



Estimated cost of complete retrofit of target Milwaukee homes: \$243.1 million

Estimated annual energy savings from such a retrofit: \$83.3 million

Nominal payback period: 2.9 years

Target criteria: Owner-occupied homes built before 1960 and all rental housing

Number of target residences: 210,044

Average yearly energy savings per residence: \$397

Milwaukee Retrofit



Capturing Home Energy Savings in Milwaukee

As the world comes to grips with the economic, environmental and political hazards of conventional energy use, Wisconsin is blessed with a major, largely untapped domestic energy resource.

Efficiency.

In contrast to the standard practice of relying on ever-more imported fossil fuel and more power plants in which to burn it, improving Wisconsin's energy efficiency would reduce pollution, and keep more of our dollars inside our borders. It would also cost relatively little and require no lifestyle changes.

Here we consider efficiency in homes, which account for about a quarter of all energy used in Wisconsin. Residential efficiency improvements involve time-tested measures such as installing fluorescent lighting, reducing air leakage, improving insulation, and upgrading appliances.

Milwaukee has a large stock of housing that is a good target for retrofitting to improve energy efficiency — older single-family homes and multi-unit structures of all ages. COWS estimates that retrofitting these homes would generate as much as \$83.3 million in annual savings from a one-time investment of up to \$243.0 million. After the upfront cost is paid, the savings are essentially free money — a steady \$83.3 million annual stream kept in Milwaukee rather than going out a window to some foreign source of energy. (These estimates are nominal, not including interest payments on the initial financing or cost of program overhead, which would raise costs and payback periods, nor projected increases in energy costs, which would increase savings and lower payback periods. The estimates also do not take into account existing programs, such as Wisconsin Weatherization Assistance Program, that are available to do similar work and would reduce costs to this new effort.)

Along with direct income gains, the project would provide new jobs and skill-upgrading opportunities for area residents, raise property values, and improve public health by reducing emissions. It would also provide a visible local anchor for the city's energy-efficiency cluster of firms and services, recently identified by the Mayor's Green Team as a promising source of regional competitive advantage.

Several potential sources could provide the capital for this project. First, the savings to state citizens would be widespread enough to make it a "public improvement," justifying use of general-purpose revenue funds. Under plausible assumptions, the increased income and economic activity would generate taxes sufficient to pay off the project's costs. Second, the project could qualify for federal or state monies currently targeted toward energy efficiency, such as Wisconsin's public benefits fund. Third, the project could be financed through a city or state revenue bond issue, with the expected energy savings used for repayment. All three options should be explored, but we concentrate here on the third, self-financing option, which has obvious public policy and political appeal. In that option, the project would be a genuine investment in the private market sense. It would earn investors a return, in addition to benefiting residents and the general public.

Estimating the Savings

What is needed to retrofit any particular structure of course varies, recommending an “energy audit” of target buildings before work begins. A simple, inexpensive retrofit might involve replacing standard incandescent light bulbs with energy-saving, longer-lasting fluorescents. At the other end of the scale, a complex, expensive retrofit might involve boiler replacements or major changes to a building’s shell. In between those extremes are measures such as upgrading appliance, fixing air leaks, and adding controls to minimize lighting use. As a rule, retrofits can reduce energy use by up to 30 percent with relatively minor work, and substantially more with greater investment.

The Milwaukee project would target all rental units and pre-1960 owner-occupied houses. Rental housing is famously energy inefficient; tenants are unwilling to improve someone else’s building, while many landlords likewise are less than eager to put capital into properties that are generating income without the improvements — energy bills are the tenants’ problem. In addition, many residents and landlords lack the capital to effect improvements, even if they were so inclined. Older owner-occupied homes tend to be inefficient simply because they are older — that is, built at a time when energy efficiency was not a major concern. While owners have a direct incentive to upgrade, they often lack the knowledge or finances to do so. Because both types of housing have a disproportionate share of lower-income occupants, gains in efficiency would provide needed dollars for many households, boosting economic prospects and property values in struggling neighborhoods.

In estimating potential costs and savings for homes in Milwaukee, COWS relied on two studies from the Energy Center of Wisconsin, one on rentals and one on owner-occupied houses (Energy and Rental Housing: A Wisconsin Characterization Study, V1, 2005, and Energy and Housing in Wisconsin: A Study of Owner-Occupied Single Family Homes, 2000). We corrected findings for inflation and applied the findings to Milwaukee’s residential housing stock as reported in Census files. Retrofitting Milwaukee rental and older owner-occupied homes, using efficiency measures with a payback period of 10 years or less, would cost \$243.1 million, and yield annual \$83.3 million in energy savings. (See Table 1.)

