allow their normal debt/income underwriting guidelines to be exceeded by purchasers of energy efficient homes because of the expectation that lower utility bills will provide the borrower with greater debt repayment capacity.^(a) Impetus for this change in underwriting policy has come from the principal purchasers of home mortgages in the secondary mortgage market, the Federal National Mortgage Association^(b) and the Federal Home Loan Mortgage Corporation (FHLMC).^(c) A 1984 survey of 150 primary lending institutions found that 11% offered preferential underwriting standards for purchasers of energy efficient homes.^(d) This percentage is consistent with a 1980 survey, where 12% of a sample of 1,000 primary lenders indicated that they gave preferential underwriting treatment to purchasers of energy efficient homes.^(e) The percentage of lenders offering preferential underwriting standards today is

-
- (a) Traditionally, most lenders have been willing to extend financing up to the point that the buyer's combined monthly housing expenses do not exceed 25-28% of stable monthly income and total monthly debt payments do not exceed 33-36% of income. See for example, Federal Home Loan Mortgage Corporation, Washington, D. C., Underwriting Guidelines Home Mortgages, Publication No. 19, July 1985.
 - (b) "Financing Energy Conservation," Federal National Mortgage Association Announcement No. 84-23, August 1984.
 - (c) FHLMC Fact Sheet, "Federal Home Loan Mortgage Corporation's Energy Policy," October 1984. "Sell More Homes with Freddie Mac's New Energy Policy," FHLMC Publication No. 21, February 1983.
 - (d) Burson-Marsteller, New York City, "Do Mortgage Lenders Favor Energy Efficient Homes?," prepared for the Owens-Corning Fiberglas Corp., Owens-Corning Pub. No. 5-8L-12696, July 1984.
 - (e) FHLMC, "Energy Survey: Facts and Findings," Publication No. 48, December 1980.

likely somewhat higher because of the policies of the secondary purchasers. Some primary lenders will also relax their normal underwriting ratios for purchasers of energy efficient HUD-Code manufactured homes.^(a)

First time home buyers should especially benefit from policies to allow greater debt/income ratios for energy efficient housing. Unlike repeat buyers, they do not have equity from a prior home to apply to their down payment. Consequently, the first time buyer requires proportionately more financing than the repeat buyer (Table 2.1).

Purchase of an energy efficient home verified by a energy rating is not the only way a buyer can qualify for a favorable loan underwriting ratio. The buyer at the margin of loan qualification can also comparison shop among lenders. Many lending institutions will adjust the standard loan underwriting ratios to meet the requirements of their local market, their own mortgage loan products, and the particular circumstances of individual buyers. The tendency to adjust the loan ratios is especially great if the lender plans to keep the loan rather than sell it on the secondary mortgage market. A recent survey conducted by the U.S. League of Savings Institutions indicates

TABLE 2.1. Characteristics of First Time and Repeat Home Buyers in 1985

<u>Characteristic</u>	<u>First Time Buyers</u>	<u>Repeat Buyers</u>
Percent of homes purchased	36.6%	63.4%
Average down payment as % of purchase price	11.4%	32.7%
Average monthly principal and interest payment as % of household income	32.7%	28.0%
Median home price	\$75,100	\$106,200
Median household income	\$37,520	\$47,380

Source: John Pfister, "1985 Home Buyer Survey: Prices Rise Modestly," The Guarantor, published by the Chicago Title Insurance Co., p. 10, January/February 1986.

(a) Examples include Green Tree Acceptance of St. Paul, Minnesota, and Chemical Financing, Irving, Texas.

the flexibility of most lenders in applying loan/income underwriting ratios.^(a) The League surveyed 93 lending institutions from throughout the U.S. that had assets exceeding \$500 million. Only 43% of the respondents indicated they usually apply the standard 25-28% ratio for housing expenses/monthly income. In a separate question, only 38% indicated they usually apply the standard 33-36% ratio when the buyer's total monthly payments are considered. Over half the respondents, therefore, usually apply an underwriting standard that differs from the traditional ranges. In most cases, the standards that are applied are less restrictive than the traditional 25-28% and 33-36% ratio ranges.^(b)

Renters also can potentially be greatly aided by a HERS program. Approximately 31% of U.S. housing units are rental units.^(c) Energy efficiency and associated energy costs can be quite important to the renters of these units. Median family income for renters in 1983 was \$12,400, while for homeowners it was 24,400.^(d) Additionally, rental housing units overall have lower thermal integrity than owner-occupied units.^(e) Many renters consequently consume more energy per sq ft of living space than owner occupants or accept a lower comfort level in their housing unit.^(f)

2.3 BENEFITS FOR UTILITIES

Utilities, especially electric utilities, are by far the largest sponsors of HERS programs. The utilities appear to have several reasons for sponsoring the programs. The importance of particular reasons varies among utilities. One significant advantage enjoyed by both investor-owned utilities (IOUs) and

(a) D. Bennewitz and R. T. Carrigan, What Have We Learned From Our Single-Family Mortgage Experience, U. S. League of Savings Institutions, Chicago, Illinois, 1986.

(b) Ibid., p. 7.

(c) U.S. Bureau of the Census, General Housing Characteristics, Current Housing Reports Series H-150-83, Table A-2, October 1984.

(d) Ibid.

(e) P. L. Hendrickson, Background Information for Programs to Improve the Energy Efficiency of Northwest Residential Rental Property, PNL-5790, Section 2.7, February 1986. (Hereafter cited as PNL-5790.)

(f) PNL-5790, Table 2.11. See also Section 5.1.2.

publicly owned utilities is that the cost of administering a HERS program can virtually always be passed on to ratepayers.

The most frequent reason stated by utilities for sponsoring HERS programs is achieving energy conservation. Conservation can result in deferment of generating capacity additions, in lower power production costs for the utility and correspondingly lower energy bills for the consumer, and in increased flexibility in energy demand management because the conservation resource can be added in increments. Most utilities state that they are interested in overall energy conservation. Others, e.g., Modesto Irrigation District, specifically state that their principal objective is to reduce the growth rate of peak power consumption. A second reason for utility sponsorship is presumably providing the information benefits of a HERS to housing consumers. A HERS program can also provide the utility itself with information on the energy efficiency of housing units in its service area. Utilities also sponsor HERS programs for the potential public relations benefits. HERS sponsorship can potentially enhance customer good will and the utility's image in its service area as an energy expert.

One final reason for utility sponsorship that usually is not explicitly stated is to promote the utility's energy product; a utility may make use of its product a condition for receiving a rating. Nevada Power, for example, requires that participants in its Energy Efficient Home certification program use heat pumps and an electric water heater. During the first 18 months of operation, the program was estimated to have added approximately \$284,000 in sales revenue based on the company's estimate that 40% of qualifying homes would have otherwise used natural gas for space and water heating.^(a) Southwestern Electric Power Co. requires electric HVAC equipment and appliances for its Energy Efficient Home Program and, in addition, requires minimum electrical service capacity of 150 amps with 200 amps recommended.^(b) One reason for the capacity requirements may be to reduce losses in the home's electrical lines

(a) Nevada Power Co., 1984 Report on Energy Conservation and Load Management Activities, p. 15.

(b) Southwestern Electric Power Co., "SWEPCO's Energy Efficient Home," brochure.

and equipment. A second possible reason, though, is that the company wants to be sure that new homes have sufficient service capacity for future electricity-consuming appliances.

2.4 BENEFITS FOR OTHER HOUSING INDUSTRY GROUPS

In addition to housing consumers and program sponsors, a variety of other groups can indirectly benefit from HERS programs. Home builders, for example, can benefit because the programs help them market to consumers interested in and willing to pay for energy efficient new housing. The rating helps to assure builders that incremental energy efficiency improvement expenditures can be recaptured when a housing unit is sold or rented. Builders also benefit from program incentives (see Section 3.7) such as subsidized advertising, up-front cash payments, and sponsor representatives at builder open houses.

Building supply companies can use a HERS to promote use of their products. Owens-Corning Fiberglas Corp. and Manville Corp., for example, require that builders use the firms' energy conservation products to make a new home eligible for their certification programs.

Real estate agents can also benefit from the enhanced marketability that a rating provides for energy efficient homes.^(a) The rating provides prospective buyers with energy information in addition to energy efficiency representations made by the real estate agent and homeowner.

Real estate lenders can potentially benefit in two related ways from a HERS program. First, to the extent that a HERS program encourages cost-effective, energy efficient housing, the number of loan foreclosures attributable to the borrower's inability to pay energy bills should decrease somewhat. Second, the lender can make a loan to a buyer of an energy efficient home who is at the margin of his borrowing capacity with increased assurance that the borrower can meet his mortgage payments and that the loan can be sold on the secondary mortgage market (see Section 2.2).

(a) A poor rating or a lack of certification can, of course, adversely affect the marketability of a home. A real estate agent can point this fact out to the homeowner and suggest that energy efficiency retrofit work prior to sale may be desirable.

Finally, real estate appraisers and real estate tax assessors can potentially benefit because a rating will provide an additional indication of a home's market value. Rating data have been added, for example, to the data bases used by appraisers in the Puget Sound region as part of the HERS program sponsored by Western Resources Institute.^(a) As the quantity of rating data and associated home sales prices increases, it should become possible for appraisers and assessors to incorporate the impact of a rating into appraised value.

2.5 HERS COSTS

Several groups incur costs related to implementation of HERS programs. This section discusses the costs incurred by sponsors, ratepayers, builders, homeowners, home buyers, and renters.

Sponsors incur a variety of costs related to HERS implementation. The largest single cost in most cases is employee labor to develop and test the rating system and perform ratings and inspections. Other costs can include such things as incentive payments, advertising, and materials such as brochures and computer software.

The sponsor with the largest current costs per participating home is probably the Bonneville Power Administration (BPA) and its utility customers participating in the Super Good Cents Program. Their total costs per certified home are likely on the order of \$3,000. This amount includes a \$2,000 incentive payment that will decrease in future years. The relatively high financial incentive is based on direction from the Northwest Power Planning Council. The payment is intended to offset some of the difference in construction costs between the level of energy efficiency that is optimal for the consumer and the increased level that represents a cost-effective electricity resource for the Northwest region.^(b) The program costs incurred by other sponsors can vary dramatically as suggested by the anticipated 1986 costs for IOUs offering certification programs in Texas shown in Table 2.2.

(a) A. M. Patten, J. F. Parker, Washington State Energy Office, Residential Energy Evaluation Program, WAOENG 84-09, Appendix O, March 1984.

(b) 51 Federal Register 7364, March 3, 1986.

TABLE 2.2. Expected 1986 Utility Costs for IOU Certification Programs in Texas

Sponsor	Incentive Costs/Home	Other Program Costs/Home	Total Sponsor Costs/Home
Central Power and Light	\$0	\$755	\$755
Southwestern Electric Power	\$0	\$489	\$489
Southwestern Public Service	\$496	\$192	\$688
Texas-New Mexico Power	\$0	\$36	\$36
Texas Utilities Electric	\$181	\$52	\$233

Sources: Energy Efficiency Plans submitted in December 1985 by each company to the Public Utility Commission of Texas.

Most existing HERS sponsors are electric utilities. The costs incurred by utility sponsors are virtually always passed on to their ratepayers. The practice applies to both IOUs and publicly owned utilities. A high percentage of ratepayers are not participants in a rating program and consequently do not directly benefit from it. Sponsors of the programs, however, can point to the facts that nonparticipants indirectly benefit from the societal benefits discussed in Section 2.1, the benefits they may derive from purchasing or renting a rated home in the future, and the possibility of lower utility bills as discussed in Section 2.3. Relatively few HERS sponsors have quantitatively evaluated the net benefits of HERS programs to nonparticipants.^(a)

Builders incur additional costs to meet a certification level or a particular rating. These costs are in turn passed on to home buyers and renters. Estimates of the incremental construction cost to meet certification standards over conventional construction range from as little as \$0.50/sq ft (Mississippi

(a) Procedures for calculating benefit/cost ratios and net present values for utility conservation programs from the standpoint of participants, nonparticipants, the utility, and society are presented in Standard Practice for Cost-Benefit Analysis of Conservation and Load Management Programs, a joint staff report prepared by the California Public Utilities Commission and California Energy Commission, February 1983. IOUs serving California are required to use the criteria and procedures in the document for evaluation of their programs.

Power) to as much as \$3.00/sq ft^(a) (BPA). Some HERS sponsors (e.g., Suburban Maryland Building Industry Association) also charge builders a fee to participate in their program.

Homeowners can incur HERS-related costs if they retrofit their home to meet a particular rating. In some programs (e.g., Western Resources Institute) they may also pay to have the rating performed.

(a) The Northwest Power Planning Council estimates that incremental construction costs to meet the Model Conservation Standards will be \$1.50-\$3.00 per sq ft of heated space. 50 Federal Register 30659, July 26, 1985.

3.0 CHARACTERISTICS OF EXISTING HERS PROGRAMS

This section summarizes characteristics of existing HERS programs. Topics covered include types of sponsoring organizations, rating approaches, information included in the rating, types of housing that qualify for a rating, qualifying energy sources, inspection procedures, and financial and promotional incentives for participation.

The information discussed in this section is drawn from the descriptions of individual rating programs in Appendix A. These programs represent all rating programs with at least a partial energy conservation objective that the author was able to locate. The search for programs was reasonably thorough, but not exhaustive. There are undoubtedly existing programs that did not come to the author's attention. The sponsors of the rating programs in Appendix A are markedly different than the HERS sponsors found for a comparable PNL report issued in 1982 (PNL-4359). This difference suggests that the HERS concept is still rapidly changing and evolving.

3.1 SPONSORING ORGANIZATIONS

The types of organizations sponsoring existing HERS programs, while dominated by utilities, are quite varied. Categories of organizations include investor and publicly owned utilities, municipal governments, state energy offices, federal agencies (e.g., BPA), federally owned corporations (e.g., TVA), energy extension service offices, nonprofit corporations, home builder associations, and building supplier corporations.

By far the greatest number of HERS sponsors are electric utilities. There are a number of possible reasons to account for their predominance. First, they stand to benefit from rating programs through deferred additions to generating capacity and better customer relations as discussed in Section 2.2. Second, they are in a position to fund the programs relatively easily through ratepayer funds. A third potential reason that is seldom directly mentioned is the possibility of influencing the energy sources used in new construction through HERS program requirements. Few natural gas utilities operate HERS, presumably because increased sales are more important to their business than

energy conservation. Unlike electric utilities, gas utilities do not face large capital expenditures for new capacity additions. The non-utility HERS sponsors include a wide spectrum of organizations.

3.2 TECHNICAL BASIS

HERS programs generally use one of five approaches to determine whether a particular home qualifies for certification or what its energy efficiency rating will be. These approaches are:

1. a performance standard with suggested prescriptive paths
2. a system that allocates points for particular levels of energy efficiency features
3. a mandatory prescriptive standard
4. a rating based on prior energy consumption
5. a rating based on an energy consumption calculational procedure.

The first approach is to set a performance standard that exceeds (i.e., produces a more energy efficient building) existing building energy code requirements. To aid builders and building inspectors, the sponsor also typically provides one or more suggested prescriptive paths that can be used to successfully obtain certification or achieve a particular rating. The suggested paths are often developed using a building energy consumption computer code that incorporates local climate data. The BPA Super Good Cents Program is an example of this approach. Sometimes, certain energy efficiency measures on the suggested prescriptive path will be mandatory. The most common mandatory measure for program certification/qualification seems to be installation of a heat pump (e.g., the Arkansas Power and Light Energy Saver Home Award Program).

A second approach is to establish a scoring system where points can be obtained for particular levels of various energy efficiency features. The homeowner's rating or certification is based on the number of points received. The HERS programs of the Austin Resource Management Department, Western Resources Institute, Dallas Power and Light, and the State of Florida illustrate this approach. Again, an energy consumption computer code is typically

used for points allocation. The point system programs can be thought of as a variation of the first approach. The total point targets are actually the performance standard. The mix of levels of individual energy efficiency features that will yield the desired point total represent alternative prescriptive paths. There are usually few, if any, mandatory features as long as sufficient points are obtained.

A third common approach for new home certification programs is use of a prescriptive standard that requires installation of certain energy efficiency features. The certification programs of the Nevada Power Co. and the Philadelphia Electric Co. illustrate this approach.

A fourth approach is to base the rating on prior energy consumption. Prior consumption can be used with corresponding weather data and the number of heated/cooled sq ft to calculate a rating or index that typically has units of Btus/degree days/sq ft. The rating system developed by the Energy Extension Service at Iowa State University uses this approach. Problems with using a prior energy consumption performance approach include 1) secondary fuels (e.g., wood and kerosene) and sometimes even primary fuels (e.g., oil) are difficult to account for, 2) weather must be accounted for, 3) occupancy can change during the measurement period, and 4) the resulting rating will be significantly influenced by the occupant's lifestyle. Among the advantages of a performance-based approach are that one year or more of utility billing information is generally available and that an onsite inspection may not be needed. A performance-based rating may be especially appropriate for an existing multifamily building because the effects of occupant behavior will tend to balance out in the aggregate.^(a)

The fifth approach is to compute a home energy rating based on the energy efficiency features in a home. A detailed computer code or algorithm is normally used to make the computation. Existing examples of this approach are the CONN-SAVE energy rating and the two pilot programs sponsored by the California Energy Commission. A prior example was the DOE-sponsored pilot program in

(a) See Yates Associates, Rental Housing Energy Efficiency Rating Systems: Final Report, prepared for BPA, pp. B.35-B.43, July 1986.

Massachusetts reported in PNL-4763. After reviewing the available literature, one author concluded that the best of existing energy projection tools is capable of estimating actual energy consumption within plus or minus 20%. (a)

The five preceding categories capture most, but not all, approaches that are being used to determine home energy ratings or whether a particular home qualifies for certification. An example of an approach not included in the previous categories is the HERS program administered by the Ann Arbor (Michigan) Energy Office. Under this program a homeowner can qualify his home for certification by installing all conservation features recommended by an energy auditor.

3.3 INFORMATION INCLUDED IN THE RATING OR CERTIFICATE

The fundamental purpose of any HERS is to convey energy efficiency information to homeowners and other groups and to have that information acted on. The type of information conveyed during the rating process is thus highly important to the ultimate success of a program.^(b)

Several types of information can be conveyed to a homeowner in an energy efficiency rating or certificate. The simplest and most common piece of information is a certificate or some type of medallion stating that the home qualifies for certification by meeting the sponsor's energy efficiency requirements. For most of the certificate programs, this is the only information that the homeowner receives automatically. Brochures describing the program and its requirements are generally also available from the sponsor if requested. The certificates themselves seldom include a description of the program's energy efficiency requirements or the features found in the home. Inclusion of this information on the certificate could potentially be valuable when the home is resold because it would give prospective purchasers specific information on the

(a) William Wright, Building Design Tool Council, Washington, D.C., An Overview of Accuracy Issues in Home Energy Rating Systems, p. 10, prepared for DOE, May 1985.

(b) The pilot HERS project conducted in conjunction with MASS-SAVE included extensive pretesting of the types of information a rating should convey. See Section 2.0 of PNL-4763.

installed features. The energy efficiency measures required for certification at the time of resale could easily be different than earlier requirements.

For graduated rating programs, the homeowner receives information on where his home places on the rating scale. He may also receive information on the number of points received during the scoring process. For rating programs based on prior energy consumption, the homeowner usually receives an index number that reflects prior energy consumption.

Other useful information beyond certification or the rating score can be conveyed to the homeowner. Programs that include information on how a home's energy efficiency rating can be improved by incorporation of cost-effective energy efficiency features include CONN-SAVE, the Florida Five Star Program, and Western Resources Institute. Programs that provide the homeowner an estimate of annual energy consumption and cost include CONN-SAVE and Owens-Corning Fiberglas. A rating sponsor needs to be aware, however, that the potential for liability probably increases as the amount of information conveyed increases (see Section 5.2).

Among existing HERS programs, the energy rating offered by CONN-SAVE in conjunction with an energy audit perhaps best illustrates a program that seeks to provide the housing consumer with extensive, useful information. The homeowner receives four rating scores: 1) the rating his home would have with no energy conservation measures, 2) the actual rating, 3) what the rating could be raised to after installation of low cost energy conservation measures, and 4) the potential rating if all energy conservation measures recommended by the energy audit are installed. In addition to the point total, the homeowner also receives an estimate of the annual energy cost for each of the four cases. The estimated costs are based on standardized assumptions about lifestyle and fuel cost.

Finally, Nevada Power Co. has a relatively unique information addition to its certification program for new housing. Each homeowner receives a manual entitled, "How to Operate Your Energy Efficient Home."

3.4 TYPES OF QUALIFYING HOUSING

Virtually all existing HERS programs are limited to particular types of housing. Housing types include new and existing single and multifamily buildings and HUD-Code manufactured homes. Reasons for and against including particular housing types in a program are discussed in Section 5.1. The most common housing type that qualifies for HERS programs is new, site-built, detached, single family homes. Existing multifamily buildings, especially rental buildings, are seldom eligible for HERS programs. Among programs included in this report, only the Denver Energy Resource Center, the Ann Arbor Energy Office, and West Texas Utilities Co. offer a certification or rating for existing multifamily rental units.^(a) HUD-Code manufactured homes, especially existing homes, are also a housing type that do not qualify for most HERS programs.

3.5 QUALIFYING ENERGY SOURCES

The types of energy used in the home affect whether the home can qualify for many HERS programs. The types of qualifying energy sources are related to the type of sponsor. For most utility-sponsored HERS programs, space conditioning and water heating must be performed with the energy product sold by the utility. Limited exceptions to this policy exist; e.g., Public Service Co. of Oklahoma and Wisconsin Electric Power are electric utilities that offer Good Cents certification for homes heated by both electricity and natural gas. Non-utility HERS sponsors generally do not use type of energy as a qualification criterion.

3.6 RATING AND INSPECTION PROCEDURES

Most HERS sponsors use one of their own employees or someone under contract to the sponsor to perform an energy efficiency rating or determine

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- (a) 1. A certification program for existing rental units in Wisconsin operated from 1981-1985 (Section 4.3). See PNL-5790, p. 4.5.
2. A recent report specifically directed at the merits of a rating program for existing rental housing is Yates Associates, Inc., Portland, Oregon, Rental Housing Energy Efficiency Rating System, prepared for the BPA Office of Conservation, July 1986. The report emphasizes implementation and marketing issues.

whether a housing unit qualifies for certification. Exceptions to this general rule among HERS programs discussed in this report are shown in Table 3.1.

Most HERS sponsors also have one of their own employees or a third party inspect a home one or more times before a home is certified or given a final energy efficiency rating. Sponsors that do not follow this practice include the home builder associations; the sponsors of programs which base the rating on prior energy consumption--Iowa Energy Extension Service, Denver Energy Resource Center, and the Ann Arbor Energy Office; the building supplier corporations--Owens-Corning Fiberglas and Manville; the Austin Resource Management Department; and most sponsors that include HUD-Code manufactured homes in their programs including Arkansas Power & Light and Carolina Power & Light. Potential liability aspects of not performing inspections are discussed in Section 5.2.1.

