

Connecting Residential Energy Efficiency and Carbon Emissions Reductions:

MaineHousing's Carbon Market Project

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INTRODUCTION

Climate-related phrases have infiltrated dinner table conversations as part of the general acceptance that climate change is a global problem and that greenhouse gas emissions must be reduced. “Carbon offsets” can be purchased online. Colleges, universities, businesses, and even homes are going “carbon neutral.” A national “cap-and-trade” market-based system is coming. The big questions regarding climate change and carbon dioxide (CO₂) reductions boil down to these: are the reductions real, and how do we know for sure? MaineHousing is one year into developing a

carbon market project that will reduce CO₂ emissions from energy-efficiency measures in residential buildings. We have the data and details on residential energy savings to develop the program that will allow housing finance agencies to market these emissions reductions as a carbon offset category in the national cap-and-trade system.

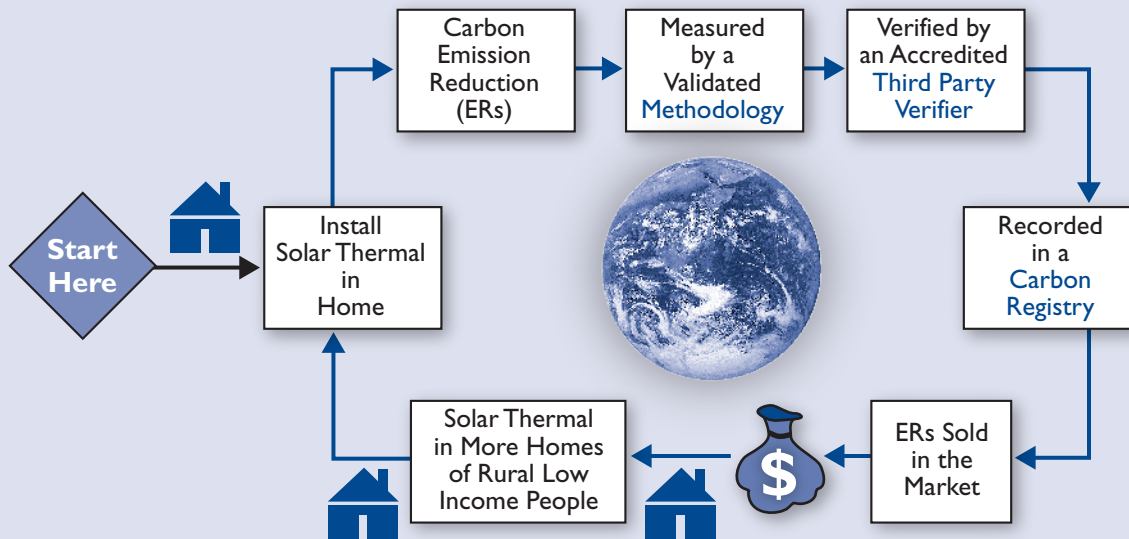
In the carbon world, the low-hanging fruit have been harvested. Easy, large-scale industrial projects such as methane recapture from farms and cogeneration plants that produce both heat and electricity have been exhausted. Buildings in the United States generate close to 40 percent of our greenhouse gas emissions. Residences alone contribute 22 percent. The next frontier for emissions reductions is energy use in buildings.

Residential energy use in Maine is an urgent issue. The state is heavily dependent on heating oil; for 84 percent of Maine homes, oil is the primary source of heat. Additionally, the housing stock is one of the oldest in the country; our buildings are drafty and in desperate need of insulation. High dependency on the carbon-heavy fuel source, coupled with leaky homes, makes Maine’s residential sector a larger producer of greenhouse gas emissions than the national residential average. When fuel oil reached \$5.00 a gallon last summer, Maine glimpsed the future and saw how high fuel costs drastically stifle our economy and jobs as well as decrease the comfort of our homes. Many homeowners are unable to sufficiently heat their homes. Though fuel prices are not currently increasing, predictions call for price increases in the future. Market volatility and the inevitable return of high fuel prices have motivated the governor, the legislature, and agencies to promote energy conservation. With all these factors colliding, one thing is clear; there is an immediate need to address energy use in housing.

