Review of Energy-Efficient New Homes Programs in the Southwest

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Introduction

This report reviews state and utility programs aimed at stimulating the construction of highly energy-efficient new homes in the states of Arizona, Colorado, Nevada, and Utah. Given the high rates of home construction in these states, there is considerable activity related to promoting new home energy efficiency. The programs include a wide range of approaches including technical assistance and training, financial incentives, home energy ratings, labeling, and performance guarantees. In some cases, program providers are utilizing a combination of approaches. This report contains descriptive information as well as program results where available, along with contact information for those interested in more information.

Arizona

Arizona is a leader in residential new construction programs and particularly in performance-testing of homes. Arizona utilities and the State of Arizona Energy Office have been training builders and testing homes in the field using blower doors, duct blasters, and other performance testing equipment since the mid 1990's.

The Arizona utility programs offer a wide range of services for builders including plan review, technical assistance, HERS ratings, field inspections, performance testing, and building science training. Several utilities have offered energy cost guarantee programs to customers and financial incentives to builders. The utilities also promote the new construction programs and educate their customers about the benefits of living in an energy efficient home.

In 2004, over 11,000 homes built in Arizona were ENERGY STAR homes, which is about 14% of all 2004 new home building permits in the state (about 81,000 total). This compares to an average ENERGY STAR home penetration of 8% nationally. In 2004, 8.6% of all ENERGY STAR homes in the nation were built in Arizona.

While ENERGY STAR homes have had strong penetration in Arizona in the recent past, there are some questions about the future performance of the program in the state, in particular:

- How will the new ENERGY STAR performance requirements affect builder support and consumer interest in the near future?
- Will the strong housing market in Arizona (builders are selling homes as fast as they can build them) together with the stricter ENERGY STAR performance requirements reduce builder commitment to ENERGY STAR homes?
- How does the increase in the average size of new homes impact total energy use for the new home sector, including ENERGY STAR homes?

These are issues that the Arizona Energy Office, the utilities, and others in the building industry are examining closely as the new ENERGY STAR requirements are implemented and as the housing market in Arizona evolves.

Below are summaries of the residential new construction programs and services offered by the Arizona Energy Office and the four largest utilities in Arizona.

1) Arizona Department of Commerce Energy Office

The Arizona Energy Office (AEO) offers training and technical assistance to builders and the building trades, promotes energy efficient homes, supports energy efficiency in affordable housing, and is helping to develop a weatherization and building science Center.

Training and Technical Assistance. The Arizona Energy Office cosponsors building science and performance testing training in Arizona, generally for about two weeks each year. The workshops are conducted in partnership with Arizona utilities and delivered by John Tooley of Advanced Energy Corporation. The training is open to all building trades and is focused on the incorporation of basic building science techniques throughout the building process to promote the energy conservation initiatives. Major areas of focus include proper design, advanced detailing, and correct installation of ductwork, insulation, and ventilation systems.

The Arizona Energy Office also offers training focused to individual builders or specific groups, using the same lessons and tools employed in the John Tooley training. Experience from the last few years has demonstrated the effectiveness of providing training and technical assistance to individual builders. Preliminary fieldwork on their existing product, including infrared and regular photos, duct tests, blower door tests, pressure diagnostics, and other measurements are completed. This information is used to develop the training material used with the individual builder. This has been very effective in a number of ways. The main advantage is the education of a larger number of people within a builder's organization. Earlier in AEO efforts an individual or small number of individuals would take up the cause for incorporating energy features into their building process but would run into road blocks within their organization from elements that did not understand the benefits to their company. By training a larger number of an organization's personnel from all parts of the company, with information focused on the company's buildings specifically, it has become much easier to get new innovations incorporated into the building process.

The Arizona Energy Office provides presentations on building science to educational institutions and at housing related conferences throughout Arizona. The primary message in AEO presentations is that incorporating basic building science techniques is the key to high performance homes.

Affordable Housing and Energy Efficiency. AEO is working with Arizona's affordable housing network to improve the energy performance of the affordable housing stock

- AEO is partnering with the Arizona Department of Housing in several areas. The main area of success has been the incorporation of specifications (many developed as part of Building America) into the Low-Income Housing Tax Credit Program. The federal Tax Credit Program is used by developers to construct thousands of affordable units each year. These specs bring the units on par with the energy efficiency found in the guarantee home programs offered by utilities (20% to 40% more efficient than code). The specs include (but are not limited to) duct leakage of under 3% of unit square footage, room pressure of under +/-3 Pascals (door closure), insulation installation standards (no gaps, no voids, no compression, no misalignment), and indoor air quality requirements. AEO provides plan review and inspections on a random number of units to insure compliance. One key to the success of this program is the field training provided to the developers/trades involved with these projects. There are a number of large developers that specialize in the Tax Credit Program. This training focuses on helping them meet the specs as effectively as possible, and at the lowest cost. After working with a developer, they understand what is required and, most importantly, understand why they are doing this. A number of developers have adopted the specs for all the work they do in multi-family housing, both affordable and market, in Arizona and in other states. They understand that by building units that perform well it increases their ability to get and retain renters in their units, with less turnover. This program has been in place for the past eight years.
- AEO is working with a number of local non-profits on projects that will include all of the energy efficiency performance specifications (ducts, pressure, insulation, ENERGY STAR) plus green technologies/renewables. This includes training and technical assistance for all involved in the project (architect, mechanical, building trades) and assistance on the inspections/compliance with specs.
- AEO is working to expand the use of building science in affordable housing complexes. Partners include Arizona Public Service, HUD, and local governments. AEO has completed a number of joint projects using federal Weatherization Assistance Program (WAP) and/or low-income DSM funds on HUD Section 8 housing. The complex owners/HUD fund the HVAC replacement and other rehab work, while WAP/DSM provide the weatherization work (duct sealing, room pressure, insulation). AEO analyzed the projects and installed new duct systems, tested at under 3% leakage. Without WAP/DSM involvement the new HUD-required AC units would have been installed on ducts with 50%+ leakage rates that would have made the units unaffordable.

