

Lessons Learned: Five Years of Home Energy Rating Systems (HERS) and Energy-Efficient Mortgages (EEMs) in the Pilot States

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ABSTRACT

In the United States, well over \$100 billion is spent annually to provide energy to homes. Two tools that can help improve the energy efficiency of the nation's housing stock are home energy rating systems (HERS) and energy-efficient mortgages (EEMs). A home energy rating measures the energy efficiency of a house and recommends cost-effective energy improvements. An energy-efficient mortgage is any mortgage for which underwriting guidelines have been relaxed specifically for energy efficiency features, or for which any form of financing incentive is given for energy efficiency.

This paper traces the evolution of the HERS technical guidelines and the HERS/EEMs pilot program and addresses common characteristics associated with higher market penetration of home energy ratings, a higher incidence of EEMs or other financing that used a HERS, and a probability of continuance if outside funding should cease.

Introduction

In the early 1990s, the U.S. Department of Energy (DOE) initiated action to link EEMs with home energy rating systems. The idea of using EEMs to spread the first cost of improvements over time, thus reducing a major hurdle for homeowners, had been in existence since the early 1980s. But the mortgage industry was reluctant to make loans for energy improvements unless the energy improvements actually saved on borrowers' monthly energy costs. HERS had also been used during the 1980s, but had not been systematically tied to mortgage lending. In 1991, DOE, in cooperation with the U.S. Department of Housing and Urban Development (HUD), convened the National Collaborative on Home Energy Rating Systems and Mortgage Incentives for Energy Efficiency. Its mission, completed in 1992, was to reach consensus on a voluntary national program to link credible HERS with mortgage incentives for energy-efficient housing (HERS/EEMs National Collaborative 1992a, 1992b). Widespread availability of EEMs, combined with accurate HERS, was intended to make it easier and more affordable for Americans to live in energy-efficient homes.

A few months after the Collaborative's *Blueprint for Action* was published, Congress passed the Energy Policy Act of 1992 (EPACT), which provided for the establishment of credible voluntary national guidelines for residential energy rating systems (hereafter called home energy rating systems) and for a pilot test of EEMs through Federal loan instruments in five states. In carrying out its part of the mandate under EPACT, DOE initiated two parallel paths: (1) Working with stakeholders, DOE acted to develop a set of credible technical guidelines that could be used on a voluntary basis to provide accurate outputs on energy improvements and cost savings for homeowners and mortgage lenders, and (2) DOE, working with the HERS providers in the pilot states selected by HUD (Alaska, Arkansas, California, Vermont, and Virginia), developed a program to link HERS with EEMs in the states and to evaluate the program's success. The first

path, on technical guidelines, is described in Plympton (2000). The balance of the paper focuses on the second path taken by DOE, on institutionalizing the use of HERS to provide a technical — basis for mortgage lending to pay for energy improvements in housing.

The HERS/EEMs Pilot State Programs

A HERS program already existed in each of the pilot states selected by HUD in 1993. These were: Alaska: Alaska Housing Finance Corporation (AHFC) and Energy Rated Homes of Alaska (ERH-AK), Arkansas—Energy Rated Homes of Arkansas (ERH-AR), California—California Home Energy Efficiency Rating System (CHEERS), Vermont—Energy Rated Homes of Vermont (ERH-VT), Virginia—Virginia Home Energy Rating Organization (V-HERO). DOE worked with the HERS provider organizations in each of the pilot states to foster the development of infrastructures to provide home energy ratings and to link rating outputs with EEMs.

Evaluation Methods

An evaluation plan developed by NREL and HERS/EEMs stakeholders (Collins, et al. 1994) guided data collection on HERS/EEMs programs (see also Collins, Farhar, and Walsh 1996; Farhar, Collins, and Walsh 1996, 1997). The HERS provider program directors were interviewed at length on several occasions, the last during 1999; they also provided quantitative information on program characteristics (such as budgets) and accomplishments (such as the number of ratings completed). The HERS providers reviewed the numerical information for accuracy.

