

## **A Systematic, Statewide, Program-Wide Approach to Energy-Efficient Housing Production**

Despite its rapid population growth and its reputation as a center for banking, research and technology, most of North Carolina is made up of small towns and rural communities. Two thirds of its 9.5 million people live in towns of fewer than 10,000. Many local economies still rely on textiles and tobacco, as well as chemicals, wood products, and hog and poultry production. It is a difficult environment for promoting energy-efficient home construction, especially for families with incomes of \$25,000 to \$62,000 a year.

Nevertheless, 90 percent of the housing production that the North Carolina Housing Finance Agency funded in 2010 will meet or exceed ENERGY STAR standards, or (for rehab) will incorporate ENERGY STAR products and equipment. Since 2000, we have financed 12,500 energy-efficient and healthy homes, apartments and supportive housing units all across the state—in rural crossroads as well as in progressive and environmentally conscious towns like Asheville and Chapel Hill. NCHFA’s leadership in bringing energy efficiency into North Carolina’s affordable housing sector was recognized this spring by the U.S. Environmental Protection Agency with an ENERGY STAR Excellence Award.

We are continuing the effort. In 2009 we added incentives to our home ownership loan pools that promote green building certification. In 2011, our Home Energy Loan Program will be the North Carolina testing ground for Home Performance with Energy Star, an initiative by the EPA and the U.S. Department of Energy to provide a process to help homeowners make energy improvements in existing homes.

**We have achieved broad penetration as the result of a practical and cost-effective strategy** that our agency has sustained and expanded over a dozen years. We knew that to reach hundreds of small towns, we’d need to work with lots of partners of all kinds and with old and new housing. The predominance of rural and blue collar communities meant we would have to show a strong cost/benefit result to gain acceptance—few of our partners or their clients would accept energy standards just because it is a social priority. Consequently, we took a deliberate, results-oriented approach, emphasizing building science and engaging local governments, nonprofits, Habitat for Humanity chapters, as well as for-profit developers.

Our chief partner has been Advanced Energy Corporation, a non-profit building science company based in Raleigh. We first worked with Advanced Energy in the 1990s, when they helped develop standards and training to improve energy efficiency in the housing rehabilitation we financed.

**Since 2000, we have incorporated Advanced Energy’s SystemVision approach in our home ownership production programs**, which fund single-family development with many of the same small-scale, local housing producers that use our rehab programs. SystemVision is the only home performance program in the nation that offers homeowners a guarantee regarding heating and cooling costs. When we began the partnership, our goal was to improve the quality and long-term affordability of the housing we financed, and Advanced Energy’s was to test its home construction techniques in the affordable market.

The SystemVision approach carefully weighs the cost of upgrades against the benefits for homeowners—not only in reduced energy costs, but in home comfort, durability, moisture control that prevents mold and mildew, and air quality. Rather than aiming for the very highest level of efficiency or the “greenest of the green,” it focuses on upgrades that make a difference in North Carolina’s climate and that produce the greatest return on investment. With construction upgrades that cost in the range of \$1 per square foot, SystemVision homes have been proven more than 15 percent more energy-efficient than code-built homes, with standards that surpass ENERGY STAR.

Just as important for our local partners, SystemVision construction techniques are low-tech and readily teachable to contractors and Habitat volunteers. The approach succeeds through attention to detail: tight insulation, a tight envelope, properly sized and meticulously installed heating/cooling systems, and mechanical fresh air ventilation.

Advanced Energy trains contractors and volunteers, tweaks house plans and specs, inspects each home at critical junctures, performance-tests the completed homes, and then provides the home buyer with the written energy guarantee. The guarantee specifies that for two years the heating/cooling costs of the home will not exceed a specific amount—typically, \$25 to \$30 a month. The homes exceed ENERGY STAR standards and qualify for a 5 percent utility discount.

We offer incentives for SystemVision construction in all of our homeownership loan pools for local governments, nonprofits and self-help housing producers. Using HOME funds and the state Housing Trust Fund, these provide amortizing and deferred loans up to \$25,000 to buyers who purchase homes developed by loan pool participants. The sponsor receives an additional \$4,000 grant to build the home to SystemVision standards. The grant covers construction upgrades, a payment to Advanced Energy for services, and about \$1,000 to offset the sponsor's overhead.

Through 2010, more than 1,600 homes financed by NCHFA have been SystemVision-certified—with Habitat for Humanity chapters among the most enthusiastic adopters. In 2010, 77 percent of the 253 Habitat homes that NCHFA financed were SystemVision homes. Seventy percent of the state's 81 Habitat chapters have built SystemVision homes.