MAINE HOMES AND THE CARBON MARKET

The health of Maine’s natural and economic environment is closely connected to climate change. We have an opportunity to make real emissions reductions in people’s homes. Energy conservation is the most cost-effective way to reduce energy bills. Not only that, any energy-efficiency measure is also a CO₂ reduction measure. Approved CO₂ emissions reductions can then

How Emissions Reductions (ERs) Are Generated and Readied for Trade in the Carbon Market



An energy-efficiency measure, or renewable energy measure, is installed in a home, which generates ERs. The ERs must be measured by a validated methodology approved through a carbon standard. The methodology clearly explains how the ERs are created, how they are monitored, and how they are measured. Using an approved methodology helps to ensure the quality and permanence of the ER. There are several carbon standards. We have chosen the voluntary carbon standard because its strict standards ensure that the ERs are real, measurable, permanent, surplus, and verifiable. Once the ERs are created, they must be verified by an independent third-party verifier. The verifier submits a report that tallies the ERs generated, and each certified ER must be recorded in an acclaimed registry and given a unique serial number to avoid double counting or double selling. Once the ER is accepted by the voluntary carbon standard it becomes a voluntary carbon unit (VCU). VCUs can be bought and sold in the voluntary carbon market. One VCU equals one metric ton of CO₂ equivalent. All six greenhouse gases are assigned a CO₂ equivalent value that is generated from the relative global warming potential (GWP) of the gas compared to CO₂, which has a GWP of 1. Any revenue generated from energy-efficiency ERs are reinvested into programs that further promote energy conservation and emissions reductions.

be incorporated into a carbon program and sold on the carbon market to generate a new revenue stream to expand energy efficiency efforts.

What exactly is an emissions reduction? How does it generate revenue? An emissions reduction (ER) is a quantifiable amount of greenhouse gas that is not emitted into the atmosphere due to the application of a reduction measure, such as insulation in houses,

a smokestack scrubber in a factory, or installing a solar thermal unit on the roof. For example, in a solar thermal unit, the energy from the sun is transferred to domestic water, which is then stored in a large tank until there is a demand for hot water. The hot water from the solar-heated tank is then transferred to the shower or the faucet. The ER is generated by replacing the fossil fuel that would have originally heated the

water with the emissions-free solar energy instead. The fuel replaced can be measured and becomes the ER. ERs are synonymous with carbon offsets, and they can be sold in either a voluntary or compliance carbon market. Currently in the U.S., most ERs are purchased to offset unavoidable emissions, thus allowing the purchaser to become carbon neutral, or to have no net emissions.

What is a carbon market? Two types of carbon markets exist: compliance markets and voluntary markets. Countries that are mandated to meet certain emissions targets function within a compliance market. Their emissions targets are regulated and are not voluntary. The Kyoto Protocol is a compliance-based treaty in which 170 developed nations have agreed to reduce their greenhouse gas emissions by 5.2 percent below 1990 levels. Participants must reduce their emissions to the target level by implementing reduction measures, by partnering with a developing country on a new project that generates reductions, or by purchasing offsets. Participating countries must “true-up,” or show that they have met the emissions targets between 2008 and 2012.

The second type of carbon market is the voluntary market. Currently, because the Bush Administration did not ratify the Kyoto Protocol and no other federal legislation exists, the U.S. functions within a voluntary market. In voluntary markets, no targets are mandatory. Instead, the emissions reductions are optional and sources are less regulated. Anyone can buy these emissions reductions to offset home heating, campus electricity consumption, or business travel.

The lack of a national climate change plan has not deterred regional and local entities from developing action plans. The Regional Greenhouse Gas Initiative (RGGI, or “Reggie”) is a binding climate agreement between 10 New England and Mid-Atlantic states. (See Bogdonoff, this issue.) Another voluntarily binding program is the American College and University Presidents Climate Commitment, in which colleges and universities have agreed to reduce their emissions and become carbon neutral. As participants in the Climate Commitment, Unity College, in Unity, Maine, approached MaineHousing about purchasing carbon ERs derived from energy-efficiency improvements made within the MaineHousing office building,

Unity College Associate Professor and Director of Sustainability Mick Womersley wanted to keep dollars spent for carbon offsets in Maine to keep the multiplier effect of spending in state.

