LBL-23926
c.2

Lawrence Berkeley Laboratory
UNIVERSITY OF CALIFORNIA

APPLIED SCIENCE DIVISION

RECEIVED
LAWRENCE
BERKELEY LABORATORY

OCT 1 9 1987

LIBRARY AND
DOCUMENTS SECTION

Presented at the 3rd International Congress on Energy Conservation Program Evaluation: Practical Methods, Useful Results, Chicago, IL, August 19–21, 1987

Evaluation of the Implementation of Home Energy Rating Systems

E. Vine, B.K. Barnes, R. Ritschard

September 1987

TWO-WEEK LOAN COPY
This is a Library Circulating Copy
which may be borrowed for two weeks.

APPLIED SCIENCE
DIVISION

LBL-23926
c.2

Prepared for the U.S. Department of Energy under Contract DE-AC03-76SF00098

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

LBL-23926

EVALUATION OF THE IMPLEMENTATION OF HOME ENERGY RATING SYSTEMS

Edward Vine
B.K. Barnes
Ronald Ritschard

Energy Analysis Program
Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

September 1987

This work was supported by the Assistant Secretary for Conservation and Renewable Energy, Office of Buildings and Community Systems, Building Services Division, U.S. Department of Energy under Contract No. DE-AC03-76SF00098.

ABSTRACT

We evaluate the implementation of home energy rating and labelling programs (HERS) that are being conducted around the country. We examine the nature of different implementation problems and the kinds of strategies that have been used to deal with them to ensure the effective penetration of HERS to all HERS users. We use a model of the implementation process that assumes implementation is strongly influenced by the local context, involves two-way communication, and assumes little commonality of purpose among participants, saving a concensus on reaching some sort of decision.

INTRODUCTION

The rating and labelling of new and existing energy-efficient homes by local, state, and federal government agencies, utility companies, and other organizations has been an activity marked by periods of intense interest and benign neglect. During the late 1970's, home energy rating systems became important components of several energy conservation programs conducted by governmental and non-governmental organizations at national, regional, and local levels. By 1982, when the first national review of HERS was prepared, it seemed that the idea of a home energy rating system had become entrenched as an effective means of pursuing the goal of energy conservation (1). Since that time, however, a number of these systems have been abandoned, and only a few have endured. Nevertheless, a number of HERS remain, and interest in HERS has increased in selected areas (notably in Alaska, Arkansas, Colorado, New Jersey, New York, Vermont, Washington, and Wisconsin).

During the implementation of HERS, a number of problems were encountered by the sponsors, and a number of strategies were developed to resolve these problems in order to ensure the effective penetration of HERS to all HERS users. In our evaluation of HERS, we found that the successful implementation of HERS was based on a sensitivity to the needs of local users, and on two-way communication, in which the sponsors and users discuss the benefits and costs of promoting a HERS. In the following discussion, we describe the distribution of HERS around the country, present our major findings, and describe the various needs of the individuals and organizations affected by HERS and how they were addressed in the implementation of HERS.

HERS DISTRIBUTION

In January 1986, we conducted a national telephone survey of home energy rating systems to examine the different kinds of HERS and implementation systems being used and to discover the range of possible implementation problems and solutions experienced by the users of these systems (2). Because of our interest in a statewide HERS, we first contacted all state energy offices in the U.S. to discover where existing HERS were operating. Major systems were followed up in each state, and we examined those operated by local governments and utility companies. Because we were primarily interested in obtaining a description of only one HERS per state, we did not normally investigate additional HERS in a particular state if that rating system was a duplication of one already reviewed. As a result, 28 states were able to provide examples of some form of HERS that was currently in operation.