**We have taken a similar systems approach in supportive housing.** Our supportive housing projects range from independent apartments to licensed- and non-licensed shared housing for people with a wide range of disabilities and needs. Most have incomes 30 percent of median or less. Most facilities are small, with a few shelters serving up to 150 people. We finance new construction, adaptive reuse and rehab.

Although SystemVision standards—developed for single family homes—do not translate perfectly for group facilities, since 2007 we have successfully applied the same concepts and process to 44 properties with 926 units, striving for a tight building envelope, carefully sealed ductwork, correctly sized and installed HVAC units, and careful insulation. Advanced Energy consults with sponsors on building plans, makes recommendations, provides training, and is available to performance-test the finished building. We include the incremental cost in our financing, which usually comes from the state Housing Trust Fund.

While no SystemVision certification exists for multifamily properties, we estimate that 75 percent of the supportive housing properties would qualify. Some sponsors have gone well beyond our guidelines to build solar-powered facilities with sophisticated “green” features—a small apartment development in Carrboro for people with mental disabilities and a maternity home for teens in Greensboro are two examples. A Greensboro sponsor reports that the utility bills for his new facility are half those of other, smaller properties his group operates.

Since most of the supportive housing sponsors are mission-driven, community-based nonprofits and units of local government, both the operating savings and access to Advanced Energy's construction expertise are important benefits. In fact, manageable operating costs can determine success or failure for them.

**Whole-house rehab.** We have involved Advanced Energy in the development of standards for our Single Family Rehabilitation program since the mid-1990s. SFR now funds 150 home rehabilitations a year, investing \$45,000 a unit from the HOME Program. Local sponsors comply with detailed specifications intended to air-seal the heated/cooled living space, provide effective insulation (for practicality, usually attics but not walls), and correctly rated and installed HVAC systems with properly sealed ducts.

Advanced Energy and our staff train sponsors and contractors. Performance testings, such as the blower-door tests for the building envelope, are performed by sponsors or contractors. To date, almost 1,500 homes have been rehabilitated in this way.

**We chose ENERGY STAR as the standard for our Housing Credit Program** because its national recognition makes it familiar to multifamily developers and Housing Credit investors. Also, ENERGY STAR credentialed professionals are widely available to train builders and contractors, assist with quality control, and provide certification.

We first provided incentives for ENERGY STAR certification in 2007. Since 2009, we have required all new construction projects to be ENERGY STAR-certified. Adaptive reuse and rehabilitated projects must comply to the extent that it is economically feasible, and any replacement materials and components must meet the same design standards as new construction.

Only two ENERGY STAR Housing Credit properties (103 units) were built before we offered incentives. In five years, we have financed 6,925 units that will be ENERGY STAR-certified, and another 1,470 through adaptive reuse and rehabilitated that will incorporate ENERGY STAR materials and equipment.

**Our new venture to introduce Home Performance with ENERGY STAR (HPwES) into North Carolina** is a logical next step. It takes an analytical, systems approach into smaller-scale renovations such as might be undertaken by individual homeowners. Bob Dunham, recently retired from our staff, collaborated with the Environment Protection Agency and Advanced Energy to develop HPwES recommendations for North Carolina, and Advanced Energy will be the state sponsor. NCHFA is offering HPwES this spring as an option to participants in our Home Energy Loan Program, which provides forgivable loans up to \$10,000. The eight organizations that have elected to use the HPwES process will be provided a pre-work analysis of the needs of each home to be rehabilitated by a HPwES contractor, a list of recommendations developed with input from our staff, and guidance in prioritizing the recommendations to get the most payoff within their budget, and quality control testing when the work is complete. We expect successfully completed homes to qualify for a 5 percent utility company discount.

Our pilot will provide insights into how the HPwES process can be extended to individual North Carolina homeowners. The method also can be of great help to our local partners that are turning to purchase/rehab/resale of foreclosed homes for affordable housing production—some working in scattered sites, and a few, reclaiming entire foreclosed neighborhoods, as in Salisbury and Charlotte.

**One of the most exciting aspects of our work is the expertise it has built in our local partners.** Some 116 sponsor organizations and more than 600 of their contractors have been trained in SystemVision, and 60 Housing Credit developers have now built at least one ENERGY STAR-certified property. Contractors who have learned energy-saving construction techniques for our projects are applying them in their other work. And partners, like the cities of Charlotte and Greensboro, are undertaking full-scale, SystemVision homeownership developments with their own funds.

Although NCHFA's goal has been to improve the long-term affordability of its housing, the environmental benefit has been substantial. For the first 1,000 SystemVision homes alone, Advanced Energy calculated that energy savings would be the equivalent of three million tons of coal and would reduce carbon dioxide emissions by 7.9 million pounds. To counter the effect of that much carbon dioxide, one would have to plant 629,000 trees—or reduce automobile use by 10.4 million miles.