Several HERS sponsors have developed innovative ways to perform inspections. The Emerald Public Utility District, a participant in the BPA Super Good Cents Program, uses local building inspectors; Philadelphia Electric Co. uses an independent inspection firm that uses quite sophisticated test procedures; and CONN-SAVE uses residential energy auditors.^(a)

TABLE 3.1. HERS Programs Where Ratings Are Not Performed by Employees or Representatives of the Sponsor

<u>Sponsor</u>	<u>Rater</u>
Canadian Home Builders' Association	Individual Builders
French Ministry of Urban Planning and Housing	Independent Firm, Utilities
Home Builders Association of Greater Kansas City	Individual Builders
Suburban Maryland Building Industry Association	Individual Builders
Western Resources Institute	Home Appraisers ^(a)

(a) Western Resources Institute also performs ratings.

(a) Energy auditors were also used in the MASS-SAVE pilot HERS project, see PNL-4763.

New HUD-Code manufactured homes present special inspection problems for HERS sponsors. These homes are constructed at a manufacturing plant and then transported to a dealer or directly to a lot for placement. The transport distance can sometimes be as much as 300 miles or even more. Consequently, many homes will be constructed outside the service area or jurisdiction of a HERS sponsor, but transported into these areas for final siting. Ideally, inspection should occur at the plant where the installed energy efficiency features will be most exposed. Such inspection may be impractical, however, when the plant is not near the sponsor. Because of these inspection difficulties, most HERS sponsors that include HUD-Code manufactured homes in their programs rely on self-certification by the manufacturer. One sponsor, Portland General Electric, inspects prospective Good Cents homes at a manufacturing plant located within its service area.

Performing onsite inspections of rated homes clearly adds significantly to the cost of a rating. There are also substantial potential benefits including greater assurance that energy efficiency features are present and installed correctly, reduced liability exposure (see Section 5.2), and greater user confidence in the correctness of the rating (see Section 2.1).

Rating programs where the sponsor does not perform the rating or conduct an onsite inspection are not included in this report. The "Pennsylvania Home Energy Cost Estimator" prepared by the Pennsylvania Governor's Energy Council; the "Wisconsin Home Energy Rating System," prepared by the Wisconsin Department of Industry, Labor and Human Relations;^(a) and "A Buyer's Guide to an Energy Efficient Home," prepared for the Georgia Governor's Office of Energy Resources contain examples of "do it yourself" home energy ratings.

3.7 FINANCIAL AND PROMOTIONAL INCENTIVES FOR PROGRAM PARTICIPATION

HERS sponsors provide a wide variety of financial and promotional incentives to encourage participation in their programs. Some of the incentives being offered and representative sponsors offering the incentive are shown in

(a) See, Wisconsin Division of State Energy, "Wisconsin Energy News," p. 4, September/October 1986.

Table 3.2. BPA and its participating publicly owned electric utility customers have been especially aggressive in promoting the Super Good Cents program in the Northwest. Additional promotional activities of BPA and its participating utility customers are discussed in Section A.2.1.

TABLE 3.2. Financial and Promotional Incentives for Participants in HERS Programs

<u>Incentive</u>	<u>Representative Sponsors</u>
Up-front cash payment	BPA, TVA
Subsidized home financing	France
Reduced electricity rates	Duke Power, Carolina Power & Light, Public Service Co. of Oklahoma, Connecticut Light & Power, United Illuminating
One-time credit to utility bill	Florida Power, Cobb Electric Membership Corp., Modesto Irrigation District
Subsidized advertising for builders	BPA, Mississippi Power, B.C. Hydro
Sponsor representative at builder "open houses"	Philadelphia Electric, Pacific Power
"Parade of Homes" sponsorship	Portland General Electric
Subsidized sale of building plans for homes that meet program standards	Iowa Power & Light, TVA, Eugene Water and Electric Board (BPA program)
Increase in allowable subdivision density	Ashland (Oregon) Department of Electric Utilities (BPA program)
Subsidized electric line extension	Columbia River Public Utility District (BPA program)

4.0 ATTITUDES TOWARD HERS

The survey literature on attitudes toward home energy ratings is limited. The few surveys that were found are summarized in this section. In general the respondents in the surveys most favoring HERS are home buyers and renters. The group that least favored HERS were owners and managers of existing multifamily rental property. Owners of single family homes tended to favor HERS only if they planned to sell an energy efficient home. In spite of generally favorable overall attitudes, prior research has shown that favorable attitudes toward energy conservation programs do not necessarily result in energy conserving behavior or actual energy savings.^(a) The issue of whether HERS programs actually lead to energy savings is discussed in Section 6. Attitudes toward HERS are discussed in this section from the perspective of home buyers, home sellers, renters, rental housing owners, and real estate agents. No survey literature of builder attitudes was located for this report.

4.1 HOME BUYERS

Home buyers and renters have much to gain from an energy efficiency rating (Section 2.2), especially if it is provided to them at no cost. The limited survey results available have shown that they generally view HERS programs favorably. For example, of 196 recent home buyers in King County, Washington, surveyed in mid-1983, 83% said they would have been very interested in knowing the energy efficiency rating of prospective homes they were considering.^(b) In the same survey, 96% of buyers said a high rating would be important to their home selection process, 56% indicated they would have been willing to pay up to

(a) L. Condelli, D. Archer, et al., University of California Santa Cruz, "Improving Utility Conservation Programs: Outcomes, Interventions, and Evaluations," Energy, Vol. 9, No. 6, p. 485, 1984.

(b) Kurt Wehbring, David M. Dornbusch and Co., Portland, Oregon, "Surveys in Support of the Residential Energy Evaluation Program." The survey results appear as Appendix G in Washington State Energy Office, Residential Energy Evaluation Program, WAOENG 84-09, March 1984. The survey is hereafter cited as "Wehbring." Seattle and Bellevue are the largest cities in King County.

\$25 for a rating on a desired home, and 57% said the possibility of obtaining more mortgage money through a high rating would have been influential in their home selection process.

Four hundred respondents in Lane County, Oregon, were asked in June 1985 what method they would prefer to determine energy efficiency if they were purchasing a newly constructed home. The most favored response was utility certification (65%), followed by self-determination (22%), builder (9%), architect (3%), and real estate agent (1%).^(a) The building code and building inspector were apparently not offered by the researchers as an option.

Four focus groups were convened in August 1984 in conjunction with the Western Resources Institute rating program.^(b) Two groups contained prospective first time home buyers and two groups contained owners whose homes were currently for sale. The prospective first time home buyers were virtually all in favor of a rating system because of the information it would provide. There was almost no interest expressed, however, in using a rating to qualify for additional loan money.

Two focus groups of recent home buyers and sellers were convened in June 1982 in conjunction with the MASS-SAVE pilot project reported in PNL-4763 and PNL-4764.^(c) One group of participants felt that a rating would provide useful information for home shopping. Another group felt it could effectively obtain the energy efficiency information itself.^(d) This latter group was also skeptical that a rating could produce accurate and reliable information.

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- (a) Mar%stat Market Research and Analysis, "Community Opinion Study Regarding Energy Efficiency," prepared for the Eugene Water and Electric Board.
 - (b) M. L. Moss and Co., Bainbridge Island, Washington, Residential Energy Efficiency Program: Consumer Focus Group Research, prepared for the Federal Home Loan Bank of Seattle, Pacific First Federal Savings Bank, and Western Resources Institute, August 1984.
 - (c) Decision Research Corp., Lexington, Massachusetts, The Use of Home Energy Audits and Home Energy Rating Systems in the Home Selection Process, July 1982.
 - (d) PNL-4763, p. 2.8.

4.2 HOME SELLERS

The focus groups conducted for the MASS-SAVE and Western Resources Institute rating programs revealed that home sellers with an energy efficient home can potentially benefit from a HERS and are likely to favor ratings. Sellers with an inefficient home are unlikely to benefit and are unlikely to want a rating performed. Neither result seems surprising.

The Wehbring survey included 204 recent home sellers in King County. Forty-two percent of these sellers had made energy conservation improvements to their homes during the previous five years. Seventy-seven percent thought their home's energy efficiency was either "good" or "fair." Fifty-six percent of the 204 respondents would have liked to have had an energy rating for their home. Interestingly, when asked whether they would make energy efficiency improvements prior to sale if all homes had energy efficiency ratings, 77% replied "yes." Sixty-seven percent of the sellers would have been willing to pay \$25 for the rating (\$1983). Finally, the respondents' preferred groups to perform ratings were independent firms (51%) and utilities (39%). The home buyer respondents in Wehbring's survey also preferred these two groups with percentages of 51% and 31% respectively.

4.3 RENTERS

Available survey data suggest that renters strongly support the availability of energy ratings for rental housing units. Low income renters are particularly supportive. The most comprehensive survey information on renter attitudes towards HERS is in a recent report by Columbia Information Systems for the BPA Office of Conservation.^(a) The survey was administered by telephone in February 1986 to 800 renters living in Idaho, Oregon, Washington and western Montana.

Ninety-six percent of the CIS respondents found the idea of a HERS "very" or "somewhat" appealing and 94% indicated a rating would influence their selection of a rental unit. The percentage of respondents indicating that a rating

(a) Columbia Information Systems, Portland, Oregon, Rental Housing Energy Rating System Market Survey, March 1986. Hereafter cited as "CIS."

would have "a great deal of influence" on their selection process ranged from 64.6% for those with annual household income less than \$10,000 to 51.1% for those with incomes over \$30,000.^(a) Fifty-seven percent of respondents had inquired about utility bills before renting their current housing unit.^(b) Eighty-nine percent indicated they would be willing to pay \$10/month or more in rent for an energy efficient rental unit that saved \$10/month in energy costs over an otherwise comparable less efficient unit.^(c) Seventy-two percent of the respondents preferred a rating scale with several graduated categories of energy efficiency.^(d) Ten percent favored a pass-fail, i.e., certification rating, and 18% favored a 0-100 rating scale. The preferred unit for classification was estimated energy cost (65%) as opposed to estimated energy consumption (35%).

A survey of Pennsylvania residents in late 1982 also found strong renter support for a HERS. The survey was administered to approximately 1750 occupants of single family detached homes and attached rowhouses. Overall, 89% of respondents indicated that a HERS program would enhance purchase/renting of energy efficient homes and 93% thought it would encourage the construction of more energy efficient homes.^(e) Eighty-eight percent of the renters in the sample felt that energy efficiency labeling of buildings should be mandatory, compared to 60% of homeowners.^(f)

Further support for rating programs was shown by renters in Wisconsin. In response to an order by the state Public Service Commission (PSC), utilities in Wisconsin operated a certification program for energy efficient rental housing

(a) CIS, Tables 10, 12.

(b) CIS, Table 52.

(c) CIS, Table 53.

(d) CIS, Table 55.

(e) Urban Systems Research and Engineering, Cambridge, Massachusetts, Pennsylvania Housing Stock and Energy Conservation Survey, prepared for the Pennsylvania Governor's Energy Council, p. 95, April 1983.

(f) Ibid., p. 64.

units between 1981-1985.^(a) As of January 1, 1985, residential rental property in Wisconsin must meet minimum energy conservation standards set by the State Department of Industry, Labor and Human Relations prior to sale of the property.^(b) In submissions to the Wisconsin PSC, most utilities favored elimination of the certificate program in favor of the mandatory retrofit requirements. The Commission, however, chose to suspend rather than eliminate the program. Several Wisconsin consumer groups opposed elimination of the seal and certificate program because of its role in providing energy efficiency information to prospective tenants.^(c) The program is scheduled to be re-introduced in 1987 under a revised format in which ratings will be based on prior energy consumption performance.^(d)

4.4 RENTAL HOUSING OWNERS

No survey data on the attitudes of builders and owners of newly constructed multifamily rental housing toward HERS were found. Several existing HERS programs^(e) include these buildings, however, and presumably many owners are amenable to participation. Nearly 3/4 of the housing units receiving the energy efficient home certification from Nevada Power Co., for example, have been apartment units.

Owners of existing rental housing units appear to be less amenable to a HERS program. A likely reason is that their rental units will in most cases be less energy efficient than newly constructed units, and hence be at a marketing disadvantage.

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- (a) The certificate program operated by the Wisconsin Gas Co. in response to the order is described in: 1) Brian K. Fay, "Voluntary Rental Living Unit Program," ACEEE 1984, p. C-18; and 2) D. Bleviss and A. Gravitz, Energy Conservation Coalition, Washington, D.C., Energy Conservation and Existing Rental Housing, pp. 27-30, October 1984.
 - (b) Wisconsin Statutes, Section 101.122.
 - (c) PNL-5790, p. 4.5.
 - (d) P. Berkowitz and P. Newman, Public Service Commission of Wisconsin, Rental Working Group Rating System: Status Report, July 1986.
 - (e) For example, BPA, Florida Power, Georgia Power, Ministry of Urban Planning and Housing (France), Public Service Co. of Oklahoma, Nevada Power, and Wisconsin Electric Power.

As part of its work for BPA, Columbia Information Systems held two focus groups in Portland and Seattle in March 1986 with owners and managers of existing rental housing complexes. Of the 23 owner/managers participating in the groups, only one person reacted favorably to a HERS for existing rental units.^(a) This owner had retrofitted an older building with energy efficiency measures and felt that a HERS would enable her building to better compete with newer complexes. Negative reactions of other owner/managers included the following:

- a rating will "red flag" an older inefficient building
- poor payback because the weatherization investment cannot be effectively recaptured in rents
- concerns over the time and cost to obtain a rating
- concerns over the accuracy of any rating system
- inability to effectively weatherize older buildings (e.g., inability to add insulation to buildings with flat roofs).

In spite of the group's generally negative reactions toward retrofit, prior surveys have shown that Northwest rental housing owners have made substantial energy conservation improvements.^(b)

Few existing HERS programs apply to existing multifamily buildings (Sec-
ing, 3.4). This result perhaps reflects the owners' disinterest in participat-
ing, as well as other complicating factors such as the difficulty of arranging
onsite inspections and the fact that units within a building may differ in
energy efficiency.

4.5 REAL ESTATE AGENTS

Real estate agents are an important group in helping to meet the objective
of HERS to facilitate the incorporation of energy efficiency into a home's
market value. Agents often influence both the asking and offering prices of

(a) CIS, Section VI.

(b) PNL-5790, Section 3.

homes. A 1981 survey conducted by the National Association of Realtors found that approximately 85% of home sales are handled by real estate brokers and agents.^(a)

Real estate agents are naturally interested in selling a home and realizing their commission. Agents are unlikely to suggest that a rating be performed if a home is likely to receive a low rating^(b) or if the rating process will delay a home sale.^(c) Nevertheless, in the Wehbring survey, 13 out of 25 agents surveyed indicated they would recommend to a home seller that a home energy efficiency rating be performed.

Real estate agents have shown little interest in conducting ratings themselves.^(d) Among their concerns are liability exposure (see California Energy Commission, Section A.1) and insufficient energy efficiency knowledge. In Boulder, Colorado, the Board of Realtors developed an energy survey/rating for existing homes to be administered by local Realtors. After 18 months, less than 5% of Board members were using the survey/rating and less than 1% of eligible homes were receiving the survey/rating.^(e) In the Wehbring survey, the groups most favored as raters by real estate agents were appraisers and utilities.

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- (a) National Association of Realtors, Chicago, Illinois, National Homebuying Survey, 1981.
 - (b) Diana Metzler, City of Visalia, California, VISAVisa: Final Report, p. 9, prepared for the California Energy Extension Service, December 1985. (Hereafter cited as "Metzler.") This report describes and evaluates an energy rating program that operated in Visalia from 1981-1985.
 - (c) PNL-4763, p. 5.7.
 - (d) M. L. Frankel and J. A. Duberg, Centaur Associates, Washington, D.C., An Evaluation of the Home Energy Rating Concept and the Massachusetts Pilot Project, PNL-4764, p. 3.26, June 1983.
 - (e) Infinite Energy, Denver, Colorado, Market Penetration Projections Austin Energy Star Program, prepared for the City of Austin Resource Management Department, February 1985.

5.0 DESIGN AND IMPLEMENTATION ISSUES

There are many issues related to design and implementation of a home energy rating program that should be addressed by prospective HERS sponsors. Most of the issues also merit periodic review once a HERS is in place. Table 5.1 contains a list of the more important design issues and some possible options associated with selected issues. Table 5.2 contains comparable information for implementation issues. It is not within the scope of this report to

TABLE 5.1. HERS Design Issues

Issue	Possible Options
1. Housing types to include	Single family, multifamily, HUD-Code manufactured homes
2. Rating scale (score)	Pass-fail, i.e., certification, scale; graduated scale, e.g., 0-100 points 1-5 "stars"
3. Criteria for determining certification requirements or rating score categories	Relationship to building energy code; life cycle cost; net present value; installation of DOE/RCS program measures at 10 CFR 456, Appendix I; typical energy consumption performance
4. Information to convey, if any, in addition to score	Estimated energy consumption and/or cost, impact of retrofit on rating
5. Energy uses to include	Space conditioning, hot water heating, other appliances
6. Should HERS eligibility depend on types of energy used?	
7. Technical basis for rating	(See Section 3.2)
8. Building thermal load model, if any, to use	DOE.2, CIRA, CALPASS, BLAST, etc.
9. Standard assumptions to use, if any, for factors such as HVAC equipment efficiency and thermostat setting.	
10. Housing designs to use in modeling	One story, two story, split level, townhouse, etc.

TABLE 5.2. HERS Implementation Issues

Issue	Possible Options
1. Who should compute the rating?	Sponsor employees, third parties, builders, appraisers
2. Should rated housing units be inspected by a sponsor representative?	
3. How much should be charged, if anything, for a rating?	
4. What groups should be involved?	Lenders, real estate agents, appraisers
5. What incentives should be offered, if any, for HERS participation?	Cash payments, advertising allowances, technical assistance
6. How should a rating program be marketed?	Advertising, presentations, mailings, logo
7. What types of training are needed for user groups?	
8. Should ratings be retained for future users?	
9. How can liability potential be mitigated?	Inspection, appropriate scale design, properly qualified information transmittal
10. Should a pilot test be used?	

examine all of the issues. The interested reader can find many of the issues discussed in the publications listed in the bibliography.

This section discusses one design issue and one issue related to both design and implementation of a HERS. Section 5.1 contains a discussion of arguments for and against including particular housing types in a HERS program. The arguments appear to be strongest for including new single and multi-family homes in a program and weakest for existing single family homes and existing HUD-Code manufactured homes. The arguments for including new HUD-Code

manufactured homes and existing multifamily buildings are intermediate to the two preceding groups. Section 5.2 discusses the issue of mitigating liability potential when designing and implementing a HERS program.

5.1 TYPES OF HOUSING TO INCLUDE

A fundamental question that must be addressed early in the planning for a HERS program is the types of housing that will be included within the program scope. The three principal housing types are: 1) single family [both detached and attached (i.e., row houses or townhouses)], 2) multifamily, and 3) HUD-Code manufactured homes (commonly known as mobile homes). Within these three groups there are newly constructed and existing homes, and owner- and renter-occupied homes. The total number of possible housing types is thus quite large.

A number of criteria can affect the selection decision. These criteria include: 1) the resources and interests of the sponsor, 2) the level of interest of builders and housing owners in having a rating, 3) the cost and degree of difficulty of performing the rating, 4) the alternatives available to housing consumers and others to obtain energy efficiency information on housing units, 5) the degree of importance of energy efficiency information to the consumers of each housing type, and 6) the alternatives available for enhancing energy conservation in the supply of the particular housing stock. Most of those criteria do not lend themselves well to quantification. Nevertheless, it is possible to qualitatively examine the housing types with respect to the criteria.

5.1.1 Single Family Homes

There are substantial arguments for including newly constructed single family homes within the scope of a HERS program. The vast majority of existing programs have recognized the advantages and included new homes. Programs that have excluded new homes generally have special reasons, e.g., the rating is based on prior energy consumption or the rating is performed by an energy auditor. The arguments for including existing single family homes are less convincing.

5.1.1.1 New Homes

New single family homes represent an attractive housing type to include in a HERS program for several reasons. First, new homes have a long life expectancy. Consequently, there is potentially a large "lost opportunity energy conservation resource" when new homes are not built to optimum energy efficiency. Second, the easiest and least expensive time to add energy efficiency measures is when a home is being constructed. Third, it is easier for a HERS sponsor to inspect a home under construction than an existing home. A fourth reason is that home builders are a much smaller group to recruit and train to participate in a HERS program than homeowners. Most sponsors have found builders to be relatively receptive to participation because many builders perceive HERS as a marketing aid for their homes. Finally, purchasers of new homes do not have the option of using prior utility bills as an energy efficiency information source. An energy rating is thus especially useful for this group.

Building energy codes are an alternative to achieving energy efficiency in new homes. The mandatory nature of codes, however, often makes enactment of codes that incorporate optimum energy efficiency requirements politically difficult.

In 1985, construction was started on 1,072,400 privately owned single family homes in the U.S.^(a) This figure represents 2% of the 1980 single family home housing stock.

5.1.1.2 Existing Homes

Existing single family homes are eligible for far fewer HERS programs than new homes. The strongest argument for including existing homes in a HERS program is that they comprise such a large portion of the housing stock. Survey data from the 1980 Census of Housing indicated that approximately 67% of housing units (53,860,000 units) were single unit structures.^(b) Single family

(a) U.S. Bureau of the Census, Construction Reports Housing Starts, C20-86-4, Table 1, April 1986.

(b) U.S. Bureau of the Census, Statistical Abstract of the United States 1985, p. 734.

homes also provide approximately 35% of all rental housing units.^(a) Consequently if existing single family homes are omitted from a HERS program, the single largest portion of the housing stock will be ineligible for a rating.

Many HERS programs simply do not have the resources to include all housing types within their program. For a program operating under such a constraint, there are several arguments that could be cited as reasons to omit existing single family homes from a program. One reason is that the target audience for attracting program participants is much larger than for new homes. Each existing homeowner must be individually contacted and convinced of the merits of the HERS program. The marketing cost per rated home is thus likely to be higher than for new homes where one participating builder constructs many homes. Moreover, prior research has shown that many existing single family homeowners are unlikely to be interested in having a rating, particularly if their home is likely to be rated low or if they have no immediate plans to sell their home. In the rating test program in Visalia, California, for example, an extensive effort was made to interest single family homeowners and renters in a limited geographic area in a combined energy audit and rating performed at no cost to the owner. Promotional devices included mailings, flyers, telephone calls, newspaper articles about the program, and door-to-door personal contact. Of 530 owners/renters contacted, only 68 or 13% agreed to the audit/rating.^(b) Reasons cited for nonparticipation included: 1) previously received an energy audit, 2) belief that an underlying motive in the audit/rating was to sell them something, 3) renters' belief that the audit/rating was pointless because the owner would take no energy efficiency improvement action, 4) satisfaction with present energy costs, and 5) a belief that no energy efficiency improvements were needed.

A second reason for possibly excluding existing single family homes from a HERS program is that prospective purchasers and renters have energy efficiency information alternatives other than a rating. There is also empirical evidence that they are using this information to capitalize energy efficiency features into a home's market value.