The 28 states provided information about 34 HERS programs (Table 1): 14 of these were located in the southeast, 8 in the midwest, 5 in the northeast, 4 in the Pacific/mountain region, and 3 in the southwest. Although our sampling procedure was crude, we believe that this distribution accurately reflects the distribution of HERS through the country and the full range of likely implementation and delivery programs. They seem to be concentrated mainly in those areas concerned with regulating cooling loads. Most (20) of the programs were developed at the national or regional level, 6 by states and 7 by large utility companies or energy production and distribution authorities, as compared to the local level, where 14 HERS were developed, usually, by smaller utilities. However, the role of utilites should not be overestimated. Home builders associations, in particular, have tended to play a critical role in the adoption of most successful programs, are often used in consultation within the development phase, and have helped implement some of the major HERS in operation.

We categorize the explanations offered by other states for their lack of HERS into three areas. First, there were those who indicated the lack of general public interest. They typically felt that interest in energy efficiency was a response to the "energy crisis" of the early 1970s. HERS were, therefore, seen as part of a temporary arsenal of tools for dealing with short-term crises. They felt the public would not be interested in, would not accept, and would not use HERS once the energy crisis was no longer visible. This attitude was particularly the case in the midwest. Second, there were those who felt that the benefits of a HERS could only be marginal, and that such programs would not be cost-effective to them. Such states were unaware of the strong commitment to HERS and attendant programs in the south, and their effect on managing peak loads and building demand in off-peak seasons. And third, there were states who simply had not considered HERS and who didn't understand the meaning and relevance of HERS.

HERS FINDINGS

The first critical observation, based on our survey, is that it is virtually impossible to treat HERS in isolation from other energy conservation efforts. In particular, HERS' connection to auditing is often complex and inseparable. The promotion of HERS is intimately connected to the promotion of energy efficiency, and HERS are rarely offered in isolation. More frequently, a HERS is a part of an energy-efficiency package that might include anything, from free-sizing services and air-duct distribution design to free or subsidized weatherization materials and low-cost loans. This has made our task more difficult, since it means that, effectively, the study of HERS resists being reduced to a

Table 1. Home Energy Rating Systems Surveyed

HERS Program	Single Family		Multi-Family	
	New	Existing	New	Existing
Alabama Power : Good Cents	C			
Energy Rated Houses of Alaska	A/C	A/C		
Salt River Project (Arizona) : Energy Efficient Homes	A			
Arkansas Power and Light : Energy Efficient Rating:	A/C	A/C		
Denver Energy Resource Center (Colorado) : Home Energy Rating	B			
Conn Save (Connecticut) : Cornerstone Home Energy Rating	C	C	C	C
Florida Energy Proficiency Award	A	A		
Gulf Power (Florida) : Good Cents	C	C		
Georgia Power : Good Cents	C	C		
Illinois Power : NEW	A/C	A/C		
Delmarva (Delaware, Maryland, Virginia) : Super E Home	C			
Mass Save (Massachusetts) : Mass Save	C	C		
Mississippi Valley Gas : Gas Mark	A		A	
Mississippi Power and Light : E3 and Energy Saving Home	C			
St. Louis Home Builder's Association (Missouri) : Energy Mark Program	A			
Union Electric (Missouri) : NEW	A	A		
Kansas City power and Light (Missouri) : Save America's Valued Energy	A			
Nevada Power : Energy Efficient Homes	A			
Southwest Gas (Nevada, Arizona) : Flame of Excellence	A			
Public Service Company of New Mexico : SMART	C			
New York State Department of Energy : Thermal Rating	A/C	A/C		
Duke Power (North Carolina) : Energy Efficient Structures	A	A	A	A
Ohio Department of Energy and Conservation : Home Energy Analysis Audit		C		
Oklahoma Natural Gas : Conservator Home Award	A			
Pennsylvania Governor's Council : Home Energy Cost Estimator	C	C		
Tennessee Valley Authority : Super Saver Homes	A/C		A/C	
Watt Count Engineering	C	C		
Texas Utilities Electric Company : Energy Action Homes	A	A	A	
Gulf States Utilities (Texas) : Good Cents	C			
City of Austin (Texas) : Look for the Star	C			
Virginia Power : Energy Saver Home	A			
Western Resources Institute (Washington) : Energy Rated Houses	A/C	A/C		
Wisconsin Division of State Energy : Energy Auditing Program	C	C	C	C
Wisconsin Electric Power Company : Good Cents	C			

A = Prescriptive; B = Performance; C = Calculational.

conveniently discrete subject matter; it resists separate examination in order to determine its independent contribution to demand-side management.