Weatherization and Building Science Training Center. The Weatherization and Building Science Training Center, to be located at the Foundation for Senior Living weatherization program office/warehouse facilities in Phoenix, will be used to provide Weatherization Assistance Program (WAP) personnel with the knowledge and skills needed to successfully implement Arizona's WAP program. It will also be available to provide building science training to the construction trades. The Center's primary goal is to provide personnel with the knowledge/ability to apply a decision making process which

will allow them to do what makes the most sense for each house or unit. AEO and the Center sponsors are also in the process of establishing a certification program through the Building Performance Institute (BPI). This will enable the Center to provide certifications under three classifications: Building Analyst, Building Shell Technician, and Energy Auditor.

The Center will be developed in phases. The initial phase of the Center will consist of a carbon monoxide lab (under construction); phase 2 will be a mobile home training lab (mobile home or construction trailer) and work stations (duct sealing, HVAC, insulation installation), and phase 3 will be a full scale house (2000 sq. ft.) that will be used for building science training (pressure/thermal diagnostics and testing). AEO has received DOE funding for the carbon monoxide lab (phase 1) and is working with Arizona utilities and others to secure additional funding.

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2) Arizona Public Service (APS)

Residential new construction is booming in the APS service territory, particularly in Phoenix where there were over 60,000 housing starts in 2005 (about 30,000 in the APS service territory portion of the Phoenix area). The pace of new construction is a major driver of APS system load growth, which is forecasted to average about 4% per year over the next few years. APS understands that it is easier and more cost-effective to implement energy efficiency at the time of construction rather than attempt to retrofit energy efficiency after a home has been built.

APS has been working with builders and educating consumers for many years. Since 2001, over 12,000 homes have participated in the APS Performance Built Homes program. The APS Performance Built Homes program requires homes to exceed ENERGY STAR standards and meet performance tests. Builders offer homebuyers guaranteed heating and cooling costs as part of the program.

APS has proposed a revised new homes program, for 2006 and future years, as part of its rate case settlement approved in April 2005 (approval of the revised program is pending at the Arizona Corporation Commission). The revised APS new construction program provides marketing, technical assistance, performance testing services, financial

incentives, and training to builders. All homes must meet or exceed the minimum requirements for the ENERGY STAR home program, and the revised APS program is based on the more stringent ENERGY STAR standards to be implemented in 2006. The program emphasizes the whole-building approach and includes field performance testing and inspections to ensure performance. One objective of the program is to encourage the installation of high SEER (SEER 14 or higher) air conditioning equipment that also has high EER ratings (12 or higher). The program also works with builders who offer guaranteed heating and cooling costs as a component of their energy-efficiency packages. APS offers financial incentives to builders ($400/home) to meet the new ENERGY STAR standards and for upgrading to high-efficiency lighting and appliances. The program also offers educational materials and training to homeowners, builders, subcontractors, and realtors/sales agents.

APS estimates that about 4,000 homes will participate in the revised program in each of the next few years. APS also estimates over 1 kW in peak demand reduction per participating home, with the homes in the program reducing system peak demand by about 4.3 MW per program year.

In 2005, Advanced Energy completed the Phoenix Home Energy Efficiency Study for U.S. EPA.[1] Advanced Energy evaluated a total of 7,141 houses, including 3,336 Baseline homes, 2,979 ENERGY STAR homes, and 826 Guaranteed Performance homes. In addition to energy use profiles, they collected information on square footage, number of stories, vintage, orientation, existence of a swimming pool, and other general characteristics. The effects of variables were limited by creating similar subsets of homes. The most comparable subset in the study suggested that the ENERGY STAR homes on average used 3.50 kWh/ft^2, compared to 4.16 kWh/ft^2 for the typical Baseline homes. This represents a savings of 16% for summer/cooling intensity. The same subset of Guaranteed Performance homes consumed 2.80 kWh/ft^2 on average, 33% lower summer/cooling intensity than the typical Baseline homes, and 20% lower than ENERGY STAR homes. Note, however, that since the typical ENERGY STAR and Guaranteed Performance home used in the study were larger than the typical Baseline home, the average annual electric consumption for both groups was higher than the Baseline homes. Baseline homes used 14,107 kWh per year on average, Guaranteed Performance homes used 14,904 kWh per year, and ENERGY STAR homes used an average of 15,831 kWh per year.

