Energy Rated Homes of America Uniform Energy Rating System Profile #90

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For many years Americans have been familiar with the U.S. EPA's miles per gallon ratings which clearly identify the fuel economy of cars. More recently Americans have become attuned to the bright yellow energy guides found on refrigerators, freezers, and air conditioners in household appliance showrooms. Illogically, however, homes are generally not rated for their fuel economy. The lifecycle energy costs of a home, like a car or appliance, are important values which to date have been invisible to consumers, and as a result home buyers assess their decisions based only on homes' first costs.

Energy Rated Homes of AmericaTM believes that by rating homes consumers will be better armed to make critical home buying decisions. This in turn, will push the entire "shelter industry" (from builders to appraisers to real estate agents to lenders) to focus more on homes' energy efficiency, an awareness that will inevitably reduce household energy consumption and make housing more affordable.

Based on ratings from ERHA's Uniform Energy Rating System[™], lenders can be confident that homes classified as "efficient" will indeed have lower utility bills and that their home owners will have more money to spend on their monthly mortgage payments. A host of innovative lending practices are being piloted and implemented that take advantage of the transferability of these savings into mortgage payments. Thus lenders are easing and "stretching" home owners' debt-to-income ratios for energy-efficient homes.

Rating sheets for homes developed from the Uniform Energy Rating System provide an "as-is" rating for the home based on a 100-point scale. An "improvement-options" rating also provides an indication of how homes would rate as well as potential savings if they followed a set of fully detailed retrofit measures, in an improvement sheet. Thus the process of rating a home not only provides a score, but provides the home owner with cost effective and suggested improvements. Furthermore, the funds necessary to carry out these improvements can be added to mortgages, allowing inefficient homes to be upgraded and the cost of improvements financed over the life of the loan.

To date, Energy Rated Homes of America's Uniform Energy Rating System has been implemented in 12 states using a variety of implementation strategies. Sometimes the program is run by a utility or the state itself, but typically the program is run by a non-profit group and funded through a combination of home owners, builders, and utilities keen on coupling ratings with their new and existing home construction programs.

ENERGY RATED HOMES OF AMERICA Uniform Energy Rating System Sector: Residential Measures include CFLs; water Measures: heater tank wraps; ceiling, floor, and pipe insulation; efficient refrigerators and freezers; high efficiency space & water heating equipment; air leakage reduction; and controls Mechanism: ERHA provides national administration of the UERS, a system of agreements allowing the shelter industry to incorporate a uniform energy rating system into the marketplace. ERHA helps members to start up the UERS program, maintains a data bank of houses rated under the UERS, and provides oversight of the program History: UERS first developed in 1983 in Pacific Northwest. In 1987 administrative responsibilities turned over to ERHA in Arkansas

CUMULATIVE ERHA DATA

Data bank ratings (5/18/94): 15,626 Costs (1990-93): \$471,583

CONVENTIONS

For the entire 1994 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. **ANNUALSAVINGS** refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first fullyear effect of the measures installed in a given year. **CUMULATIVE SAVINGS** represent the savings in a given year for all measures installed to date. **LIFECYCLESAVINGS** are calculated by multiplying the annual savings by the assumed average measure lifetime. **CAUTION:** cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated. A home energy rating system (HERS) is a method of documenting the energy efficiency of a house so that valid comparisons of energy use can be made from house to house and state to state throughout the country. A HERS represents complex information packaged in a simplified way. Appliance labels and mileage ratings on cars are two examples of ratings that have been designed to help consumers factor energy efficiency into their purchasing decisions. Without an energy rating, a new home buyer has little chance of discovering energy costs until he or she actually moves in. Worse yet, high utility bills can make what appeared to be an affordable house not affordable at all. [R#1]

There are basically two types of home energy rating systems, certification and scaled rating systems. Certification systems are typically for new homes and certify that the home has been built to a specific standard. These standards are usually pass/fail. The standards vary from program to program. Typically these standards only address the insulation levels of the thermal envelope. Often certification programs are designed to market certain products. For example, a utility-sponsored certification program may require certain types of heating systems or fuel sources. Another certification program may require a certain type of insulation.[R#1]

Scaled rating systems provide a scale allowing for a range of efficiencies with which to make comparisons of one house against another. Most scaled rating systems are state sponsored and are designed to compare all house types in an unbiased manner. They typically address all components of the house contributing to overall energy efficiency as well as estimating total annual energy costs. [R#1]

Energy Rated Homes of America (the subject of this profile) is a non-profit, membership organization which administers the Uniform Energy Rating System (UERS), a scaled rating system. The UERS is the only nonbiased, nonprofit, home energy rating system designed to be the national uniform system that meets the needs of all housing-related industries. In fact, the UERS was originally conceived for use by lenders. The UERS, and energy rating systems in general, tie in nicely with Energy-Efficient Mortgages (EEMs). An EEM reflects the fact that lower energy bills allow home owners the ability to afford a higher monthly mortgage payment, whereby potential home buyers are allowed a higher mortgage. By quantifying the energy efficiency of a home, a scaled energy rating system provides lenders with a clear idea of how much the home buyer's mortgage can be "stretched."

Literally hundreds of housing rating systems (counting pass/fail certification programs) have been tried by states, utilities, and vendors over the years, including Good Cents, Super Good Cents, R-2000, Smart \$aver Homes, and Energy Star among others (See The Results Center Profiles #7,11,26,47,67). Good Cents and Super Good Cents are franchised and implemented by approximately 400 utilities in more than 30 states. To date less than a dozen different scaled rating systems have been tested throughout the country, while scaled home energy rating systems have existed in some form at the local or state level in approximately 20 states. California, for example, has a unique and well-known rating system called the California Home Energy-Efficiency Rating System or "CHEERS." It is unique because it got its start when Pacific Gas & Electric (PG&E) approached the California Energy Commission (CEC) in 1990 with an initiative to establish a uniform statewide HERS as well as linking the program with EEMs. CEC agreed and PG&E contracted with a group to establish the non-profit CHEERS organization to implement the project. Operations began in February 1993 and approximately 11,000 ratings have already been performed. [R#1,6,15]

NATIONAL LEGISLATION

Two events focused attention on HERS and EEMs and triggered action at the national level in early 1991. The first was the passage of the National Affordable Housing Act of 1990 which directed the U.S. Department of Housing and Urban Development (HUD) to develop a uniform plan to make housing more affordable through mortgage financing incentives for energy efficiency. The second was the National Energy Strategy in February 1991 which stated federal policy on the use of mortgage finance to increase housing efficiency. In addition, the National Energy Policy Act passed in 1992 urges all 50 states to adopt home energy rating systems as quickly as possible. [R#6]

The U.S. Department of Energy (DOE) in cooperation with HUD convened the National Collaborative on Home Energy Rating Systems and mortgage incentives for energy efficiency as part of the National Energy Strategy. The first meeting of the collaborative took place March 26, 1991, followed by 10 additional meetings through January 1992. The National Collaborative consisted of representatives from 25 organizations in the housing, mortgage finance, and energy supply industries, along with state and federal government, federally-chartered financial institutions, and public interest organizations. Four technical advisory committees supported their work. The mission of the National Collaborative was to reach a consensus on a voluntary national program to link credible home energy rating systems with mortgage incentives for energy-efficient housing. [R#5]

In its "Blueprint For Action," The National Collaborative came up with a strategy to deliver an effective EEM program related to voluntary HERS. Goals included developing common standards for EEMs among the five federal agencies and federally-chartered financial institutions: Federal National Mortgage Association (Fannie Mae), Federal Home Loan Mortgage Corporation (Freddie Mac), Federal Housing Administration (FHA), Department of Veterans Affairs (DVA), and Farmers Home Administration (FmHA.) Other goals included removing any unnecessary barriers to implementing EEMs and simplifying the loan process, developing training and promotional programs to educate lenders, builders, real-estate professionals, appraisers, and consumers about EEMs, and to collect and analyze data from existing EEM programs. The National Collaborative also hoped to develop a reliable, nationally uniform HERS program that could be used on a voluntary basis, implement HERS through state and local programs, and institute quality control mechanisms. [R#5]