This diversity in implementation is in part a consequence of the diversity in the target populations which range from homeowners and homebuyers (consumers) to real estate appraisers. Moreover, different expectations for, and uses of, HERS exist within these groups, and these differences affect the kinds of strategies evolved for successful implementation of HERS. Often, in the development of a particular program, the different goals and interests of participants need to be reconciled through negotiation; the alternative being the withdrawal of support by critical parties, or even the development of rival systems.

Many failed HERS started from the assumption that the public were energy experts, and that the provision of a HERS was only viable if it met a market demand. By energy experts we mean that the public was treated as if they knew what energy efficiency was, how the structure of their house affected it, how they could improve that structure to improve its energy efficiency, and how they could determine the economic viability of the various ways in which energy efficiency might be accomplished, how energy-efficient improvements would affect their personal comfort, and how this would be translated into utility bill savings and added value to their house. When such a public was surveyed and found to be uninterested in energy efficiency, many energy authorities treated this information as evidence that a HERS was unwanted, unnecessary, and unviable. Accordingly, many failed HERS were typically passively operated, with little or no promotional budget, used a tool which could not evaluate alternative paths to energy efficiency, and which presented the rating in a way that had little chance of capturing the homeowner's imagination, to convince the homeowner of the need to weatherize or retrofit. In contrast, we found that such a lack of interest on the behalf of the public was due to lack of knowledge and information, and that part of the function of a HERS should be to educate the public, increase their energy awareness, and create a demand for energy efficiency.

The success in implementing a HERS is dependent on success in *marketing* the HERS. Successful marketing is achieved only after a comprehensive appreciation and treatment of the diversity in target populations. Programs that have had a restrained approach to the implementation of HERS--by insisting on treating implementation problems as basically technical, engineering problems (e.g., focusing on the accuracy of the tool), or by

taking a laissez-faire approach to marketing (e.g., simply meeting a demand for energy efficiency, rather than helping to create more demand)--or programs that have adopted an aggressive, non-responsive approach, have had a poor track record. Successful implementation requires: sensitivity to the diversity of the market; an active approach to marketing; an appreciation of the range of different uses of HERS and the range of apprehensions felt by the various target groups; and the willingness to be responsive to the major user groups in the administration and further development of the program. The rest of this paper discusses the perspectives and needs of the individuals and organizations affected by HERS and the solutions used to address their needs.

NEEDS AND SOLUTIONS

Homeowners and Home Buyers

The aim of a home energy rating is to influence the behavior of one of two ultimate target populations, homeowners or builders, so that they either improve the energy efficiency of their homes, or build to higher standards of energy efficiency. In considering consumers' (homeowners and home buyers) interests in a HERS, it is apparent that their aims or motivations were primarily based on costs and their desire for physical comfort. HERS programs have in the past been promoted to these groups through an emphasis on energy efficiency, yet accumulated evidence seems to suggest that this motivation plays little part in either home-purchasing decisions or decisions to retrofit. Much more important to them are the costs of energy and the provision of thermal comfort. Saving through energy efficiency has been a successful promotional device, but there is still a widespread belief, especially for low-income groups, that energy-efficiency and cost savings can only be achieved with reduced thermal comfort. This belief is one of the main barriers that must be overcome in dealing with the general public. To this end, recent promotional programs have focused on the thermal comfort advantages of energy-efficient homes, and rebates have been offered to builders to promote the correct sizing of air-distribution systems, and, therefore, make the homes more comfortable. To date, these strategies have been particularly successful.