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[1] *Phoenix Home Energy Efficiency Study*, prepared by Advanced Energy for U.S. EPA; 2005.

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3) Salt River Project (SRP)

The Salt River Project PowerWise Homes program recognizes energy efficient subdivisions in the metropolitan Phoenix area that meet specific program requirements. The SRP PowerWise Homes program, implemented in 2005, is a replacement and technical upgrade of the prior SRP Certified Home program.

SRP PowerWise homes are required to meet or exceed a HERS rating of 87 and to have high efficiency cooling and heating equipment (see Table 1). Each PowerWise home (or a sample of homes in a development) must be inspected and performance tested in the field to ensure that it meets program specifications. SRP also provides plan review services, technical assistance and training to builders, and education and marketing to potential homebuyers. Below is a table comparing the requirements in the new PowerWise Homes program to the requirements in the prior Certified Homes program.

Table 1. Requirements in the SRP PowerWise Homes Program

	SRP Certified Homes Prior to May 1, 2005	**SRP PowerWise Homes[2] Effective May 1, 2005**
Cooling/Heating Equipment	Heat pump required; 10 SEER	Dual fuel OK; 13 SEER 11 EER
Review of HVAC Calculations and Sizing	No	Yes
Qualifying Points	Determined by SRP	Determined by National Home Energy Rating System (HERS) Board
Physical Test for Leakage	No	Yes
HERS Rating	82-84	87+

SRP estimates that an SRP PowerWise home is over 15% more energy efficient than the homes built to meet the older requirements of the SRP Certified Home program.

In its last full year of operation (May 2004 through April 2005),[3] the old SRP Certified Homes program committed almost 16,000 homes to the program.

In the first eight months of the new PowerWise Homes program (May 1 through December 31, 2005), SRP reports that 13 builders agreed to participate, committing 45

[2] SRP is considering revisions to the PowerWise Home program, possibly including revisions to the SEER and EER requirements, which could be effective in July 2006.
[3] The SRP Fiscal Year and reporting period is from May 1 through April 30.

communities representing over 10,200 homes to the program. SRP is forecasting commitments of about 9,000 PowerWise homes per year in future years.

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4) Tucson Electric Power (TEP)

In recent years, Pima County (the county including Tucson) has averaged about 10,000 new residential building permits per year. Like the Phoenix metropolitan area, the real estate market is booming, and it is a significant driver of electric system load growth. Tucson Electric Power (TEP) has been a leader among utilities in working with builders and consumers to encourage energy efficient homes.

TEP offers the Guarantee Home Program, which guarantees heating and cooling costs and comfort for three years. If the annual energy cost exceeds the specified cost, TEP will refund the difference to the homeowner. TEP conducts HERS ratings, on-site inspections, and performance tests on the homes to ensure they meet program specifications. Guarantee program homes meet or exceed the ENERGY STAR requirements. The homes are eligible to receive a reduced electric rate that is 12%, 18% (with enrollment in time-of-use rates), or 22% (with time-of-use rates and solar or heat pump water heating) lower than the standard residential rate. Guarantee homes must be equipped with electric heat pumps and electric water heaters, though they may use natural gas for fireplaces, stoves, clothes dryers, and pool heaters. TEP also offers a financial incentive, coop advertising/marketing support, and training to participating builders.

TEP has a particularly strong commitment to measured performance through performance testing and site inspections. TEP's staff undertakes quality control by conducting instrumented inspections of each home at three points in the construction process: framing and distribution system installed; insulation installed; and final. Duct blasters, blower doors, and manometers are employed to ensure that ducts and conditioned envelopes are well sealed and that new homes are pressure balanced. Program requirements include properly-installed insulation, duct sealing, envelope sealing, correct sizing of HVAC equipment, pressure balancing (frequently requiring the installation of additional return air paths), and fresh air ventilation systems that slightly pressurize the tight building envelopes.

TEP Guarantee homes meet or exceed ENERGY STAR standards because of the program requirements for fresh-air ventilation, insulation installed right, pressure management, and lower duct leakage standards – plus the inspection of every home.

About 100 builders participate in the TEP Guarantee Home Program. In 2005 about 2,500 homes participated in the program, which is estimated to be 25% of all homes built in the Tucson area.

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5) Southwest Gas

The Southwest Gas Energy Advantage Plus (EAP) new home construction program is an opportunity for Tucson area builders to get recognition for building energy efficient homes. EAP homes must be at least 15% more energy efficient than the standard building code.[4] Southwest Gas offers plan review plus performance testing and inspection services to ensure that the homes meet the program standards. The EAP program does not provide a financial incentive to the builder.

Southwest Gas estimates that about 6,400 homes in Tucson will be built to EAP program specifications in 2005. The EAP program is not currently available in other Southwest Gas service territories in Arizona. There is a proposal in the ongoing Southwest Gas rate case (with an Arizona Corporation Commission decision pending) to expand the EAP program to other geographical areas served by the company.

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[4] As of October 1, 2005, the 2003 IECC with amendments is the building energy code in effect for the City of Tucson. In 2004, Southwest Gas changed the EAP program requirements to reference the most recent IECC in effect (i.e., EAP homes are 15% more efficient than the IECC code) rather than the Model Energy Code.