The data on EEMs were obtained from HUD/FHA's Computerized Housing Underwriting Management System (CHUMS), which records mortgage data nationwide for FHA's loan products. Although these data are known to have problems,¹ they derive from the only relatively consistent source of information on the number of EEMs in the nation.

This paper covers the accomplishments of the HERS/EEMs pilot states from 1993 through 1998,² including such indicators as funding, ratings and EEMs achieved, active raters, and training and marketing activities. A brief description of each HERS program's evolution is included, as well as their directors' views of the programs' future prospects. Finally, an analysis is provided of successful HERS program characteristics and factors that appear to contribute to HERS program success.

¹There are problems with the accuracy of EEMs reporting in the FHA CHUMS database. For a detailed explication of these problems, see Farhar, Collins, and Walsh (1997), pp. 47-48. The problems include lack of training for underwriters and others in properly recording EEMs. The net result is that EEMs are both under- and overreported; that is, some loans that are not actually EEMs are counted as EEMs, and some loans that are actually EEMs are not counted as EEMs. The magnitude of the error in each direction remains unknown, but may balance itself out, according to one HUD official.

²The original five EEMs pilot states were designated by HUD in May 1993; HERS provider organizations in Mississippi and Colorado were funded by DOE beginning in FY 1996.

Accomplishments

How well have the HERS programs realized the national goal of linking home energy ratings with energy efficiency financing? This section discusses the many roles that the HERS programs played in their effort to link and spread the use of ratings and EEMs. Data are presented on the human resources developed; the ratings accomplished; the marketing, training, and education conducted; and the EEMs achieved. The extent to which ratings have been used in energy efficiency financing in the HERS/EEMs pilot states is also described.

Ratings

The number of residential ratings completed during the pilot program is one indicator of their effectiveness. Figure 1 shows the raw numbers of ratings completed by the pilot states. A total of 63,165 ratings have been completed in the seven pilot states from 1993 through 1998.³ The highest number of ratings occurred in California (23,645); Virginia completed the next most, at 18,410 ratings. However, the pilot states vary substantially in population.

Because the states in which the pilot programs operate vary considerably in population,⁴ normalizing the number of ratings permits a more adequate assessment of rating performance. Figure 2 presents the number of ratings, counted cumulatively from 1993 through 1998, as a percentage of total number of households in 1998 by pilot state. The figure shows that, proportionally, Alaska had the highest number of ratings at 6% of the total number of households in 1998. Ratings in the other pilot states amounted to less than 1% of total households, although HERS were not offered in Colorado and Mississippi until 1996.

EEMs

The number of EEMs completed during the pilot program is another indicator of their effectiveness. From FY 1994 through FY 1998, a total of 8,534 FHA EEMs were completed in the seven pilot states, with a total value of \$902.35 million.

The HERS providers also spent part of their resources to educate themselves about EEMs programs and to design HERS outputs that would work well with EEMs processes. Details on mortgage activities in the HERS/EEMs pilot states for FHA and U.S. Department of Veterans Affairs loans and EEMs are summarized in Farhar (2000). Figure 3 shows that, nationwide, EEMs—showing low market penetration—amounted to approximately 1.5% of FHA loans in FY 1998. FHA penetration varies by state, and FHA data alone are not the only indicator of EEM activity. Certain states, most notably Alaska and Vermont, have state energy efficiency financing programs and FHA EEMs are not a significant component of energy efficiency financing in these states.

³Alaska, Arkansas, Colorado, Mississippi, Vermont, and Virginia process ratings performed in other states; these are not counted in the totals.