The kinds of economic factors considered in investment decisions by consumers include the size of the investment, its effective rate of return in terms of annual savings on energy bills, the repayment period, the capital appreciation of their property accruing as a result of energy-efficient improvements, and the related change in the resale value of their property. In response to these concerns, HERS sponsors have used educational

programs, rebates, guaranteed savings, and lower utility rates to assure consumers that they will be definitely saving energy and money by investing in energy-efficient homes. It is important to note that different socioeconomic groups seem to have different criteria for making an investment decision. The time frame for repayment is more restricted in the case of low-income groups, and no group seems to have a time frame nearly as long as the 'conservatively short' periods used in the cost-effectiveness calculations of most HERS developers. HERS developers seem to prefer a 7-year time frame, while consumers prefer less than 6 months for smaller investments, and only up to 5 years for larger ones (and this time frame is even smaller for low-income groups).

Consumers are dependent on energy authorities for providing them with information about the economic benefits of energy efficiency, how they might be affected, and what their cost will be. Vague information is typically inadequate for making a rational investment decision, so that HERS should be flexible tools to provide customized information. Problems with the accuracy of the tool as it relates to the reliability of savings predictions for the individual consumer can be successfully buffered through the offering of securities, in the form of guarantees, lower energy rates, or rebates on more efficient equipment.

The function of the rating tool is to provide measurements of both current efficiency and what might be done to change that efficiency. But it is also a part of the promotional process, and it needs to be convincing to the homeowner. In particular, the rating itself must be seen as authoritative and meaningful, and it must be seen that if homeowners do make certain changes some real benefits will occur. Such benefits must also be seen as being cost-effective, as an investment adding to the value of their homes, and as increasing their personal comfort.

Highly related to these issues is that of the trustworthiness of the HERS sponsor. When the sponsor is a utility, consumers are suspicious about the potentially contradictory objectives of the organization: make money by selling energy versus decrease energy consumption by promoting HERS. Consumers do not readily see the connection between energy efficiency and the profitability of utility companies. Consequently, consumers (especially, low-income groups) become suspicious of energy-efficiency programs. Such suspicions can be alleviated through the use of educational programs that promote not only energy-efficiency investments, but explain the interest of the implementing authority in them. The offering of actual guarantees (e.g., rebates, guaranteed savings, and lower

utility rates), used to assure the investor of a real return, has the secondary consequence of reinforcing the trustworthiness of the agency.

Builders

Builders are generally very conservative and resistant to the introduction of novel ideas and technologies. New, energy-efficient technologies need to be tactfully introduced, or builder resentment of 'outside' intereference will prevent their widespread adoption. To this end, the implementation of HERS, in particular those designed for new construction, must be sensitive to the needs of builders. Through educational programs, builders need to be convinced that HERS sponsors have a legitimate interest in promoting energy-related building technologies so that HERS can be seen as acceptable activities and not as attempts to arbitrarily intrude on the builders' domain. Having convinced the builders of the legitimacy of their interest, the strategy of HERS sponsors has been to work with builders as 'partners,' not infringing on the traditional prerogatives of the building trade. This 'partnership' approach has strongly characterized most successful HERS programs and has been repeatedly identified by the administrators of such programs as a critical factor in their success.

Builders operate by the profit motive, and both the cost-effectiveness of HERS and their ability to be used as effective marketing devices need to be demonstrated. Typically, building to HERS standards within a HERS program costs money, time, and effort. For example, many programs charge a fee for participants, which seem to be regarded as generally prohibitive, regardless of the actual size of that fee. Also, new building materials and techniques require new skills, which have to be acquired and paid for, and HERS programs often involve a series of inspections that entail much effort on the part of the builder. In short, HERS can be very demanding of builders.