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Colorado

1) Fort Collins Utilities

Fort Collins is a fast-growing, progressive community in northern Colorado whose municipally-owned utility reflects many of the values of the community. Close to 1,500 new homes are built each year in the Fort Collins Utilities service area. Since the early 1990s, the utility has taken the initiative to educate and promote the building of new homes that are as energy efficient as practical. This work has all been couched in a building-science, "house-as-a-system" context that also stresses comfort, health and safety, and building durability. This has included a number of program measures, such as:

- In coordination with the city's Building & Zoning Department, the development and promulgation of up-to-date building codes;
- The undertaking a careful field-based study of the effects of the new codes in residential building quality (www.fcgov.com/utilities/home-study.php), an effort that exposed a number of failures that in turn has been useful in educating both builders and code officials, ultimately resulting in substantial improvements in the energy efficiency of many new homes;
- The training of most of the builders operating in the community in the achieving of more efficient homes;
- The development of the Builder's Guide to Energy Efficient Home Construction, on-line at www.fcgov.com/electric/builders-guide/index.htm;
- The development of a comprehensive plan for improving new housing stock in Colorado via an extensive, year-long process that involved working with a wide variety of stakeholders in the building and related sectors;
- The design, production, and distribution of a variety of first-rate materials useful in educating potential owners of new homes about the ins and outs of energy-efficient buildings, along with the importance of asking a number of pointed questions of builders and their sales people;
- The development of a comprehensive, quite useful website that includes excellent material on a range of new home energy issues;
- The sponsorship of a program to educate selected contractors in the craft of systematically conducting residential retrofits according to building science first principles; and
- The design and conducting of a handful of DSM programs designed to raise the efficiency of lighting and appliances in the service territory. More DSM programs are in the works to help meet the goals of the utility's Electric Energy Supply Policy (www.fcgov.com/utilities/powertosave/energygoals.php).

In order to influence a larger community and leverage its resources, Fort Collins Utilities has increasingly partnered with other organizations to achieve its energy efficiency goals. For example, the utility is co-sponsoring along with the City of Boulder (at a cost of $25,000 from each organization) a pilot project to train retrofit contractors and promote the Home Performance with ENERGY STAR® program. Further, "Colorado New Home Choices," the web site on energy-efficient new homes (www.ColoradoNewHomeChoices.org), is co-sponsored by E-Star Colorado, and both organizations contribute to content and fiscal support for maintaining the site and fielding inquiries from users. This site includes a number of excellent, downloadable publications that should be of interest to builders, researchers, and others involved in the Building America Program. These include:

- "What to Look for in a New Home: A Buyer's Guide to Comfort, Health, Durability and Value" – an overview piece that introduces consumers to benefits, concepts, and vocabulary around high-performing home choices.
- Questions to Ask, a list of questions (and reasons for asking them) helpful to buyers in comparing the energy efficiency and related performance of homes and builders; and
- A series of two-page fact sheets that provide key information on the "pieces of the puzzle," such as solar-smart design, insulation, air sealing, moisture management, forced-air heating and cooling, and indoor air quality.

Of particular relevance to Building America initiatives is the formation and work of the New Homes Stakeholders' Group. Formed in mid-2003 from a group of almost 40 stakeholders representing the housing industry (builders, designers, suppliers), energy-efficiency organizations, utility and distribution companies, real estate firms, and the education community, the stakeholders' group had nine half to full-day meetings over almost a year. This group toured new homes under construction, discussed problems with conventional approaches, and looked at many different avenues to improve performance – all from a "housing market as a system" perspective. A key result was the sharing of ideas on a common subject among people who in the course of normal affairs do not meet with one another. With aid from the Fort Collins Utilities staff and consultants, the group hammered out a vision of the Colorado new home market in 2010 and a set of concrete activities on how to get there. The final report, a 74-page document entitled "A High Performance Colorado Housing Market," was published in May of 2004 and is available for downloading, along with extensive notes on the half-day to full-day meetings of the group, at http://www.fcgov.com/utilities/nhsg.php.

The short version of the vision is as follows: In 2010, most new homes perform better (are more comfortable, healthier, more durable, with much lower energy costs) than in the past, yet don't cost more to own. Direct participants in the housing market and the society at large are all benefiting from the transition to high-performing homes.

Key action items the group believes are essential to realize this vision include:

- Periodically evaluating housing performance;
- Building consumer awareness of high-performing homes;
- Developing targeted awareness efforts for support industries;
- Developing targeted awareness efforts for builders and trade partners;
- Improving contractor training for high-performing homes;
- Providing training for sales staff and real estate agents;
- Supporting new home certification;
- Developing a contractor certification program;
- Developing stronger infrastructure around inspection/performance testing/commissioning; and
- Developing model resources that high-performing home builders can customize for their needs.

The process and associated work to produce the main report and related activities cost the utility about $30,000, an investment viewed as sound by all parties. Implementation is being accomplished in several ways, mostly by the individuals and the organizations they represent undertaking practices that actively support better performing new homes in general and at least some of the action items identified by the group in particular. Following up on the NHSG work, a group called "Partners for High Performance Homes" (www.coloradoenergy.org/highperformance/default.htm) has been formed with a state-wide focus. Organized by Susan Castellon of the Colorado Governor's Office of Energy Management and Conservation, the group is primarily a networking effort that facilitates more effective coordination of efforts among the many entities in the state that are working in some way to improve the performance of new homes.