(a) Ibid, p. 735.

(b) Metzler, p. 24.

One obvious alternative information source is prior utility bills. Sellers will typically provide this information on request. It is generally included on multiple listing forms used by real estate agents. Many utilities will also disclose the information, even without the approval of the occupant.^(a) Utility bill information is clearly not an absolute indication of energy efficiency. Variables such as occupant lifestyle and use of secondary fuels such as wood are not reflected in billing information. Billing information does, however, provide information for both consumption and dollar expenditures and can be a useful indicator of energy efficiency.

Prospective purchasers and renters can physically inspect a housing unit for its energy efficiency. An indication of energy efficiency and the operating condition of HVAC and water heating equipment can also be obtained if prospective purchasers retain a professional home inspector or appraiser before completing a purchase to determine a home's overall condition. In some parts of the country, e.g., California, Texas, and the Northeast, home inspections are becoming common.^(b) Many banks require an inspection as a condition of providing mortgage financing. Fees for an inspection average about \$150.^(c) In Texas real estate inspectors are licensed by the state.^(d) Applicants for a license must have received 90 hours of relevant course instruction and pass an examination administered by the Texas Real Estate Commission. There are approximately 700 licensed inspectors in Texas.

A third potential source of energy efficiency information for existing housing units is prior energy audits. Thousands of U.S. homes have been

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- (a) 1. In the Visalia test program, Southern California Gas Co. did not require owner consent for release of consumption data. Southern California Edison Co. did require written consent from the owner or renter occupant. Metzler, p. 7.
2. In Oregon all IOUS will provide a heating cost estimate to prospective renters without requiring owner consent. Personal communication with Steve Schue, Office of the Oregon Public Utility Commissioner, September 4, 1986.
- (b) Wall Street Journal, p. 31, October 22, 1985. See also, American Society of Home Inspectors, Washington, D.C., Proceedings of the First International Conference for Independent Home and Building Inspectors, 1986.
- (c) Ibid. Prospective renters can, of course, also retain an inspector; however, the fee is likely to deter all but long-term renters.
- (d) Texas Statutes, Section 18(c), Article 6573a.

audited either under the DOE-administered Residential Conservation Service Program^(a) or state or local initiated programs. The audit results will often be available from the existing homeowner or from the organization sponsoring the audit program.

There is empirical evidence that consumers of both owner- and renter-occupied housing are able to capitalize some of the value of energy efficiency measures into the market value of existing housing units. A number of information sources contribute to the consumer's ability to capitalize energy efficiency features, but prior utility bill information and physical inspections are presumably the most significant.

Using a regression of house sales prices on housing characteristics, several investigators have examined the extent of housing market capitalization of energy efficiency measures and associated implicit consumer internal rates of return. In a study of the Knoxville, Tennessee, housing market in 1978, Johnson found that the marginal effect of a \$1 savings in the annual fuel bill was to increase the sale price of the house by approximately \$21.^(b) She further found that the capitalization was consistent with a social discount rate of about 10%. Dinan examined resale prices for 234 homes in Des Moines, Iowa, for the period January-June 1982. She found that a \$1 decrease in annual fuel expenditures attributable to greater energy efficiency increased the expected selling price of the home by \$11.63.^(c) Longbeth investigated the resale of existing single family, natural-gas-heated homes in Columbus, Ohio.^(d) She found that additional insulation increased sales price and that increased gas consumption decreased sales price. Laquatra examined resale price data for 81 homes in the Minneapolis area and found that a decrease of

(a) 10 CFR 456.

(b) Ruth C. Johnson, Housing Market Capitalization of Energy Savings Durable Good Investments, ORNL/CON-74, July 1981.

(c) Terry M. Dinan, Obtaining the Optimal Fuel Conserving Investment Mix: A Linear Programming-Hedonic Technique Approach, Ph.D. thesis, Iowa State University, 1984.

(d) Molly Longbeth, et al., "Conservation Characteristics Among Determinants of Residential Property Value," Journal of Consumer Research, p. 564, June 1984.

degree day in design thermal integrity resulted in an increase sales price of \$2,510.^(a) Empirical research has also shown that rents are discounted in housing units where tenants must pay higher than average utility costs.^(b)

In a recent qualitative survey, nine real estate brokers and appraisers from throughout the U.S. estimated that, on average, 77% of the cost of minor energy efficiency upgrades and 62% of major upgrades could be recaptured if the improved home were sold several months after the improvement.^(c)

5.1.2 Multifamily Buildings

New multifamily buildings are eligible for many existing rating programs, but still far fewer than new single family homes. Existing multifamily buildings, especially rental buildings, are eligible for only a very small number of HERS programs. The omission of multifamily buildings from many HERS programs is unfortunate in some respects because the potential benefits of including them can exceed the benefits for single family homes.

5.1.2.1 New Buildings

All of the reasons cited in Section 5.1.1.1 that make new single family homes attractive for inclusion in a HERS program also apply to new multifamily buildings. Several additional factors make new multifamily buildings attractive for HERS programs. Multifamily buildings where the units are rented are especially attractive for HERS programs.^(d)

(a) J. Laquatra, "Valuation of Household Investment in Energy Efficient Design," ACEEE 1984, p. F-154.

(b) 1. Lou McClelland, Tenant Paid Energy Costs in Multifamily Rental Housing: Effects on Energy Use, Owner Investment, and the Market Value of Energy, DOE/CS-20050-1, p. E-10, December 1983.
2. J. Follain and S. Malpezzi, "Dissecting Housing Values and Rent: Estimates of Hedonic Indexes for Thirty Nine Large SMSAs," Working Paper 249-17, The Urban Institute, Washington, D.C., 1980.

(c) New Shelter, Rodale Press, p. 47, May/June 1986.

(d) 1980 Census of Housing data indicated that approximately 84% of the occupants of residential buildings with 2 or more units were renters. U.S. Bureau of the Census, Statistical Abstract of the United States 1985, p. 734, 735.

Historically, rental housing units have been constructed with fewer energy efficiency features than housing intended for owner occupants.^(a) One likely reason is that in most buildings, energy costs are paid by the renter rather than the owner. Survey data from the 1983 Annual Housing Survey on fuel use and payment are shown in Table 5.3. Overall, the data indicate that approximately 64% of renters in multifamily buildings directly pay their own heating bill. Many owners are not confident that incremental energy efficiency investments can be recaptured in rents and are content to let tenants pay their own utility bills. Moreover, new multifamily buildings are more likely than older buildings to have energy costs individually metered and billed to renters. HERS programs can potentially offset the tendency to underinvest in the energy efficiency of new multifamily buildings by providing greater confidence to owners that the investment can be recaptured in rents and at resale.

In addition to providing an incentive for more energy efficient construction, a rating system can also provide a valuable service to prospective renters. Renters on average have considerably lower incomes than owners

TABLE 5.3. Heating Fuel and Payment in U.S. Renter-Occupied, Multifamily Buildings

<u>Primary Space Heating Fuel</u>	<u>% of Units with Fuel</u>	<u>% of Units with Fuel Where Fuel Cost is Included in Rent</u>
Natural Gas	40%	53%
Electricity	51	21
Fuel Oil	5	76
Other	4	

Source: U.S. Bureau of the Census, Energy Related Housing Characteristics for the United States and Regions 1983, Current Housing Reports Series H-150 83, Table D-5, September 1985.

(a) PNL-5790, Section 2.7.

(Section 2.2). Energy costs are thus particularly important to them. Additionally, because many tenants have a relatively shorter tenure in their rental unit, they may not have sufficient incentive to conduct a thorough review of a rental unit's energy efficiency. A rating system can potentially significantly facilitate the process by which a renter incorporates energy efficiency into his selection process. Conservation in rental units can also be particularly effective in meeting a utility's conservation objectives because renters are less likely than owners to use secondary fuels such as wood.^(a)

Another reason that new multifamily units are attractive for HERS sponsors is that inspection and administrative costs per housing unit should be considerably lower than for single family homes. Additionally, a rating for a multifamily rental unit will likely be used considerably more often than a rating for a single family home because resident turnover is significantly higher in rental units.^(b)

5.1.2.2 Existing Buildings

The arguments for and against including existing multifamily buildings in a HERS program are similar to the preceding discussions. For owner-occupied units, the discussion in Section 5.1.1.2 on existing single family homes is applicable. For renter-occupied units, much of the preceding discussion on new multifamily buildings is applicable. An additional complicating factor for existing rental buildings is that there are many owners to contact, many of whom will not be local residents, and a large percentage that are not likely to be receptive to a HERS program (see Section 4.4).

A HERS sponsor who desires to realize some of the potential benefits discussed in Section 2.0 might consider an alternative energy information delivery mechanism. One possible mechanism is getting utilities to make past billing records easily available to prospective renters.

(a) PNL-5790, p. 2.10.

(b) PNL-5790, Table 2.6.

5.1.3 HUD-Code Manufactured Homes

HUD-Code manufactured homes are an important part of the U.S. housing stock. In 1985, for example, HUD-Code homes constituted 17% of all new single housing units started.^(a) The arguments for including existing HUD-Code homes in HERS programs are generally similar to the arguments for other single family homes. For new HUD-Code homes, however, there are other important considerations.

5.1.3.1 New Homes

There are particular reasons that argue both for and against including new HUD-Code manufactured homes in a HERS program. An argument for inclusion is that state and local governments cannot use building energy codes to improve the energy efficiency of HUD-Code homes. The construction of HUD-Code homes, including energy features, is regulated by the U.S. Department of Housing and Urban Development (HUD) under the authority of the National Manufactured Housing Construction and Safety Standards Act of 1974. Regulations adopted by HUD under the Act preempt state and local regulations.^(b) The HUD construction standards for manufactured homes include thermal performance standards at 24 CFR 3280 Subpart F. The standards are relatively weak, i.e., they can be met with fewer energy efficiency features than most state and local building energy codes require for site-built homes.

A factor that makes including new HUD-Code manufactured homes in a HERS program difficult, however, is the problem of inspection (see Section 3.6). Although HUD-Code homes are built at a limited number of plants within a region, the plants will often not be conveniently located in relation to a HERS sponsor. Most current HERS sponsors that include HUD-Code manufactured homes within their program scope have consequently decided not to inspect the homes. One utility, Portland General Electric, does inspect prospective homes. It is currently offering its program, however, in conjunction with only one manufacturer that is conveniently located within its service area.

(a) U.S. Bureau of the Census, Construction Reports Housing Starts, C20-86-4, Table 6, April 1986.

(b) 42 U.S.C. 5403(d).

If a HERS sponsor chooses not to inspect prospective homes itself, it can potentially use a third party. The production inspection agencies that each manufacturer is required by HUD to utilize are possible third party inspection entities.^(a)

There is some indication that manufacturers of HUD-Code homes are moving in the direction of HERS programs. Most of these manufacturers offer optional energy efficiency packages.^(b) At least one manufacturer, Champion Home Builders Co., based in Dryden, Michigan, is marketing its optional energy conservation package under a format that resembles a certification rating. Manufactured homes built with the package are marketed nationally as "Weather-Shield Homes."^(c) The package includes upgraded insulation and sheathing board to reduce air infiltration; together, these measures are estimated to save the purchaser approximately \$25/month over a comparable home built to the minimum HUD thermal performance requirement. Homes built with the package receive an emblem that is prominently placed on the outside of the home near the front door. Although this program differs from the HERS programs in Appendix A because there is no third party sponsor, in actual practice the Champion program is similar to the programs of the Home Builder Associations that are discussed in Appendix A.

For rating programs for new HUD-Code manufactured homes to operate effectively, dealers must be active participants. Survey data from 1981 indicated that 2/3 of new HUD-Code homes were purchased directly from a dealer's existing inventory and that only 1/3 were custom ordered.^(d)

5.1.3.2 Existing Homes

The arguments for including existing HUD-Code homes in a rating program are similar to the arguments for other existing single family homes. One

(a) 24 CFR 3282.204, 3282.362.

(b) P. L. Hendrickson, et al., Marketing Energy Conservation Options to Northwest Manufactured Home Buyers, PNL-5496 Rev. 1, Section 3.0, October 1985. (Hereafter cited as PNL-5496 Rev. 1.)

(c) "New Emblem Identifies Weather-Shield Homes," Automation in Housing and Manufactured Home Dealer, published by CMN Associates, Inc., Carpinteria, California, p. 32, July 1986.

(d) PNL-5496 Rev. 1, p. 6.4.

additional element is that HUD-Code home occupants, on average, have lower household incomes than occupants of other single family homes,^(a) making energy bills a particularly important part of their household budget.

5.2 MITIGATION OF LIABILITY

The issue of potential liability resulting from implementation of a HERS was addressed by the author in a 1983 report (PNL-4873). A principal conclusion in the report was that potential liability is a legitimate concern, but that careful design and implementation of a rating program can mitigate its possibility and extent. This section updates the 1983 report with more recent information on two negotiated settlements and a discussion of indoor air quality.

5.2.1 Recent Negotiated Settlements

During preparation of PNL-4873, the author found no reported state or federal court cases involving energy efficiency ratings or labels. A computer-assisted search in May 1986 again revealed no cases. The fact that no reported cases exist does not necessarily mean that no legal action involving HERS have been initiated. Most actions involving ratings are likely to be settled by arbitration, out-of-court negotiations, or in unreported state or local trial court decisions. Information on these types of actions is difficult to obtain, but information on two out-of-court settlements was discovered during preparation of this report.

The most significant legal action involving a HERS is probably the 1984 settlement between the Georgia Power Co. and the Georgia Governor's Office of Consumer Affairs. Purchasers and owners of Good Cents certified homes in Georgia Power's service area complained to the office that their homes had less insulation than required for Good Cents certification. Complaints were also received from certain insulation contractors that other contractors were underinstalling insulation. The majority of the affected homes had not been inspected by a Georgia Power representative. Georgia Power's policy was to

(a) PNL-5496 Rev. 1, p. 2.9.

inspect the first few Good Cents homes constructed by a builder and thereafter rely on his self-certification of compliance with the Good Cents prescriptive standards.

In response to the complaints, the Governor's Office of Consumer Affairs initiated an investigation under the authority of the Georgia Fair Business Practices Act of 1975.^(a) The Office confirmed that some Good Cents home did not receive specified levels of attic insulation. Georgia Power did not admit to any violations of the Act, but did enter into an Assurance of Voluntary Compliance Agreement with the Office.^(b) Under the terms of the Agreement, the company agreed to send a letter to all owner/occupants of Good Cents homes in its service area offering to audit the home to determine if the level of attic insulation required for the Good Cents certification was actually present.^(c) Georgia Power also agreed to correct or have corrected any attic insulation deficiencies found during such audits.

Approximately 20,000 letters were subsequently mailed to Good Cents home owner/occupants. Of these, approximately 6,000 owner/occupants requested an audit. Insulation deficiencies were found and subsequently corrected in approximately 2,000 of the audited homes.^(d) Much of the cost of correcting the deficiencies was paid by the building and insulation contractors who were involved in the original construction. Several of the contractors also signed separate Assurance of Voluntary Compliance Agreements with the Office of Consumer Affairs.

Georgia Power also agreed in the Assurance of Voluntary Compliance to assure that all future Good Cents homes in its service area received the proper amount of insulation. The company is presumably meeting this condition. In an effort to minimize the likelihood of comparable future incidents, however, its Good Cents literature has been recast to state that the Good Cents energy

(a) Georgia Code Annotated, Chapter 106-12.

(b) Filed in the Superior Court of Fulton County, Georgia, October 23, 1984, Civil Action No. D-14691.

(c) The required levels were R-26 or R-30 for housing units completed after June 1, 1982, and R-19 for units completed prior to this date.

(d) Personal communication with Dan Jacobs, Georgia Governor's Office of Consumer Affairs, Atlanta, Georgia, November 19, 1985.

efficiency features are Georgia Power's recommendations and that "the builder certifies that all recommendations are present and properly installed before Georgia Power gives the structure a Good Cents Award."^(a) Whether this language would successfully protect Georgia Power from possible future liability is unknown.

The lesson of the case for other HERS sponsors seems to be that onsite home inspections of rated homes should not be omitted unless the sponsor is reasonably confident that the energy efficiency features implied by a rating are actually present in the house. The Connecticut Light and Power Company's 100 Plus certification program for new homes (Section A.2.2) illustrates one approach to gaining this confidence without conducting onsite inspections. Prior to awarding its certificate, the company requires the signature(s) of: 1) a registered architect or professional engineer, or 2) the builder and the building inspector, or 3) the builder and the purchaser.

A second example of possible liability may indirectly affect some HERS programs. Wick Building Systems, Inc. constructed and marketed an energy efficient HUD-Code manufactured home in the early 1980s.^(b) As part of the marketing program, an estimate of energy consumption and cost was provided to purchasers. Some purchasers realized consumption and expenditures that exceeded the estimates, and sought compensation from the company. The claims were settled out of court. The lesson from this example seems to be that estimates of energy consumption and cost should be properly qualified to make clear that actual consumption and cost depend on various lifestyle characteristics of the home occupants.^(c) A HERS sponsor will normally not want to guarantee that specific energy savings will be realized if a particular energy efficiency standard is met.

5.2.2 Indoor Air Quality

HERS programs seek to achieve energy conservation through more energy efficient homes. One common way to achieve greater energy efficiency is to

(a) Georgia Power Co., "What's the First Thing to Ask About when Looking for a Home, Condo, or Apartment," brochure, 1985.

(b) PNL-5496 Rev. 1, p. A.29.

(c) See Section 7.1 of PNL-4873 for further discussion of this point.

reduce a home's air exchange rate. Overall, approximately one-third of heat loss from homes is through air leakage.^(a)

The performance of individual buildings varies widely. Supertight homes can have as little as 0.1 air changes per hour while older leaky homes can have as many as 4.^(b) One possible consequence of a more airtight home is increased levels of indoor air pollution.^(c) Pollutants of concern include radon, formaldehyde and other organic vapors, combustion gases, respirable suspended particulates, household chemicals, microorganisms, allergic agents, and even excessive moisture.^(d) These pollutants can have significant health effects, especially for individuals who are sensitive to a particular pollutant.

The issue of concern to a HERs sponsor is whether it can possibly incur liability to an occupant of a rated house who suffers an adverse health reaction attributable to indoor air quality (IAQ). For sponsors who are merely rating a home without making express or implied recommendations about appropriate levels of airtightness, the possibility of liability seems remote. For sponsors of certification programs who are either explicitly or implicitly recommending and encouraging a particular level of energy efficiency and

(a) "The Dynamics of Indoor Air Quality," EPRI Journal, Electric Power Research Institute, Palo Alto, CA, p. 20, March 1986.

(b) Ibid.

(c) A variety of factors other than the degree of airtightness can affect indoor air quality. These include the occupants and their activities, pets, the operating characteristics of combustion sources, the interior volume of the home, air circulation within the home, the outdoor and soil concentration of pollutants, building materials, and the reactivity of pollutants within the residence. Three scientists at Lawrence Berkeley Laboratory state in a recent paper that the extent of indoor pollutant concentrations is largely determined by the pollutant sources and source emission rates rather than the extent of ventilation. D. T. Grimsrud, et al., "The Compatibility of Energy Efficiency and Indoor Air Quality in Residences," ACEEE 1986, p. 7.90.

(d) Although not normally considered a "pollutant," excessive moisture resulting from inadequate ventilation in energy efficient residences can lead to condensation and increased humidity. These in turn can lead to structural degradation and possible health problems resulting from growth in molds, mildew, and housedust mites.

airtightness, the possibility is more real. The issue is similar to the possibility of liability when a utility recommends that a homeowner install particular weatherization measures.

Those who have considered the question of whether a utility or other entity can potentially incur liability for energy efficiency recommendations that detrimentally affect IAQ have generally concluded that the answer is "yes,"^(a) and that the most likely theory for liability is negligence.^(b) Issues for inquiry relating to negligence would include the duty of a sponsor to exercise due care in its explicit or implicit recommendations, whether the adverse health impact was actually caused by a sponsor's recommendations, the foreseeability of adverse health consequences, and the overall reasonableness of the sponsor's actions.

HERS sponsors are likely under a duty to exercise care in their actions to assure that their information and recommendations to builders and owners are reasonable and prudent. Most sponsors will likely be held to a higher standard of care than ordinary persons because the sponsor will typically be perceived as an energy expert.^(c) However, a prospective plaintiff would have difficulty showing that an adverse health reaction was actually caused by a sponsor's recommendations or that the adverse reaction was foreseeable; many factors can contribute to adverse IAQ and health impacts and that there is still considerable scientific uncertainty on the health effects of long-term exposure to indoor pollutants.^(d) Finally, the reasonableness of a sponsor's actions in relation to the benefits of a HERS program (Section 2) and the possible health

(a) R. A. Haik and J. E. Hinderaker, "The Impact of Indoor Air Quality on the Gas Industry," Energy Law Journal, p. 420, Vol. 5, No. 2, 1984.

(b) 1. Statement of Eric R. Scott, Pacific Gas and Electric Co., in Proceedings: Indoor Air Quality Seminar--Implications for Electric Utility Conservation Programs, EPRI EA/EM-3824, p. 14-18, January 1985.

2. Letter from Walter Perry III, Assistant Attorney General of the State of Oregon, to Deanna Mueller-Crispin, Oregon Department of Energy, Salem, Oregon, DOJ File No. 330-010-GOD11-84, June 25, 1984.

(c) Perry, *ibid*.

(d) See for example Section 5 of Manual on Indoor Air Quality, EPRI EM-3469, February 1984.

risks will be relevant. The reasonableness of the sponsor's action may be based on the balance between the utility of the action and the magnitude of the risk.^(a)

To mitigate the possibility of a negligence finding, a HERS sponsor may want to seriously consider providing builders and homeowners with information on IAQ, its relationship to energy efficient housing, and possible health risks.^(b) BPA, for example, has prepared an unusually extensive 27-page brochure that is given to participants in its weatherization and energy efficient new home programs.^(c) BPA also provides for a notice to be placed on a home's electrical panel to inform future occupants that energy efficiency measures have been installed. The notice includes an address from which the occupant can request additional information on IAQ and its relationship to energy efficient housing. A builder's signature or a homeowner's waiver or release of any future claims based on a sponsor's negligence may not be successful in mitigating a sponsor's liability. Although such agreements are theoretically valid, they are not favored by courts and there are both judicial and statutory exceptions to the general rule of validity.^(d)

A HERS sponsor may also want to stay current on the results of IAQ research to be sure that its energy efficiency recommendations are consistent with current knowledge regarding associated health impacts.