⁴1998 population: Alaska—614,010; Arkansas—2,538,303; California—32,666,550; Colorado—3,970,971; Mississippi—2,752,092; Vermont—590,883; Virginia—6,791,345 (U.S. Bureau of the Census, *State Population Estimates and Demographic Components of Population Change: July 1, 1997 to July 1, 1998.*)

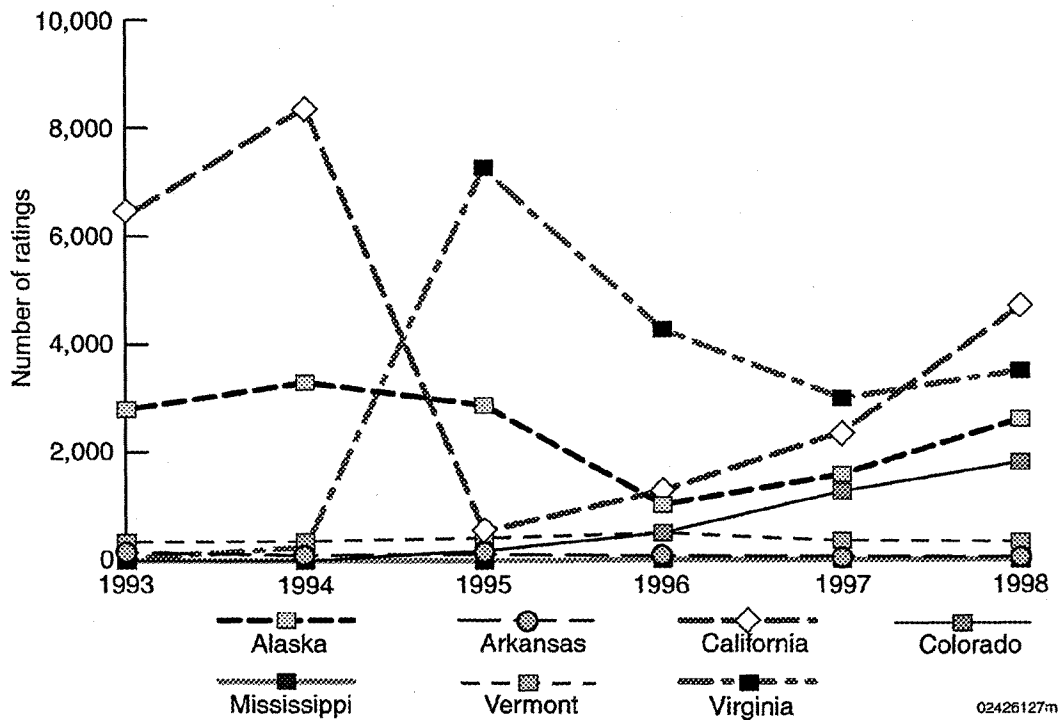


Figure 1. Ratings Completed in HERS/EEMs Pilot States by Year, 1993–1998

Figure 4 shows that Colorado and Arkansas have the relatively highest penetration of FHA EEMs, when the data are normalized by the number of FHA loans in the state, at 2.3% each. California (1.3%) and Mississippi (1.2%) have FHA/EEMs penetration near the national average. Normalized penetration rates of FHA EEMs in Virginia (0.9%), Alaska (0.8%),⁵ and Vermont (0.6%) are the lowest among the pilot states, at least based on the FHA CHUMS data.

Ratings Linked with EEMs

Data were gathered on the number of FHA EEMs from the FHA CHUMS database for FY 1993 through FY 1998 for the HERS/EEMs pilot states (Farhar 2000). FHA reports no EEMs for Colorado and Mississippi until FY 1996, after their HERS programs were in operation. Nevertheless, California (6,042), Colorado (1,106), and Virginia (819) have the most EEMs completed between FY 1993 and FY 1998. The number of EEMs reported in Colorado rose from 143 in FY 1997 to 930 in FY 1998, more than a 600% increase in one year, a much higher

⁵The data for the AHFC EEMs are not included because they are not FHA EEMs and would not be counted in the CHUMS data base. If both FHA and AHFC EEMs were counted, 8.7% of all loans in Alaska would be EEMs.