The picture that emerges from these activities is one of concerted efforts at market transformation. Gathering stakeholders from disparate organizations to work together on the common issue of energy-efficient housing resulted in learning not only about achieving better new housing, but also about the perspectives of people likely to be different from one's own. In the end, virtually all participants gained organizational savvy, practical wisdom—and new friends—all of which will be useful in achieving a societal goal that researchers will characterize as market transformation. Thus, the New Homes Stakeholders Group was not simply a discrete set of meetings that produced an interesting document available on a web site, but rather a key element in the development of important new infrastructure that provides a variety of synergisms along the road to better-performing new homes.

Educating builders in techniques to improve their products, making sure codes officials are knowledgeable and vigilant about the details that can make a big difference in performance, and testing homes for energy efficiency (including compliance with standards established by Building America, ENERGY STAR, and others) before they are sold, all contribute to the larger cause. On the customer side, equipping new home buyers with knowledge of the important elements of a home's performance that will contribute to energy savings, comfort, safety, low maintenance costs, and long life is a critical element in the production of better homes. In this regard, the wide availability and use of such documents as the list of questions buyers should ask of builders makes it

hard for sales people to peddle inferior homes – and easier for builders of excellent homes to close deals. This is where the rubber meets the road and where market transformation will gain its greatest traction. There are already important signs in the building community of a competitive race to the top where builders are intent on offering the best energy performing home possible and advertising this factor more vigorously than the material used for kitchen counter tops. That's progress.

Ensuring that more homeowners and builders have access to the educational material developed by Fort Collins Utilities should multiply the effects of this hopeful trend. Using the builders who are already producing excellent products – and are proud of them – is an important key in spreading the word.

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2) E-Star Colorado™

E-Star Colorado™ is a non-profit organization committed to advancing energy efficiency in both new and existing housing. To meet this objective, E-Star partners with, supports, and provides information through its Energy Ratings to participants in the housing industry, including homebuyers and homeowners, builders, Home Energy Raters, real estate professionals, code officials, and utilities. E-Star is a market-based mechanism for improving home energy efficiency, with the goal of making homeownership more affordable and easier to accomplish.

The E-Star program originated in 1995 as a project of the Colorado Governor's Office of Energy Management and Conservation. Begun with seed money from the U.S. Department of Energy, the program was first administered by the Colorado Housing and Finance Authority, and is now a stand-alone non-profit organization.

An E-Star Home Energy Rating is a measure of a home's energy-efficiency, accomplished through detailed technical inspection and testing by a certified Rater, and analyzed by an accredited Home Energy Rating System (HERS). The E-Star Rating takes into consideration measurements or tests of insulation, windows, walls, basements, attics, crawl spaces, HVAC systems, water heaters, building leakiness, and solar orientation. These inputs are run through E-Star's software to produce an energy rating.

E-Star is an accredited HERS provider, and the major trainer and certifier of Home Energy Raters in Colorado, providing independent third-party ratings for new and existing homes. Such ratings serve many purposes, such as providing qualifications for a special energy-efficiency mortgage for the homebuyer, providing proof of quality construction for builders, and providing property-specific recommendations for energy-efficiency improvements for builders or homeowners. In addition, it is becoming common for the E-Star HERS rating to be used to demonstrate code compliance under the IECC, reducing the workload for local building code officials. In fact, several building code departments provide building permit fee reductions to those builders who use the ratings for code compliance.

E-Star also works to promote energy efficiency as a wise financial decision in addition to being an environmentally responsible one, and provides the information and resources necessary to make this a reality for its partners.

Since its inception in 1995, over 10,000 E-Star Colorado Home Energy Ratings have been completed across the state. About 2,300 ratings were conducted in 2003 alone, of which 1,115 were of ENERGY STAR-rated homes. E-Star has five full-time employees and one half-time employee, and an annual operating budget of about $600,000. In the future E-Star hopes to continue to expand its mortgage brokering services, offering clients additional energy efficiency mortgage and energy improvement mortgage options. Currently, customers obtaining mortgages through E-Star receive either a free energy rating or $300 if their home has already been rated.

Table 2 below lists by year the number of ENERGY STAR-rated homes (homes rated at 86 or above on the HERS scale) that E-Star has rated since 1999, with utility bill savings, natural gas savings, and electricity savings.

Table 2. E-Star Colorado ENERGY STAR-rated Homes, 1999 – 2003

	Number of Homes Rated	Utility Bill Savings (dollars)	Natural Gas Savings (therms)	Electricity Savings (kWh)
1999	42	17,711	34,747	19,198
2000	128	58,678	108,201	94,914
2001	334	211,329	258,401	114,860
2002	641	304,946	569,009	232,276
2003	1,115	664,657	1,016,843	562,292
2004	1,190	839,242	1,110,318	663,785
TOTAL	**2,524**	**1,257,321**	**1,585,852**	**1,023,540**

Source: E-Star Colorado

E-Star Colorado's web site is organized to provide handy information to a variety of audiences, to wit,

- Homeowners and homebuyers (here's what to look for, the importance of ratings);

- Builders (why ratings can improved your homes and business, annual awards for excellence);
- Energy raters (how to get involved, training, and follow up);
- Real Estate Professionals (understanding energy-efficient homes, energy-efficient mortgages, how to order a rating);
- Code Officials (fulfilling code compliance via ratings, thereby saving time and money); and
- Utilities (partnering with E-Star to mutual benefit)

E Star Colorado directs builders interested in improving the energy efficiency of their homes to the Building America website.