The magnitude of potential damages for adverse health impacts if a HERS sponsor were to be found negligent in its recommendations are significantly larger than other areas of potential HERS-related damages such as the impact of

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- (a) Restatement (Second) of Torts, Sections 292,293, American Law Institute Publishers, St. Paul, Minnesota.
 - (b) Section 301 of the Restatement (Second) of Torts states that the exercise of care to give reasonably adequate warnings of risk can prevent an action from being negligent if the risk of the action results from the lack of warning.
 - (c) "Issue Background: Energy Efficient New Homes and Indoor Air Pollutants," DOE/BP-467, July 1985. See also, M. Piper, "Home Weatherization and Indoor Air Pollutants - The Bonneville Power Administration's Preferred Alternative: Informed Consumer Choice," ACEEE 1986, p. 7.201.
 - (d) J. A. Dooley, Modern Tort Law, Callaghan and Co., Wilmette, Illinois, Section 25.02, 1982.

a negligently performed rating on a home's sales price. A 1984 decision by the Washington State Supreme Court illustrates the magnitude of potential damages.^(a) The plaintiff in the case purchased a new HUD-Code manufactured home in 1977 and later experienced severe eye and throat irritation and asthma attacks. Her allergist testified at the trial that the asthma was caused by exposure to formaldehyde fumes in the home. The trial court award of \$566,500 in damages to the plaintiff was affirmed by the Washington Supreme Court.

The authors of a 1984 article found no judgments against utilities directly related to their energy conservation programs.^(b) As stated in Section 5.2.1, no cases were found for this report involving ratings and labels. The magnitude of potential liability if an adverse health effect can be linked to an energy efficiency or airtightness recommendation by a HERS sponsor suggests, though, that due care and appropriate mitigating steps should be exercised.^(c)

(a) Tideman v. Fleetwood Homes of Washington, 102 Wn2d 334, 684 P.2d 1302 (1984).

(b) Haik and Hinderaker, op. cit., p. 423.

(c) The Moorhead, Minnesota, Public Service Department has taken the mitigating step of not calling its program a rating or certification program. The municipal utility offers reduced electricity rates for qualifying new and existing homes. Qualifying homes must meet insulation and glazing criteria, have energy storage capability, and maintain 0.5-0.7 air changes per hour. Although the program closely resembles other certification programs, the utility does not formally "certify" qualifying homes or provide any type of award or medallion. Whether this approach would protect the utility from a liability claim is not known.

6.0 HAVE HERS PROGRAMS SAVED ENERGY?

The principal objective of HERS programs is to achieve energy conservation by helping incorporate energy efficiency into the market value of housing units. The conservation should ideally supply the energy resource at less cost than a new generating resource. In some cases, e.g., reduction of energy imports for national security reasons, conservation can still be valuable even if the cost exceeds the cost of new generation. A secondary objective of the programs is to provide energy efficiency information to housing consumers to better enable them to evaluate and purchase the level of housing energy efficiency they desire. Fulfillment of this objective, however, is not likely to be sufficient to justify HERS program costs.

Whether existing HERS programs are saving energy and whether the savings justify program expenditures on a national basis are questions that need to be addressed when evaluating the effectiveness of HERS programs. At the present time, there is not sufficient information to conclusively answer either question. Sufficient information to answer the questions for certain individual programs that have been operating several years is perhaps available; although, few analyses have been performed in part because of difficulties discussed below. Overall, however, it does seem reasonably clear that HERS programs are contributing to more energy efficient housing and to corresponding energy savings.

The principal difficulty in measuring the energy savings attributable to a HERS program is estimating the level of energy efficiency that would have occurred without the program. This determination is difficult because many factors^(a) influence the installation of energy efficiency measures including:

- other government and utility information and incentive conservation programs
- changes in building energy codes

(a) Further discussion of certain of these factors is in E. J. Soderstrom, et al., Oak Ridge National Laboratory, Evaluation of Conservation Programs: A Primer, ONRL/CON-76, July 1981.

- fuel price and interest rate changes and expectations
- family structure and lifestyle changes
- weather
- incentives such as the potential surcharge^(a) on power purchased from BPA for use in areas where the model conservation standards issued by the Northwest Power Planning Council are not being implemented.

In addition, HERS programs can potentially contribute to residential energy savings in a variety of ways that are difficult to track (see Section 2.1).

HERS sponsors that have attempted to estimate energy savings attributable to their program have typically compared estimated energy consumption in a certified or rated home to consumption in baseline homes or homes built to minimum building energy code requirements.^(b) The underlying but unproven assumption is that the rated home would have the same energy efficiency as the baseline home except for the existence of the HERS program. Consumption in the rated home is generally estimated with a simulation model, although some sponsors (e.g., Alabama Power Co. and Central Power & Light) have collected metered consumption data.

Energy efficient housing provides no guarantee that projected energy savings will occur. Occupants of energy efficient homes, for example, have an incentive to increase their comfort level because the marginal cost of heating or cooling to their desired level is lower than in inefficient homes. Two studies involving HERS illustrate the incentive to use greater energy efficiency for improved comfort. Neither study, however, appeared to account for any of the above factors that can also affect energy consumption. McClelland found that occupants of apartment units certified as Good Cents units by

(a) See the discussion of the BPA program in Section A.2.1. The surcharge issue is discussed at 51 Federal Register 23118, June 25, 1986.

(b) An example of this approach is in Conservation Power Plant Plan, Vol. II, p. 135, April 1985, prepared by the Resource Management Department and Electric Utility Department, City of Austin, Texas.

Georgia Power Co. used as much energy as other comparable units.^(a) In another study, the energy consumption of 68 homeowners/tenants who received a free energy efficiency rating and audit in Visalia, California, was monitored. Forty-two percent of this group made at least one energy efficiency improvement subsequent to the rating/audit. Nevertheless, for the 68 occupants as a whole the rating/audit had no impact on energy consumption.^(b)

In spite of the preceding examples of occupants using increased energy efficiency for greater comfort rather than energy savings, improved energy efficiency, on average, has been shown to yield energy savings. Using empirical data from 4081 households, Adams and Rockwood estimated that electricity consumption in electrically heated homes in the U.S. would decrease 7.2 to 13.6% if building shell thermal efficiency increased 20%.^(c) LBL scientists have examined measured energy consumption data following conservation retrofits. Over 115 retrofit projects with individual projects covering up to 33,000 homes are included in its data base. The LBL researchers have found that retrofits typically reduce heating energy use 20 to 30%. In approximately 75% of the projects the cost of conserving each unit of energy is less than current heating fuel or electricity costs.^(d)

Overall then, it seems almost certain that HERS programs are achieving energy savings. Few attempts have been made to quantify savings directly attributable to individual programs. Making such an estimate is difficult, but likely can be achieved within reasonable uncertainty bounds. Incorporating data on historical trends in building energy efficiency and on actual energy efficiency construction and retrofit experience in areas geographically close to the boundaries of the HERS program is a possible way to estimate effects attributable to the HERS program alone. In the future, state public utility

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- (a) Lou McClelland, Tenant Paid Energy Costs in Multifamily Rental Housing: Effects on Energy Use, Owner Investment, and the Market Value of Energy. DOE/CS-20050-1, P. E-10, December 1983.
 - (b) Metzler, p. 25.
 - (c) R. C. Adams, A. D. Rockwood, Impact of Improved Building Thermal Efficiency on Residential Energy Demand, PNL-3733, April 1983.
 - (d) C. A. Goldman, "Measured Energy Savings from Residential Retrofits: Updated Results from the BECA-B Project," Energy and Buildings, p. 137, May 1985.

commissions are likely to require more specific information on the cost effectiveness and equity of individual conservation programs such as HERS programs^(a). Such information can be used to determine the need for additional generating resources and the least cost approach to providing needed resources, to decide whether the expenses of proposed conservation programs should be included as a cost of service expense or perhaps capitalized, and also to potentially adjust a utility's authorized rate of return on invested capital.

(a) The Public Utility Commission of Texas, for example, requires that investor-owned electric utilities file an energy efficiency plan that includes reasons for selection of particular conservation programs and sufficient supporting documentation and data to enable evaluation of their programs. See Treadway and also the California requirements referred to in Section 2.5.

APPENDIX A

SUMMARY OF EXISTING HOME ENERGY RATING PROGRAMS

APPENDIX A

SUMMARY OF EXISTING HOME ENERGY RATING PROGRAMS

This Appendix contains summaries of existing home energy rating programs. A reasonably comprehensive search was conducted to locate existing programs as of 1986, but there are undoubtedly programs that did not come to the author's attention.^(a) The reader should also be aware that rating programs are still changing fairly quickly. Judging by past experience, some of the programs included in the Appendix will likely be terminated over the next few years, to be replaced in some cases by revised programs.

The descriptions of individual HERS programs focus on the programs' operational aspects. Some information is included on energy efficiency features considered in the rating process or required for certification, but this information is included to illustrate the scope of the rating program and is not intended to be complete. The reader desiring specific, current information on the technical aspects or requirements of a particular program should contact the individual or department listed as a "contact" at the end of each program description.

The rating programs are divided into two overall categories: graduated rating scale programs and certification programs. The latter category is further divided into programs affiliated with the Good Cents Program marketed by Southern Electric International and other certification programs.

A.1 GRADUATED RATING SCALE PROGRAMS

The first section of the Appendix summarizes existing HERS programs that offer ratings on a graduated scale. There are far fewer of these programs than certification, i.e., pass-fail, programs. Possible reasons for the fewer number of graduated scale programs include greater technical and administrative

(a) Edward Vine and colleagues at the Lawrence Berkeley Laboratory have recently conducted a national telephone survey relating to HERS. A report summarizing their results will likely be published in early 1987.

difficulty and increased liability concerns. Nevertheless, the relatively few existing programs cover a broad cross section of rating sponsors, geographic locations, and operational aspects.

AUSTIN RESOURCE MANAGEMENT DEPARTMENT
ENERGY STAR RATING PROGRAM

The Energy Star program is a graduated rating program operated by the City of Austin, Texas. The program currently applies to newly constructed detached homes served by the city's Electric Utility Department. The Department plans future application to attached, multifamily, and existing homes.

Under the program, a new home is assigned rating points corresponding to its energy efficiency features. A home receiving 100-249 points receives a "one star" rating. Homes with 250-399 points receive a "two star" rating, and homes over 400 points receive a "three star" rating. Features that are considered in awarding points are:

- window orientation, shading, and layers of glazing
- presence of skylights
- extent of air infiltration
- extent of wall and ceiling insulation and reflectivity
- extent of floor insulation
- whether home has two stories
- extent of duct insulation
- efficiency of water and space heating/cooling equipment.

One point in the rating process approximates one Btu/sq ft/yr in energy savings. There are no minimum requirements for any energy efficiency feature. Electric space conditioning is not required for participation in the program.

The program was implemented in July 1985. The Department projects that program costs between 1986 and 1989 will be approximately \$1.18 million, that during this period 29,596,000 kWh of electrical savings attributable to the program will occur, and that approximately 19,000 homes will be rated.

In an interesting application of the program, Austin has agreed to provide water and sewer service to new municipal utility districts outside the city's boundary on the condition that all new homes be built to a level of 300 or more points.

- Additional Information:
1. "Austin Energy Star Letter."
 2. "Austin Energy Star," brochure.
 3. "Energy Rating Worksheet."
 4. "Marketing Brochure,"
"Homebuyer Brochure."
 5. Austin Resource Management and Electric Utility
Departments, Conservation Power Plant Plan, April
1985, (updated annually).
 6. Builders Handbook.
 7. Rebecca Vories, Infinite Energy, Denver, Colorado,
Market Penetration Projections, February 1985;
Market Study and Evaluation Design, December 1984.
 8. Infinite Energy, "Marketing the Austin Energy Star
Program: Using Private Sector Techniques to
Market a Public Sector Program," ACEEE 1986,
p. 5.167.

Contact: Doug Seiter
Resource Management Department
City of Austin
P.O. Box 1088
Austin, TX 78767-8818
512-441-9240

Rebecca Vories
Infinite Energy
P.O. Box 17945
Denver, CO 80217
303-296-1532

CALIFORNIA ENERGY COMMISSION
HERS PILOT PROGRAMS

The California Energy Commission has partially funded two pilot HERS programs in Pasadena and Roseville, California. Implementation began in 1985 and will continue into 1987. The programs were funded to study the extent to which a HERS enhances the energy efficiency of existing housing and benefits home buyers and sellers, real estate agents, and lenders. The results of the pilot programs will be evaluated by the Lawrence Berkeley Laboratory (LBL). The Commission will decide whether to expand the program to the entire state.

Homes in the pilot program are being rated on a scale of 1 (least efficient) to 6 (most efficient) using an energy efficiency slide rule developed by LBL. Separate slide rules were prepared to reflect the climates of Pasadena and Roseville. The slide rules take into account one- and two-story homes; insulation levels; level of infiltration; the area, orientation, and number of windows; the impact of thermal mass; and HVAC and hot water heating efficiency.

Ratings in Pasadena are being performed by city building inspectors. Ratings in Roseville are being performed by employees of the Roseville Electric Department. A third pilot program was originally planned for Marin County where ratings were to be performed by real estate agents. The program was canceled, largely because of liability concerns of the local real estate brokers and agents. A court case^(a) holding that California real estate brokers have a duty to inspect for and disclose to prospective buyers matters materially affecting the value of residential property they have listed contributed to this concern.

(a) Easton v. Strassburger, 152 Cal. App.3d 90, 199 Cal. Rptr. 383 (1984).

- Additional Information:
1. California Energy Commission, "Home Rating and Labeling Pilot Demonstration for California: A Report to the Legislature," June 1985.
 2. "Pasadena Pioneers Energy Program," Western City, March 1985, p. 17.
 3. R. Ritschard, et al., LBL, "Energy Calculation Slide Rules for Single Family Houses," Passive and Low Energy EcoTechniques, Pergamon Press, CONF-840866, p. 1016, 1984, also published in ACEEE 1984, p. B-259.

Contact: Bob Eller
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1516 Ninth Street
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Berkeley, CA 94720
415-486-6047

CONN SAVE HOME ENERGY RATING

CONN SAVE is a nonprofit corporation formed in 1980 by utilities serving Connecticut to provide home and apartment energy audits, conservation services, and energy efficiency education. The sponsoring utilities are Connecticut Light and Power, Connecticut Natural Gas Corp., the City of Groton Department of Utilities, Southern Connecticut Gas Co., and the United Illuminating Co. As of August 1985, CONN SAVE had performed 161,000 energy audits under the Residential Conservation Service (RCS) Program administered by DOE (10 CFR 456).

Beginning in 1985, CONN SAVE added a home energy rating to the report prepared for the owner of each existing single family home that receives an RCS energy audit. The rating is based on points, with most homes falling between 1 and 100 points. The homeowner receives four rating scores: 1) the rating his home would have with no energy conservation measures, 2) the actual rating, 3) what the rating could be raised to after installation of low-cost energy conservation measures, and 4) the potential rating if all energy conservation measures recommended by the energy audit are installed. In addition to the point total, the homeowner also receives an estimate of annual energy cost for each of the four cases. The estimated costs are based on standardized assumptions about lifestyle and fuel costs.

The software used by CONN SAVE to conduct RCS audits and perform energy ratings was developed and is maintained by the Cornerstones Energy Group.

CONN SAVE and the Alliance to Save Energy are participating in a demonstration program in 1986 to encourage home buyers to retrofit energy efficient features in homes they are purchasing.^(a) The retrofit is to be done at the time of purchase with the cost added to the buyer's mortgage loan. The Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation have agreed to purchase such loans from primary home lenders. The demonstration is being conducted in Hartford, Connecticut.

(a) Public Utilities Fortnightly, p. 35, November 28, 1985.

- Additional Information:
1. Sample CONN SAVE Home Energy Audit Report.
 2. Arthur Weir, "Energy Conservation Education Becomes Conservation Reality," Proceedings of the Second Great PG&E Energy Expo - 1985, Vol. II, p. 289, May 1985.
 3. Robin Miller, "The Energy Efficient Mortgage: New Lending Policies to Boost Bank Acceptance," ACEEE 1986, p. 4.109.

<u>Contacts:</u>	Arthur J. Weir Executive Director CONN SAVE P.O. Box 9207 Wethersfield, CT 06109 203-563-3337	Steven M. Brown Cornerstones Energy Group 54 Cumberland St. Brunswick, ME 04011 207-729-6701	Robin Miller Alliance to Save Energy 1925 K St., N.W. Suite 206 Washington, D.C. 20006 202-857-0666
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DENVER ENERGY RESOURCE CENTER
HOME HEATING PERFORMANCE RATING

The Denver Energy Resource Center offers a graduated energy efficiency rating for existing single and multifamily homes in the metropolitan Denver area. The rating is modeled after the similar Home Heating Index developed at Iowa State University. The Center, a branch of the Colorado Energy Extension Service, developed the rating procedure with funding from the Colorado Office of Energy Conservation.

The Home Heating Performance Rating has units of Btu/degree days/sq ft of conditioned space. This unit is a measure of the total heating energy input needed by a home during the middle of the local heating season (December-February). Information on total Btu equivalent of all heating fuels, heating degree days for the same period as the fuel consumption data, area of heated floor space, and ambient indoor air temperature are needed to calculate the rating. A rating of 7 or lower is regarded as an energy efficient home.

The information required for the rating is collected by the homeowner and mailed to the Center. The homeowner can also authorize the Center to obtain fuel consumption records from the appropriate utility. The computed energy rating is mailed back to the homeowner. Representatives of the Energy Center do not inspect the homes.

Contact: Mar-E Robnett
Denver Energy Resource Center
1662-A Lafayette St.
Denver, CO 80218
303-863-0909

HOME BUILDERS ASSOCIATION OF GREATER KANSAS CITY
SAVE HOME PROGRAM

The SAVE Home Program is a voluntary rating program for new single family homes developed by the Home Builders Association of Greater Kansas City with assistance from Kansas City Power and Light Co. The program is based on a point system, with more points awarded to more energy efficient homes. The three awards that can be achieved with associated minimum point levels are bronze level (175 points), silver level (325 points), and gold level (500 points).

Points are awarded in a number of categories including insulation, windows, doors, HVAC equipment efficiency, water heating efficiency, lighting and appliance efficiency, the efficiency of auxiliary heat sources, home design and orientation, landscaping, extent of earth contact, extent of passive heating and cooling, and infiltration reduction measures.

Certification is performed exclusively by the builder. No third party inspections other than normal building code inspections are performed. Participating builders place a permanent plaque at the entrance of each home indicating one of the three award levels. The homeowner is also furnished a written copy of the home's energy efficiency features and the points earned. The Home Builders Association maintains a permanent record of all SAVE homes.

The SAVE Program and qualifying SAVE homes were prominently displayed in the Home Builders "Home Plan and Guide Book" issued in conjunction with their 38th Annual Fall Parade of Homes in 1985.

Additional Information: 1. "Save Energy, Save Money, With a SAVE Home," brochure.
2. Point Scoring Sheets.

Contact: Home Builders Association of Greater Kansas City
600 E. 103rd St.
Kansas City, MO 64131
816-942-8800

IOWA STATE UNIVERSITY ENERGY EXTENSION SERVICE
HOME HEATING INDEX

The Home Heating Index (HHI) was developed by the Iowa State University Energy Extension Service in 1981. The HHI has units of Btu/°F-day-sq ft. The total amount of heat energy supplied to a home to maintain an interior temperature of 65°F between December and February is determined. This figure is divided by the heating degree days for the period and the interior area of the home to give the HHI.

The HHI can vary from about 2 to 20. The lower the number the more efficient the home. New homes in Iowa typically have an average HHI of about 6 and existing homes an average of about 8. An HHI can be estimated for a new home using construction plans and a heat load calculation model.

The Energy Extension Service and Cooperative Extension Service have forms available that will enable a homeowner to calculate the HHI. Alternatively, the homeowner can complete a questionnaire and have the Energy Extension Service compute it.

In 1985, the Iowa legislature enacted a bill^(a) directing the State Building Code Commissioner to adopt an energy efficiency code for new single and two family homes based on the HHI. The minimum acceptable standard for new construction is to be the average HHI of existing homes as determined by the Iowa Energy Policy Council. The Commissioner is currently working to translate the HHI performance requirement into prescriptive features for use by builders and building inspectors.

The Energy Extension Service in North Dakota also has a brochure available that instructs homeowners how to calculate their HHI.

Additional Information: 1. Laurent Hodges, Iowa State University Physics Department, "Rating the Heating Energy Efficiency of Homes and Small Buildings," ACEEE 1984, p. B-122.

(a) House File 341, to be codified in the Iowa Code, Chapter 103A.

2. Laurent Hodges et al., "The Home Heating Index," Progress in Passive Solar Energy Systems, p. 128, American Solar Energy Society, Inc., New York, NY, 1982.
3. "The Home Heating Index: How Efficient is Your Home?" Iowa Energy Extension Service Publication EES-38.
4. L. Hodges, et al., "The Use of an Energy Rating System in the Solar Bank Program and the State Building Code: The Iowa Experience," Solar 85 Conference Proceedings, American Solar Energy Society, CONF-851030, p. 413, 1985.
5. Harvey J. Hirning, Cooperative Extension Service, North Dakota State University, Fargo, ND, "The Home Heating Energy Index," Publication EES-1 Revised, November 1985.

Contact: Energy Extension Service
Iowa State University
Haber Road
Ames, Iowa 50011
515-294-8815

MINISTRY OF URBAN PLANNING AND HOUSING (FRANCE)
HIGH ENERGY PERFORMANCE LABEL

The Ministry of Urban Planning and Housing in France introduced the High Energy Performance Label program in 1984. The program applies to new single and multifamily homes. Labels are awarded in four categories. A home with energy savings 15% lower than estimated consumption at minimum code requirements receives a 1 star label. New homes with savings of 25%, 35% and 45% receive 2, 3, and 4 stars, respectively. In 1984, nearly 15% of new residential housing units in France received a high energy performance label.

Prospective high energy performance homes are certified by private entities under an agreement with the Ministry. As of 1984, two utilities and one independent organization were certifying homes and issuing the appropriate label.

The certification process is relatively complex compared with typical procedures used in the U.S. The certification authority initially examines the building plans. If it appears that the building will qualify, a temporary label is issued. Next the authority inspects the building to verify installation of energy conserving features. The final label is not issued until proper operation of the space and water heating systems has been demonstrated, typically one year after construction is completed. For multifamily buildings, only one category of label is issued; the least energy efficient unit in the building must meet the performance requirement for the particular label category.

Purchasers of homes receiving a high energy performance label are eligible for an interest rate subsidy provided by the French government.

Additional Information: 1. Emmanuel Auneau, "High Energy Performance Label in the Context of French Energy Policy for New Buildings," ACEEE 1984, p. B-6.

Contact: Emmanuel Auneau
Directorate of Construction
Energy and Building Mission
Ministry of Urban Planning and Housing
2, avenue du Parc de Passy
75016 Paris
France

STATE OF FLORIDA
FLORIDA ENERGY EFFICIENCY CODE
FIVE STAR HOME AWARD PROGRAM

The State of Florida has two graduated home energy rating programs. The Florida Energy Efficiency Code applies to all new residential and nonresidential construction. The Five Star Program applies to existing homes, and many utilities also apply it to new homes.