Following the release of "A Blueprint For Action," a group representing mortgage finance, energy, builder, and consumer organizations and HERS providers formed the Home Energy Rating Systems (HERS) Council which was incorporated in February 1993. The Council's mission is to increase energy efficiency in housing by serving as an education and research resource and by establishing a nationwide voluntary program for accrediting systems and certifying tools that assign home energy-efficiency ratings, consistent with uniform guidelines, to access energy-efficient mortgages and other programs. In addition, on June 11, 1992 the HUD/FHA task force was assembled to make recommendations on financing energy efficiency in private mortgages. In short the national collaborative sought to develop minimum standards for home energy ratings that would in turn be acceptable for mortgage companies. [R#2,5,6]

In addition, three legislative bills passed in 1992: The National Energy Policy Act (EPAct), the Housing and Community Development Act, and the Veterans Home Loan Program Amendments. EPAct directed DOE to develop voluntary guidelines to encourage uniformity in HERS. EPAct also stipulates that federally-assisted new housing must comply with energy-efficient building standards to receive mortgages insured by HUD/FHA under the National Housing Act of 1949. New housing subject to mortgages made by the FmHA also must meet or exceed energy-efficient building standards. The Housing and Community Development Act of 1992 calls for the development of the five state EEM pilot program for existing housing that is currently being implemented in Alaska, Arkansas, California, Vermont, and Virginia. The Veterans Home Loan Program Amendments of 1992 include provisions for a 50-state EEM demonstration program that has been in effect since November 1992. [R#6]

Energy Rated Homes of America (ERHA) is a 501(c)(3) non-profit, membership organization which was incorporated in the State of Arkansas in 1987 to provide national administration of the Uniform Energy Rating System (UERS). The UERS is a system of agreements that allows the shelter industry to incorporate a uniform energy rating system into the marketplace. ERHA helps states, municipalities and utilities, and other interest groups in starting up the UERS program, maintains a data bank of houses rated under the UERS, and provides oversight, direction, and quality control of the program. ERHA is governed by a board of directors composed of representatives from the different programs offering the UERS. [R#1]

Funding for ERHA comes from memberships, grants, fees charged for program development, and ongoing revenues charged for archiving of ratings which is required as part of the membership agreement. States joining ERHA must pay a one-time only membership fee of \$20,000 while local members joining the program pay a \$5,000 one-time membership fee. Currently ERHA requires that participants pay an archiving fee for official home energy ratings. As such, states pay fees in proportion to the number of ratings performed. Presently, however, the ERHA board is considering dropping the archiving fee in favor of an annual renewal fee. [R#1]

ENERGY RATED HOMES OF AMERICA SYSTEM COMPONENTS

The five general services provided by ERHA and the Uniform Energy Rating System to participating states and locales include technical development, training, education/ marketing, and administration.

Technical development: ERHA works with local technical committees to develop a program responsive to the local climate, housing types, and different utility rate structures. The ERHA approved software tools analyze a house and generate an energy rating based on the UERS, rating the energy efficiency of the house as well as estimating annual energy use and costs. The software generates a Rating Sheet in a format uniform and consistent with all programs using the UERS. The Rating Sheet is the final rating documentation for the home owner or mortgage underwriter. [R#1]

In addition, the software includes utility cost schedules, benchmark energy costs, efficiency level descriptions, and a users guide. The cost schedules of all utilities in the given state or area are included to calculate annual energy costs. The benchmark energy costs are historically weighted average efficiency levels for all homes commonly found within the state or locale, and are used to estimate the savings of a more efficient house compared to the baseline house of the same size, style, and fuel mix. Efficiency level descriptors are used to present the efficiency levels of walls, floors, ceilings, air leakage, HVAC efficiencies, etc. that are typically found in the field for both new and existing construction.[R#1]

Training: Training is provided for raters, appraisers, mortgage underwriters, and local operators of the system. Builder and real estate training programs are also available. Initial training is provided by ERHA; local programs provide ongoing training. Training for HVAC and improvement contractors has now been added, and duct leakage training for raters and contractors is also scheduled on a regular basis.[R#1]

Marketing and educational materials: Comprehensive manuals on using the ERH system are developed specific to each state for mortgage underwriters, appraisers, and energy raters. Materials include logos, newsletters, TV spots, radio spots, industry slide shows and videos, yard signs, counter-top consumer brochures, industry brochures, etc. All programs offering the UERS share the materials developed by each.[R#1] *Construction*

It is important to note that members are charged for the above services. Typically state and local members pay between 40,000 and 80,000 beyond the initial membership fee for training, software tools, and marketing materials. The degree to which member states utilize these services is totally up to the given state. [R#2]

Operations: ERHA provides national administration of the UERS. ERHA functions as a partnership of participating ERH programs and the shelter industry. On the local/state level, the UERS is typically administered by non-profit organizations, although sometimes by a utility or state. [R#1]

HISTORY OF ENERGY RATED HOMES AND THE UNIFORM ENERGY RATING SYSTEM

In 1983, the Uniform Energy Rating System (UERS) was started in the Pacific Northwest by Western Resources Institute (WRI), a nonprofit organization affiliated with the University of Washington. WRI was initially contracted by Washington State Energy Office and later by Bonneville Power Administration (BPA) to develop the UERS. In 1985 WRI was contracted to modify the UERS to account for improved energy efficiency codes and standards. While early funding for the program came primarily from BPA, the goal was to create a national program that all sectors of the shelter industry could support. Later, BPA shifted its focus to its Super Good Cents program, due to a strong interest in the new home market as opposed to existing homes. [R#1,12]

In 1985, the National Energy Rated Homes Steering Committee was formed to provide direction to a national program. In the same year WRI was contracted to develop the program for the Alaskan cities of Anchorage, Fairbanks, and Juneau. In 1986, WRI was contracted by the Arkansas Energy Office to expand the program to Arkansas. Later that year, the State of Vermont, through its state energy office, contracted with WRI for program development. [R#1] In January 1987 Energy Ratings, Inc. (ERI) was established to administer the rating system in Arkansas. In July 1987 the responsibility for administering the Energy Rated Homes program was transferred from WRI to ERI in Little Rock, Arkansas. ERI agreed to assume WRI's role with regard to the existing WRI contracts with Alaska and Vermont. In addition, ERI agreed to establish a national notfor-profit shelter industry association to assume ongoing ownership and administration of the Uniform Energy Rating System. ERI agreed to then transfer ownership of the UERS to this nonprofit. ERI and Energy Rated Homes of Vermont established Energy Rated Homes of America (ERHA) as the nonprofit, membership organization to own and administer the UERS. All of the shelter industries, states and municipalities who were involved in the ERHA system were to be members, and all would share in the operation and policy decisions of this national program. The Arkansas and Vermont programs agreed to capitalize ERHA, each providing a one-time \$20,000 membership and licensing fee which would also be required of all future members. ERI agreed to serve as the national ERHA headquarters and to administer the program on behalf of ERHA.[R#1]

Former CEO Ron Hughes credits President Clinton for his role in backing ERI with a series of grants through the Arkansas Energy Offices, during the President's tenure as the Governor of Arkansas. "I've been committed to it from the start," Clinton said of Energy Rated Homes at the annual meeting of ERI in Little Rock on May 17, 1989. Clinton approved Arkansas' contribution to establish ERHA and this cooperation helped build the coalition of representatives from the building industry, utilities, financial institutions, appraisers and real estate agents that worked with ERHA to fully develop the existing program. [R#1] The Uniform Energy Rating System (UERS) administered by ERHA is a scaled rating system. The UERS can rate all house types from older, inefficient structures to homes of the future. The UERS uses a 0 to 100 point scale. Each point in the 100 point system represents approximately 1% of potential energy savings. A Rating Sheet is produced for each rating which presents a home's rating both numerically and using the Star system. This uniform rating allows the home to be compared with other homes near and far away. The Rating Sheet also presents an approximation of the home's annual operating costs for heating, cooling, lights, and appliances. Data collected during the rating process includes house type, heated floor area, envelope efficiency (including air leakage which is typically tested using a blower door), solar gain, cooling, water heater efficiency, and space heating and cooling efficiency. Duct leakage is also being collected by some of the member programs.