MaineHousing offsets are created locally and directly benefit low-income people. As the project members researched and explored carbon markets, we soon realized that in order to sell the carbon ERs, we would have to measure them following a validated methodology, have them certified by a third-party verifier, and register each metric ton (2,204.6 lbs of CO₂). We soon realized that we would have a much bigger impact if we extended the project beyond the office, so we began to create a program to quantify, verify, and sell CO₂ emissions reductions generated from renewable energy and energy-efficiency projects in low-income housing.

EXPANDING HOME ENERGY-EFFICIENCY PROGRAMS SAVES MONEY AND CREATES JOBS

The MaineHousing Carbon Market Project will provide households access to carbon market revenue that would otherwise remain unavailable. The additional revenue stream will enable housing agencies to expand energy-efficiency programs that directly benefit household members in both single family and multi-family dwellings. The project is developing documents for two project types that apply to the residential sector: solar thermal hot water installations and residential energy-efficiency measures, which include weatherization, energy-efficient mortgages, and home energy-efficiency loans. These program areas generate real emissions reductions that can be measured, verified, registered and traded within the voluntary market. We are taking the necessary steps to ensure the quality of ERs generated within the project so that they will be considered pre-compliance, meaning they will be eligible as compliance-quality ERs when the compliance market is established in the U.S.

Throughout the research and development process, we have been analyzing which energy-efficiency program areas will generate the most ERs, have a real impact on climate change, and benefit the people of Maine. It has become clear that weatherizing the homes of Maine is a direct solution that will help

to reduce the impact of rising fuel costs, reduce the dependency on oil to heat homes, and reduce greenhouse gas emissions within the residential sector.

Weatherizing a home includes the following:

- An initial energy audit that catalogs energy use in the home.
- A prioritized list of actions to address excessive energy loss.
- The installation of the energy efficiency measures by a contractor.
- A final inspection to make sure the work was completed properly.
- Measuring and monitoring emissions reductions.

Following are a few examples of energy efficiency measures:

- Installing insulation in the attic.
- Blowing dense-blown cellulose insulation into the wall cavities.
- Adding 6-mil polyethylene plastic as a vapor barrier to prevent moisture and air movement.
- Installing insulated doors and windows.
- Replacing an old boiler with a significantly more efficient one.

Making these improvements, paying for parts and labor, and conducting the energy audit can be expensive. Most weatherization jobs require an average upfront investment of \$5,300. For most families the cost is too great, so homes are left as-is.