The Florida Energy Efficiency Code became effective in October 1980 and has subsequently been amended several times. The 1986 Code became effective April 1, 1986. New construction can generally comply with the code through a point system, a systems analysis method, a prescriptive compliance method, or a component performance approach. Under the point system, a higher point total correlates with lower energy efficiency. The maximum number of points for code compliance is 100. Local building inspectors verify compliance with the code requirements. Unlike most building codes, the Florida Code requires that an energy performance index (EPI) display card be placed on the building permit by the local building inspector and that the card be prominently displayed on the completed building until time of sale.^(a) Thus, the prospective new home buyer can know not only that a home meets the minimum Energy Efficiency Code requirements, but also the extent to which the home is more efficient than minimum requirements.

The Five Star Home Award Program is designed to indicate the relative energy efficiency of residential buildings. Effective June 1, 1984, all electric utilities (publicly and investor-owned) in the state are required by the Florida Public Service Commission to offer the program to their residential customers who are eligible for an energy conservation audit.^(b) A "Five Star" home is a home with all applicable energy conservation measures installed. Specifically, a home with 0-20 points receives a five star award, 21-40 points

(a) Florida Statutes, section 553.9085.

(b) Florida Administrative Code, section 25-17.555. Fifty-five electric utilities serve Florida customers. Of these, 6 are IOUs, 33 are municipal systems, and 16 are rural electric cooperatives. Electrical World Directory of Electric Utilities, McGraw-Hill, 1985-1986 edition.

a four star, 11-60 points a three star, 61-80 points a two star, 81-100 points a one star, and homes with 101 or more points receive zero stars. Utilities compute points using worksheets tailored for their local climate. Owners of four or five star homes receive an award certificate. Other owners receive a list of measures that can be installed to achieve a four or five star rating.

Some Florida utilities have voluntarily made the Five Star program available for new homes. Jacksonville Electric Authority (JEA), for example, awards five stars to new homes with an EPI of 50 or lower, four stars to homes with an EPI of 51-75 and three stars to homes with an EPI of 76-100. JEA inspects each new home twice before issuing the award. JEA also maintains a written registry of all certified Five Star homes in its service area and a library of associated floor plans and elevations submitted by builders. The registry and library are available to all JEA customers.

Additional Information

1. "What Builders Should Know About the Florida Energy Efficiency Code," brochure available from the Department of Community Affairs.
2. "Applying for a Residential Star Rating: Builders," "Does Your Home Have Star Quality," brochures available from the Jacksonville Electric Authority.

Contacts: Jack Hawsom, Codes Director
Energy Code Program
Florida Department of Community Affairs
2571 Executive Center Circle, East
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WESTERN RESOURCES INSTITUTE
SHELTER INDUSTRY ENERGY RATED HOMES

The Energy Rated Homes (ERH) Program is administered by the Western Resources Institute (WRI), a nonprofit corporation based in Seattle. The program provides an energy rating for existing and new single family, site-built homes. Ratings range from one to five stars, with five star ratings awarded to the most energy efficient homes. Planning work for the program began in 1981. Much of the early financial support came from the BPA. Home ratings were initially performed on a trial basis in 1983. A major test of the program was begun in October 1985. The program currently operates in the Puget Sound area, especially metropolitan Seattle. Over 2,000 homes have been rated.^(a) WRI hopes to expand the program nationally.^(b) There are specific plans to implement it in Alaska, Arkansas, and Vermont.^(c)

Under the ERH Program, homes are rated from 0-100 points (more points correlate with greater energy efficiency). The rater uses a form that corresponds to the basic home design (e.g., single story, two story, split level). Points are awarded in a variety of categories including air infiltration, insulation levels, extent of glazing, passive solar potential, and space and water heating efficiency. WRI used the BPA's Standard Heat Loss Methodology as the basis for allocating points. The rater also estimates energy cost. Normally only the star rating is presented to the homeowner in the form of a certificate. The point total and estimated energy cost information are retained by the rater.

Although the ERH Program has been designed to be used by all shelter industry groups, special emphasis was given from the outset to integration with the residential lending community. The major marketing thrust of the program has been to emphasize the ability of buyers of highly rated homes to qualify for additional financing beyond that for which their monthly income alone would normally qualify them (see Section 2.2). Ratings are primarily performed by

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- (a) H. O. Pollakowski, K. Baker, The Effect of the Shelter Industry Energy Rated Homes System on Homeownership, p. 2, May 1986.
 - (b) The Seattle Times/Seattle Post-Intelligencer, p. C5, October 20, 1985.
 - (c) Forbes, p. 12, October 27, 1986.

appraisers as part of the appraisal process in a loan application. The incremental fee for preparation of the rating by an appraiser is approximately \$35-\$50. This fee is normally paid by the home buyer. Representatives of several residential lenders have served in an advisory capacity in the development of the program.

Lenders, builders, and real estate brokers must join the ERH membership system before to using the rating program. Specific marketing materials have been prepared by WRI for each of these groups.

WRI will also perform ratings for homeowners who desire to have a rating prior to selling their home. WRI's fee of \$85 also includes a list of the most cost-effective energy efficiency improvements for the home.

- Additional Information:
1. Consumer Energy Council of America, Washington, D.C., Home Energy Rating Systems: Purposes, Operations, Barriers and Future Research Needs, p. 70, January 1985.
 2. Annette Frahm, WRI, "Developing Energy Efficiency Guidelines for Residential Underwriting: The Shelter Industry Program," ACEEE 1984, p. B-61.
 3. Beverly Hoskin, Federal Home Loan Bank of Seattle, "FHLB of Seattle Supports Shelter Industry Program," Bank Notes, p. 6, Autumn 1984.
 4. J. Hubert and J. Luboff, "The Washington Program: A Shelter Industry Residential Energy Evaluation Program," ACEEE 1982.
 5. Jay Luboff and Ron Hughes, "The Energy Rated Homes System: A Grassroots Approach to a National Uniform Energy Rating System," Proceedings of the Eleventh National Passive Solar Conference, American Solar Energy Society, p. 528, June 1986.
 6. M. L. Moss and Co., Bainbridge Island, Washington, Residential Energy Efficiency Program: Consumer Focus Group Research, prepared for the Federal Home Loan Bank of Seattle, Pacific First Federal Savings Bank, and WRI, August 1984.
 7. Henry O. Pollakowski, Kermit Baker, Joint Center for Housing Studies of the Massachusetts

Institute of Technology and Harvard University,
The Effect of the Shelter Industry Energy Rated
Homes System on Homeownership, prepared for the
Federal Home Loan Bank of Seattle, May 1986.

8. John Teutsch and James Faulstich, "The Energy
Factor in the Market Equation," Mortgage Banking,
p. 25, May 1985.
9. Washington State Energy Office, Residential
Energy Evaluation Program, WAOENG 84-09,
March 1984. This report contains an evaluation
of the ERH Program including a needs assessment,
a technical evaluation performed by two BPA staff
members, and market research information.

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501-371-1370

A.2 CERTIFICATION PROGRAMS

This portion of the Appendix includes information on programs that provide a pass-fail rating. If a home meets a predetermined level of energy efficiency, the owner generally receives a certificate attesting to the fact that the home meets or "passes" the energy standard. The programs are divided into two sections. Section A.2.1 contains information on programs affiliated with the Good Cents Program. Section A.2.2 contains information on other certification programs.

A.2.1 Good Cents Programs

The Good Cents Home Program is a national marketing program for certifying energy efficient homes. The program was first implemented in 1976 at the Gulf Power Co., an investor-owned utility serving northwest Florida that is part of the Southern Electric System. The program was subsequently implemented by the other three members of the System--Alabama Power Co., Georgia Power Co., and Mississippi Power Co. The program is marketed nationally by Southern Electric International (SEI), a subsidiary of the Southern Electric System.

As of spring 1986, there were 24 utilities (Table A.1) offering the Good Cents Program to their customers under an agreement with SEI. In addition to these 24 utilities, BPA administers the "Super Good Cents" program for approximately 68 of its utility customers in the Northwest. The customers are publicly owned electric utilities that purchase wholesale electric power from BPA.

The Good Cents Program is principally directed at newly constructed, site-built, single family homes. Some participating utilities have also applied it to newly constructed multifamily buildings (e.g., Georgia Power), existing single family homes (e.g., Public Service Co. of Oklahoma), and new HUD-Code manufactured homes (e.g., Portland General Electric). SEI also markets a separate Good Cents Program for commercial buildings.

Good Cents certification requires that a housing unit meet an energy efficiency performance standard established by the participating utility. In conjunction with SEI, virtually all of the utilities have established suggested prescriptive features for their service area that will qualify a home for

TABLE A.1. Utilities Operating the Good Cents Program

Central Maine Power Co.
Central Power and Light Co.
Duncan Power and Light (Oklahoma)
Flint Electric Membership Corp. (Georgia)
Florida Public Utilities Co.
General Public Utilities Corp.
 Jersey Central Power and Light Co.
 Metropolitan Edison Co.
 Pennsylvania Electric Co.
Gulf States Utilities Co.
Idaho Power Co.
Northern States Power Co.
Lee County Electric Cooperative
Orange and Rockland Utilities, Inc. (New York)
Pacific Power
Portland General Electric Co.
Public Service Co. of Oklahoma
Savannah Electric and Power Co.
The Southern Co.
 Alabama Power Co.
 Georgia Power Co.
 Gulf Power Co.
 Mississippi Power Co.
Wisconsin Electric Power Co.
Wisconsin Power and Light Co.
Wisconsin Public Service Corp.

certification. SEI does not require a minimum performance standard or the presence of particular energy efficiency features for participation in the program.

Utilities that purchase the right to market the Good Cents Program within their service area can obtain a variety of resources from SEI. The core

materials available to each participating utility include: 1) a construction handbook identifying features necessary to meet the performance standard, 2) a marketing and program implementation guide, 3) a graphics manual and advertising guide. In addition, participating utilities obtain the right to use the Good Cents logo. Optional resources that can be purchased include: 1) a handbook for utility employees, 2) a home buyers guide, 3) a media package, 4) Good Cents certificates, 5) a builders guide, and 6) computer software (the "Residential Building Energy Program") for performing load calculations, simulations, and economic analyses.

A variety of Good Cents promotional items such as clothing, umbrellas, hats, etc., are also available through SEI. The Good Cents programs of 11 of the participating utilities are described in Section A.2.1.

Additional Information: 1. "Good News," periodic newsletter.
2. "Good Cents Is What America Needs," brochure.

Contact: Calvin W. Wilson II
Senior National Marketing Representative
Southern Electric International, Inc.
75 N. Pace Blvd.
P.O. Box 1151
Pensacola, Florida 32520-1151
904-434-8781

ALABAMA POWER CO.

Alabama Power is one of the four utilities in the Southern Electric System that operate the Good Cents Program. A newly constructed home in the Alabama Power service area can be certified as a Good Cents home by meeting either a performance or a prescriptive standard. As of September 1985, Alabama Power had certified approximately 6400 Good Cents Homes.

Under the performance standard, the maximum cooling load of the residence cannot exceed 14 Btu/hr/sq ft. In addition, each cooling unit must have a minimum SEER of 7.5, and a maximum installed cooling system of 12 Btu/hr/sq ft plus 6000 Btu/hr/cooling zone. The maximum installed cooling system may be increased for units with a SEER greater than 7.5.

The prescriptive approach to Good Cents certification is available for homes with less than 1200 sq ft of conditioned space. These homes can qualify by incorporating six of the ten features listed below:

- heat pump certified by Alabama Power
- R-19 floor insulation
- R-16 wall
- R-30 attic
- vapor seal lining ceiling, floors, and walls
- double pane glass
- insulated doors
- exhaust system in kitchen and bathroom, damper in fireplace
- energy efficient water heating system, centrally located super-insulated water heater and shower control regulator (2 out of 3 required)
- ducts located in conditioned area.

Alabama Power provides builder incentives of up to \$360 per single family home, \$80 per multifamily home with a heat pump, and \$40 per multifamily home with electric resistance heat.

- Additional Information:
1. "Homes That Are Worth More," brochure, 1984.
 2. W. D. Johnson and C. F. Will, Alabama Power Co. Technical Services Section, Metered Good Cents Homes, May 1981.
 3. Blevins, Table 3-9.

Contact: John Hollingsworth
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Alabama Power Co.
P.O. Box 2641
Birmingham, AL 35291
205-250-4398

BONNEVILLE POWER ADMINISTRATION

The Bonneville Power Administration (BPA) is a component of the U.S. Department of Energy. It was established to market power from federal hydro-electric projects in the Northwest. BPA markets wholesale electric power to approximately 120 publicly owned utilities and 9 investor-owned utilities. It directly serves 6 federal agencies and approximately 17 industrial customers.^(a) In 1985 it also sold power to 15 customers outside of the Northwest region. In recent years, BPA has assumed a variety of energy conservation functions under the provisions of the Pacific Northwest Electric Power Planning Act of 1980.^(b)

BPA initiated the "Super Good Cents" Program in fall 1984. As of October 1986 the program was being implemented by 75 publicly owned utilities in the Northwest^(c) that purchase power from BPA. Site-built single and multifamily homes with electric space conditioning are eligible for the program.^(d) To be eligible for certification, a new home must be constructed to meet the energy efficiency levels in the Model Conservation Standards^(e) (MCS) prepared by the Northwest Power Planning Council, and must also meet one of four BPA ventilation options. These standards generally require a considerably higher level of thermal performance than existing building energy codes in the region. BPA adopted the term "Super Good Cents" to distinguish its program from Good Cents Programs being operated by three investor-owned utilities in the region--Idaho Power, Pacific Power, and Portland General Electric. The thermal performance standards for these Good Cents Programs are lower than the MCS/Super Good Cents performance standards.

(a) BPA, 1985 Annual Report.

(b) 16 U.S.C. 839.

(c) Idaho, Oregon, Washington, and western Montana.

(d) BPA and the Snohomish County Public Utility District are also working jointly on a demonstration project of 34 HUD-Code manufactured homes built to the Super Good Cents performance standard. The homes are located on the Tulalip Indian Reservation near Everett, Washington.

(e) Northwest Power Planning Council, Portland, Oregon, 1986 Northwest Conservation and Electric Power Plan, Vol. 1, Appendix I-B. 51 Federal Register 7364, March 3, 1986.

BPA provides extensive assistance to its participating utility customers for Super Good Cents promotion. The extent of the assistance available to individual utilities varies somewhat depending on the utility's percentage of load served by power purchased from BPA. The assistance includes:

- Regionwide advertising emphasizing television that is paid for by BPA.
- Cooperative advertising campaigns whereby BPA reimburses participating utilities for 50% or more of Super Good Cents advertising.
- A financial incentive of \$2,000 in 1986, \$1,500 in 1987, and \$1,000 in 1988 for construction of qualifying single family homes. Qualifying multifamily buildings receive these amounts for the first unit in a building and \$750/unit for each additional unit. This payment is reduced to \$600/unit in 1987 and \$400/unit in 1988. The incentive is payable to the builder or the purchaser at the option of the participating utility. The amount of the incentives are currently being reviewed by BPA.
- Reimbursement of up to \$10,000 plus \$100 for each certified home for utility marketing efforts with builders, lenders, real estate agents and others in the shelter industry.
- Preparation of brochures and a scale model of a Super Good Cents home.
- Preparation of slide shows for general and builder audiences.
- Distribution of a portable computer and software to analyze the thermal characteristics of house plans.
- Funding state energy offices in Idaho, Montana, Oregon, and Washington to offer technical assistance on Super Good Cents qualification.

Several of BPA's utility customers are implementing the Super Good Cents Program in innovative ways. In Ashland, Oregon, builders can receive a 20% increase in allowable home density by agreeing to construct only Super Good

Cents homes in a subdivision.^(a) The Eugene (Oregon) Water and Electric Board is publishing its own newsletter ("Building Cents-ibly") that includes technical and marketing information for builders. In 1986, the Board is making up to 15 \$1,000 awards for innovative home designs that meet the Super Good Cents performance standard. The winning designs will be assembled into a book that will be provided to prospective new home buyers at no charge. The Board will reimburse home buyers for 50% of the cost of purchasing construction plans for winning designs. The Board is also paying builders to delay the closing and occupancy of two Super Good Cents homes so that the homes will be available for public viewing. The Emerald Public Utility District (PUD) reached an agreement with the Lane County Commissioners (Oregon) for county building inspectors to inspect prospective Super Good Cents homes for compliance with the program requirements.^(b) Emerald will rely on this inspection in awarding Super Good Cents certificates. The Columbia River PUD (Oregon) pays the first \$1,000 of line extension costs to Super Good Cents homes.^(c) This cost would otherwise be paid by the builder or homeowner.

Since BPA is a federal agency, the publicly available information on the Super Good Cents program is unusually extensive.

- Additional Information:
1. "Home Buyer's Guide," DOE/BP-17009-1, May 1985.
 2. "Super Good Cents Bulletin," a periodic newsletter prepared by BPA.
 3. "Issue Alert--BPA Launches Super Good Cents," DDE/BP-325, October 1984.
 4. Market Decisions Corp., Portland, Oregon, Super Good Cents Home Program Consumer Attitude and Awareness Study, November 1985.
 5. Technical Reference Manual, January 1985.
 6. "Record of Decision--The 1986 Super Good Cents Program," February 26, 1986.

(a) BPA Office of Conservation, "Super Good Cents Bulletin," August 1985.

(b) BPA Office of Conservation, "Super Good Cents Bulletin," October 1985.

(c) BPA Office of Conservation, "Super Good Cents Bulletin," September 1986.

Contacts: Pat Durocher
Office of Conservation--KRP
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208
503-230-5489

Bob Lorenzen
Energy Conservation Center
Eugene Water and Electric Board
399 East 10th
Eugene, OR 97401
503-484-1125

CENTRAL POWER AND LIGHT CO.

Central Power and Light is an investor-owned utility serving portions of south Texas. It initiated the Good Cents program in spring 1983. Qualifying new single family homes must have: 1) proper sizing of air conditioning equipment through a calculated heat gain of not more than 12,000 Btu per 1000 sq ft of conditioned space, 2) total space conditioning and water heating energy requirements that are approximately 50% less than a conventionally built home, and 3) electric space conditioning and water heating. A suggested prescriptive path to meet the performance requirements is provided. Extension of the program to existing single family homes is planned.

Central has evaluated the energy efficiency of 16 Good Cents certified homes in its service area and compared their performance to 12 conventional homes for the period June 1984 to May 1985. The Good Cents homes averaged 1869 sq ft and the conventional homes averaged 1613 sq ft. Total energy consumption per sq ft for the Good Cents homes averaged 43.7% less than the conventional homes during this period. Each Good Cents home is also estimated to have reduced peak demand by 2.52 kW and 3.34 kW at summer and winter system peaks, respectively, in comparison to conventional homes also with electric space conditioning and water heating.

During the first three years of program operation, approximately 7% of new homes in the company's service area were built to the Good Cents performance standard. The company estimates that this figure will increase by approximately 5% a year, reaching 50% by 1993. Central estimates that 25% of the certified homes would have been built with natural gas as the primary energy source if the Good Cents program did not exist.

Central estimates that incremental construction costs to meet the performance standard in 1986 will average \$1,575. It estimates that the company's cost per participant in 1986 will be \$755.

- Additional Information:
1. Energy Efficiency Plan submitted to the Public Utility Commission of Texas, December 1985.
 2. Treadway.
 3. "Home Buyer's Guide."
 4. Blevins, Table 3-24.

Contact: Ric Tipton, Technical Research Supervisor
Jeff Stracener, Marketing Load Management Specialist
Central Power and Light Co.
120 N. Chaparral St.
Corpus Christi, TX 78403
512-881-5300

GEORGIA POWER CO.

Georgia Power is one of the four Southern Co. utilities that operate the Good Cents Program. It has operated the program since 1976. Since that time the energy efficiency standard required for Good Cents certification has changed several times. A summary of important prescriptive features needed for certification as of 1985 are listed below:

- insulation requirements
 - R-30 for flat ceilings
 - R-19 for vaulted ceilings .
 - R-13 for walls
 - R-11 for floors
- double glazed windows or storm windows
- insulated door or hollow door with storm door
- attic ventilation
- infiltration control
- minimum heat pump SEER of 8.0
- minimum air conditioning SEER of 9.5.

Certification is available for newly constructed site-built homes and condominiums and for apartment buildings.

Georgia Power entered into an agreement with the Georgia Governor's Office of Consumer Affairs in October 1984 relating to certified homes that allegedly did not meet the company's Good Cents energy efficiency standards. The agreement is discussed in Section 5.2.

Additional Information: 1. "What's the First Thing to Ask About When Looking for a Home, Condo, or Apartment?" brochure, 1985.

Contact: Jim Slaughter
Georgia Power Co.
P.O. Box 4545
Atlanta, GA 30302
404-526-7313

GULF POWER CO.

Gulf Power Co. originally developed the Good Cents Program, and is one of the four utility components of the Southern Co. that operate the program. Implementation began in 1976. Through August 1985, the company has certified 26,683 Good Cents homes.

The Gulf Power energy performance standard is designed so that space conditioning and water heating costs are reduced by 50% or more over conventional construction in the local area. Specifically, the company has found that compared to minimum code construction, a Good Cents home uses 6120 fewer kWh/yr and has peak winter saving of 2.27 kW and peak summer savings of 1.7 kW. Building to the Good Cents standard is estimated by the utility to add approximately 4% to conventional construction costs.

The energy efficiency features that Gulf Power recommends to qualify for certification are listed below:

- insulation
 - ceilings R-38
 - floor R-19
 - walls R-19
 - ducts R-38
- attic ventilation
- double pane or storm windows
- door insulation
- vapor barrier
- heat pump
- energy efficient water heater.

Along with a certificate, an energy analysis performed with the SEI Residential Building Energy program is performed for most Good Cents homes. The analysis provides the homeowner with information on the estimated cost to heat and cool the home, first year energy savings attributable to Good Cents features, and the payback period for the features.

Additional Information: 1. "Home Buyer's Guide."
2. Blevins, Table 3-9.

Contact: Ron Yaden
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Gulf Power Co.
P.O. Box 1151
Pensacola, FL 32520
904-434-8376

LEE COUNTY ELECTRIC COOPERATIVE INC.

Lee County Electric Cooperative operates a Good Cents certification program for new site-built homes. The Cooperative inspects the homes at the mid-point of construction and also after construction is completed. The certificate awarded to owners of qualifying homes is signed by the builder and the Cooperative.

The standard for Good Cents certification is designed to save the homeowner up to 25% on heating, cooling, and water heating costs. The minimum features required for certification are summarized below:

- insulation
 - attic R-30
 - wall R-6 (concrete block)
 - R-11 (wood frame)
 - ducts R-11 (if located in unconditioned space)
 - floors R-11
- insulated doors
- shaded or tinted glazing
- installation of measures to minimize infiltration
- energy efficiency water heater
- energy efficient heating/cooling equipment
 - minimum 9.0 SEER on straight cool system
 - minimum 8.0 SEER, 2.7 COP on heat pump system.

Additional Information: 1. "Specifications Good Cents Home Program," March 1985.

Contact: Mark Soucy
Lee County Electric Cooperative Inc.
P.O. Box 3455
North Fort Myers, FL 33903
813-995-2121

MISSISSIPPI POWER CO.