The Rating Sheet provides an "as is" rating as well as an indication of how the house would rate if recommended improvements were made. An Improvement Worksheet is provided along with the Rating Sheet which outlines the most cost-effective improvement measures that the home owner can make to enhance the home's energy efficiency. Recommendations are ranked according to the measure cost compared to the estimated savings. Measures can also be ranked according to cost versus points gained, return on investment, simple payback, or net present value. [R#1]

The table on page 8 includes the 10 housing categories covered on each rating sheet. (Note that this table is not an exact replica of an ERHA Rating Sheet.) House type, heated floor area, amount of energy purchased annually, and annual energy costs are recorded, but do not receive a rating score. The categories assigned rating points are: envelope efficiency (heating related), solar gain, cooling, water heater location and type, and space heating and

cooling efficiency devices. For each of these rated components there are generally five possible levels of energy efficiency (Levels A through E with E being the most efficient). These represent the different levels typically encountered in the climate region where the house is located. The particular house reflected by the table received an "as is" rating of 53.4, equal to Two Stars. [R#1,13]

The UERS developed by ERHA is a voluntary rating system recognizing that local needs, housing types, fuel types, and climates vary around the country. The UERS addresses these varying local conditions with the assistance of local technical and steering committees. UERS currently uses three sophisticated software tools to calculate ratings based on information gathered during an onsite inspection. [R#1,2]

The 100-point UERS scale allows comparisons to be made of all houses, both new and existing. In addition, the UERS scale allows comparisons between different utility DSM programs, local codes, industry standards, and even other rating systems. The 100-point scale ranges from the worst house imaginable (0 points) to the ultra efficient 100 point house. The scale is specific to climate but does not change over time. The point on the scale considered "efficient" may change, but the scale itself will not. In other words while the average efficiency of homes within a community or utility service territory may increase from 40 points to 50 points, or the minimum energy code may increase from 75 to 80 points on the scale, the scale's calibration will not change. Utilities, however, will want to pay close attention to the average efficiency of homes within their service territories and provide incentives to beat the baseline level accordingly.

Stars are awarded based on the number of points. One Star is poor, Two Stars are fair, Three Stars are good, Four Stars are efficient, and Five Stars plus is the highest efficiency rating possible and difficult to achieve. The *Gradersea*

Uniform Energy Rating System (continued)

SAMPLE "AS IS" RATING SHEET (ARKANSAS)		
RATING CATEGORIES RATING DESCRIPTORS		SCORE
	One Others Desider Oracitation	Not Octored
House Type	One Story, Regular Grawispace	Not Scored
Heated Floor Area	1,200 Square Feet	Not Scored
Envelope Efficiency	Ceiling, Walls, Floor, Windows, Air Leakage	17.1
Solar Gain	6% - 10% of floor is south facing window area	6.3
Cooling	Roof Color, Thermal Mass, Window Area & Direction, Overhang, Skylights	26.5
Water Heater	Location, Fuel Type	2.5
Space Heating & Cooling Efficiency	Heating Fuel Type, Electric/Gas Utilities	1
Uniform Energy Rating	Total Score	53.4 (Two Stars)
Energy Purchased	MBtu/Year (112 electricity; 36 natural gas)	Not Scored
Energy Cost	\$1,556/Year	Not Scored

rating is based on the overall performance of the house, allowing trade-offs not accounted for with a prescriptive approach that specifies a minimum level of efficiency for each component. [R#1]

An energy rating under the UERS is designed for use as mortgage loan file documentation and has been approved by the "secondary market" of lenders and appraisers since 1986. A nationally available program like UERS provides FHA, DVA, FmHA, Fannie Mae, and Freddie Mac with a consistent, reliable methodology for incorporating energy costs into the mortgage process. Energy Rated Homes began at the request of lenders and appraisers and was designed to factor energy efficiency and energy costs into the loan process. Fannie Mae and Freddie Mac have worked with the Energy Rated Homes staff since the beginning of the program in 1984 providing clear guidance on the level of detail and types of information that would be required to "stretch" loan qualifying ratios and to thus create energy efficient mortgages. Because certain lenders require houses to be certified "efficient" in order to gain more favorable financing, the UERS scale is further divided into ten star levels. A rating of Four Stars or higher is required for an "efficient" rating.

BENEFITS OF THE UNIFORM ENERGY RATING SYSTEM

The Uniform Energy Rating System provides multiple benefits that collectively will assist in the transformation of the housing market to greater and greater efficiency. In addition to this societal benefit there are clear benefits to home owners, builders, improvement contractors, real estate agents, mortgage companies, appraisers, states, and utilities.

Home owners' benefits: Perhaps the primary benefit of UERS is that it educates existing home owners and home buyers about the energy efficiency of a home so they can make informed decisions when buying or making energy improvements. The ultimate result of the UERS program

is that more families will be able to qualify for home ownership by purchasing energy-efficient houses. First time home buyers should especially benefit from policies to allow greater debt to income ratios for efficient housing.

Builders' benefits: The UERS rating also serves as an important role within the building profession. UERS provides documentation for builders that incorporate energy efficiency into the homes that they build, providing proof of the added value of the added costs related to energy efficiency. In soft real estate markets, energy efficiency becomes a documented feature that can promote sales providing a marketable advantage for builders' "spec" homes and a selling point that can be used by real estate agents. [R#1]

Contractors' benefits: While many home certification programs, such as Good Cents and Super Good Cents, have focused their attention on new home construction, avoiding what utilities call "lost opportunities," UERS provides a means of assessing the efficiency of both new and existing homes. It is the focus of UERS on existing homes that creates tremendous opportunities for improvement contractors, such as HVAC contractors who repair leaky ducts. If all homes in the country were elevated in terms of energy efficiency, not only would U.S. citizens alleviate billions of dollars of utility bills, but unemployment might literally vanish. Retrofitting today's homes with cost effective improvements represents a gold mine of employment opportunity, a significant benefit of UERS that will likely get states' attention over time.

Real estate agents' benefits: Just as builders have energy efficiency as a "selling tool," real estate agents in increasing numbers are beginning to recognize that efficiency sells. In soft real estate markets real estate agents will promote homes' efficiency, furthering the awareness-building process surrounding lifecycle energy costs of buildings, and thus promoting energy-efficient home construction over time.

Mortgage companies' benefits: The UERS has become an important tool for mortgage companies keen on providing energy-efficient mortgages. By "stretching" debt to income ratios, lenders will be able to lend more money to more people with greater confidence that these investments will indeed be repaid with interest. The uniform rating system provides these companies, like each of the shelter industries, with a voluntary system that is easy to understand and use.

Appraisers' benefits: While appraisers have slowly recognized the importance of energy costs to home owners, they are now recognizing in increasing numbers that UERS can support their work, allowing them yet another tool and indicator (like square footage, number of bathrooms, driveway length) to assess homes based on consumers' interests and desires. With a database of rated houses and energy ratings now showing up in the Multi-List Services (MLS, a listing of all houses for sale in a given area), ERHA can help appraisers begin to value efficiency.

States' benefits: State energy offices have the basic mission of promoting the wise use of energy within their states, and UERS supports this mission nicely. States that have adopted UERS have done so because it is tested, it rates both new and existing houses, it is fuel neutral, and it allows a private/public sector partnership. Furthermore, UERS can be tied to low-interest loan programs, affordable housing programs, radon inspections, and as a follow-up to utility residential conservation service (RCS) audits. In addition, some states are allowing the UERS as an alternative code compliance tool. [R#1]

Utilities' benefits: Both electric and gas utilities keen on promoting greater levels of energy efficiency within their customer base can use UERS as a means of identifying average usage patterns and then to develop DSM programs for new and existing construction that provide incentives to increase the average level of efficiency. Furthermore, by supporting energy rating systems and UERS, utilities can cost effectively support increased efficiency, often without having to provide more costly direct incentives through conventional DSM program designs and direct installation programs. UERS represents a means for utilities to lower their DSM costs while continuing to promote greater levels of efficiency within their residential customer base. The ERHA database is ideal for helping utilities profile housing stock, design DSM programs, and track savings.

Thanks to home energy rating systems, mortgage lenders can help more prospective home buyers become home owners if the home being purchased uses energy efficiently. An Energy-Efficient Mortgage (EEM) takes into account the fact that people with lower energy bills have more money available for their mortgage payment. When making a home loan, a lender typically figures that a maximum of 25 to 28 percent of a buyer's monthly income can go toward paying the mortgage principle and interest, plus taxes and insurance. However, if a home is highly energyefficient, lower utility bills result, meaning that the income to expense ratio (housing) can be stretched to 30% for a conventional EEM or 31% for an FHA EEM. With an EEM people can qualify for a larger mortgage if they are buying an energy-efficient home, or as another option they can finance energy improvements with their mortgage if they are buying an inefficient home and want to bring it up to par. When an EEM is used to finance energy improvements it is often referred to as an "Energy Improvement Mortgage" (EIM). [R#1,3]

Because energy improvements are financed with the mortgage, the borrower's monthly payment increases slightly, but that increase is more than offset by reduced energy costs. By stretching the qualifying ratios of buyers of new, energy-efficient homes, borrowers qualify for a larger loan based on the additional disposable income that results from lower utility bills. For low- and moderate-income buyers, this can make a major difference in qualifying for a loan at all.