Builders are uncertain as to how a HERS will affect the marketability of their product. Typically, building to a higher HERS standard translates into added costs of several thousand dollars. If costs do increase, the builder is going to be concerned as to how this can be passed along to the consumer. He is concerned with the elasticity of the demand for his product, and, hence, is ultimately dependent on the consumer's interest in energy efficiency. HERS sponsors have typically responded to this need of the builder by providing a marketing program, offering cooperative advertising, and independently promoting individual builders participating in the program. Furthermore, energy-efficient construction is often accompanied by decreased sizing requirements for various equipment

(often as an inducement to the builder), and this can generally translate into reduced costs to the builder. HERS agencies also offer rebates to builders for installing energy-efficient equipment. To increase their understanding of HERS and energy-efficient construction, informational and training programs, workshops, and the construction of demonstration homes were targeted to the building community.

Some of the biggest advantages of participating in a HERS have occurred in depressed housing markets. When demand for housing is high and supply low, builders can usually sell whatever they build and, therefore, are not interested in participating in HERS. But when the housing market is depressed, energy efficiency can be used to increase the marketing advantage of participating builders.

Two groups have been very active in encouraging builders to support and participate in HERS, and their involvement has given credibility to rating and labeling programs. The first group consists of 'innovators,' the 'Young Turks' of the trade, whose commitment to energy efficiency has paid off in economically depressed times. The second group is composed of homebuilders associations (local and national) who actively research the market, promote the success of building innovators, and help develop local and regional HERS. Homebuilders associations are generally committed to energy efficiency and strongly support HERS programs.

Realtors

HERS have basically been directed to new construction and, most typically, to large construction projects. Under these conditions, sales are usually made by sales department personnel connected to the developer and not by independent realtors. Consequently, realtors are often ignored. In addition, realtors are often perceived as part-time or transitory workers and, consequently, represent a shifting target group. Because realtors have a high turnover, requiring continuous education, educative efforts are often felt to be "wasted" on them. Nevertheless, for HERS that are directed at existing construction, a largely untapped area, a key to successful implementation in this sector continues to be the real estate agent.

The most effective strategies directed to realtors have been educational. Realtors that use HERS in selling houses can often increase their competitive edge by being more knowledgeable and more concerned with the future comforts of the prospective buyer. The National Association of Realtors assisted in the educational process and gave some

credibility to the program. Energy-efficient houses also usually sell at a higher price, and higher prices translate into higher commissions for the realtor. When HERS are accompanied by recognition from the secondary lending community (Fannie Mae or Freddie Mac), the buying market is expected to increase, as lower-income households are helped in home purchasing through lowered income-payment ratios. The plausible house price range for all income levels actually increases, as they can finance more expensive property. All of this can translate into more commissions to the realtor.

Primary and secondary lending institutions

There is little evidence of the impact of secondary lending institutions (Fannie Mae and Freddie Mac) on home buying: we were unable to find data on any new loans being made just because a home was energy efficient. Primary lenders, the local banking and credit union institutions, can potentially have a greater impact since their contacts with consumers are closer. However, relatively few banks actually consider energy efficiency in their lending decisions. Consequently, Freddie Mac and Fannie Mae endorsement has mainly been of great marketing value to the HERS agencies in dealing with recalcitrant builders, or in arguing the potential of HERS to realtors, than in creating greater demand for energy-efficient housing by the general public. Homebuilding associations, in particular, have successfully used the marketing argument with their members. Actual research on the number of loans made consequent to the use of energy efficiency information is sorely needed.

HERS Raters

In terms of HERS delivery, the two major vehicles are utility representatives and builders. To a large extent, the appropriateness of the rater is determined by the type of HERS in operation, since different types of HERS place different requirements on the delivery operation. Simple prescriptive systems can be constructed to allow mimimal training and can often be used by the consumers themselves. Calculational systems either require more detailed data (e.g., building blueprints) or are more complex in their calculational methods (requiring special training). Detailed information can usually be supplied by the builder, and, in such cases, builders become the default raters; special training requirements usually require utility raters.