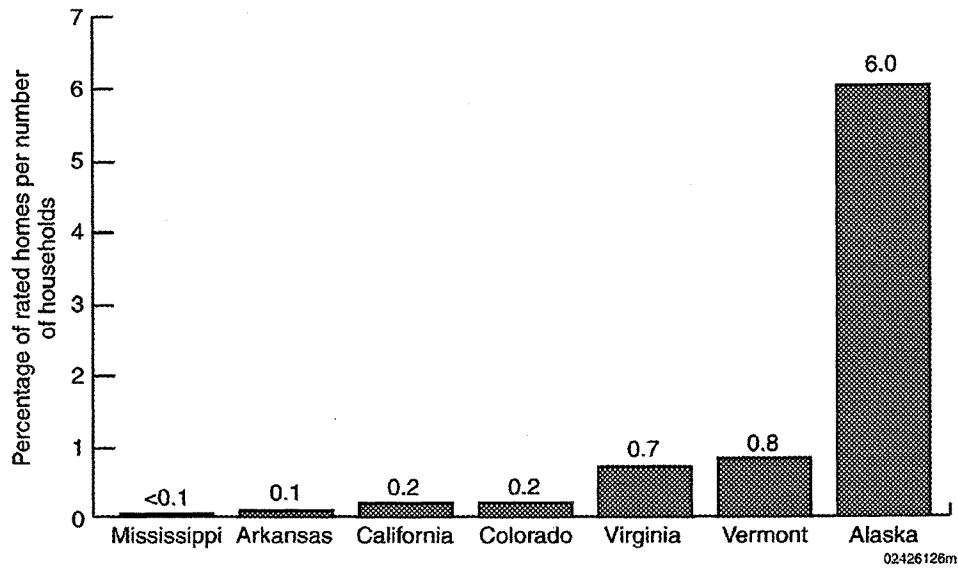


Figure 2. Percentage of Cumulative Ratings per Total Number of Households in 1998 by Pilot State⁶

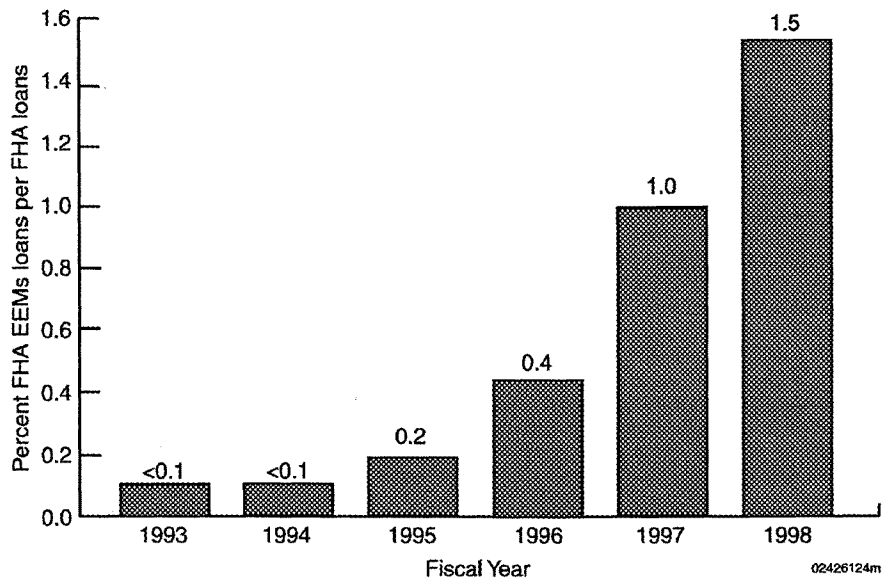


Figure 3. FHA EEMs as a Percentage of Total FHA Loans by Fiscal Year

⁶Household data from <http://www.census.gov/population/estimates/housing/sthuhh1.txt>, Table ST-98-46, Estimates of Housing Units, Households, Households by Age of Householder, and Persons per Household: July 1, 1998, U.S. Census Bureau, Internet release date: 12/8/99; accessed 12/27/99.