EEMs have been available nationwide since the 1980s but only a limited number of states have made a concerted effort to encourage their use. The key to an EEM, of course, is documenting the home's energy efficiency, and that is where the UERS comes into play.[R#1,3]

For home owners seeking an EEM, applications are directed to a local mortgage lender who participates in the EEM program of a secondary mortgage lender such as Fannie Mae or Freddie Mac, or an agency insuring or guaranteeing the mortgage such as HUD/FHA or DVA. A borrower does not apply to these organizations directly.

Currently there are four existing EEM programs run by Federal Housing Administration (FHA), Department of Veterans Affairs (DVA), Farmers Home Administration (FmHA), and Federal National Mortgage Association (Fannie Mae) along with Federal Home Loan Mortgage Corporation (Freddie Mac).

FHA insures home mortgages for qualifying home buyers. FHA allows an increase in the loan amount within certain limits and stretches the income qualifying ratios for mortgages on new homes meeting specific guidelines for energy efficiency. VA guarantees mortgages for qualifying veterans with little or no down payment and allows an increase in the mortgage amount for energy-related improvements. FmHA requires conformance with its thermal performance construction standards for all its loans, which are provided directly to qualifying borrowers in rural areas under 10,000 population. FmHA will loan an additional amount for energy improvements that are economically justified.

Fannie Mae and Freddie Mac have developed criteria for lenders which spell out the mortgages they are willing to buy. Lenders in turn can offer such loans to borrowers. Both Freddie Mac and Fannie Mae offer a 2% ratio stretch for new residential construction meeting MEC 1992 or equivalent building standards. Although each of the programs makes EEMs available, each follows its own rules, uses its own forms, and has its own procedures. [R#6]

Because lenders process mortgages according to well-established procedures, timing is critical. A borrower hoping to obtain an EEM must discuss this goal with the lender early in the mortgage application process. While shopping for a home, the borrower must identify a participating EEM lender to find out its specific requirements. If the home already meets an accepted energy efficiency standard, the purchaser must provide the documentation to the lender as soon as possible in the mortgage application process. A borrower hoping to finance energy conservation improvements as part of the mortgage must have the planned upgrades documented by an appraiser or energy consultant, as the lender requires, and installation has to be completed within a required period of time. Currently the onus is primarily on home buyers to take advantage of EEMs and EIMs; over time this will likely change as the programs become institutionalized.

Four new pilot EEM programs have been developed since late 1992 which attempt to streamline the process by which home buyers can obtain energy improvement mortgages. There is a nationwide pilot program for Veterans Affairs (VA) borrowers, a five state pilot for Federal Housing Administration (FHA) borrowers, and a Vermont-only pilot at four Vermont lending institutions for Fannie Mae mortgages. These three pilot programs apply to EEMs for existing homes and to Energy Improvements Mortgages as well. Energy improvements must be documented as cost effective under the FHA and Fannie Mae programs, but this is not required with the VA program. All of the programs put a cap on the amount of energy improvements that can be financed. In addition, Colorado is developing a pilot program with Fannie Mae and Freddie Mac which will be available in the fall of 1994, to make guidelines for EIMs more accessible. [R#3]

The five states selected to pilot HUD's energy-efficient mortgage for FHA loans are Alaska, Arkansas, California, Vermont, and Virginia. Of these states, only California uses a HERS system other than UERS. With this pilot program a borrower can finance into the mortgage 100% of the cost of cost-effective energy-efficient improvements. Buyers can add on to the mortgage up to \$4,000 or 5% of the property's value (up to \$8,000), whichever is higher. In addition, \$200 can be financed for the cost of the rating inspection. U.S. DOE has also added Colorado as a pilot state as part of the Climate Action Plan.[R#4]

The table on page 12 reflects a sample Home Energy Rating Report used in conjunction with an application for an EEM insured by FHA. This report includes the current status of ceiling insulation, wall insulation, floor/crawl insulation, windows and doors, air changes per hour, duct leakage, the water heater, heating equipment efficiency, and cooling equipment. The report also contains recommended improvement measures, the cost for these improvements, the annual dollar savings that will result from the improvements, and the useful measure life. Note that the 24 year useful life assigned to the total package in the table is based on the savings and useful life of each measure. This "weighted average" useful life of the package of improvements is determined to allow calculation of

FHA EEM: HOME ENERGY RATING REPORT					
IMPROVEMENT MEASURE	EXISTING	RECOMMENDED	COST OF MEASURE	ANNUAL SAVINGS	USEFUL LIFE
Ceiling Insulation	R-19	R-38	\$331	\$24	30
Wall Insulation	R-11	No Change	NA	NA	NA
Floor/Crawl Insulation	None	R-19	\$497	\$97	30
Windows and Doors	Low E Glass	No Change	NA	NA	NA
Air Changes Per Hour	1.07	0.55	\$240	\$91	30
Duct Leakage	20%	<2%	\$180	\$124	30
Water Heater	Level B	Level D	\$40	\$23	15
Heating Equipment Efficiency	65%	80%	\$4000	\$219	15
Cooling Equipment	7 SEER	12 SEER	& Cooling	& Cooling	15
Total Package		All of Above	\$5,288	\$578	24

the "present value" of the improvements. This is required in the FHA pilot and is also useful to appraisers "valuing" efficiency using the FHLMC Form 70A/FNMA Form 1004A Energy Addendum.[R#2,13]

MACROECONOMIC IMPACTS

The potential impacts based on national implementation of the UERS tied to EEMs are tremendous. At the request of the Federal Home Loan Bank of Seattle and WRI, the Harvard and Massachusetts Institute of Technology Joint Center for Housing Studies completed a report in 1986 that looked at the impact of ERH being implemented on a national basis, and estimated that through the use of energy-efficient mortgages there could be an, "increase of up to 11% to 22% in the number of first-time home buyers who could now qualify for home ownership," equivalent to 250,000 annually. Another estimate by Time Magazine in 1984 claims that "each rise of 1% interest knocks 2.5 million potential home buyers out of the market." If a family can save \$50 a month on utility bills, this would be the equivalent of a full point reduction in the interest rate paid on their mortgage. Therefore, if a point increase takes 2.5 million people out of the market, a system that confirms \$50 per month in energy savings could theoretically bring 2.5 million people back into the market. In addition, this program ideally provides the much needed incentive for builders to make energy-efficient investments in their newly constructed homes. If buyers can more easily qualify for more energy-efficient homes, and appraisers can add value for efficiency measures, then builders will certainly build this type of structure, effectively transforming the market over time. [R#1] ■

Currently the program is available to varying degrees in 12 states. ERHA's goal is to have a member in every state. Presently there are two ERHA membership options: members can join on a statewide basis or at the local level. Previously there was a third membership option for individual members (HVAC contractors for example). Currently there are 10 State Members, one local member (El Paso Electric), and one individual private sector member in Kansas. The State of Kansas will likely become a full member later this year. [R#2,13]

For new members joining the ERHA program there are several requirements made by ERHA:

• A Technical Committee of builders, utilities, HVAC contractors, and others must be assembled to assist in defining climate zones, housing types, and typical levels of efficiency encountered.

• A Steering Committee must be created to provide guidance for program development and implementation.

• Descriptions of a minimum of 200 houses (including insulation level, orientation, window/door area, HVAC equipment, and air leakage) and the metered energy costs for these houses are provided to ERHA. This data usually comes from utility audits and is used for the purpose of calibrating the ERHA rating system software against the housing in a given area. The participant must also provide typical installed costs of improvement measures.

• An individual or entity must be designated as the contact person for ERHA. Typically this is a utility, a state energy office, or a non-profit institution with expertise in the housing area.

• The participant must also provide ERHA with utility rate schedules for all of the major utilities and fuel sources in the area, including electric, gas, wood, and propane.

• Members are also responsible for arranging for the training classes for builders, raters, appraisers, and lenders. [R#1]

• A member reports either monthly or quarterly to ERHA all houses that have been rated through the program. Only ERHA-approved trainers can train and certify energy raters.