Table 1. Potential energy savings in Milwaukee housing.

	Units	Cost/unit	Total cost	Annual savings/unit	Total annual savings
Rental	126,992	\$1,278	\$162,061,336	\$482	\$61,116,164
Owner-occupied, pre-1960	83,052	\$975	\$80,992,356	\$265	\$22,214,673
Combined	210,044	\$1,157	\$243,053,693	\$397	\$83,330,837

Capturing the Savings

An old joke has it that an economist who sees a \$10 bill on the sidewalk won't bother to pick it up because she knows it can't exist. In a perfect market driven by informed consumers, such unclaimed values aren't possible. In the real world, markets are beset by widespread "imperfections" that depart from the competitive ideal – including information problems, inequities in bargaining power, and transactions costs – and with "failures" — including externalities and undersupplied public goods – that distort investment and purchasing decisions.

Energy savings of the sort that we're talking about are like that \$10 bill – they wouldn't exist in Econ 101 theory, because rational consumers would have already captured them. But they do exist. We have previously discussed the landlord-tenant issue that lets energy savings slip through the cracks. In addition, most consumers lack relevant information: the existence and magnitude of the savings; the cost or means of achieving them; and ways to shop for them, particularly when renting. Incentives are often perverse or conflicting. For example, the IRS allows commercial landlords to write off energy costs and requires them to depreciate buildings over just 30 years. Time horizons are low since people move frequently, and valuation of efficiency improvements during residence is not well developed. Transaction costs are high: Imagine the hassles involved in arranging to have someone do an energy audit and full retrofit of your home — especially if you had no initial capital!

Where such problems don't exist — for example, in a large industrial facility that uses a lot of energy, knows those costs, and has competitive reason to worry about them — robust markets for energy efficiency have developed. An entire industry of energy service companies (ESCOs) exists to help such large customers. Essentially, the customers agree to pay the ESCO, over some specified period, a portion of their current energy costs. The ESCO then reduces those costs through efficiencies it introduces, and the customer pockets the difference.

The proposal for Milwaukee concerns private residences, not industrial buildings. But in principle this different ownership should present no real problems in capturing the savings to finance the work in the same way; other cities, such as Cambridge, MA, and New York are undertaking similar projects. A simple method would be for the relevant utility to bill participating customers a higher rate per unit of energy after their retrofit was complete. So a customer who realized a 30 percent improvement in efficiency — and thus a 30 percent reduction in monthly energy use — might be billed at 120 percent of the standard rate. This customer would still see a 16 percent reduction in her bill ($.7 \times 1.2 = .84$), while the extra income to the utility could be used to pay a revenue bond issue that financed the retrofit. The speed of payback and rate of return to investors can be set in different ways. The goal would be to maximize both consumer participation in the program and investor willingness to underwrite it.

Other program benefits noted above can be had if some non-technical problems are solved. For example, workers performing the retrofits can include many low-income community residents, who can acquire new skills and "career ladders" for advancement. It will be important that the jobs pay decent wages and benefits — because it's good public policy and necessary to labor support of the project, which in turn is critical to the transfer of such skills. It would be good if the particular technologies applied in the project benefited from the expert help available in Milwaukee from members of the energy efficiency cluster. In a project of this sort, with so many potential contributors and beneficiaries, there will inevitably be problems in organizing all the people with a stake in moving it forward. But that, of course, is a nice problem to have.

The potential of this project is huge, and multiple players — including energy- and construction-related business and labor leaders, state and local leaders, and financiers — are increasingly engaged in discussing it. It's time to move toward action. The possibilities for Milwaukee – and, because this would be a model program, for the rest of the state and nation as well – are too great to do anything less.

- **C O W S**
- center on wisconsin strategy
- The Center on Wisconsin Strategy (COWS) is a non-profit, nonpartisan "think-and-do tank" dedicated to improving economic performance and living standards in the state of Wisconsin and nationally.
- Based at the University of Wisconsin-Madison, COWS works to promote "high road" strategies that support living wages, environmental sustainability, strong communities, and public accountability.
- For more information visit: www.cows.org
- **May 2007**