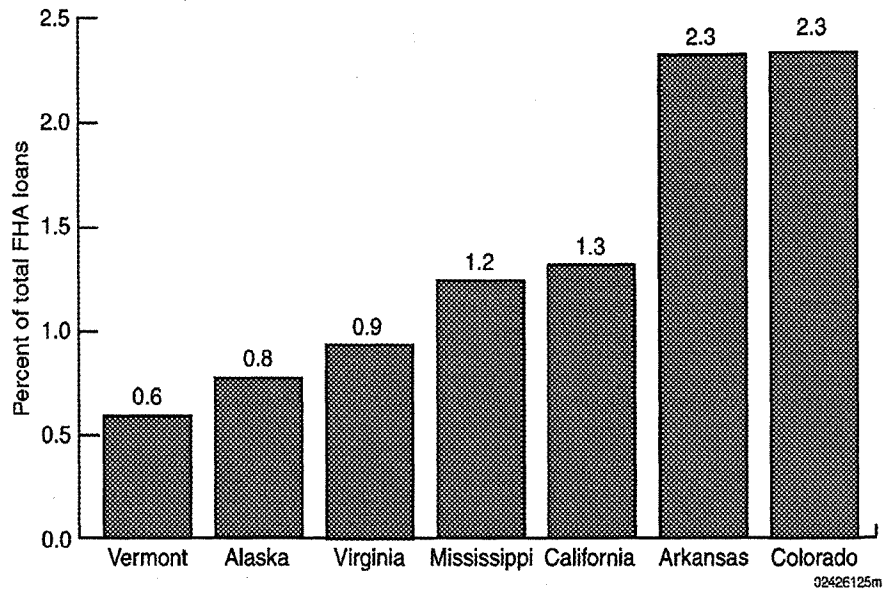


Figure 4. Percentage of FHA EEMs per Total FHA Loans for 1998, by HERS/EEMs Pilot State

increase than that in any other pilot state. However, these numbers should be approached with caution because of a degree of inaccuracy in the FHA CHUMS data.⁷ When comparing the number of ratings and FHA EEMs in each of the pilot states from 1993 through 1998, we find that in most of the pilot states, many more ratings are being completed than are apparently being used for FHA EEMs. Although HERS are required by FHA for EEMs to be issued, many EEMs are apparently being issued without ratings, at least from the HERS provider organizations in the state of mortgage issue.⁸ The best available data show that in Arkansas and Mississippi, more EEMs are being reported than there are ratings being completed.⁹ Several factors could affect these counts. As noted earlier, there are EEMs reporting problems in the CHUMS data system. Also, there may be inaccuracies in the rating data reported by the pilot states. In addition, the two kinds of data are off by six months. Nevertheless, these are the only data available on the incidence of EEMs in the nation and in the HERS/EEMs pilot states.

⁷See footnote 1.

⁸Some of the ratings used in EEMs could have been done in prior years or by organizations other than the HERS provider organizations studies, which would affect the counts. For example, if the National Home Energy Resources Organization (N-HERO) performed a rating for a California home that was ultimately used to qualify a California borrower for an EEM, this rating would not be included in the count of ratings for California. Nevertheless, based on anecdotal information, the impact of the N-HERO ratings on the numbers of ratings and EEMs reported for each pilot state is estimated to be small.

⁹The Colorado HERS program director reports anecdotal information that homeowners may use rating information to decide on the best energy improvements without obtaining mortgages to make the improvements.

Sources of Funding for HERS Programs in the HERS/EEMs Pilot States

HERS programs' funding sources vary considerably. In California, for example, utilities provided most of the early CHEERS program funding (from 1993-1995), whereas in Alaska and Colorado, state energy offices were the primary supporters of the HERS programs. DOE supported each of the HERS programs for the duration of the five-year pilot for the original five EEMs pilot states (Alaska, Arkansas, California, Vermont, and Virginia) beginning in FY 1994, and added funding support for Colorado and Mississippi in FY 1996. Other sources of funding include, for example, ratings/dues/sales, National Renewable Energy Laboratory (NREL) (for data base development and evaluation research), and state funds.

The annual budgets for the HERS programs vary considerably by state, from a low of \$133,709 in Arkansas to a high of \$1,235,000 in Colorado for FY 1998. Detailed information is presented in Farhar (2000).