While there are a total of 10 ERHA State Members, several are relatively new. The following case studies focus on the three state members (Alaska, Vermont, and Rhode Island) who were among the first to join ERHA and which have been performing energy ratings for several years, as well as Colorado, a relative newcomer to ERHA that has developed what may become the state-of-the-art implementation of ERHA's UERS.

ALASKA

Energy Rated Homes of Alaska is a public/private partnership between the Alaska Housing Finance Corporation (AHFC), the state's utilities, and housing industry. In 1986, Alaska became the first state in the nation to develop a home energy rating system. AHFC administers the program and policy guidance is provided through a housing and utility industry advisory group. Since the program's inception more than 6,000 homes across the state have been rated, equal to 2.8% of the state's housing stock. Ratings are provided by independent housing and energy efficiency professionals trained and certified by AHFC. With the ERH Alaska program, energy raters are independent contractors who charge a fee which varies from rater to rater. This fee is paid in part by AHFC and in part by the consumer and typically costs the consumer \$100.[R#8]

In Alaska, a transformation of the housing market has begun with a pronounced trend towards the construction of energy-efficient homes. The state's home energy rating system has been a key driver for this change. Since 1986, the efficiency of newly-constructed homes in the state has increased from an average of 2 Stars Plus to 4 Stars, a 12.3% improvement in homes' energy efficiency. Furthermore, home owners who have participated in the program have improved the energy ratings of their homes by an average of 15% after making the cost-effective improvements recommended through the rating process. Post-improvement ratings are a requirement for EEMs or utility rebate programs. Occasionally homeowners trying to sell their homes will get post-improvement ratings. [R#8] Ŧ

These efficiency gains are especially crucial in Alaska where the cost of heating is the highest cost of housing outside of rent or mortgage payments. Alaskans spend more than \$214 million annually on home heating and lead the nation in terms of per capita energy consumption. In 1992, the per capita energy consumption in Alaska averaged 1,040 million Btu while the national average was 322 million Btu.[R#4,8,14]

In 1992 Alaskan utilities began using the home energy rating system to deliver their residential DSM programs. Presently Alaska Electric Light and Power of Juneau, the Homer Electric Association, and the Golden Valley Association of Fairbanks use Energy Rated Homes of Alaska to deliver their residential DSM programs. [R#8]

Golden Valley Electric Association (GVEA) is a memberowned utility with 19,000 members and provides service to the Fairbanks, Delta, Nenana, Healy, and Cantwell areas. With Golden Valley Electric's Home Sense program, the utility offers customers the opportunity to take part in two programs at once: Energy Rated Homes of Alaska and Home Sense. By taking part in both programs at once members pay only for the ERHA rating and receive the Home Sense service at no charge. A home energy rating costs about \$100 and receiving a Home Sense audit without the energy rating costs \$75, so customers receiving both services at once benefit by only paying for the energy rating.

The ERH Alaska component of the dual program provides a rating based on thermal efficiency including a blower door test. An appliance audit is conducted as part of the home energy rating and the energy rater installs the efficiency measures (flow restricters, compact fluorescent bulbs, water heater wraps) funded by the utility. After the rating is complete the home owner is eligible to participate in AHFC's home energy rebate program for other improvements recommended through the rating. More than 1,000 customers have participated in the program. [R#8]

ERH of Alaska is also a driver for the following efforts:

• Because lenders and builders are familiar with the rating system, ERH Alaska is the industry's preferred method of demonstrating compliance with local building codes. Because the program drives EEMs, builders take advantage of the program and this is one of the reasons HUD reports Alaska is one of the most active states in the country in terms of mortgage stretches.[R#4]

• A Five Star Plus rating from ERH Alaska is required as part of the certification of homes under the Alaska Craftsman Home program (see The Results Center Profile #47). The Alaska Craftsman Home program is a prime model for how a home builder program can link to the UERS. Four Star Plus, Five Star, and Five Star Plus homes are also eligible for loans and rebates from the Alaska Housing Finance Corporation.[R#1,4]

• Multi-listing Service (MLS) of Alaska is now incorporating information on a home's energy rating as part of the listing of properties for real estate agents. The Alaska Appraisal Institute is also incorporating information on a home's energy rating as part of the computerized state appraisal database.[R#4]

• AHFC offers an Energy Efficient Interest Rate Reduction program which applies to homes documented as energy efficient through ERH Alaska. AHFC offers an interest rate reduction of 1% for Five Star Plus rated homes, 3/4% for Five Star rated homes, and 1/2% reduction for Four Star Plus rated homes.[R#4]

VERMONT

Energy Rated Homes of Vermont (ERH-VT) is a nonprofit organization that was founded in 1987 and which is committed to affordable, energy-efficient housing. ERH-VT is administered by the Vermont Energy Investment Corporation of Burlington, Vermont and rates new and existing homes for energy efficiency and improvements. ERH-VT uses the standard UERS rating system of One to Five Stars. ERH-VT is recognized as a national leader in the promotion of energy-efficient building techniques and mortgage programs that reward energy efficiency. The program was awarded a "1993 Vermont Governor's Award for Environmental Excellence in Pollution Prevention." ERH-VT was one of just two nonprofit environmental and community organizations to receive the honor for working to "prevent pollution at the source rather than control it after it has been created." ERH-VT has completed more than 1,600 home energy ratings and is the leader among UERS programs for the number of energyefficient mortgages processed with more than 900 to date. Approximately 50% of ratings ordered in Vermont have been "buyer ordered," typically by mortgage lenders, and

50% have been "seller ordered," primarily ordered by builders. [R#3,4]

Based on mail-back cards received from lenders, 80% of the lender-ordered ratings are used to create an EEM, with 75% of those EEMs used to stretch qualifying ratios for buyers of Four Star homes and 5% used to escrow funds for energy improvements to bring a home up to Four Stars. Vermont was also selected as one of five states to pilot the FHA EEM program.[R#4]

A Fannie Mae EEM pilot program now exists in Vermont which allows home buyers or refinancers to finance up to \$5,000 of cost-effective energy improvements as part of the mortgage without additional underwriting or appraisal. [R#4]

Presently five Vermont utilities help pay for energy ratings for new residential construction. In this case Central Vermont Public Service, Citizens Utilities Co., Green Mountain Power Corp., Vermont Gas Systems, and Washington Electric Cooperative (WEC) offer to pay all or part of the \$300 rating fee to builders who install various energyefficiency measures, such as compact fluorescent light fixtures and high-efficiency appliances. By providing free or subsidized ratings, the utilities create a valuable incentive for energy-efficient residential construction. [R#3]

The cost of an ERH-VT energy rating is now \$400 for the first rating ordered in a calendar year and \$300 for each rating afterwards. This is because the first rating each year includes an annual \$100 membership fee. Membership fees paid in October, November, or December carry over into the next calendar year.[R#3]

Central Vermont Public Service: Builders installing at least five fluorescent lighting fixtures (excluding any installed in closets, basements, garages, or under cabinets) can receive up to \$300 toward the cost of an energy rating. Builders also have the option of installing other approved energy conservation measures for individual incentives. The program applies to new residential construction and substantial renovation. [R#3]

Citizens Utilities Company: The Save-a-Watt program pays the full cost of an energy rating from ERH-VT and provides rebates of \$30 for each qualifying efficient lighting fixture and \$50 for a qualifying high-efficiency refrigerator. Added cash incentives are available if specified ef-

ficiency packages are installed in homes with electric water heaters. $[\,R\#3\,]$

Green Mountain Power Corporation: The Power\$avers Homebuilders program provides rebates of \$30 for each efficient lighting measure, \$50 for a high-efficiency refrigerator, and incremental cost incentives for a range of custom efficiency measures. GMP also provides water-heater tank wraps, tank and pipe insulation, and aerators for electric water heaters at no cost. Incentives can total more than \$200 which can be used to offset the cost of a home rating. The program is available to builders or developers, home buyers or existing customers. GMP performs a brief verification inspection once all measures are installed. For projects qualifying and starting prior to 1994 participants installing efficiency measures totaling \$150 in rebates and having an energy rating performed by Energy Rated Homes of Vermont were eligible to receive an additional \$150 toward the cost of the rating. (Note that this program is currently being redesigned by GMP.)[R#3]