Three other delivery systems are city building inspectors/auditors, real estate appraisers, and associated energy service industry experts (e.g., insulation specialists). Using city officials is often efficient if the HERS can be connected with an existing residential

auditing or inspection program; however, because of potential liability and conflict of interest problems, building inspectors are seldom used. The major problem in using appraisers as raters is that the actual appraisal occurs late in the home selling process, so that the appraiser's rating has little effect on whether a house is sold or not. In addition, appraiser ratings may cost as much as $100, and this added expense may be seen as a major detriment.

Some very successful HERS have been developed and aggressively marketed by engineering companies specializing in energy efficiency or insulation. Local dealers or franchise owners, after specialized training, perform the rating in conjunction with the marketing of particular conservation services. To date, these activities have been mainly directed to new construction, which is easily accessed and involves large-scale sales. More recently, existing stock has been suggested as having a larger potential, and a greater stability, particularly in depressed housing markets.

It seems to us that a critical factor in the delivery of HERS has to do with the perceived authority of the rating agent. Simple HERS seem attractive in that they are easy to use, inexpensive, and allow consumers to perform their own ratings. In these situations, there is no information about effective implementation rates for retrofit procedures as a consequence of the rating process. If the HERS intends to be separate from the auditing process, the authority of the rating will still be critical for its acceptance and will be used by the consumer to judge whether the HERS is simply a marketing gimmick or provides critical information. Rated homes have to be seen as very effective investments, representing genuine improvements in thermal comfort with energy-saving advantages over other alternatives. We suspect that single sheets of paper and a simple calculation with mimeographed comments to aid the interpretation of results are not going to be very compelling. The results of a HERS rating should be clear and the recommendations should be precise, but they should also have the appearance of authority in order for them to be accepted and acted upon.*

HERS IN THE MULTI-FAMILY SECTOR

Most of the previous discussion of HERS dealt with the rating and labelling of new and existing single-family homes. We did encounter several multi-family rating systems, but

* For a recent examination of the importance of the perceived authority of the rating tool and the rater, see Ritschard et al., 1987.

HERS have often avoided intervening in the multi-family sector because of the landlord-tenant relationship. Most multi-family HERS placed the burden on the landlord to upgrade the energy efficiency of the building. Landlords argue that structural improvements are expensive, and they cannot expect immediate payback in terms of reduced energy expenditures, since most energy is paid for by the tenant. The people who recoup the investment, as well as the comfort, will be the tenants. Thus, there exists no effective motivation for the landlord.

Most tenants who implement HERS recommendations make easy, low-cost investments, but their ability to retrofit existing structures to meet certifiable standards is usually limited. Consequently, most HERS authorities only require low-cost improvements, the kind of modifications that are economically feasible to tenants. Thus, landlords feel that if tenants want to decrease their energy bills through increased energy efficiency, then the effort should be left to them, since they have the motivation, will enjoy the benefits, and can economically afford the investment (often with subsidies from HERS sponsors). On the other hand, tenants anticipate that the return of such investments will be long-term, so that if they made the investment, they would not be around long enough to recoup it. Thus, they don't want to pay for the upgrading of the landlord's building.

In sum, there are few, if any, advantages in making the landlord primarily responsible for reducing energy use in the multi-family sector, and HERS sponsors are afraid of provoking landlords to lobby the legislature to eliminate HERS or to refuse to cooperate with all energy-efficiency programs. A solution to this dilemma may be available by utilizing a two-pronged approach. First, a prescriptive HERS would be used for individual units, and the HERS would target tenants to adopt low-cost energy conservation measures. After this program has been implemented (and the landlord assuaged), a more rigorous calculational HERS would be used for increasing the thermal integrity of the entire building, and the HERS would target landlords with educational programs, describing the real benefits available to them (e.g., decreased operating expenses for common areas (hallways), increased property value, and increased competitive edge over other desirable buildings). Such sharing of the energy burden would enable both tenants and landlords to take advantage of the energy-efficient opportunities available to them.