Mississippi Power offers Good Cents certification for qualifying newly constructed homes. To qualify, a home must be all electric and served by Mississippi Power through a single electric meter. Mississippi Power offers a promotional benefit to builders by listing Good Cents certified homes in advertisements placed in local newspapers. Each home can be listed up to 9 times.

The principal requirements/recommendations for Good Cents certification are summarized below:

- maximum sensible cooling requirement of 8.5 Btu/hr/sq ft of conditioned area
- use of a heat pump
- installation of vapor barrier
- insulated doors
- double pane windows
- insulation
 - ceiling R-30
 - walls R-18
 - floors R-19
 - ducts R-8
 - slab floor perimeter R-7.5.

Mississippi Power estimates that Good Cents construction adds \$0.50-\$1.00/sq ft to conventional home construction costs in its service area.

Additional Information: 1. "The Good Cents Home," brochure.

Contact: Residential Marketing Department
Mississippi Power Co.
P.D. Box 4079
Gulfport, MS 39501
601-864-1211

PACIFIC POWER

Pacific Power began offering the Good Cents program for newly constructed single family homes in its service area in 1984. The program replaces the earlier "Energy Saver Home" program operated by the company since 1978.

The principal energy efficiency features that Pacific Power recommends for Good Cents certification are listed below:

- insulation
 - ceiling R-38
 - ducts R-11
 - floors R-19 with crawl space
 - R-9 for slab on grade
 - walls R-19
- insulated door
- double pane windows, triple pane in colder areas
- heat pump for space conditioning and water heating
- attic ventilation system
- moisture and infiltration barrier.

Pacific Power's Good Cents promotional activities include 1) providing institutional advertising and brochures, 2) providing construction site and open house signs for builders, 3) paying for open house advertising, 4) providing a Pacific Power representative to answer questions at an open house, and 5) attaching a permanent Good Cents plaque to the home as well as providing a Good Cents certificate.

Additional Information: 1. "Home Buyer's Guide."
2. "A Total Marketing Plan Builders Can Bank On--The Good Cents Home."

Contact: Bob Helm
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920 S.W. 6th Ave.
Portland, OR 97204
503-243-1122

PORTLAND GENERAL ELECTRIC CO.

Portland General Electric (PGE) began offering the Good Cents program for site-built homes in 1984. In 1985 the program was extended to include HUD-Code manufactured homes.

PGE's recommended features for Good Cents certification are listed below:

- insulation
 - ceiling R-38
 - ducts R-11
 - floor R-19 with crawl space
 - wall R-19
- insulated door
- double pane windows
- heat pump for space conditioning and a zonal heating option
- infiltration control.

In addition to the recommended features, an electric water heater insulated to R-15 with distribution pipes insulated to R-4 is required for certification.

In PGE's service area, a Good Cents home is estimated to use approximately 2.5-3 kWh/sq ft/yr. The Good Cents features are estimated to add approximately 3% to construction cost over conventional construction, but reduce heating and cooling costs as much as 50%.^(a)

In 1985-86 PGE sponsored the construction of 11 Good Cents homes by vocational students at 18 Oregon high schools. PGE loaned the schools the money to buy the home site and the materials.^(a) PGE also helps to sponsor an annual "Parade of Homes" show for new site-built Good Cents homes. The April 1986 show featured 15 homes.

PGE is one of very few Good Cents utilities to also offer certification for HUD-Code manufactured homes. Silvercrest Industries, Inc., of Woodburn, Oregon, is the first Northwest manufacturer to offer the Good Cents construction option for homes to be sited in PGE's service area; its first Good

(a) Portland General Corp., 1985 Annual Report, p. 8.

Cents home was manufactured in December 1985. All of Silvercrest's manufactured homes can be ordered to qualify for Good Cents certification. A PGE representative inspects the homes prior to certification.^(a)

- Additional Information:
1. "Home Buyer's Guide."
 2. Good Cents Construction Practices and Applications; October 1985:
 - a. 24" Framing
 - b. Continuous Drywall
 - c. Equipment Specifications
 - d. Thermal Specifications--Materials and Installation
 - e. Poly-wrap
 - f. Standard Framing.

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PGE Central Division
3700 S.E. 17th Ave.
Portland, OR 97202
503-226-8653

Dave Anderson
Sales Supervisor
14655 S.W. Old Scholls Ferry Rd.
Beaverton, OR 97007
503-643-5454

(a) Western Trailer and Mobile Home News, Portland, Oregon, p. 35, March 1986.

PUBLIC SERVICE CO. OF OKLAHOMA

Public Service Company of Oklahoma offers an extensive Good Cents Program for new site-built homes and multifamily buildings and for existing single family homes. In addition, owners of Good Cents homes can qualify for slightly lower electricity rates and for a credit for installing an energy efficient heat pump. Even though Public Service is an electric utility, homes heated by natural gas are eligible for certification. The programs began in 1984.

The energy-efficiency requirements for certification of new Good Cents single family homes and multifamily buildings are set to achieve a 50% reduction in heating and cooling energy consumption over conventional construction practices in the utility's service area. The requirements for certification of existing homes as a "Good Cents Improved Home" are set to achieve a 30% reduction in heating and cooling energy over 15-20 year old conventional homes.

Public Service has an extensive inspection program. New homes are typically inspected five or six times to verify compliance with Good Cents standards.

The recommended energy efficiency features for each class of home are summarized below:

	<u>New Home</u>	<u>New Multifamily</u>	<u>Existing Home</u>
Insulation			
Attic	R-38	R-30	R-30
Floor			
slab foundation	R-5	R-5	
crawl space	R-19	R-19	R-19
Outside wall	R-19	R-14.3	
Common wall		R-11	
Ducts	R-6	R-6	R-6

	<u>New Home</u>	<u>New Multifamily</u>	<u>Existing Home</u>
Doors	Storm or insulated		Storm or insulated
Windows	Storm or insulated		Storm or insulated
Glass area	10% of floor area		
Infiltration	Caulking, vapor barrier weatherstripping	Caulking, weatherstripping	Caulking, weatherstripping
Space conditioning	Heat pump or air conditioning rated 8.5 SEER, gas furnace with AFUE of 0.75	Heat pump rated 8.5 SEER	Heat pump or air conditioning rated 8.5 SEER (required for certification)
Water heating	Insulated and/or heat pump		Insulated and/or heat pump

Occupants of Good Cents certified housing units are eligible for a reduced electricity rate from Public Service. The reduction is limited to the off-peak season (October-May) and to consumption in excess of 800 kWh/month. All Public Service customers are also eligible for partial reimbursement for installation of high efficiency air conditioners and heat pumps. The reimbursement is allocated as a credit on the customer's electric bill. The allowance is graduated and increases with the SEER of the installed unit.

- Additional Information:
1. "Good Cents Improvement Home," "A New Direction for Energy Savings," "The Secret to Successful Apartment Leasing," brochures.
 2. "Home Buyers' Guide."
 3. Blevins, Table 3-9.

Contact: Ellen Owen
Good Cents Marketing
Public Service Co. of Oklahoma
P.O. Box 201
Tulsa, OK 74102-9988
918-599-2828

Michael Bibby
Manager, Market Research
918-599-2642

WISCONSIN ELECTRIC POWER CO.

Wisconsin Electric Power began its Good Cents Program in spring 1985. Certification is available for new residential units including multifamily buildings. Qualification is not limited to all electric homes. A Wisconsin Electric customer service representative inspects homes two or more times during construction to verify the incorporation and installation of energy efficiency features.

The performance standard for Good Cents certification is a maximum heat loss of 14 Btu/hr/sq ft of living space and 12 Btu/hr/sq ft of basement. These figures are increased to 15 and 13, respectively, for homes with less than 1200 sq ft. The figures are based on a 70°F indoor temperature and -15°F outside temperature. The performance standards are designed to reduce energy consumption by up to 30% over conventional construction in the utility's service area.

In addition to meeting the performance standards, a home that qualifies for Good Cents certification must include 1) a vapor barrier, 2) kitchen and bathroom exhaust fans, 3) attic ventilation, and 4) energy efficient space and water heating equipment and fireplaces.

- Additional Information:
1. "Home Buyers' Guide."
 2. "Summary of Thermal Performance Standard and Recommended Features," January 18, 1985.
 3. "Good Cents Program Question and Answer Fact Sheet."

Contact: Donna Conant
Wisconsin Electric Power Co.
P.O. Box 2046
Milwaukee, WI 53201
414-277-3986

A.2.2 Other Certification Programs

This section describes certification programs that are not affiliated with the Good Cents Program. A number of program sponsors are represented including publicly and investor-owned utilities, home builder associations, building supply companies, and municipalities. Most of the programs apply only to new single family homes, although some also include multifamily buildings and existing housing units.

ANN ARBOR ENERGY OFFICE
VOLUNTARY IMPROVEMENT PROGRAM

The City of Ann Arbor Energy Office operates an energy efficiency award program for all existing housing units and commercial property in the city. Owners of qualified homes receive an energy voluntary improvement program (VIP) decal certifying compliance with program requirements.

A home can qualify for the Energy VIP award using either a structural or a performance path. Under the structural path, the homeowner must obtain an energy audit from his utility or a professional auditor and subsequently install all recommended energy conservation measures with a payback period of seven years or less. Under the performance approach, the homeowner submits heating fuel consumption for the previous year and the sq ft of conditioned space in his home. The City then determines whether the home qualifies for the award taking into account the number of heating degree days (HDD) for the period. To qualify under the performance path the owner's energy consumption (Btus/sq ft/HDD) must be in the lowest 40% of all homes in the city that are in his housing category. The categories include single family detached, single family attached, duplexes, individually metered apartment units, and master metered apartment buildings with 2 to 10, 11 to 20, and 20+ units.

The City relies on the good faith of homeowners in providing estimates of sq ft and installation of energy conservation measures. No onsite inspections of homes are made by representatives of the Energy Office.

Additional Information: 1. "Energy Voluntary Improvement Program," brochure.

Contact: Ann Arbor Energy Office
Department of Community Development
P.O. Box 8647
Ann Arbor, MI 48107
313-996-3150

ARKANSAS POWER AND LIGHT CO.
ENERGY IDEA HOME AWARD
ENERGY SAVER HOME AWARD

Arkansas Power and Light (AP&L) has offered its customers the Energy Idea Home Award certification program for site-built homes since 1977, and the Energy Saver Home Award certification program for HUD-Code manufactured homes since mid-1983.

The Energy Idea Home Award has both performance and prescriptive elements. The three basic requirements for certification are: 1) one ton or less of cooling capacity per thousand sq ft of conditioned space,^(a) 2) R-10 perimeter insulation around all concrete slab floors, and 3) cooling equipment with an installed rating not exceeding 6,000 Btu/hr above the calculated load requirements (at 25°F design temperature difference). AP&L provides 18 suggested prescriptive features that can be used to meet the one ton of cooling capacity/1,000 sq ft performance standard. These features include R-38 attic insulation, R-19 wall insulation and use of storm windows.

The Energy Idea Home Award program is principally directed at newly constructed homes. AP&L representatives review home plans and inspect the home during construction. The award certificate presented to the homeowner is signed by the builder and an AP&L customer representative. The number of Energy Idea Homes constructed in Arkansas and Southeast Missouri exceeds 8,000.

AP&L's Energy Saver Award certification program for new HUD-Code manufactured homes is a performance-based program with suggested prescriptive thermal features. The program was developed in cooperation with the Arkansas Manufactured Housing Association. The maximum heat loss transmission coefficient for certification is 0.0942 Btu/hr/sq ft/°F. The comparable coefficient in the HUD MHCSS is 0.126 (24 CFR 3280.506). As of August 1985, 20 manufactured homes had been certified.

(a) AP&L states in its literature that homes with less than 1,050 or more than 1,450 sq ft may require a variation in this ratio. One ton of cooling capacity = 12,000 Btu/hr cooling.

The suggested thermal features for Energy Saver Award certification include R-26 ceiling insulation, R-13 wall insulation, R-19 floor insulation, double pane or storm windows, insulated or storm doors, insulated hot water heater, and a maximum of 12% glass area. Other combinations of features can also be used to meet the performance standard. In addition, use of a heat pump with a SEER of 8.0 or more is required for certification.

AP&L uses various incentives to encourage manufacture of Energy Saver Award Homes. One incentive is a cooperative advertising allowance for dealers who inventory and sell the homes.

AP&L does not routinely inspect Energy Saver Homes. The manufacturer self-certifies compliance with the performance standard and places the award emblem on the home's electrical panel. Manufacturers provide AP&L a monthly list of qualifying homes and their serial numbers. In field tests AP&L has found electricity consumption of Energy Saver Homes to be significantly less than comparable homes built to the energy efficiency performance standard in the HUO MHCSS.

- Additional Information:
1. AP&L brochures describing the programs include: "Energy Idea Home Buyers Guide," "The Energy Saver Home--Today's Most Affordable Housing Buy," and "A Marketing Program for Manufactured Housing."
 2. The Energy Saver Award program is described in more detail in B. L. Mohler, S. A. Smith, Marketing Manufactured Housing Under the Super Good Cents Program, PNL-5743, January 1986, and in PNL-5496 Rev. 1, p. A.6.
 3. Blevins, Table 3-9.

Contact: Roy C. Paulette
Customer Services Representative
Arkansas Power and Light Co.
P.O. Box 551
Little Rock, AR 72203
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BRITISH COLUMBIA HYDRO
DOUBLE E HOME PROGRAM
SUPER EE HOME PROGRAM
DOUBLE E RETROFIT PROGRAM

British Columbia (B.C.) Hydro offers three Energy Efficient Home Certification Programs for its residential customers. The Double E Energy Efficient Home Program and Super EE Energy Efficient Home Program are for newly constructed residential property including multifamily buildings. The Double E retrofit program is for existing homes. The overall Energy Efficient Home Program was developed by the Canadian Electrical Association (CEA) and its member utilities including Hydro-Quebec, Ontario Hydro, Manitoba Hydro, B.C. Hydro, New Brunswick Power, Saskatchewan Power, Alberta Power, Edmonton Power, Calgary Electric, Nova Scotia Power, and Newfoundland Power.

The Double E Program has a prescriptive energy efficiency standard established by CEA for various climatic regions in Canada. The standard covers insulation levels, glazing, doors, lighting, water and space heating equipment, and fireplace performance. The Super EE Home Program is a performance-based standard that reflects the size and type of the home and the local climate. In B.C. Hydro's service area, new homes can qualify for the Super EE award by meeting the prescriptive requirements of the Double EE program plus using air tight construction and an air-to-air heat exchanger. Electric space heating is not a requirement for either program.

B.C. Hydro inspects the first few energy efficient homes constructed by participating builders for compliance with program requirements. Subsequently builders can self-certify and simply notify the utility. B.C. Hydro will subsidize the advertising of newly constructed Double E or Super EE homes up to \$500 per single family home or duplex and up to \$2,000 for each subdivision or multifamily dwelling. Eligible advertising must be preapproved by the utility.

The R-2000 Super Energy Efficient Home Program is a certification program for new single family homes sponsored by the Canadian Home Builders' Association and Energy, Mines and Resources Canada. The R-2000 energy performance

standards are very similar to the Super EE Energy Efficiency performance standard. R-2000 homes are also eligible for B.C. Hydro's advertising allowance.

Additional Information: 1. Canadian Electrical Association, Technical Guidelines for the "Double E" Home Program, October 1981.

Contact: R. E. Derby
B. C. Hydro
201-4940 Burnaby Way
Burnaby, B.C.
Canada V5G 4K6
604-298-2411

CANADIAN HOME BUILDERS' ASSOCIATION
ENERGY, MINES AND RESOURCES CANADA
R-2000 SUPER ENERGY EFFICIENT HOME PROGRAM

The R-2000 Home Program is a voluntary certification program designed to encourage the construction of energy efficient new single family homes throughout Canada. The program was begun in 1982 as a cooperative federal government-industry effort by Energy, Mines and Resources (EMR) Canada and the Canadian Home Builders' Association (CHBA).

To qualify for a R-2000 certificate, a home must be built to the energy performance standard for the particular climatic region by a builder registered under the program. In addition to a numbered identification certificate, a homeowner also receives an identification sticker to be attached to the home's electrical panel. As of 1985, approximately 300 builders were participating in the program and approximately 800 homes had been built. The sponsor's goals are to involve 2,500 builders and complete 20,000 homes across Canada by 1991. Participating builders must attend CHBA training sessions.

All R-2000 homes contain the following features:

- a continuous air-vapor barrier
- double the insulation levels of conventional construction
- a continuous, mechanical heat recovery ventilation system
- double or triple glazed windows.

An air leakage test conducted by CHBA or an approved agency is conducted prior to award of the R-2000 certificate. In addition the builder must certify to the CHBA that the home was built to R-2000 standards. Monitoring studies have shown that total energy consumption in R-2000 homes is about 30% lower than that of typical Canadian houses constructed in 1978 and 55% lower than typical houses built in 1975.

The estimated energy performance of prospective R-2000 homes is verified with the "HOT-2000" computer program. The program can be run on a variety of minicomputers. It is available through Anderson Techno-Products, Inc. (613-722-5091) under a licensing agreement with EMR.

- Additional Information:
1. "Marketing the Results of R&D: The Super Energy Efficient R-2000 Home," Research and Development Bulletin, Science and Professional Services Directorate, Ottawa, Canada, p. II-VI, November 1985.
 2. Bureau of Management Consulting, Ottawa, Review of Technical Requirements for R-2000 Homes, prepared for Energy, Mines and Resources Canada, January 1985.
 3. "Living in R-2000 Comfort," brochure prepared by the Canadian Home Builders' Association.
 4. "Information for Home Builders," and "Guide to the R-2000 Home," brochures issued by Energy, Mines and Resources Canada.
 5. Mark Riley, "Super Energy Efficient Home Demonstration Program: Background and Current Status," Issues in Residential Energy Conservation Seminar Proceedings, U.S. Department of Housing and Urban Development, HUD-0003618, p. 36, July 1983.
 6. J. R. Hughes, "At Last - Official R-2000 Results," Habitat 2000, p. 4, 5, Summer 1986.

Contacts: Jeffrey Macivor
R-2000 Home Program
Energy, Mines and Resources Canada
580 Booth Street
Ottawa, Ontario
Canada K1A 0E4
416-966-8480

Henry ten Oen
Canadian Home Builders' Association
Suite 400
20 Toronto Street
Toronto, Ontario
Canada M5C 2E8
416-364-4135

CAROLINA POWER AND LIGHT
COMMON SENSE HOMES

Carolina Power offers a certification program for energy efficient new site-built, single family homes and multifamily buildings and for new HUD-Code manufactured homes. New site-built residential units can be certified as a Common Sense house or apartment if heating requirements do not exceed 0.1 watt/sq ft of heated area/°F temperature difference and if a heat pump is used for space cooling. HUD-Code manufactured homes have the same performance requirement, but incorporation of a heat pump is not required. The utility provides recommended prescriptive features to meet the performance requirement.

Carolina Power has the option of inspecting all prospective Common Sense homes. In practice, Carolina Power employees inspect the first few homes a builder constructs and thereafter rely on his self-certification. The utility does not inspect HUD-Code manufactured homes.

Occupants of Common Sense homes receive a 5% discount on their electricity bill. This credit was approved by the North Carolina Utilities Commission and the South Carolina Public Service Commission as an incentive for energy efficient new construction.

The Common Sense program began in 1977/1978. Through 1985, approximately 19,000 apartment units, 14,000 HUD-Code manufactured homes, and 44,000 site-built, single family homes have received Common Sense certification.

Additional Information: 1. Brochures on "The Common Sense Home," "The Common Sense Apartment," and the "Common Sense Manufactured Home."

Contact: Morris McClellion
Residential Specialist
Carolina Power and Light Co.
P.O. Box 1551
Raleigh, NC 27602
919-836-7824

CASCADE NATURAL GAS CORP.
BEST HOME PROGRAM

Cascade Natural Gas is an investor-owned natural gas distribution company serving portions of Oregon and Washington. Its Best Home certification program was initiated in August 1985, in part, as a marketing response to the Good Cents/Super Good Cents programs operating in its service areas.

The Best Home program is available for new site-built, single family homes. The program has only two requirements beyond state energy code requirements. Homes can qualify by installing a natural gas furnace with a minimum AFUE of 80% and an automatic set-back thermostat. Gas hot water heating is also required for certification.

Cascade will reimburse advertising costs for builders of Best Homes up to a maximum of \$100/home.

Washington Natural Gas Co., also based in Seattle, operates the Heatkeeper Home Program, a certification program very similar to Cascade's Best Home program.

Additional Information: 1. "Best Home Built in Energy Savings Technology--
Program for Home Builders."

Contact: Cascade Natural Gas Corp.
P.O. Box 24464
Seattle, WA 98124
206-624-3900

CEDAR FALLS UTILITIES
ENERGY EFFICIENT HOME PROGRAM

Cedar Falls Utilities is a municipal utility providing electrical, water, and natural gas service in Cedar Falls, Iowa. It has operated the Energy Efficient Home certification program for new single family, site-built homes since 1978.

Two awards are offered: the Energy Efficient Home Award and the Super-insulated Home Award. The standards for both programs are prescriptive and include requirements for insulation levels, glazing, HVAC equipment, ventilation, and appliances. The utility will consult at no charge with builders and prospective owners on qualification alternatives for the awards. Utility employees inspect the home several times during construction, including an insulation inspection just before the plasterboard is installed. Deficiencies are not taken up with the owner unless they are not corrected satisfactorily by the builder.

The homeowner receives a certification form, a brass door knocker, and a framed 8" x 10" color photograph of the home.

Additional Information: 1. "Energy Efficient Home Program," brochure.

Contact: Bob Cavin
Energy Services Supervisor
Cedar Falls Utilities
P.O. Box 769
Cedar Falls, Iowa 50613
319-266-1761

COBB ELECTRIC MEMBERSHIP CORP.
ENERGY MANAGEMENT CONSTRUCTION

Cobb Electric Membership Corp., a rural electric cooperative system, operates the Energy Management Construction (EMC) Program to encourage the construction of energy efficient new single family homes. Owners of new homes built to Cobb's prescriptive standards receive a certificate that the home was built to the program standards. The program has mandatory requirements for insulation levels, glazing and surface barriers, area of windows, doors, infiltration controls, vapor barriers, ventilation, and fireplace installation. Use of an energy efficient heat pump for space heating and cooling is required for certification under the program. Electric water heating and appliances are not required. In addition to the mandatory requirements, Cobb recommends incorporation of a number of other energy efficiency features.

Cobb employees inspect all prospective EMC homes to verify compliance with the program requirements. Owners of EMC homes can receive up to a \$400 credit on their electric bill depending on the cooling capacity of their heat pump unit.

Additional Information: 1. "Cobb EMC Saves You Energy and Dollars."
2. "Cobb EMC Home Duct System Installation Requirements."