Vermont Gas Systems: The Homebase New Construction program pays the \$300 fee for an energy rating and provides cash incentives of up to \$0.95 per square foot to builders for new homes designed and built to the Four Stars Plus standard of energy efficiency. The maximum builder incentive is \$1,700 for single family homes and \$1,550 per unit for multi-family homes. The goal of the program is to reduce natural gas consumption and peak day demand through energy efficiency improvements. Home buyers also benefit because a home meeting program standards will use approximately 20% less energy than a home of ordinary construction.[R#3,10]

There are three requirements for builders participating in the program. First, builders must provide ERH-VT with plans and specifications of the home's design which are evaluated and then returned to the builder with recommendations for energy efficiency improvements. Builders agreeing to the improvements become program participants. Second, while the home is under construction a Vermont Gas or ERH-VT representative performs a site visit to verify improvements and answer questions. Once the home is completed, a final verification inspection is performed by ERH-VT, checking for installed measures as well as conducting a blower door test. [R#10]

Washington Electric Cooperative: With the New Home Construction program, customers building new @

homes pay a \$300 assessment fee to the Cooperative, which allocates this money for a home energy rating as well as consulting from a home-energy specialist. Customers send their proposed home plans to the Cooperative, which forwards them to a Home Energy Rating contractor. Customers with plans receiving a passing grade (5.0) on both the TRC test and electrical test receive \$750, following a site visit to verify the score. For plans that do not receive an initial passing grade, the energy specialist works with the builder and homeowner, recommending changes that will lead to a passing score. Once the necessary changes are made and the home is completed, a verification and home energy rating are performed by the energy specialist. If the home passes the TRC and electrical test, the homeowner receives a check for \$750.

RHODE ISLAND

Rhode Island joined ERHA and tied it in with utility DSM programs. The UERS program is run by Rhode Islanders Saving Energy (RISE), a non-profit energy services company. RISE has a contract with all nine utilities in the state to administer a variety of DSM programs and as such has been able to nicely dovetail home energy ratings into its broader mission. All houses participating in a utility's DSM programs also receive a free energy rating. (Funding for this has been partially supported by the Governor's office.) Rhode Island leads the UERS in terms of number of houses rated with more than 12,000 rated. For customers receiving a rating of Three Stars or less, RISE will line up a contractor to install recommended improvements, supervise the work, and provide a post-installation inspection, with funding coming from the home owner often as part of an EEM.[R#1,11]

Rhode Island Housing and Mortgage Finance Corporation and RISE have formed a partnership to provide Energy-Saver Mortgages which save home buyers up to \$900 on closing costs. This credit is available only to firsttime home buyers who use Rhode Island Housing's lowinterest mortgages (First Time Home Buyers program). RISE contributes one quarter of a percent of the mortgage amount to buyers of homes receiving a Four Star or better rating. If the home does not achieve a Four Star rating RISE will contribute one half a percent of the mortgage amount if buyers add energy improvements in order to earn the rating. These credits come directly from the RISE budget and are designed as a marketing tool for the program. This credit is paid directly to the lender prior to closing and is applied to closing costs. The cost of the improvements must be escrowed at the closing and the improvements must be completed within 90 days of closing. Rhode Island Housing will finance up to \$5,000 in improvements as part of the mortgage. [R#4,11]

First-time home buyers can be eligible for Rhode Island Housing's First Time Home Buyers program if their income does not exceed \$40,600 for a one or two person household or \$46,690 for a household of three or more. Households with incomes up to \$23,000 are eligible for an interest rate of 4.25% for the first two years of the mortgage, 4.75% for years three and four, 5.375% for years five and six and 6.125% for the remaining 24 years of the loan. [R#11]

Households with incomes from \$23,001 to \$31,000 are eligible for a starting rate of 5.375%, which increases to 6.125% after two years. Those earning from \$31,001 to \$47,265 are eligible for a 6.125% rate for the entire 30-year term. Down payments can be as low as 5% of the purchase price. Lenders charge an origination fee of one point, equal to 1% of the amount borrowed. [R#11]

COLORADO

The Colorado Energy-Efficient Homes program is organized as a coalition effort operating a statewide non-profit organization called Energy Rated Homes of Colorado (ERHC). ERHC is presently being run by the Colorado Office of Energy Conservation (OEC). ERHC is the result of a coalition among OEC, rural electric associations, municipal utilities, investor owned utilities, lenders, builders, appraisers, and inspectors, as well as the City of Denver. Coalition partners will contribute annual funding to ERHC. Planning for ERHC and its associated programs began in July 1993 and ERHC plans to begin full-scale operation in the fall of 1994.

The goal of the ERHC program is to make Colorado the leading state in the nation in providing a market-driven consumer program for improving the energy efficiency of homes by January 1996. The program will help Colorado residences access EEMs, EIMs, and Energy Efficiency Improvement Upgrades. (This latter distinction refers to financing that is typically related to a utility DSM program and which applies to home owners not in the buy/sell process.) [R#12]

Colorado is the state most responsible for developing pilot guidelines for EEMs and EIMs for Fannie Mae and

Freddie Mac, which likely will be used nationally. Freddie Mac, Fannie Mae, VA and HUD will allow EIMs at the time of purchase, and the appraiser will accept the energy value cost that is part of the UERS rating as an acceptable add-on cost to the existing market value.[R#12]

Colorado is unique from other ERHA member states for several reasons. First, with \$2.6 million in startup funding (provided by OEC and intended to last 4 years), including \$1.3 million allocated for incentives, Colorado has a much larger initial funding base than other members. Second, utilities will be partners in the program, such that the utilities are the actual implementers of the ratings as well as sharing in program costs annually, paying 30¢ per meter for initial program buy-in. Utilities statewide have been asked to pay a share of the administrative and marketing costs for the effort, and where appropriate, link the program to DSM or direct loan programs in their service territories. [R#12]

The \$1.3 million in incentives will likely be used in three capacities: 1) to buy-down the initial cost of ratings, 2) to act as a fund for an energy bill indemnification program, and 3) to provide incentives for loan originators and real estate agents. The energy bill indemnification program is a proposal by the Colorado Improvements Association (a contractor association) which would guarantee customers who received a home rating and then installed recommended measures that their energy bills would not exceed a certain amount for the three years following installation. This maximum bill amount would be calculated based on historical billing data. If bills did exceed the limit customers would be reimbursed the difference.[R#12]

MEASURES INSTALLED

While the exact types of measures installed by home owners wishing to improve the energy efficiency of their homes will vary from state to state and home to home, there are several general types of installed measures recommended by UERS raters. Recommended measures include, but are not limited to compact fluorescent lamps (CFLs); water heater tank wraps; wall, ceiling, floor, and pipe insulation; efficient refrigerators and freezers; new higher efficiency space heating and water heating equipment; air leakage reduction; and controls.

Another area that ERHA has effectively promoted is the link between the energy efficiency of both new and existing homes and duct testing and repair. (See Profile #51)

The interface between home energy ratings and the quite complex field of duct testing and repair has been important to ERHA and particularly the Energy Rated Homes of Arkansas for a number of reasons. First and foremost, ERHA has raised awareness about the importance of duct testing and repair. Many utilities have denied that leaky ducts represent a significant energy loss in homes. Blower door testing, a primary component of ERHA's UERS, has disproved this assumption.

To back up the findings of its home energy ratings, ERHA has had to get a handle on the magnitude of duct leakage in order to estimate energy bills for rated homes. What ERHA has found, thanks to extensive expertise gained in this area, is that duct repairs are often the first or second most cost effective retrofit recommended to boost a home's efficiency. This in turn has forced ERHA to work with contractors, providing training to teach them how to safely repair ducts and to subsequently capture large energy savings. Finally, as ducts have been repaired homes have become more comfortable, lowering homes' thermal demands and opening the door for better HVAC applications for the delivery of both heating and cooling. [R#2]

STAFFING REQUIREMENTS

Presently there are 4 full-time equivalents (FTEs) working at ERHA's headquarters and administering the national program. Ron Hughes served as CEO from 1987 through May 1994 and is currently responsible for marketing and technical support. Evan Brown is Technical Director and provides technical support and maintenance of the ERHA database. Karen Walker is the Director of Operations in charge of program administration, and Lara Boyce is the Office Manager. [R#2,13]

STATE STAFFING EXAMPLES: ALASKA AND VERMONT

ERH Alaska has 3 1/4 FTEs working on the program, with one full time program coordinator, a full time technical director, an office manager (1/2 FTE), and one marketing employee (3/4 FTE). As discussed above, Golden Valley Electric Association's (GVEA) Home Sense program is directly tied to ERH Alaska and requires 1 1/2 FTEs to implement. Presently, ERH VT has 2 1/2 FTEs devoted to the program. [R#8,10]

While home energy ratings in and of themselves do not result in energy savings, every rating includes recommendations for energy efficiency improvements that will bring the given house up to a higher level of efficiency and thus a higher rating. Naturally builders that are keen on attaining high ratings for new construction create actual savings from baseline conditions.