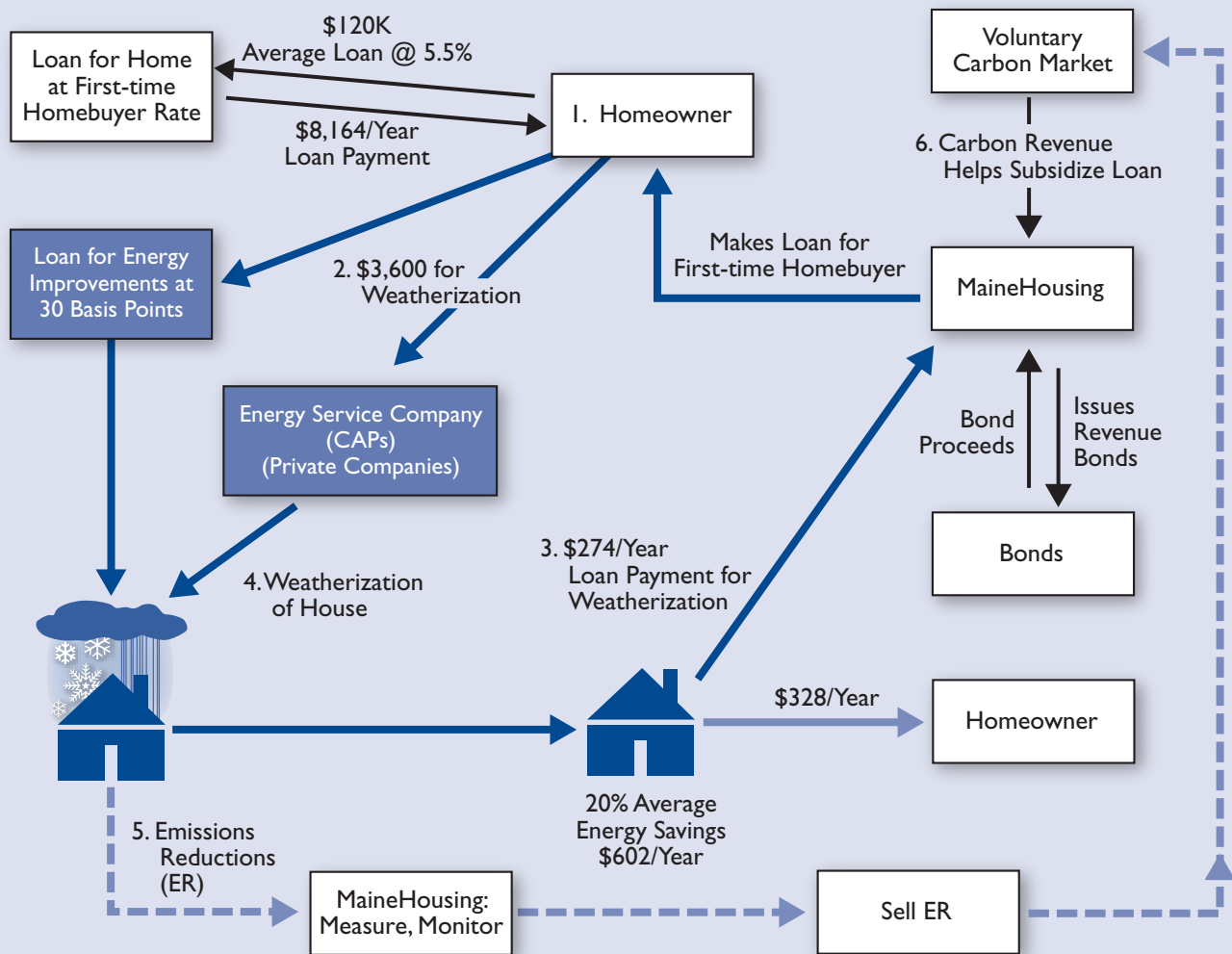
Under the current weatherization program, MaineHousing works with the regional Community Action Agencies (CAPs) and oversees the weatherization of approximately 1,000 homes a year. Data on the weatherized homes have been collected for 30 years. These data show that each weatherized home has an average energy reduction of 20 percent. It is this reduction in fuel use, combined with the increased air quality, comfort, and durability of the home that makes weatherization such an effective tool to reduce

the burden of high energy costs. The benefits of weatherizing homes expand beyond the boundary of the building envelope. Increasing the demand for weatherization technicians will help to increase the green workforce and create more jobs in the state. Energy experts definitively assert that weatherization efforts and tightening the building envelope significantly reduce energy consumption in homes, which directly benefits Maine's people, Maine's economy, and Maine's environment.

To date, the largest limiting factor to weatherizing homes on a large scale is the lack of a trained workforce to install the efficiency measures. (See Brown and Ginn, this issue.) Blowing insulation and proper air sealing require training and certification. MaineHousing immediately responded to the governor's request to build the necessary workforce to weatherize all homes in Maine. The result was the creation of the Governor's Weatherization Program, which will help to expand weatherization efforts on several levels. First, training programs for weatherization technicians will increase the available workforce by encouraging contractors to participate now, while there are few new construction jobs. To date, 67 technicians have successfully completed the certification process. Second, the energy-auditing process will be streamlined and be required to verify the energy savings. Streamlining the process will reduce the need for administrative overhead and allow for a quicker response time to auditing requests. Third, as the workforce grows, more and more homes will be weatherized.