Contact: Randy McCord or Frank McCrink
Energy Services Department
Cobb Electric Membership Corp.
P.O. Box 369
Marietta, GA 30061
404-424-1504

CONNECTICUT LIGHT AND POWER CO.
100 PLUS PROGRAM

Connecticut Light and Power Co. (CL&P), a component of Northeast Utilities, has operated the 100 Plus certification program since 1982. It replaced the company's prior National Energy Watch Program.^(a) The 100 Plus program applies to existing and new single and multifamily housing with electric heating. Qualifying homes must score 100 or more points on CL&P's Energy Efficient Home Construction Checklist. The list covers insulation levels, window glazing, exterior doors, extent of air infiltration, use of solar energy and HVAC and water heating equipment. Points correlate with expected fuel savings.

CL&P's goals for the 100 Plus program include: 1) energy efficiency improvements leading to deferral of new generating facilities, 2) reduction in peak load growth rate, and 3) upgrading of building construction practices relating to energy efficiency. 100 Plus homes qualify for electricity Rate 5, a rate that is about 10% less than the normal residential electric rate.

CL&P estimates that in its service area a new conventional 1700 sq ft house with electric resistance heating would cost \$1438/yr (\$1985) to heat. It estimates that the same house built to the 100 Plus energy efficiency standards would cost \$971/yr. The incremental construction cost for the 100 Plus house over conventional code requirements is estimated by CL&P to be about \$1000. CL&P's 1986 in-house budget for the 100 Plus program is \$155,200. The total cost is kept relatively low because the company does not inspect prospective 100 Plus homes. Verification is accomplished by the signature(s) on the 100 Plus certification form of:

1. a registered architect or professional engineer, or
2. the builder and the building inspector, or
3. the builder and the purchaser.

The major marketing thrust of the program is new construction. In 1985, 2,306 new single family homes and 3,300 multifamily units in CL&P's service

(a) The National Energy Watch Program developed by the Edison Electric Institute is described at pp. 3.2-3.4 of PNL-4359.

area were built to the 100 Plus standards. CL&P estimates that first year energy savings from these homes in comparison to conventional construction will be 8,496 MWh and that lifetime savings will be 212,400 MWh. CL&P estimates that by 1990 the 100 Plus program will have reduced its winter peak demand by 14.4 MW.

CL&P promotes the 100 Plus program in several ways. An insert containing the checklist was incorporated in March 1985 utility bills. In 1985 CL&P awarded over 80 plaques and desk clocks to participating builders and developers. CL&P also advertises the program in Connecticut Builder magazine and prepares a quarterly article for the magazine on energy conservation. The "Energy Line" Newsletter issued by Northeast Utilities also contains information on the program.

- Additional Information:
1. CL&P, Energy Alliance--Customer Assistance and Conservation Programs Annual Report, March 1986.
 2. "How to Save Energy and Money in an Electrically Heated Home," brochure.
 3. "Questions Most Often Asked About Building to NU's 100 Plus Standards," Energy Line, Vol. 1 No. 1, 1985.
 4. "100 Plus Homes Continue to Grow in Popularity," Energy Line, Vol. 1 No. 2, 1985.

Contact: Energy Management Services Department
Connecticut Light & Power Co.
P.O. Box 2370
Hartford, CT 06146
203-249-5711

DALLAS POWER AND LIGHT CO.
TEXAS ELECTRIC SERVICE CO.
TEXAS POWER AND LIGHT CO.
ENERGY ACTION HOME PROGRAM

The three utilities listed above operate the Energy Action Home certification program for new single and multifamily housing units. The utilities are divisions of Texas Utilities Electric Co. which in turn is a subsidiary of the Texas Utilities Co. The Energy Action Home Program began in January 1986. It replaces the earlier E-OK program operated by the utilities.^(a)

To qualify as an Energy Action Home, the housing unit must receive a minimum of 100 points on the Home Energy Appraisal Rating Form for the local area designed by the Texas Association of Builders. The form covers a number of features including glass area, type of exterior doors, insulation levels, air infiltration, fireplaces, duct system, type and location of HVAC equipment and home design. The utilities estimate that each qualifying home reduces peak system demand by 1.04 kW over conventional construction.

The companies offer a rebate for the installation of energy efficient HVAC equipment. The rebate ranges from \$25-75/ton of capacity depending on the efficiency of the equipment and the size of the housing unit. The companies also offer an incentive for structural thermal integrity ranging from \$75 for apartment units up to \$250 for single family homes. The companies estimate that in 1986 their total incentive payments per qualifying housing unit will be \$181 and their other program costs will be \$52 per unit. Incremental construction and equipment costs for qualifying homes are estimated to be \$900 in 1986.

- Additional Information:
1. "An Energy Efficient Way to Heat up Your Cash Flow--Build Energy Action Homes," brochure.
 2. "Buy an Energy Action Home--Feel Good Inside Every Month," brochure.
 3. Texas Association of Builders, "A Voluntary Home Energy Appraisal Rating Program for New Residential Construction in the State of Texas."

(a) The E-OK Program is described at p. 3.7 of PNL-4359.

4. Energy Efficiency Plan submitted by Texas Utilities Electric Co. to the Public Utility Commission of Texas, December 1985.
5. Treadway.
6. Blevins, Table 3-24.

Contacts:

Marilyn Harris
Dallas Power and Light
1506 Commerce Street
Dallas, TX 75201
214-698-7667

Tom Beard
Texas Power and Light
P.O. Box 660268
Dallas, TX 75266
214-954-5255

Systems Conservation and Load Management Department
Texas Utilities Electric Co.
2001 Bryan Tower
Dallas, TX 75201
214-653-4600

DETROIT EDISON CO.
FUEL EFFICIENCY AWARD
ENERGY EFFICIENCY EXCELLENCE AWARD

Detroit Edison offers two certification programs for new single and multi-family housing units. The Energy Efficiency Award has the highest compliance standard. The awards are made to builders who can then use them in marketing the homes. A Detroit Edison representative inspects all homes before the awards are granted. Owners of either type of home qualify for a lower electricity rate between November and May.

Homes must contain a heat pump to be eligible for the awards. Detroit Edison also has prescriptive requirements for various features including insulation levels, infiltration control, moisture control, water heating, windows and doors, lighting, and fireplace installation. Energy Efficiency Excellence Award Homes must be all-electric.

- Additional Information:
1. "Detroit Edison's Energy Efficiency Excellence Award Program."
 2. "Detroit Edison's Fuel Efficiency Award Program."

Contact: Sheila Anthony
Residential Market Planner
Detroit Edison Co.
2000 Second Ave.
Detroit, MI 48226
313-237-9151

DUKE POWER CO.
ENERGY EFFICIENT STRUCTURE PROGRAM

The Duke Power Energy Efficient Structure (EES) Program is described at pages 3.29-3.30 of PNL-4359. Very little has changed in the program since 1982 other than the electric rate discount for qualifying homes.

The EES program is a certification program for existing and new housing in Duke's North and South Carolina service areas. The program began in 1976. Qualifying homes must meet an energy efficiency performance requirement. Most homes qualify by meeting Duke's recommended prescriptive features for insulation, attic ventilation, fireplace installation, vapor barriers, windows, doors, air ducts, and cooling equipment. Electric space conditioning is not required. As of late 1985, approximately 102,000 homes had received EES certification. Approximately 71% of new homes are currently being built to meet or exceed the EES standard.

All owners of EES homes qualify for a lower electricity rate.^(a) In South Carolina, for example, an EES homeowner consuming 2000/kWh in a month would have a bill of \$93.53. An owner of a home not eligible for the conservation rate would pay \$113.33. The features required for the conservation electricity rate are similar to but not identical with the features recommended for EES certification. In 1985, Duke Power had approximately 1.2 million residential customers of which 173,000 qualified for the conservation electricity rate.

- Additional Information:
1. Rate Schedules R and RC, North Carolina Utilities Commission and South Carolina Public Service Commission.
 2. "EES--Finally a Plan to Help Your New House Cope with Rising Energy Costs," brochure.
 3. PNL-4359, p. 3.29.
 4. Blevins, Table 3-9.

(a) The lower conservation rate is the schedule RC rate.

Contact: Donald Stafford
Residential Construction Specialist
Duke Power Co.
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Charlotte, NC 28242
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FLORIDA POWER CORP.
ENERGY SAVER AWARD
SUPER SAVER AWARD

Florida Power operates two certification programs for new single and multifamily homes and new HUD-Code manufactured homes. Both awards for site-built homes require greater energy efficiency than the minimum Florida Energy Efficiency Code requirements. Florida Power's requirements for certification of site-built homes include specified insulation levels and HVAC equipment size and efficiency. Super Saver Homes qualify for the Florida Five-Star energy rating (see Section A.1). Super Saver Homes must meet the Energy Efficiency Code using the point system. Single family homes must have 50 or fewer points; units in multifamily buildings must have 60 or fewer points.

Florida Power's certification awards are also available for HUD-Code manufactured homes. To qualify for the Energy Saver award, the home must provide 15% more efficiency than the HUD performance standard.^(a) Use of a heat pump or conventional air conditioning with a minimum SEER specified by Florida Power is required. A Super Saver HUD-Code manufactured home must also have a heat recovery or solar water heater. Certification award labels for HUD-Code manufactured homes are placed on the home's electrical panel.

The purchaser of a Super Saver site-built or HUD-Code manufactured home qualifies for a \$350 electricity credit from Florida Power.

- Additional Information:
1. "Super Saver Energy Award for New Homes, Apartments, and Condominiums," brochure.
 2. "Energy Saver and Super Saver Energy Award for Manufactured Homes," brochure.

Contact: Conservation and Energy Services Division
Florida Power Corp.
P.O. Box 14042
St. Petersburg, FL 33733
813-866-5151

(a) The maximum HUD thermal transmission coefficient for the area that includes Florida is 0.157 BTU/hr/sq ft/°F. 24 CFR 3280.506.

GREENVILLE UTILITIES COMMISSION
E-300 STRUCTURE

Greenville Utilities Commission, a municipally owned electric system, operates the E-300 Structure certification program for new residential and light commercial buildings in its service area. Qualifying buildings must: 1) consume no more than 300 Btu/hr/1000 sq ft of conditioned space/°F temperature difference, 2) have all exterior bottom wall plates sealed, and 3) have all wiring and plumbing areas sealed. The Commission provides recommended energy efficiency features that will enable the 300 Btu/hr performance standard to be met. An E-300 structure is estimated to use up to 40% less energy than a comparable structure built to minimum code requirements. Thermal performance is estimated using procedures established by the Air Conditioning Contractors of America. As of 1985, 34 local building contractors were participating in the program and 75-80% of eligible new construction qualified as an E-300 structure.

Builders receive an onsite sign to identify the building being constructed as an E-300 structure. Owners receive a sticker for the electrical panel and a certificate that identify the building as an E-300 structure certified by Greenville Utilities. A Commission employee inspects each prospective E-300 structure several times during construction.

Additional Information: 1. "The E-300 Structure--Setting the Standard for Energy Efficiency," brochure.

Contact: Andy Yakim
Energy Services Officer
Greenville Utilities Commission
P.O. Box 1847
Greenville, NC 27835
919-752-7166

IOWA POWER AND LIGHT CO.
PAYBACK PLUS HOME

Iowa Power operates the Payback Plus Home program for new site-built, single family homes and condominiums. Qualifying homes must meet a maximum heat loss performance standard of 16 Btu/sq ft/hr and must also be electrically heated. Iowa Power recommends various prescriptive energy efficiency features to meet the performance standard.

Building plans for four homes that meet the Payback Plus standard can be purchased through Iowa Power. Iowa Power will also examine building plans at no charge to determine if a prospective home meets the performance standard.

- Additional Information:
1. "The Payback Plus Home Plans Catalog."
 2. Terry J. Stoffer, "Advertising Strategy--Can Energy Conservation be Sold Like Soup?" Proceedings of the Second Great PG&E Energy Expo 1985, Vol. II, p. 599, May 1985.
 3. Public Utilities Fortnightly, p. 59, April 26, 1984.
 4. Eugene Young, "Iowa Power Marketing Philosophy," Strategic Planning and Marketing for Demand-Side Management: Selected Seminar Papers, EPRI-EA-4308, p. 5-1, 5, November 1985.

Contact: Duke Fulton
Iowa Power and Light Co.
P.O. Box 657
Des Moines, Iowa 50303
515-281-2202

LAKELAND ELECTRIC AND WATER
MANUFACTURED HOME ENERGY VALUE AWARD

Lakeland Electric and Water, a municipal utility in Florida, offers a certification program for new HUD-Code manufactured homes. To qualify for certification a home must have a maximum thermal transmission coefficient of 0.133 Btu/hr/sq ft/°F. This figure is 15% less than the HUD maximum requirement and is the same performance standard used by Florida Power Corp. for its HUD-Code manufactured home certification program. Other requirements of Lakeland Electric for certification as an Energy Value Award Home include:

- a heat pump with minimum SEER of 8.5 and COP of 2.8 and backup electric heat with no more than 5 kW for the first 2.5 tons of capacity and 2 kW/ton thereafter, or
- a natural gas furnace with an intermittent ignition device and conventional air conditioning with a minimum SEER of 9.0.

Lakeland Electric keeps an inventory of manufacturers who will build qualifying homes. Manufacturer and dealer names and model numbers are supplied by Lakeland Electric to customers who inquire about such information.

Owners of qualifying Energy Value Award homes receive a certificate from Lakeland Electric. Lakeland Electric also operates the Florida Five-Star Program for both new and existing site-built homes.

Additional Information: 1. "Manufactured Home Buyer's Guide and Energy Value Award," brochure.

Contact: Barbara Barrett
Consumer Services Division
Department of Electric and Water Utilities
City of Lakeland
1000 E. Parker St.
Lakeland, FL 33801
813-687-3636

MANVILLE CORP.
ENERGY CONQUEST HOME

The Energy Conquest Home Program is a national certification program operated by the Manville Corp. for new single family homes. Builders desiring to participate submit a completed home energy questionnaire to a Manville representative for each home design. Manville uses its own computer software to determine the optimum package of energy conservation features for the particular location on a benefit/cost basis. The computer program also provides an estimate of energy consumption. To qualify for certification, the home must be built with the optimum package of energy conservation measures and must also incorporate Manville Gold fiberglass insulation and polyisocyanurate sheathing.

Manville supplies builders with a variety of marketing aids for the program. These include a medallion for completed homes, point-of-purchase displays, brochures, and national advertising.

- Additional Information:
1. Technical Information Manual.
 2. "Energy Conquest Homes--A Competitive Edge in the Home Building Industry," brochure.

Contact: John K. Robinson
Building Materials Marketing Division
Manville Corp.
P.O. Box 5108
Denver, CO 80217
303-978-3035

MODESTO IRRIGATION DISTRICT
POWER SAVER HOME PROGRAM

The Modesto Irrigation District (MID) provides electrical service in the area of Modesto, California. It began the Power Saver Home (PSH) Program in fall 1985. The program is a certification program for new, site-built, single family homes. The principal objective of the program is reduction of peak electricity demand for space cooling during summer months.

MID has established a relatively unique standard for PSH qualification. Qualifying homes of 1,528 sq ft or more must have a projected peak load demand of 1 kW less than a home built to the minimum energy efficiency requirements of the California energy conservation standards for new buildings.^(a) Homes smaller than 1,528 sq ft must save 0.66 watts/sq ft. There are no prescriptive requirements for certification. MID plans to retain the 1 kW and 0.66 watt/sq ft incremental requirements as the California energy conservation standards require more energy efficient construction in the future. MID has determined that purchase of a PSH will be cost-effective for the consumer.

Builders participating in the PSH Program receive advertising and promotional assistance from MID. They are also eligible for waiver of the electricity pole installation fee. Purchasers of Power Saver Homes receive a one-time credit to their utility bill that varies from \$120 for a projected 0.6 kW reduction in peak demand to \$475 for a 2 kW reduction. Purchasers also receive a certificate and an estimate of annual energy savings attributable to their home's energy efficiency features.

Builders of prospective Power Saver Homes submit plans to the MID prior to construction for verification that the home will meet the performance standard. MID staff will make recommendations for designs that do not meet the Power Saver Standards. Staff members inspect all homes after completion to verify compliance with the standard. MID plans to expand the program to new multifamily buildings in the future.

(a) The standards appear in Title 24 of the California Administrative Code.

A report on the program by Barakat Associates estimates that MID will save 1.75 MW in peak generation requirements over the first five years of the program. Approximately 1400 new homes are expected to be certified during the 5-year period. Over 30 years, the present value of net economic benefits to MID from these homes was estimated to be approximately \$2.5 million (\$1,985).

- Additional Information:
1. Barakat Associates, "The MID Power Saver Homes Program Plan and Report," July 25, 1985.
 2. L. A. Woehrle, "Murray and Modesto Make a Match," Public Power, p. 20, July-August 1986.
 3. G. W. Ryan, "A History of the Development of the Power Saver Program," presented at the American Public Power Association Annual Conference, Toronto, Canada, June 1986.

Contact: Jack Krieg or Gordon Ryan
Modesto Irrigation District
P.O. Box 4060
Modesto, CA 95352
209-578-1212

NEVADA POWER CO.
ENERGY EFFICIENT HOME AWARD

Nevada Power Co. has operated a certification program for new energy efficient residential housing since August 1983. The program is open to all site-built housing units. Through 1985, 8237 housing units in the utility's service area had been built to meet or exceed the Energy Efficient Home Award standard. Of these, 73.9% were apartment units, 8.8% were single family detached homes and 15.6% were townhouses or condominiums. Over 300 builders are participating in the program.

The certification award is based on a prescriptive standard. The following minimum standards must be met:

- Insulation
 - Attic R-30
 - Wall R-19
 - Doors R-5
 - Ducts 2" fiberglass
 - Water Heater Tank R-6
- Maximum air infiltration rate of 0.5/cu ft/min/sq ft
- Attic ventilation
- Programmable thermostat
- Heat pump with minimum SEER of 8.0
- Electric water heater
- Double pane glass with glazing not exceeding one third of wall area.

All homes are inspected and approved by a Nevada Power representative.

Participating builders receive the following amenities from the utility:

1. Award stickers for the home and a metal doorbell plate identifying the home as qualifying for the Energy Efficient Home Award
2. Water heater insulation blankets and hot water flow restrictors
3. Posters and handouts for use at point-of-sale

4. Free heat loss and payback analysis of conservation features for prospective homes
5. A cash rebate based on the size and efficiency of the heat pump and/or heat recovery unit for water heaters.

Purchasers of Energy Efficient Homes receive a certificate and a manual entitled "How to Operate Your Energy Efficient Home."

Nevada Power estimates that during its first 18 months the Award Program resulted in peak load shift or load reduction of 1.9 MW representing a \$570,000 savings in avoided plant capacity costs. From the utility's perspective, the program generated \$284,000 in additional revenue during this period. This increase is based on its estimate that 40% of qualifying homes would have otherwise used natural gas for space and water heating. Summer peak load reduction from homes certified through December 31, 1985, is estimated by the utility to be 7.6 MW, representing \$2.4 million in avoided plant capacity costs.

- Additional Information:
1. 1984 Report on Energy Conservation and Load Management Activities.
 2. 1985 Energy Conservation and Load Management Annual Report.
 3. "Energy Efficient Home Award Program for Homebuilders."

Contact: Energy Conservation and Load Management Department
Nevada Power Co.
P.O. Box 230
Las Vegas, NV 89151
702-367-5125

OWENS-CORNING FIBERGLAS CORP.

THERMAL CRAFTED HOME

ENERGY QUALIFIED HOME

Owens Corning operates certification programs for new site-built, single family homes (the Thermal Crafted Home Program) and new HUD-Code manufactured homes (the Energy Qualified Home Program). Both programs are operated nationally.

The Thermal Crafted Home Program is a performance-based certification program begun in 1983. It makes extensive use of Energy Performance Design System (EPDS), a proprietary energy analysis workbook and computer program. EPDS takes into account a variety of variables affecting energy efficiency including: hourly weather data, home orientation, insulation levels, the number and insulating value of doors and windows, HVAC equipment fuels and efficiency, and projected air infiltration rate. The System has been field validated. To qualify for the Thermal Crafted certification, a home must meet the energy performance standard for the particular climate and must also incorporate Owens-Corning insulation products. The final decision on the Thermal Crafted designation is made by a local Owens-Corning representative based on home plans submitted by the builder.

Over 1,200 builders are participating in the program nationally. Participating builders can obtain a variety of marketing aids. Purchasers of Thermal Crafted homes receive an estimate of space conditioning fuel consumption and cost generated by the EPDS and a Thermal Crafted Home Performance Certificate. Because the program operates nationally, a Thermal Crafted Home may also qualify for a certification or rating under a locally sponsored HERS program.

The Energy Qualified (EQ) Home Program is a certification program for new HUD-Code manufactured homes. The qualification standard for certification is similar to the Thermal Crafted Home Program. Prior to 1986, EQ homes had to meet a prescriptive standard to qualify for certification. Owens-Corning has developed the EQ Financing Program in conjunction with Green Tree Acceptance, Inc. Purchasers of EQ homes are eligible for a higher debt/income ratio and a

slightly lower interest rate if the home is financed through Green Tree. Owens-Corning supplies dealers with a variety of merchandising aids. Purchasers receive a certificate designating their home as an EQ home.

- Additional Information:
1. Owens-Corning has several brochures available that describe the Thermal Crafted and EQ programs.
 2. The pre-1986 EQ Program is described in more detail in Appendix A of PNL-5496 Rev. 1.
 3. "Companies Work Together to Lower Home Financing Rate," Mobile/Manufactured Home Merchandiser, Chicago, Illinois, p. 54, March 1986.

Contacts: Glenn Singer
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Owens-Corning Fiberglas Corp.
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1100 Amhoist Tower
345 Saint Peter St.
St. Paul, MN 55102-1639
612-293-3400 (800)328-4585

PHILADELPHIA ELECTRIC CO.
EXCELLENCE IN ENERGY EFFICIENCY

The Excellence in Energy Efficiency (EEE) program is a certification program for new, single family, site-built homes. Qualifying homes must meet a prescriptive standard covering the following areas: infiltration control, ductwork, HVAC equipment size and efficiency, water heating equipment, and the building envelope. Electric space heating is required for certification.

Participating homebuilders receive support from Philadelphia Electric in several areas. The builder receives an EEE plaque and certificate to give to the home buyer. The utility provides an advertising allowance of \$100/home for the first 10 homes in an EEE subdivision and \$50/home for additional homes. The utility provides technical assistance to builders including onsite demonstrations for construction personnel. It also promotes the program through advertising. Finally, a utility representative is made available for selected open houses to answer questions about the program.

A relatively unique aspect of the program is that the energy efficiency of prospective EEE homes is verified by an independent inspection firm prior to award of the certificate. The inspection firms use sophisticated testing methods including smoke tracers, infrared thermography, and sensitive monitoring equipment. At a minimum, one out of 15 homes constructed by a builder is given a blower door test. The costs of the independent tests are paid by Philadelphia Electric.

Additional Information: 1. EEE information packets for builders and homeowners.