National energy savings: Quantifying savings on a national basis by comparing baseline energy use of homes to post-rating/retrofit energy use has been virtually impossible. This challenge is due in large part to the fact that new homes typically only receive a single rating, and existing homes are rated prior to a retrofit but are usually not rated again following the retrofit. Follow-up ratings are only required for home owners that apply and qualify for EEMs. Otherwise the decision to get a follow-up rating is left to the discretion of the home owner. [R#2,7]

State energy savings: In terms of energy savings per participant, Alaska has the best data. There 369 homes installed energy efficiency measures in 1993 based on recommendations from a home energy rating, and these participants achieved annual energy savings equal to \$516,147, creating annual savings per participant of \$1,398 or 45% of the average participant's energy costs. [R#8]

Archetypal Burlington, Vermont home energy savings:

The accompanying table is an example of the benefits of an Energy Improvement Mortgage (EIM) that was attained by the home owner of a three-bedroom, all-electric home in Burlington, Vermont that sold for \$88,000. (All figures in the following example are unlevelized.) At the time of purchase it was rated at only Two Stars Plus. ERH-VT recommended a \$4,000 package of improvements to upgrade the home to Four Stars. Using an Energy Improvement Mortgage the buyer added this amount to her mortgage and made the improvements while saving almost \$100 per month.[R#3]

The home received an initial rating of 40.5 points (Two Stars Plus) and had annual energy costs of \$2,292. Energy features prior to the home's retrofit included R-30 ceiling insulation. R-11 wall insulation. no foundation insulation. thermopane windows, zoned electric baseboard heat, an electric domestic hot water heater with a 72% efficiency rating, 50 square feet of solar gain, and moderately low levels of air leakage. Energy Rated Homes of Vermont recommended cost-effective improvements including the installation of R-10 foundation insulation, switching to gas for domestic hot water and space heating, and installing a setback thermostat. These improvements cost a total of \$4,000 and provided the house with a score of 69 points (Four Star) and reduced annual energy costs to \$864. Thus by engaging in the energy rating and fulfilling its recommended improvements, the home owner was able to reduce her total monthly expenses (including both mortgage payment and utility costs) by \$91.[R#3]

PARTICIPATION RATES

Currently there are 10 states implementing energy rating systems which are ERHA State Members: Alaska, Arkansas, Rhode Island, Vermont, Indiana, Mississippi, Iowa, Virginia, Colorado, and Louisiana. In addition to these states, one utility (El Paso Electric) runs the ERHA system in its service territory in New Mexico. Kansas has an individual ERHA member operating in the state, although it is likely that Kansas will become a state member later in 1994.

ENERGY IMPROVEMENT MORTGAGE VERMONT EXAMPLE	EXISTING CONDITIONS	WITH ENERGY IMPROVEMENTS	MARGINAL COST
Capital Cost of Home (8% over 30 years)	\$83,600	\$87,600	\$4,000
Monthly Mortgage Payment	\$613	\$641	\$28
Taxes & Insurance per Month	\$200	\$200	\$0
Monthly Energy Costs	\$191	\$72	(\$119)
Total Monthly Housing Expenses	\$1,004	\$913	(\$91)

DATA ALERT: Note that the status of the ERHA database is heavily dependent on reporting provided by the individual states. The following rating figures presented reflect the ERHA database as of May 18, 1994.

ERHA maintains a national housing data bank of all houses rated under the UERS. UERS has a regular reporting process which allows ERHA to build and access this housing data bank. Members are required to provide monthly or quarterly reports listing the rating of all individual homes that have been rated through the program. ERHA requires that the software used by members to store data on rated homes easily transfers information to the ERHA data bank. This information allows maintenance of quality control as well as the calculation of the average baseline energy costs of different housing types in different areas with different fuel mixes. This data bank can also be used to track the correlation of selling price to efficiency levels for better valuation of efficiency in the appraisal process. Ratings are currently archived by ERHA.[R#1]

ERHA has 15,626 ratings in its national database, consisting of ratings reported from six states (the other participating states are either relatively new members or have performed very few ratings.) The large majority of ratings are rated "as-is." To date approximately 80% of the ratings have been for existing homes, with the remainder for new construction. Due to the relatively low level of activity of lending programs for efficiency improvements there are few post-improvement ratings.

The ERHA database has a total of 743 ratings from Arkansas, 48 from Mississippi, 6,429 from Alaska, 1,626 from Vermont, 6,654 from Rhode Island, and 126 from Virginia. In terms of post-improvement ratings, the database contains 38 from Arkansas, 3 from Mississippi, 835 from Alaska, 407 from Vermont, 14 from Rhode Island, and 3 from Virginia.

The large majority of ratings (13,534) fall in the Two to Four Star rating zone. A total of 832 homes rated either One or One Plus Star, while 831 rated Four Star Plus, 345 rated Five Star, and 84 rated Five Star Plus. [R#7]

NUMBER OF ERHA RATINGS	TOTAL RATINGS	POST- IMPROVEMENT RATINGS
Arkansas	743	38
Mississippi	48	3
Alaska	6,429	835
Vermont	1,626	407
Rhode Island	6,654	14
Virginia	126	3
Total	15,626	1,300

ERHA STAR RATINGS	TOTAL RATINGS
One Star	283
One Star Plus	549
Two Star	1,567
Two Star Plus	2,771
Three Star	3,022
Three Star Plus	3,302
Four Star	2,872
Four Star Plus	831
Five Star	345
Five Star Plus	84
Total	15,626

Cost of the Program

ERHA COSTS OVERVIEW	OPERATIONS	LABOR	TRAVEL	TOTAL EXPENSES	TOTAL REVENUES
1990	\$45,558.0	\$22,780.0	\$7,593.0	\$75,931.0	\$72,160.0
1991	\$66,675.9	\$33,338.5	\$11,112.8	\$111,127.2	\$157,646.6
1992	\$64,243.3	\$32,121.2	\$10,707.7	\$107,072.2	\$138,950.8
1993	\$106,471.5	\$53,236.2	\$17,745.1	\$177,452.8	\$205,425.6
Total	\$282,948.8	\$141,475.8	\$47,158.6	\$471,583.2	\$574,183.0

ERHA EXPENDITURES

From 1990 through 1993, ERHA has had total expenditures of \$471,583 and total revenues of \$574,183. ERHA estimates operations to comprise 60% of expenses, labor to total 30% of expenses, and travel to equal 10% of expenses. Total expenditures have steadily increased as ERHA has grown, ranging from \$75,931 in 1990 to \$177,453 in 1993. Operations costs equaled \$106,472 in 1993, labor costs totaled \$53,236, and travel expenses were \$17,745.[R#13]



Note that the labor costs in the accompanying table do not appear reasonable to support ERHA's staff. For the past seven years ERHA and Energy Rated Homes of Arkansas have shared offices and staff, while splitting overhead and staff costs for accounting purposes only. While these two offices are now split, staff costs are paid by both agencies, explaining the apparently unrealistic numbers presented. [R#2]

BUDGET FOR AN ERHA MEMBER STATE: VERMONT

DATA ALERT: Note that the following budget is strictly an estimate of costs for ERH-VT FY 1993-94 (July - June). Dollar figures have not been levelized to \$1990. The budget was calculated assuming that 300 ratings would be performed during the year. Currently ERH-VT estimates that between 400 and 500 ratings will be performed during FY 1993-94. Nonetheless, ERH-VT estimates it will still have a budget deficit of around \$15,000.[R#10]

ERH-VT estimates its program expenses to total \$169,550 for FY 1993-94, including \$100,750 for administrative costs (59% of total expenses) and \$68,800 for rating expenses (41% of total expenses). Labor is by far the primary administrative cost, totaling \$71,900 (71% of administrative costs). Labor is also the primary component of rating expenses, totaling \$51,300 (75% of rating expenses). [R#10]