Prospects of HERS Program Continuation

DOE has been supporting the HERS/EEMs pilot programs for five years, and the funding concluded in FY 1999. The FY 2000 federal budget does not contain funding for further HERS/EEMs pilot state activities. In light of this cessation of federal funding, those pilot programs with diversified funding sources are in a better position to continue their operations than those who are not. Table 1 presents the data on DOE funding as a percentage of HERS/EEMs pilot programs' FY 1998 operating budgets, the most recent data available.

Costs of Ratings

It has been found in the pilot states that the charges for the ratings do not cover the costs of providing them. Prices charged for ratings range from a low of \$200 in Colorado to a high of \$350 in Alaska and Vermont (see Table 2). Although data are incomplete, it appears that all of the HERS provider organizations lose money each time they process a rating, ranging from a reported \$5 loss in Mississippi for each rating to a \$565 loss per rating in Virginia. These losses must be made up by other sources of funds, usually DOE funding, to keep the HERS programs solvent.

Discussion

The HERS providers in the pilot states were funded by DOE to provide technical assistance on HERS program development to states without HERS programs. Their efforts have been, in part, realized. In 1993—before the pilots began—rating services were available in all or parts of 17 states (Farhar and Eckert 1993). By 1999, that number had increased to 47 states and the District of Columbia. Regional HERS are in development in the Northeast, Midwest, and South. Nationwide, approximately 500 trained and certified raters are employed full- or part-time.

Table 1. DOE Funding as A Percentage of 1998 HERS/EEMs Pilot State Budgets

HERS/EEMs Pilot State HERS Provider	Total 1998 Budget (\$)	DOE Funding as a Percentage of 1998 Budget
Colorado	1,235,000	8
California	1,497,022	16
Energy Rated Homes of Alaska	420,358	40
Vermont	266,944	46
Virginia	362,707	67
Mississippi	182,100	81
Arkansas	133,709	99

Factors Appearing to Affect Program Operations

Several factors appear to affect HERS program operations. Although each HERS/EEMs pilot program offers a unique story, there may be some common themes. The evaluation research has yielded observations on the following themes: high levels of funding over relatively short time periods, state-funded financial incentives for energy efficiency financing for mortgage borrowers, financial incentive for lenders to market EEMs, diversification of services, continuity in HERS program leadership, and active involvement of key stakeholders. Table 3 summarizes the positions of the HERS programs on these factors.

High levels of funding. HERS programs in Alaska, California, and Colorado each received high levels of funding during short periods of time (\$8.5 million in FY 1993–FY 1995 in Alaska; \$3.2 million in California in FY 1993–FY 1995 as well as annual funding exceeding \$1 million; and \$2.5 million in Colorado in FY 1997–FY 1998). These funding “spurts” undoubtedly assisted the HERS programs.

State-funded financial incentives for energy-efficiency financing for mortgage borrowers. A slight interest rate break for EEMs (on the order of a quarter-point mortgage interest rate reduction) could make them more attractive to borrowers (although the incentive to lenders of offering an interest rate break is unclear). The Alaska Housing Finance Corporation energy-efficient mortgage offers such an interest rate break, with 1,151 loans being completed in 1998. (In contrast, only 32 EEMs were completed in Alaska in 1998.) The new YESS program in Vermont also offers an interest rate reduction to energy-efficient mortgage borrowers.

Table 2. Rating Costs in the HERS/EEMs Pilot States, 1998

Pilot State Providers	Costs to Customers (\$)	Costs of Production (\$)	Difference (\$)
Alaska			
<i>Alaska Housing Finance Corporation</i>	\$250-350	*	*
<i>Energy Rated Homes of Alaska</i>	\$150-250	\$10**	+\$140-240
Arkansas	\$250	\$450	-\$200
California	\$205	*	*
Colorado	± \$200	\$544	- \$344
Mississippi	\$235	\$240	- \$5
Vermont	\$350	\$774	- \$394
Virginia	\$250***	\$615	- \$565

*Data are unavailable.