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3) Built Green® Colorado

Built Green Colorado was created in 1995 through the joint efforts of the Home Builders Association of Metro Denver, the Colorado Governor's Office of Energy Management and Conservation, Xcel Energy, and E-Star Colorado. It is the largest green building program in the nation, with 130 builder members, 56 sponsor members, and more than 25,000 homes registered through 2004. There is a "Built Green Industry Leaders group" whose members include James Hardie Building Products, Rheem Company, Boise Building Solutions, Trex Decking, Whirlpool Corporation, Kurowski Development Co., Grace Construction Products, and Owens Corning.

Program revenues are generated through dues and fees.

A voluntary program, Built Green Colorado (BGC) encourages home builders, suppliers, and manufacturers to use technologies, products, and practices in the construction of new homes that will provide greater energy efficiency and reduce pollution; provide healthier indoor air; reduce water usage; preserve natural resources; and improve durability and reduce maintenance. In short, Built Green encourages the industry to build homes that are better built and better for the environment.

The Built Green program operates under the premise that individual builder and sponsor members as well as the home building industry at large has much to gain by presenting itself in a positive light through voluntary building programs that benefit the homebuyer, the community, and the environment. Builders who enroll in the program are not required to build every home to the program's criteria; rather, they may choose to

participate at whatever level best suits their particular market. However, homes must be constructed to the program's criteria in order to qualify for the Built Green designation.

Built Green is similar to other home building programs aimed at decreasing the environmental impact of new residential construction, but has increasingly shifted its focus to strengthening the link between green building and performance: efficiency, durability, health, and comfort. To accomplish this, the Built Green program works on two tracks, improving the quality of new homes and educating homebuyers.

Toward improving the quality of new homes, it has established three levels of participation: Built Green (Tier I), Built Green High Performance (Tier II), and Tier III, as yet unnamed. Each tier has an increasing focus on the systems approach to building science and performance. In order for new homes to reach the Built Green (Tier I) level, builders must meet a minimum energy requirement (10% above IECC 2003) and chose a minimum number of options from the Built Green Checklist, a menu of over 220 features in 28 different categories covering energy efficiency, material resource efficiency, health and safety, and resource conservation. Options are assigned point values according to their relative merit, and Built Green (Tier I) builders are required to accumulate a minimum of 70 points from the Checklist. The Checklist requires that the Built Green (Tier I) builders select points from within a specified 8 of the 28 categories:

- Energy Efficiency: Mechanical Heating & Cooling Systems
- Energy Efficiency: HVAC Distribution Systems
- Health and Safety: Improved Indoor Air Quality
- Health and Safety: Moisture Management
- Energy Efficiency: Lighting
- Material Resource Efficiency: Framing
- Material Resource Efficiency: Exterior Wall Finishes
- Resource Conservation: Water

Because of the range and number of options available on the Checklist, individual builders are likely to build Tier I "green" homes differently from one another.

Built Green High Performance (Tier II) and Tier III take a prescriptive approach to energy systems performance, requiring increasing levels of diagnostic testing, as well as requiring the builder to select a minimum number of options from the Checklist to address indoor air quality, durability, and resource conservation.

BGC provides a range of technical support and training opportunities to assist builders in making and achieving their Checklist choices. Follow-up support is also provided. As a quality control for the builders and the program, at the Built Green (Tier I) level five percent of all Built Green-registered homes are inspected on a random basis by E-Star Colorado-certified home energy raters; Built Green High Performance (Tier II) and Tier III require 25% and 100% verification respectively.

Homes are energy rated on the HERS (Home Energy Rating System) scale. Built Green (Tier I) homes must score at least 84 HERS points (82 HERS points when the reference

home is adjusted by RESNET); Built Green High Performance (Tier II) homes must score 86 HERS points; and Tier III homes must score 88 or more HERS points.

Concerning education, BGC works in a variety of ways to inform and educate the home-buying public on the specifics of the Built Green program and the benefits associated with a home that meets Built Green standards, striving to connect Built Green with "better built" in the buyer's mind. Once a year BGC runs a series of television advertisements that are targeted to Denver metro area residents and which are also viewed in other parts of the state; in the future BGC hopes to expand this advertising to cover the entire state. BGC coordinates closely with the Home Builders Associations across Colorado to promote their program through publications and public events such as Parades of Homes, Tours of Homes, and Home and Garden Shows. Over the years, BGC has learned that the builders themselves are the most effective tool in educating homebuyers. Thus, marketing materials such as brochures and yard signs are provided to builders and made available on-site. Visual displays that demonstrate the technologies employed in a Built Green home have proven to be especially effective in educating homebuyers.