Contacts: Technical Services, S19-1
Philadelphia Electric Co.
P.O. Box 8699
Philadelphia, PA 19101
215-841-5863

Andrew Huenmler
Market Analyst
Philadelphia Electric Co.
215-841-5636

SANTEE COOPER
ENERGY EFFICIENT HOME AWARD PROGRAM

Santee Cooper is an electric utility serving approximately 60,000 customers in rural South Carolina. It is owned by the state of South Carolina. The Energy Efficient Home Award is a certification program for existing and new single and multifamily homes. Certification requirements include: 1) a heat loss rate that does not exceed 22 Btu/hr/sq ft at design heating conditions, 2) an electric heat pump with a minimum SEER of 8.5, 3) an energy efficient hot water heater, and 4) various measures to reduce air infiltration. Santee has recommended prescriptive energy efficiency features to meet the 22 Btu/hr/sq ft performance standard.

Contact: Energy Management Department
Santee Cooper
1 Riverwood Drive
Moncks Corner, SC 29461-0398
803-761-8000

SOUTHWESTERN ELECTRIC POWER CO.
ENERGY EFFICIENT HOME PROGRAM

Southwestern Electric Power (SWEPCO) is an investor-owned utility serving rural portions of Arkansas, Louisiana, and Texas. It has operated the Energy Efficient Home certification program since 1976. Both new and existing single family homes are eligible. The program is offered throughout the company's service area.

To qualify for certification, a home must: 1) be all electric, 2) use a heat pump with a EER/SEER of 8.0 or higher, and 3) meet prescriptive requirements for insulation levels, attic ventilation, window glazing, exterior doors, fireplace installation, electrical wiring capacity, ducts, exhaust systems, and water heating equipment.

SWEPCO estimates that each certified home results in a system peak demand that is 1.38 kW lower than the demand if the home had been constructed to minimum code requirements. The company has also concluded that its Energy Efficient Home Program has acted to increase the energy efficiency of new housing units in its service area that do not qualify for certification.

The estimated 1986 incremental cost to program participants over minimum energy code requirements is \$908. SWEPCO estimates that its total costs are approximately \$489 per certified home.

The SWEPCO Energy Efficient Home Program is affiliated with the National Energy Watch (NEW) Program sponsored by the Edison Electric Institute. The NEW Program is discussed at p. 3.2 of PNL-4359.

- Additional Information:
1. SWEPCO's "Energy Efficient Home," brochure.
 2. Energy Efficiency Plan submitted to the Public Utility Commission of Texas, December 1985.
 3. Treadway.

Contact: Residential Marketing Department
Southwestern Electric Power Co.
P.O. Box 21106
Shreveport, LA 71156
318-222-2141

SOUTHWESTERN PUBLIC SERVICE CO.
ENERGY EFFICIENT HOME PROGRAM

Southwestern Public Service is an investor-owned utility serving northern Texas and portions of Kansas, Oklahoma, and New Mexico. It has operated the Energy Efficient Home (EEH) certification program since 1976. New residential, site-built construction including buildings with up to 10 units are eligible for certification. Southwestern provides alternative prescriptive guidelines to qualify for certification.

The percent of eligible construction qualifying for EEH certification has grown from 2.3% in 1976 to 42.7% in 1985. Over the entire period, 2,049 out of 19,063 (11%) of eligible units have qualified for certification.

Southwestern provides a financial incentive of \$0.45/sq ft for certified housing units up to a maximum payment of \$650. The company estimates that its average incentive payment is \$496 per housing unit and that its other program costs in 1986 will average \$192.47 per certified housing unit.

Additional Information: 1. Energy Efficiency Plan submitted to the Public Utility Commission of Texas, December 1985.
2. Treadway.

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Roy B. Jarnagin
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806-378-2121

SUBURBAN MARYLAND BUILDING INDUSTRY ASSOCIATION
E-7 ENERGY CONSERVATION AWARD PROGRAM

The E-7 Energy Conservation Award Program is a voluntary certification program for new single family homes in the metropolitan Washington, D.C. area. The Suburban Maryland Building Industry Association (SMBIA) operates the program in Maryland and the Northern Virginia Builders Association operates the program in areas of Northern Virginia that are not served by the Virginia Electric and Power Co. Qualifying new homes must meet the E-7 prescriptive standards that cover insulation, windows/doors, reduction of air infiltration, HVAC equipment efficiency, and domestic hot water and water flow conservation. Builders can also qualify a home with alternative conservation features provided they can show comparable or greater energy efficiency than the E-7 recommended standards. Neither Association inspects prospective E-7 homes.

Builders who elect to participate in the E-7 must meet several requirements. They must sign an indemnity form releasing SMBIA from liability resulting from the builder's participation in the program. They must sign a participation agreement for each subdivision. Home models that use different insulation packages or different energy components require a separate participation agreement form. They must pay a \$200 initiation fee and a processing fee corresponding to the number of housing units constructed. Finally, they must affirm before a Notary Public that each home meets E-7 specifications and that they will retain records on the energy efficiency features of the home for at least 3 years. A copy of this affidavit along with an E-7 certificate is presented to each home purchaser.

Builders can also receive a "Star Award" designation by incorporating additional energy efficiency features beyond the E-7 recommendations into their new homes. The "Star" designation can be used in the builder's advertising. Points are given for various features, e.g., 10 points for R-38 ceiling insulation. A total of 50 points/home is required for "Star Award" designation.

Additional Information: 1. Energy Conservation Award for New Residential Construction, July 1985.

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TENNESSEE VALLEY AUTHORITY
ENERGY SAVER HOME PROGRAM

The Tennessee Valley Authority (TVA) is a federal corporation that generates and sells power in the area of the Tennessee River system. It serves approximately 3 million consumers through 160 municipal and cooperative distributors.

The Energy Saver Home (ESH) Program is a certification program for new site-built, single and multifamily homes. It has operated since the fall of 1981 and replaced the earlier Super Saver Home Program, which began in 1975. To qualify for ESH certification, a home must be built to comply with extensive prescriptive standards that cover insulation levels, vapor barriers, ventilation, windows and doors, HVAC equipment (qualifying homes must be electrically heated or cooled), water heaters, and infiltration control. Tradeoffs in the standards can be made for particular applications; e.g., more insulation can be installed to permit greater glass area.

In October 1984, TVA began making cash incentive payments to builders or buyers and to its electricity distributors to encourage ESH construction. The distributor and the builder or buyer each receive \$200 for a qualifying single family home and \$100 for each qualifying multifamily unit. Additional incentive payments are available for installation of various energy efficiency features (e.g., a high efficiency heat pump) that exceed the minimum ESH requirements.

Prospective ESH homes are normally inspected twice by employees of participating TVA distribution customers or their representatives. The first inspection is made during construction and the second occurs as the home nears completion.

Purchasers of ESHs receive an ESH Medallion and an identification certificate. Builders can receive technical advice through district TVA ESH advisors. They can also obtain a portfolio of passive solar homes meeting ESH standards and can purchase construction drawings for individual homes.

TVA estimates that an ESH will annually use approximately 4,300 kWh less than a comparable home built to minimum code requirements. Each home is estimated to reduce TVA's winter peak load by 1.6 kW. As of September 1985, 72 TVA distributors were participating in the program, 13,500 ESHs had been certified, and 1,300 were under construction.

- Additional Information:
1. "Energy Saver Home Standards," TVA/P&E/C&EM-85/50.
 2. "TVA ESH Update," periodic newsletter.
 3. TVA Division of Conservation and Energy Management, Conservation Report 1985, TVA/P&E/C&EM-86/1.
 4. G. H. Kimmons and P. W. Burch, TVA Division of Conservation and Energy Management, "Encouraging the Construction of Energy-Efficient Homes - A Utility Perspective," TVA/P&E/C&EM-85/71.
 5. Consumer Energy Council of America, Washington, D.C., Home Energy Rating Systems: Purposes, Operations, Barriers, and Future Research Needs, January 1985, p. 62.

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615-751-5141

TEXAS-NEW MEXICO POWER CO.
ENERGY CHECKED EFFICIENCY HOME PROGRAM

Texas-New Mexico Power has operated the Energy Checked Efficiency certification program since 1975. Both new and existing single family homes are eligible for certification. To qualify for the programs, homes must receive 160 points in the following categories: insulation, infiltration, HVAC equipment efficiency, glazing, and door insulation. The points available for various insulation levels vary to reflect climate regions within the company's service area. The company estimates that a 1500-sq-ft qualifying home with electric space conditioning and water heating will use 2,900 fewer kWh/yr and will reduce peak demand 2.5 kW compared to a typical home in its service area. A company representative inspects all homes before they are certified. Texas-New Mexico Power estimates that its program costs per participating customer will be \$35.91 in 1986.

Additional Information:

1. "Energy Checked Efficiency Home," brochure.
2. Energy Efficiency Plan submitted to the Public Utility Commission of Texas, December 1985.
3. Treadway.

Contact: Texas-New Mexico Power Co.
P.O. Box 2943
Fort Worth, TX 76113
817-731-0099

UNITED ILLUMINATING CO.
HUG 'N SNUG ENERGY SAVER HOME PROGRAM

United Illuminating (UI) is an investor-owned electric utility serving portions of Connecticut. It began the Energy Saver Home certification program for qualifying new single family homes and condominiums in July 1985.

To qualify for certification a home must receive 100 or more points on UI's rating scale. UI's suggested guidelines for qualification include:

- insulation
 - R-19 for exterior walls
 - R-38 for ceiling
 - R-19 for floor
 - R-7 for slab, foundation
- double glazed windows
- insulated doors or addition of storm doors
- weatherstripping and caulking all windows and doors.

Homes do not have to be electrically heated to qualify for certification. Alternative energy conservation measures that achieve an equivalent level of efficiency are also acceptable. UI estimates that a qualifying home will use approximately 30% less energy than new homes built to minimum building code requirements.

Purchasers of qualifying homes receive a certificate award and an estimate of operating costs for space conditioning and hot water heating for both their qualifying home and the same home if built to minimum building code requirements. Owners of Energy Saver Homes with electric space heating also qualify for a lower electricity rate (Rate C) during evening hours and weekends. Owners of existing homes that meet the Energy Saver Home standards can also qualify for this rate.

UI uses software developed by Cornerstones Energy Group, New Brunswick, Maine, to assess qualification of prospective homes and estimate energy consumption and cost. The software incorporates space heating and cooling, water heating, and certain lifestyle factors such as hot water usage and thermostat settings.

UI hopes to certify 470 housing units in 1986. This figure represents about 20% of anticipated construction of new single family homes and condominiums in its service area.

- Additional Information:
1. Focus Now Customer Conservation and Assistance Programs 1986.
 2. "Making Sure Your New Home Saves Energy Dollars," brochure.

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VIRGINIA ELECTRIC AND POWER CO.
ENERGY SAVER HOME

Virginia Electric and Power Co. (VEPCO) operates the Energy Saver Home (ESH) certification program for new single family homes and townhouses. The program has been operated since 1983 and is available in VEPCO's Virginia, North Carolina, and West Virginia service areas. Over 15,000 homes have been certified since 1983.

The certification standard is prescriptive. Energy conservation categories covered include insulation for ceilings, walls, floors, slabs, ducts and doors; extent of glazing and area of windows; infiltration controls; and HVAC equipment efficiencies. Electric space conditioning is not required. The prescriptive requirements are similar throughout VEPCO's service area, but do differ somewhat based on climatic differences. VEPCO estimates that ESHs consume 20-45% less heating and cooling energy than conventional homes in its service area.

Purchasers of ESHs receive a numbered brass plate to be placed on their home's circuit breaker panel. VEPCO retains the serial number of each home. Owners also receive a limited warranty statement from VEPCO certifying that the home meets the ESH Standards. The warranty is not transferable to subsequent owners. Claims under the warranty that a home does not meet ESH standards must be submitted to VEPCO within one year.

Builders participating in the ESH program must certify to VEPCO that the applicable prescriptive standards have been met. The builder must also provide notice and opportunity for a VEPCO representative to inspect building plans prior to construction, insulation installation prior to wall closing, and HVAC equipment after installation. VEPCO supplies builders with an ESH identification sign and various promotional materials.

In November 1985, VEPCO entered into an agreement with the Northern Virginia Builders Association for joint promotion and operation of the ESH Program in VEPCO's metropolitan Washington, D.C. service area. The joint

program is designed to substitute for the E-7 program in the affected area. The Association continues to operate the E-7 program in areas not served by VEPCO.

Several elements of the joint program differ from the ESH program operated individually by VEPCO. Under the joint program, participating builders must agree to enroll all of their new homes in the ESH program. Also, the builders must sign an indemnity agreement form releasing the Association from any action of the builder under the ESH program.

Additional Information: 1. Energy Saver Home Standards.

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804-771-4593

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Associate, Technical Services Division
Northern Virginia Builders Association
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8027 Leesburg Pike
Vienna, VA 22180
703-893-6800

WEST TEXAS UTILITIES CO.
ENERGY SAVING PLAN AWARD

West Texas Utilities Co. began implementation of its Energy Saving Plan (ESP) in 1983. The plan is designed to promote energy efficient new and existing commercial and residential buildings, to reduce peak summer demand and defer new generation requirements. New and existing single family homes and apartment buildings that meet the company's prescriptive standards can qualify for an ESP Award medallion. Builders or owners can also qualify for cash incentive payments for installing energy efficient HVAC and hot water heating equipment. The prescriptive requirements for each type of housing are summarized below:

	Single Family Homes		Apartment Buildings	
	New	Existing	New	Existing
Insulation				
attic	R-30		R-30	
electric central AC		R-26		R-26
heat pump		R-30		R-30
wall	R-16	R-11	R-13	
floor	R-11			
ducts	R-6	R-6	R-6	R-6
Windows	double pane	double pane if heat pump used	double pane	double pane if heat pump used
Air Infiltration Control	yes		yes	
HVAC Equipment				
central AC SEER	9.0	8.0	9.0	8.0
heat pump SEER	8.0	8.0	8.0	8.0
room AC SEER		8.5		8.5

All homes are inspected by utility personnel before an award is granted or cash incentives are paid.

Additional Information: 1. "Energy Saving Plan: Your Blueprint to Savings and Comfort," brochure.

2. Blevins, Table 3-9.

Contact: Carl A. Piel
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Technical Services
West Texas Utilities Co.
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APPENDIX B

ENERGY EFFICIENCY LABELING PROGRAMS FOR APPLIANCES AND VEHICLES

APPENDIX B

ENERGY EFFICIENCY LABELING PROGRAMS FOR APPLIANCES AND VEHICLES

The concept of encouraging energy conservation through energy efficiency labeling is not limited to housing. Perhaps the first U.S. application was labeling the fuel efficiency of passenger vehicles. Energy efficiency ratings and labels have also been used with consumer products. The use of labels for home appliances and passenger vehicles is discussed in this Appendix. In addition, the treadware label for passenger tires is also briefly discussed as another example of a labeling program that indirectly affects energy efficiency.

B.1 CONSUMER HOME APPLIANCES

Since May 1980 manufacturers of many consumer home appliances have been required to label their products with energy efficiency information. The labeling requirements derive from the Energy Policy and Conservation Act of 1975,^(a) and are administered by the Federal Trade Commission (FTC).^(b) The energy efficiency testing procedures for the appliances are developed by DOE.^(c)

The following appliances are subject to the labeling requirements: refrigerators, freezers, refrigerator freezers, dishwashers, water heaters, room air conditioners, clothes washers and furnaces. The formats for the required labels are set out in detail in the FTC regulations.^(d) Energy cost labels are used on refrigerators, refrigerator-freezers, freezers, water heaters, dishwashers, and clothes washers. The label includes the estimated annual energy cost to operate the appliance and the range of operating costs of competing brands and models. Labels for dishwashers and clothes washers also

(a) 42 U.S.C. 6291.

(b) Applicable regulations appear at 16 CFR Part 305.

(c) Applicable regulations appear at 10 CFR Part 430.

(d) 16 CFR 305.11.

include information on operating costs with an electric and a natural gas hot water heater. Climate control appliances such as room air conditioners are labeled with an Energy Efficiency Rating (EER) or a Seasonal Energy Efficiency Rating (SEER). A chart to estimate annual energy cost is also included on the label. In addition to the product label, product displays in catalogs must also include energy efficiency information.^(a) The American Council for an Energy Efficient Economy collects the information on appliance energy efficiency and periodically publishes it in a booklet.^(b) The information is also included in the semiannual directory of the Association of Home Appliance Manufacturers (AHAM), Chicago, Illinois.

BPA recently decided to award blue ribbon stickers as annual energy efficiency awards for refrigerators and freezers. The awards will be made to approximately 15% of the models in the January AHAM directory.^(c) Northwest retailers can request the award stickers from BPA. Qualifying models will also be listed in a consumer brochure. A background report prepared for BPA examined the effectiveness of appliance labels and various incentive programs for promoting energy efficient appliances.^(d) The authors reviewed available literature; informally surveyed utilities with appliance incentive/ labeling programs, retailers, manufacturers, and energy conservation organizations; and conducted two focus groups. They concluded that the current FTC Energy Guide Labels "are not particularly effective because their format is confusing and their use is inconvenient."^(e) Other problems pointed out by manufacturers and noted in the report are that: 1) label information differs for various appliances, 2) use of national rather than regional electricity rates can be

(a) 16 CFR 305.14.

(b) A recent version is "The Most Energy Efficient Appliances," Winter 1986. It is available for \$2.00 from the American Council for an Energy Efficient Economy, 1001 Connecticut Ave., N.W., Suite 535, Washington D.C., 20036.

(c) 51 Federal Register 30530, August 27, 1986. The initial awards are included in "The Top 15% Energy Efficient Refrigerators and Freezers," brochure, DOE/BP-17529-14, August 1986.

(d) Brian Gard William Lesh, Inc., Portland, Oregon, Report on Market Research and Program Recommendations: Bonneville Power Administration Regionwide Promotion of Energy-Efficient Appliances, DOE/BP-17529-2, January 1986.

(e) Ibid., p. 5-6.

misleading, and 3) showroom appliance models may have labels based on different electricity costs depending on their date of manufacture.^(a) Nevertheless, the authors conclude that energy efficiency labels have been shown to raise consumer awareness of energy efficiency and that they are an important element of a successful program.^(b) They also recommend that the labeling process be simplified to increase its effectiveness and that efficient models simply be certified as energy efficient with a conspicuous label.^(c) Florida Power and Light is cited as effectively promoting a bright, magnetic "Select and Save" label for qualifying appliances.^(d)

B.2 PASSENGER VEHICLES

Fuel economy information for new passenger cars and light trucks has been available in the U.S. since 1974. The fuel economy numbers are generated by manufacturers and verified by the U.S. Environmental Protection Agency (EPA).^(e) The numbers must be displayed on all new passenger cars, vans, and pickup trucks. The numbers for all covered vehicles are collected and issued by DOE in an annual publication.^(f) Car dealers are required to display this publication and make it available for consumers.^(g)

The gas mileage tests and label information have changed over the years as DOE and EPA have attempted to provide information that is both accurate and useful to the consumer.^(h) For 1986 models, the label contains both a city and highway estimated mileage figure that reflects the particular engine and transmission configuration in the vehicle.

(a) Ibid., p. 3-5.

(b) Ibid., p. 2-13.

(c) Ibid., p. 5-10.

(d) Ibid., p. 2-6.

(e) EPA has extensive regulations relating to the motor vehicle fuel economy program at 40 CFR Part 600.

(f) The results for 1986 vehicles are contained in 1986 Gas Mileage Guide, DOE/CE-0019/5, October 1985.

(g) 40 CFR Part 600.405-77.

(h) The evolution of the label is described in Diane B. Pinkey, DOE, "The Fuel Economy Label - A Case Study in Government Rulemaking," Paper No. 851214, Society of Automotive Engineers, Warrendale, Pennsylvania, May 1985.

The FTC has regulations covering use of fuel economy data in new vehicle advertising.^(a) The regulations require that the mileage figure estimated by EPA be used in any advertising. Figures derived from non-EPA tests can also be disclosed provided the EPA figures are given "substantially more prominence."^(b)

The consumer impact of the fuel economy information and labeling program was examined in a 1982 report for DOE. The authors utilized literature, 1981 new car buyer surveys, 1978-1979 new vehicle owner surveys, focus groups and interviews.

Conclusions from the study include:

- the fuel economy label was used by 56% of 1981 new car buyers and the gas mileage guide by 18%
- consumers believe the fuel economy figures are useful for comparison purposes even if they overrate actual miles per gallon
- consumers believe the federal government has a legitimate role in providing unbiased measurement of fuel economy.

Even though the costs of the fuel economy labeling program are not discussed in the report, the results do suggest that the fuel economy labels are being used and are benefiting consumers.^(c)

B.3 PASSENGER CAR TIRES

New passenger car tires are labeled by the manufacturer to indicate relative performance in the areas of treadwear, traction, and temperature resistance. The requirements are administered by the National Highway Traffic

(a) 16 CFR Part 259.

(b) 16 CFR 259.2(c).

(c) Energy and Environmental Analysis, Inc., Arlington, Virginia, Automotive Consumer Response to Fuel Economy Information and Technology, DOE/PE/70032-T33, April 1982.

Safety Administration, a component of the U.S. Department of Transportation.^(a) The requirements were introduced in 1980. The labels must be permanently molded to the sidewall of the tire.

The principal objective of the tire labeling requirements is to provide consumer information. The treadwear indicator is especially valuable because it provides the consumer information on the expected life of the tire.^(b) The treadwear indicator also indirectly affects fuel consumption because radial tires have a higher treadwear rating than more conventional bias and bias-belted tires and also yield greater fuel savings. A vehicle equipped with radial tires will consume approximately 4-6% less fuel than the same vehicle with nonradial tires.^(c) More advanced radials offer the potential of an additional 3% savings.^(d)

(a) The applicable regulations are at 49 CFR 575.104.

(b) A tire with an expected operating life of 30,000 miles in a "low wear" region is given a rating of 100. A tire with a projected life of 60,000 miles in a "low wear" region would receive a label of 200.

(c) K. G. Duleep, et al., "Evaluation of Programs to Promote Fuel Saving Products in California," Paper No. 841019, Society of Automotive Engineers, Warrendale, Pennsylvania, August 1984.

(d) Ibid.

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- ACEEE 1986 Proceedings of the ACEEE 1986 Summer Study on Energy Efficiency in Buildings, August 1986.
- Blevins R. P. Blevins, Plexus Research, Inc., 1985 Survey of Utility Residential End-Use Projects, EPRI EM-4578, prepared for the Electric Power Research Institute, Palo Alto, California, May 1986.
- CIS Columbia Information Systems, Portland, Oregon, Rental Housing Energy Rating System Market Survey, prepared for the BPA Office of Conservation, Portland, Oregon, March 1986.
- Metzler Diana Metzler, City of Visalia, California, VISAVia: Final Report, prepared for the California Energy Extension Service, Sacramento, California, December 1985.
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- PNL-5790 P. L. Hendrickson, Background Information for Programs to Improve the Energy Efficiency of Northwest Residential Rental Property, PNL-5790, Pacific Northwest Laboratory, Richland, Washington, February 1986.

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Programs in Texas," Proceedings of the Third Great PG&E Energy
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Wehbring Kurt Wehbring, David Dornbush & Co., Portland, Oregon,
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Program," in Washington State Energy Office, Olympia,
Washington, Residential Energy Evaluation Program, WAOENG 84-
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