**Only the ERH-AK program data show each rating as profitable, earning as much as \$240 per rating above cost. However, this result may be a function of the way in which ERH-AK calculated the internal cost of the rating. Other HERS providers—for example, Energy Rated Homes of Colorado—reported all of their administrative costs in delivering the rating program and divided by the number of ratings delivered to derive a dollar cost per rating. ERH-AK only counted a small portion of its budget as a cost of processing ratings. If it had used the same method used by other HERS providers, ERH-AK would have reported the cost per rating as approximately \$663, with the loss per rating at approximately \$463.

***V-HERO receives a \$50 fee from the rater for each rating.

Financial incentives for lenders to market EEMs. The Virginia Home Energy Rating Organization offered a \$2,000 recognition award for the lender completing the highest number of EEMs in Virginia in 1998; 375 EEMs—a relatively high number—were completed in Virginia using ratings from the V-HERO program in 1998. This observation suggests that aggressive marketing of EEMs by the mortgage community may be important to increasing the number of EEMs achieved, and that a financial incentive for lenders could increase lender marketing efforts.

Table 3. Observations on HERS/EEMs Pilot Programs

HERS/ EEMs Programs	High Levels of Funding	State- Funded Financial Incen- tives for EEMs	Financial Incen- tives for Lenders	Diversi- fication of Services	Continuity in Program Leadership	State Popula- tion
Alaska <i>AHFC</i> <i>ERH-AK</i>	High	<i>High</i> <i>High</i>	None	<i>Yes</i> <i>Yes</i>	<i>Missing</i> <i>data</i> <i>Yes</i>	Low
Arkansas	Low	None	None	Yes	No	Medium
California	High	None	None	Yes	No	Very high
Colorado	High	Very low	None	Yes	No	Medium
Mississippi	Low	None	None	Yes	Yes	Medium
Vermont	Medium	High	None	Yes	Yes	Low
Virginia	Medium	None	In one year	Yes	Yes	Medium

Diversification of services. Vermont’s program has been incorporated into a larger entity (a nonprofit organization) and offers a suite of services, including home energy ratings, a turnkey service for lenders, code compliance documentation, and appraiser training. The Virginia program offers several services, including consulting on inner-city housing affordability, development of innovative energy-efficiency financing products, and financial incentives for lenders. Mississippi’s program also offers several services, including “EnergyCheck,” a checklist of viable energy efficiency options for the homeowner. Organizations that combine their home energy rating services with other energy efficiency, housing, and mortgage lending services may increase the probability of their viability without federal funding. Packaging services appears to have three aspects: (1) diversification of services to add value that the market recognizes and is willing to pay for, (2) sharing of administrative costs so that the incremental cost of each rating processed is reduced, and (3) reducing per-unit rating cost through working with large production builders to increase their quality assurance. Such diversification may help HERS programs to survive without continued federal funding.

Continuity in HERS program leadership. Continuity in program leadership, combined with experienced HERS program leaders, appears to be another key factor in relative success. Alaska, Vermont, and Virginia had the same managers for the duration of the five-year pilot program, which appears to have strengthened each of these programs. The remaining pilot states have experienced major shifts in leadership, which could have cost them some momentum.

Active stakeholder involvement. The extent of stakeholder involvement appears to be another factor. The two least-populated states appear to have completed, proportionally, the most ratings. This may be, at least in part, a function of a smaller state's greater opportunities for interaction among the prominent stakeholders in the energy, building, housing finance, lending, real estate, appraisal, government, and rating-provider communities. The active participation of key stakeholders appears to enhance a program's effectiveness in completing ratings. Such participation may take longer in more populous states.

Other observations. Economic prosperity, as measured by a state's median income, does not appear to be strongly associated with the number of ratings completed. Ranked in order by median income, the HERS/EEMs pilot states are:

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|----------------------|---------------------|
| 1. Alaska—High | 5. Vermont—Medium |
| 2. Colorado—Medium | 6. Arkansas—Low |
| 3. California—Medium | 7. Mississippi—Low. |
| 4. Virginia—Medium | |

Housing markets are booming in several of the pilot states, notably in California and Colorado. In these circumstances, mortgage lenders are already so busy that they do not seem to need to differentiate themselves by offering EEMs, which is a special service requiring more effort on their part. Demand for HERS/EEMs may be dampened in times of housing boom, which appears to militate against a positive effect for HERS/EEMs because of a state's higher economic prosperity. On the other hand, Alaska, with relatively high economic prosperity, used state funds and rating fees to fund its AHFC program, resulting in more ratings.