In the future there will be a continued focus on the evolution of the Built Green Checklist, as the program continues its emphasis on building sciences and the construction of high performance homes. In January 2004 BGC moved to its three tier rating system described above, and so over the next few years they expect to fine-tune this new approach and provide support for these changes. It is also hoped that the technical training for builders will continue to be enhanced and strengthened, and that the training resources can be expanded to also provide sales training to the builders, to ensure that the Built Green story is being effectively marketed to homebuyers.

In 2004, about 5,743 homes were registered as Built Green. The Built Green program achieved a 27% market share in the 8-county Denver metro area, and a 14% market share in Colorado. Overall, this represents approximately a 12% increase over the year before.

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Nevada

1) Nevada Energy Office

The Nevada State Office of Energy (NSOE) plays the roles of many other state energy offices. Its Director, who is also the Energy Advisor to the Governor, is located in the Nevada State Capital building. The NSOE is located in a different building several blocks away. Because of the Director's dual role, the NSOE is often drawn into crises of the moment such as explaining the high price of gasoline, electricity and natural gas, and dealing with supply disruption problems. The NSOE serves as a primary resource in the state for financial assistance, technical expertise, and resource referral affecting utilization of energy conservation, energy efficiency, and renewable technologies, in addition to promotion of alternative vehicle fuels and energy supply adequacy and disruption response coordination. The NSOE makes use of a Renewable Energy and Energy Conservation Task Force composed of state officials and business and industry representatives. It was created by the state's legislature to assist in developing renewable energy and energy conservation to minimize the reliance on fossil fuels.

NSOE joined with the Task Force and the electric utilities to commission a study by SWEEP to explore options for energy efficiency policies and programs. The NSOE is pursuing all of SWEEP's recommendations to some degree or another, including the following related to raising the energy efficiency of new homes:

- Adopt energy savings standards;
- Support updated building codes and energy codes; and
- Increase funding to support demand side management programs.

With respect to building energy efficiency, the NSOE increasingly and effectively partners with Nevada's two major investor-owned electric utilities to promote many DSM programs/projects of common interest. These include support of building energy code training for local jurisdiction codes officials and building, engineering and design industry members, and joint support of above-code programs with the federal government and industry (ENERGY STAR and MASCO's Environments for Living program). In addition, the office has provided significant support to the success of DOE's Rebuild America program through assistance provided to Las Vegas builders (Pulte Homes, in particular). The office also works with the utilities and a variety of other partners to promote the technical and financial assistance available through the program, focusing these resources primarily on the small business, K-12 education, and state government end-use sectors.

The NSOE is working in the two major growth areas of the state, Las Vegas and Reno (Clark and Washoe counties, respectively), to educate codes professionals and other stakeholders (from university researchers to builders) to promote the adoption of the 2003 International Energy Efficiency Code. The NSOE initiated a study, co-funded by DOE, NSOE, and the utilities, of the degree to which a sample of homes in both northern and southern Nevada met local energy efficiency codes. A key finding was that, on average,

homes in southern Nevada exceeded the 2000 IECC code by 9 percent, whereas the energy efficiency of homes built in northern Nevada missed the just-meets-code benchmark by 42 percent.

The NSOE co-sponsored a large group of stakeholders that constitute the ENERGY STAR partnership. A major multimedia campaign (billboards, radio, TV, public service announcements, newspaper ads, brochures) to promote ENERGY STAR, Rebuild America, and related energy efficiency efforts was undertaken that has had powerful effects on the new home market.

There are presently 52 ENERGY STAR builders in Nevada, 17 of which produce only ENERGY STAR-rated homes. As of September 2005, 40,356 ENERGY STAR labeled homes had been built in Nevada, 44% of which have been produced in the previous 12 months. Builders that have produced over 1,000 ENERGY STAR homes in Nevada are shown in Table 3.

Table 3. Builders with over 1,000 ENERGY STAR Homes Constructed in Nevada as of September 2005

Builder	Number of ENERGY STAR Homes
Astoria	3,126
Beazer	3,252
Concordia	1,136
D. R. Horton	1,954
Ence	1,536
K. B. Home	6,283
Lennar / Greystone / US Home	1,282
Meritage Homes	1,618
Pardee Homes	4,182
Pulte Homes	8,236
TOTAL	32,605

Source: U.S. EPA

The NSOE also promotes energy-efficient new housing in northern Nevada by partnering with the Builders' Association of Northern Nevada (BANN), Energy Rated Homes, Sierra Pacific Power Company, Fannie Mae, and HUD to sponsor an annual competition for the most energy-efficient new home. Energy Rated Homes, a non-profit organization, selects the winning builders through an objective evaluation of the overall energy efficiency of their homes based on insulation levels, window efficiency, type of heating system, air conditioner, water heater, and air tightness.

The builders with homes having the highest efficiency in each category receive awards from the Governor, along with a good deal of publicity associated with the honor. Winners meet or exceed the ENERGY STAR level of efficiency.

The NSOE is also an active sponsor of the Energy HOG campaign coordinated by the Association to Save Energy, which provides community education about wasteful energy practices.

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2) Nevada Power Company and Sierra Pacific Power Company

Nevada Power Company is an investor-owned electric utility serving Southern Nevada; Sierra Pacific Power supplies Northern Nevada. Both are subsidiaries of the Sierra Pacific Resources holding company, which also supplies natural gas in Northern Nevada. In practice, DSM and other energy efficiency programs are planned by the same staff members out of Nevada Power's office in Las Vegas.

