

Replace Windows for Energy Savings? It's Not That Simple

By Phil Cherry, Smart Energy Choices

When you ask someone what energy improvement they want to make in their home the answer you often hear is “Windows!” People want replacement windows because they often look nicer, work better than the old ones they want to replace, and because they think they can save energy on new windows.



You will save energy on new windows, but the problem is they don't always pay for themselves in energy savings over the life of the window (usually about 30 years). These windows may look nicer, and open easier, and maybe even be less challenging to clean, but don't replace your windows just because you think you'll save money on energy costs in the

short term... In some cases you won't realize a cost savings for decades.

Let's look at the numbers. When we talk about energy efficiency improvements, we use what's called an SIR – or “savings to investment” ratio. The SIR is calculated by dividing the expected savings from an energy improvement measure (windows, lighting retrofits, insulation, appliance swaps, etc.) by the cost of the measure itself. The savings are calculated over the life of the measure, so if a window has a 30 year life and the savings from replacing that window is \$5 per year, over the life of the window, the savings is \$150. If that same window costs \$200, the SIR is only 0.75 ($\$150/\$200 = 0.75$). Any SIR less than 1.0 is generally not regarded as a worthwhile energy savings investment, as the energy savings do not cover its cost.

Still, you may want to put in a window for other reasons. The above assumes that the window you are replacing is intact and functioning properly. That's not always the case and many times windows need to be replaced because they are literally falling apart, regardless of the SIR. Imagine a window with a missing or broken pane, or one where the sill is rotten and barely holding the panes. There are times when windows just need to be replaced, and the energy savings is an added benefit.

The other way to look at windows is by their ability to prevent heat loss. You are probably familiar with the concept of “R” Values. An insulating material's resistance to conductive heat flow is measured or rated in terms of its thermal resistance or R-value -- the higher the R-value, the greater the insulating effectiveness. R-Value is a measure of thermal resistance, or the ability of an object or material to resist

the flow of heat. Another measure, U-Value, measures thermal transmittance, or the heat loss through a structural element – such as a window. R and U values are inversely related where $U=1/R$. A common single glazed window has an R-value of 1, and U-value of 1. A single-glazed window with an outdoor storm has an R-value of 2, and a U-value of 0.5. A double-glazed window with argon gas may have an R-value of 3, or U-value of 0.33, and so on. The higher the R value the better...the lower the U value the better.

In terms of window assemblies, R-value is less commonly used, because it refers to a specific material component of a window, i.e. solely the glass pane. On the other hand, U-value is a measure of the insulating value of an entire window assembly, including the frame, hardware, spacers, glazing and glass. U-values are a necessity in today's market place where windows are technologically advanced combinations of multiple panes and specialty gas enclosures that prevent the transfer of heat through the window assembly as a whole. There are some excellent energy saving windows on the market today and window science has come a long way. There are now triple and quadruple paned windows with special filters, spacers and films that can greatly enhance the performance and energy savings potential of your home. However, these new technologies can be expensive, so be sure to consider the SIR of your purchase plans in order to make an informed decision.

Purchasing windows can be a confusing process. The [National Fenestration Rating Council \(NFRC\)](#) is a non-profit organization that administers an independent rating and labeling system for the energy performance of windows, doors, skylights, and films products. They and your local window dealer can help you find the best value for your home. You will save money on energy costs when purchasing new windows, however be certain to factor in the life of the windows in calculating the overall savings to your household budget. Of course every situation is different, and savings depend greatly on the area of the country you live in. In upstate New York, our savings are bound to be greater than in southern parts of the country, so factor that into your decision-making as well.

Instead of replacing windows, you may consider caulking around the window frame, both on the inside and outside of your home, or installing a storm window. You can use weatherstripping foam or v-strips to seal up any air leaks. If you have old windows with pulley systems that don't work well, you may be able to get them refurbished at a lower cost than new windows, and you'll preserve the beauty of the original windows and all the energy that went into making them. You can also purchase insulating curtains or blinds that are designed to keep the heat inside the home.



Also, don't forget the rest of your home! While you can lose a lot of energy through your windows, other parts of your home are generally even larger wasters. A free energy audit can help detect these energy losers in your walls, attic or basement, and locate major air leakage issues. If you're interested in learning more about how to make your home more energy efficient, start with Cornell Cooperative Extension's [Smart Energy Choices Program](#) for assistance with all of your energy questions.