Program revenues for ERH-VT total \$79,500 and come almost entirely (\$75,000 or 94%) from rating fees. Additional funding is provided through grants and subsidies which total \$75,000, creating total revenues of \$154,500. Funding sources for grants and subsidies include Vermont Housing Finance Agency (VHFA) providing \$50,000, Vermont Department of Public Service (DPS) providing \$15,000, and Vermont Energy Investment Corporation (VEIC) providing \$10,000. See accompanying table for additional ERH-VT budget details. ERH-VT estimates it will have a deficit of \$15,050 for FY 1993-94, which will be covered by VEIC. [R#10]

ENERGY RATED HOMES OF VERMONT FY 93-94 BUDGET (BASED ON 300 RATINGS)

ADMINISTRATIVE EXPENSES

Labor	\$71,900
Consultants- Admin/Marketing	\$7,200
Marketing Materials	\$10,000
Telephone	\$1,600
Travel- Admin	\$1,000
Legal & Accounting	\$1,000
Financial Audit	\$2,500
Printing/Copying	\$2,500
Training (Lender/Appraiser)	\$500
Materials	\$1,000
Lender Incentives	\$750
HERS Council Membership	\$500
Miscellaneous	\$300
Total Administrative Expenses	\$100,750

RATING EXPENSES

Labor	\$51,300
Checklist Fees	\$12,000
ERHA Fees	\$4,500
Travel- Rating	\$1,000
Total Rating Expenses	\$68,800
TOTAL EXPENSES	\$169,550

PROGRAM REVENUES

Rating Fees	\$75,000
Membership Fees	\$2,000
Appraiser Training Fees	\$500
Consulting	\$2,000

Net Revenues Before Subsidies \$79,500

GRANTS & SUBSIDIES

Dept. Pub. Service EEM Pilot	\$13,000
Dept.Pub.ServLighting/Appliance	\$2,000
VHFA	\$50,000
Vt. Energy Investment Corp.	\$10,000
Total Grants & Subsidies	\$75,000
TOTAL REVENUES	\$154,500
SHORTFALL AFTER SUBSIDIES	(\$15.050)

COST EFFECTIVENESS OF ERH ALASKA	1993
Number of Home Upgrades	369
Upgrade Cost	\$1,210,614
Annual Energy Savings	\$516,147
Simple Payback (Yrs)	2.3
Benefit/Cost Ratio	4.7
Ratings Cost	\$49,885
Administrative Costs	\$90,127
Total Program Costs	\$1,350,626
Overall Benefit/Cost Ratio	4.2

COST EFFECTIVENESS

In 1993, a total of 369 Alaska home owners made energy efficiency upgrades based on home energy rating recommendations. These upgrades (not including rating costs and program administrative costs) cost a total of \$1.21 million and are projected to achieve annual energy savings worth \$516,147, creating a simple payback of 2.3 years. On average, each 1993 participant spent \$3,281 on improvements. Based on a 15-year measure life for improvements and a 4% real discount rate, the combined retrofits had a benefit/cost ratio of 4.7. Based on \$150 per rating, rating costs for 1993 totaled \$49,885, and program administrative costs totaled \$90,127. Using total program costs (\$1.35 million), the benefit/cost ratio drops slightly to 4.2. [R#8]

LESSONS LEARNED

ERHA's flexibility yet uniformity has been key to its success. States and localities differ in climate, house types, and local needs. ERHA and UERS allow diversity in local programs to accommodate these different needs. ERHA is sometimes viewed as an association of many different local programs using a common rating system that is uniform in methodology but flexible in application. [R#1]

ERHA is evolving. Each time the system is developed for a new state it is improved by innovations incorporated by the new state. The innovations and marketing materials developed by each new state are shared by all members of ERHA. Therefore, changes in the way ERHA and UERS are implemented are constantly evolving and being improved. One of the ERHA program's main strengths is that it is adaptable enough that each state can modify it to its own climactic and economic peculiarities, yet still have a program that is comparable to other states.[R#1]

Energy rating systems indirectly, but certainly, can lead to improved energy efficiency, which in turn means home owners will have lower utility bills. Since high utility and energy costs are one of the eight major reasons for mortgage default, the importance of ERHA is clear for home buyers and lenders across the country. [R#1]

One of the major barriers to widespread implementation of HERS programs is lack of awareness, and this is rapidly being overcome. Other barriers such as a lack of trained raters, lenders, appraisers, and real estate professionals still exist on a large scale. Interestingly, there is not much "competition" between ERHA and other scaled rating systems. This is due primarily to the fact that until recently there was very little money to be made in this arena. In addition, other rating programs, such as those implemented in California, Arizona, and New York, are not designed or equipped to be moved out of state. ERHA does not expect future competition from existing programs but looks towards new entrants, especially energy service companies to provide rating services. [R#2,6]

HERS and EEM programs are interdependent in many ways and need to be developed simultaneously if the country's goals for energy efficiency are to be reached. To date there has been a popular misunderstanding about the link between the two, while clearly their synergistic effect is important to future states' implementation of this program concept. [R#6]

TRANSFERABILITY

Rating homes based on their energy efficiency and providing an indication of energy costs to consumers makes sense. Making energy ratings uniform from state to state also makes sense, since loans are bought and sold around the country and the secondary mortgage market has always insisted on uniformity. Providing this information to lenders allows them to approve larger loans for more expensive, energy-efficient homes that will create net monthly savings for their occupants.

ERHA's goal, reaffirmed at a Colorado meeting in May of 1994, is to have its rating system in place in each of the 50 United States. While this may seem lofty, ERHA believes that it has reached a critical mass of activity. It is the most widely used scaled HERS in the country; is flexible in its application; and its reputation is backed by years of experience in all major climate zones. [R#2]

ERHA has developed technical and marketing capabilities that it claims are the envy of other programs. It has been successful in linking with mortgage financing, affordable housing initiatives, community development, Community Reinvestment Act compliance, weatherization and rehab assistance programs, alternative code compliance, state housing finance agencies, utility DSM programs, duct training for contractors, and continuing education programs for Realtors and appraisers. [R#2]

Other scaled HERS programs such as CHEERS in California, and to a lesser extent AZ-HERS in Arizona and Energy Wise in Illinois, are successful in their own right. At least two of these independent programs are considering following Colorado's lead and joining ERHA as a state member. In the face of emerging competition, ERHA is becoming more aggressive at national expansion. [R#2]

Ironically, some of the emerging competition may come from the very organization that ERHA helped establish: the HERS Council. While a uniform national rating system may seem logical to many, the HERS Council may create another effect, in fact a mosaic or patchwork of rating systems that comply to a national set of minimal standards. Such a result would be at odds with ERHA's goal of a national, uniform system. Critics believe such a patchwork of programs would make it difficult to maintain quality control, inviting abuse. This scenario could also work in ERHA's favor, creating brand name loyalty for the rigorous program implemented by ERHA.[R#2]

- Energy Rated Homes of America, "Energy Rated Homes and the Uniform Energy Rating System," December 1, 1993.
- 2. Ron Hughes, Energy Rated Homes of America, personal communication, March - June 1994.
- 3. Energy Rated Homes of Vermont, "The Energy Efficient Mortgage Newsletter," Winter/Spring 1994.
- 4. Energy Rated Homes of America, "Home Energy Rating News," Fall 1993.
- National Renewable Energy Laboratory, "A National Program For Energy-Efficient Mortgages and Home Energy Rating Systems: A Blueprint For Action," March 1992.
- National Renewable Energy Laboratory, "Energy-Efficient Mortgages and Home Energy Rating Systems: A Report on the Nation's Progress," Barbara Farhar and Jan Eckert, September 1993.
- Evan Brown, Technical Director, Energy Rated Homes of America, personal communication, April - June 1994.
- Steve Baden, Department Head, Affordable Housing and Energy Efficiency Department, Alaska Housing Finance Corporation, personal communication, April - June 1994.
- Amy Bridge, Assistant Director, The Virginia Residential Energy Foundation, personal communication, May 1994.

- 10. Richard Faesy, Director, Energy Rated Homes Vermont, personal communication, April - June 1994.
- 11. Debi Curry, Residential Program Coordinator, Rhode Islanders Saving Energy, personal communication, May - June 1994.
- 12. Jay Luboff, Director of EEMs and HERS programs, Colorado Office of Energy Conservation, personal communication, May - June 1994.
- Karen Walker, Director of Operations, Energy Rated Homes of America, personal communication, May - June 1994.
- Energy Information Administration, "State Energy Data Report 1992, Consumption Estimates," May 1994.
- 15. Greg French, Executive Director, CHEERS, personal communication, June 1994.

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