Nevada Power collaborates closely with its sister corporation Sierra Pacific Power to run the New Construction Builder Support (NCBS) program. In southern Nevada, the program is one based on partnerships between the utility, builders, and businesses, all working together to raise the brand awareness of ENERGY STAR homes through industry and consumer education campaigns, demonstration programs, builder training seminars, and other forms of support. This includes "jawboning" with builders. The utilities are trying to forge stronger relationships with builders to achieve more efficient homes whose peak demands are as modest as possible.

Since new homes and related buildings (e.g., schools and other infrastructure) are being built at a record pace; the utility is growing quickly to keep up. Recognizing that it is in the interest of all parties to install the most energy-efficient air conditioning systems available in the new homes under construction, the utility has partnered with 26 of the largest builders to co-sponsor a major DSM program to install units that have a SEER rating that is substantially higher than that associated with current codes. Practically, this means SEER 13 A/C units. The utility is filing with the public utility commission to initiate a DSM program in 2006 in which the utility will invest $15 million and the 26 largest builders a similar amount to subsidize the installation of more efficient A/C units, with a TRC the utility estimates will be over 2. This represents a major commitment on the part of all parties, and close to a five-fold increase over past years in DSM activity for this program alone.

The utilities also sponsor an ENERGY STAR new appliance program. This includes $50 rebates for energy-efficient appliances, plus subsidizing of energy-efficient lighting. This DSM program, which was funded at $0.9 million for 2005, is slated for funding at $1.7 million in 2006.

Under consideration is a program of working with builders to help new home owners to capture the new federal tax credit for new energy-efficient dwellings. The idea is to help progressive builders use the $2,000 rebates as a market differentiator over the builders who are not producing qualifying new homes.

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Utah

1) Utah Power Energy Star Homes Program

Utah Power, a subsidiary of PaciciCorp, is the only investor-owned electric utility in Utah and supplies about 80% of all electricity sold in the state. Utah Power is required to carry out integrated resource planning and implement all DSM programs that are cost-effective based on the Total Resource Cost (TRC) test. As a result, the utility is now implementing a wide array of DSM programs. Utah Power's total DSM budget increased from about $5 million in 2001 to about $21 million in 2005.

Utah Power has developed its most recent DSM programs through an RFP process whereby the utility requests program proposals from potential program implementers. The ENERGY STAR Homes program was one program proposed in response to an RFP issued in 2004. The program was developed by a consortium that includes ICF, Inc., Ecotope, and Ecos Consulting. The program was filed by Utah Power for approval by the Utah Public Utilities Commission in late 2004 and then launched in April, 2005.[5] The budget for the first year of an anticipated five-year program effort was about $1.6 million.

While called ENERGY STAR Homes, the program promotes new single family and multi-family homes that go beyond the basic ENERGY STAR homes requirements. The original program required homes to have a high efficiency air conditioning system

[5] For details on the program, see the Utah Power program web site, http://www.ecosconsulting.com/utahpower/builders/index.html

(SEER=13 or greater), proper sizing and installation of the air conditioning system, duct sealing, and ENERGY STAR windows, along with the more basic ENERGY STAR home qualification. Certified ENERGY STAR builders meeting these "base package" criteria are paid an incentive of $350 per single family home. In addition, builders are offered extra incentives for placing ducts in conditioned space ($200), installation of evaporative cooling instead of normal compressor-based cooling ($300), installation of 15 ENERGY STAR light fixtures ($100), and installation of ENERGY STAR dishwashers or ceiling fans ($10 per unit).

The qualification requirements are similar but incentives somewhat less for multi-family housing; e.g., a builder receives $250 for each base package-qualifying multi-family housing unit. In addition to these financial incentives, Utah Power is training builders and HVAC contractors on how to comply with the requirements and is also co-funding cooperative marketing and promotion with participating builders. HERS raters are used to inspect homes and verify compliance.

As of October, 2005, Utah Power had signed up 24 builders who committed to build 269 qualifying homes by the end of the year. Participation in 2005 was somewhat less than was initially anticipated, but interest in the program is growing. The modest level of participation in the first year is understandable considering that there was almost no construction of ENERGY STAR homes in the Salt Lake City metropolitan area prior to the initiation of the program.[6]

The eligibility requirements and incentive levels are being kept essentially the same in 2006 as in 2005. But builders will have to meet the new ENERGY STAR homes specification once it takes effect.

The overall program goals are to achieve participation rates of 7,500 single family and 2,200 multi-family units (about 10% of new construction in the Utah Power service area) over a five-year period. If these goals are met, it is estimated that 17.3 GWh per year of electricity will be saved at the end of the five-year program. This equates to 1,780 kWh/yr of electricity savings per participating home on average. The total projected budget for the five-year program is $8.4 million (utility cost only), and $18.9 million considering both participant and utility costs. Given estimated avoided utility supply costs as of 2005, the projected benefit-cost ratio is in the range of 2.6-3.0 using the Total Resource Cost test.

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[6] There has been significant construction of ENERGY STAR new homes in St. George, Utah, but this city in the southwest corner of the state is outside of the Utah Power Service area.

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