The initial plan of the program is to use \$1.5 million allocated by the governor to MaineHousing to weatherize 300 homes of low-income clients. At \$5,300 a home, this, coupled with additional federal money, would weatherize approximately 2,300 homes. Weatherization efforts need to be maximized. Creating a subsidized loan for weatherization, in addition to a home energy-efficiency mortgage, is an example of what MaineHousing is doing to connect Maine citizens to the benefits of the carbon market. (See Sidebar, page 124.) The exciting and groundbreaking opportunity is gaining access to the carbon revenue stream by aggregating, verifying, and selling carbon ERs generated from these weatherization efforts. The additional

Energy-Efficient Green Mortgage with Weatherization



(1) Homeowner applies to a financial institution for a mortgage on a new house. (2) \$3,600 is also loaned to the homeowner to pay for weatherizing, or installing residential energy efficiency measures in the house. The interest rate is increased 0.3 percent but there is no increase in the amount borrowed. (3) The 0.3 percent increase in the interest rate for the weatherization amounts to \$274 per year. This is less than half the yearly energy savings. (4) Weatherizing the house results in two metric tons of carbon emission

reductions. (5) The emissions reduction is measured, verified, monitored, registered and aggregated with other emissions reductions until there is a significant amount to sell on the Voluntary Carbon Market. (6) The connection to the carbon market revenue is essential to maintaining the lower interest rate of the loan and reducing the prepayment risk of energy efficient mortgages, which allows the homebuyer to make weatherization improvements and/or obtain an energy efficiency mortgage and generate emission reductions.

Assumptions: Average 20 percent energy savings per household, cost of oil \$3.50/gallon, loan terms of 5.8 percent interest over a 15-year level payment.

revenue will help to expand energy-efficiency efforts and allow further emissions reductions to be made.

PREPARING RESIDENTIAL EMISSIONS REDUCTIONS FOR UPCOMING CAP-AND-TRADE OPPORTUNITIES

Under the new federal administration, a cap-and-trade system for addressing climate change and curbing greenhouse gas emissions is coming. President-elect Obama has expressed his commitment to involving the U.S. in combating global climate change. (See article by Cote, this issue.)

Regional cap-and-trade systems are already in place. The first and second auctions for carbon allowances under the Regional Greenhouse Gas Initiative (RGGI) occurred in September, and December, respectively. RGGI is a binding agreement to reduce emissions within the industrial utility sector to 10 percent below 2009 levels by 2019. The West Coast states, along with a few Mexican states and Canadian provinces, have created the Western Climate Initiative (WCI), designed to reduce emissions in many sectors by 15 percent below 2005 levels by 2020. Not to be outdone by the coasts, the Midwestern states developed the Midwestern Greenhouse Gas Accord, which is currently developing reduction targets for multiple sectors. A cap-and-trade system worked for reducing sulfur dioxide emissions. It is the backbone of the regional initiatives developed to date in the U.S., and it is used in compliance markets worldwide. When national carbon regulation begins, MaineHousing wants housing agencies across the nation to be ready with viable, pre-compliance quality offsets that have been generated from energy-efficiency and renewable energy measures in the housing sector.

There are many steps and documents necessary to have a project approved by a carbon standard, which ensures the quality of the emissions reductions. By developing the appropriate methodology, identifying suitable third-party verifiers, and establishing a relationship with a buyer, MaineHousing is creating a sustainable program that will facilitate the inclusion of residential emissions reductions as a legitimate offset category within the coming compliance regulations. Once rolled out to multiple state housing finance

agencies, the project will become an integral part of state and federal policy concerning eligible offset categories within the cap-and-trade scheme. The creation of this “carbon project” will solidify the residential sector as a viable offset category, thus ensuring access to carbon financing.

The global carbon economy has already arrived. Nationally, there is a proposal to securitize carbon to fund a huge Marshall Plan to weatherize homes. We have the methodology to accomplish that policy. To generate the revenue, we have established the steps, the data, and the process to convert energy-efficiency measures into actual dollars. MaineHousing’s project vividly “brings home” the battle against climate change. 

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