Conclusions

There have been major advances in HERS and EEMs since the passage of EPACT in 1992. In part because of HERS pilot state activity, HERS are now available in 47 states and the District of Columbia and EEMs are offered nationwide by several national lenders. Rating software has improved technically during the pilot test. Many states have benefited from the regional approach taken by several of the pilot states. Of the 43 nonpilot states, 30 states report agreements with HERS programs in other states and 17 report having active HERS programs in place. Accomplishments during the five years of the pilot program include completion of more than 63,000 home energy ratings and of 8,534 EEMs worth a total of more than \$902 million.

The HERS programs that have resulted in the most HERS/EEMs activity are those that have:

- Obtained high levels of funding from several sources over relatively short time periods
- Offered state-funded financial incentives for energy efficiency financing for mortgage borrowers
- Offered financial incentives for lenders to market EEMs
- Operated within a larger entity and offer other energy services along with ratings
- Maintained continuity in HERS program leadership
- Actively involved key stakeholders in housing finance, ratings, real estate, building, government, and related communities.

These strategies appear to help HERS programs to become more financially self-sufficient. The best prospects for self-sufficiency appear to involve locating the programs within another

organization and diversifying energy efficiency services. States may opt to fund HERS programs to keep them operational.

Improved market demand would assist HERS programs. Although there is some EEMs activity in the pilot states, the mortgage community has not fully embraced HERS/EEMs. The 2% debt-to-income ratio stretch offered by the conventional mortgage markets—which existed prior to the HERS/EEMs pilots—is, by itself, inadequate to increase market demand for HERS/EEMs. If a 2% ratio stretch were added to the ratio stretch already within discretion of mortgage lenders, more incentive might exist. Interest rate reductions for EEMs could also increase demand, although the rationale for such reductions has not been established by the mortgage community. Increased mortgage community commitment to and marketing of EEMs would enhance the prospects of HERS programs.

After five years and \$4.2 million in federal funding overall, it appears that most of the HERS programs in the pilot states will find it difficult to remain operational without outside support. The situation for the HERS programs is made more difficult by the fact that each rating they process actually costs them more resources than it brings in. However, by diversifying services, increasing volume while decreasing rating costs, reducing transaction costs, reducing administrative costs, and charging fees for service, the programs may be able to continue offering ratings well into the future.

Recommendations for Future Research and Analysis

Even though the HERS/EEMs pilot states program has been completed, significant questions remain about the financing of energy-efficient new housing and of energy efficiency improvements in existing housing. For example, no data exist on the energy conservation measures that have been installed through the program. In addition, no data currently exist on the amounts actually loaned for energy efficiency improvements—that is, the percentages of the total EEMs made that was used to pay for energy features. This sort of information would be helpful in increasing understanding about the market for types of energy efficiency improvements and, therefore, the marketing of EEMs products.

Peer-reviewed analysis on the impact of EEMs on mortgage loan performance is still lacking. This critical question has been identified as the core issue by the mortgage community in its design and use of EEMs products. Analysis will depend, in part, on the availability of accurate data in the databases of the federal government and the secondary mortgage markets. Until the question of default has been credibly addressed, the mortgage community may remain hesitant to aggressively market EEMs.

Recommendations for consumer education about the need for and benefits of energy efficiency are frequently made. Although consumer education is undoubtedly necessary to support the demand for energy-efficient homes and energy improvements in existing housing, it is not sufficient to bring about significant changes in the marketplace. Energy-efficient housing must be credibly labeled. Research is needed to ascertain the most useful form of and mechanism for energy efficiency labeling for housing—both new and existing—so that potential buyers, lenders, real estate professionals, and appraisers can rely on the energy information presented.

Finally, the actual impact of EEMs-financed homes on energy cost savings should be analyzed to determine the energy and cost savings as well as positive environmental effects as a result of the programs.

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