CONCLUSIONS

In conclusion, HERS that are actively marketed, have a comprehensive appreciation of the market, are adaptive to the needs of particular users, and include user participation

in the operation and revision of the program, are more successful in terms of penetration rates and in improving the energy efficiency of the older housing stock. Where successful, HERS have penetrated an estimated 40% of the new construction market and 20% of existing construction (Table 2), and energy savings have ranged from 10% to 50%. These savings do not take into account the impact of HERS on non-participants, so that HERS are more successful than indicated by the direct savings alone.

Home energy rating systems have been used effectively in the new housing market, influencing builder behavior through the institution of voluntary programs. Typically, HERS have been very successful in this regard, especially when two market criteria are met: (1) the HERS was introduced in a recessionary period, when builders are most receptive to novel ways of promoting their buildings, in ways that involve actual savings to future homeowners; and (2) the HERS is aggressively promoted by the HERS agency, with widespread media campaigns and much support of the builder, including cooperative advertising, and marketing materials and assistance.

For existing stock, the only valid measure of the success of a HERS involves consideration of the effective implementation of retrofits and weatherization activity. There are some HERS currently addressing existing homes, but the opportunity for more work in this area continues to be large.* We believe that the key to such an effective implementation involves an authoritative measuring device that can be used to evaluate a building's current energy efficiency, as well as evaluate alternate ways of improving that energy efficiency. This evaluation should be capable of translation into cost-effective terms, which generally has the most significance to the average homeowner. A further important key to the success of a home energy rating system involves the inclusion of the homeowner in the use of the tool, so that the homeowner shown what might be done to his house, what this physically involves, what the consequences will be in terms of energy, cost, and, very importantly, comfort. And we further feel that it is important to the success of a HERS to provide assistance to the homeowner to make such changes. This assistance should not simply take the form of zero or low-cost loans, but also information about local sources of materials and contractors to do the work. Educational programs, including workshops on how the homeowner can do some of this retrofitting themselves, may also be of great benefit.

* For a recent evaluation of a HERS for existing homes, see Ritschard et al., 1987.

Table 2. Market Penetrations of Home Energy Rating Systems

State	Agency*	Old Stock	New Stock
Alabama	AP	(used RCS audit)	35% (3174)
Arizona	SRP	(used RCS audit)	60% (30,000)
Connecticut	Conn Save	20% (180,000: RCS)	
Georgia	GP	20%	50%
Illinois	IP	80,000 (RCS)	
Maryland	Delmarva		18%
Mississippi	MVG		10% (60)
Mississippi	MPL		10% (41,000)
Missouri	St.Louis HBA		20%
Missouri	UP	20,000	
Missouri	KCPL	(Virtually all construction to HERS standards, but not all certified.)	
Nevada	NP		7,900
New Mexico	PNM	(used RCS audit)	almost 100%
North Carolina	Duke	"High%"	90-95%
Oklahoma	ONG		15% (11,000); 25% actually qualify
Tennessee	TVA		15% (900,000 under various programs)
Texas	TEUC		60%, another 20% structurally certifiable, but equipment not up to standard.
Texas	Austin		25-30%
Virginia	VEPCO		25-30% (35,000)
Wisconsin	WEP		14%
Watt Count			8,000

* For Agency names, see Table 1.

REFERENCES

1. P. Hendrickson, B. Garrett-Price, and T. Williams, Overview of Existing Residential Energy-Efficiency Rating Systems and Measuring Tools. Richland, Wash.: Pacific Northwest Laboratories, No. 4359, 1982.
2. E. Vine, B. K. Barnes, and R. Ritschard, Implementation of Home Energy Rating Systems. Berkeley, Calif.: Lawrence Berkeley Laboratory, LBL-22872, February 1987.
3. R. Ritschard, E. Vine, B. K. Barnes, C. Hsui, and I. Reyes, Evaluation of the California Home Energy Rating and Labeling Demonstration Program. Berkeley, Calif.: Lawrence Berkeley Laboratory, LBL-22758, March 1987.

LAWRENCE BERKELEY LABORATORY
TECHNICAL INFORMATION DEPARTMENT
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720