Energy-Efficient Windows

Technology Snapshot & Benefits:
Significant economic savings can come from modern windows. Unless recently upgraded, your windows are likely a major source of heat loss. In cold climates, windows transfer heating energy out of the building through both conduction and radiation. Additionally, depending upon how weather-tight the frame and seals, windows may transfer energy by convection as well. This situation is reversed in hot climates, with windows allowing heat into a building and forcing expensive cooling systems to work overtime.

Typical walls in homes are insulated to a level of R-11 to R-19, yet a single pane of standard glass has an insulating value of about R-1. In other words, heat can leak out of, or into, a building about 11 to 19 times more easily through glass than through the wall. This is why your grandparents insisted on installing storm windows for the winter in northern climates to boost window-insulating value to R-2, or perhaps R-2.5 with a good seal and tightly trapped air between the panes.

Modern windows using specially developed E-glass are much more effective at keeping heat and cold where you want them. Most progressive window manufacturers offer several lines of energy efficient glass with R values in excess of R-4. New designs still in laboratory development promise R-values of 10 or more.

Since glass is a fixed part of the building envelope, it performs 24 hours each and every day. With energy efficient glass, less fuel is required for a given level of comfort with corresponding cost savings and pollution savings.

Estimated Cost Savings:
Assuming the same or greater level of comfort that you are used to, you can save a lot of energy and money by eliminating heat loss or gain through windows. It is common in Northern climates to save 30-40% of annual heating costs with super-efficient windows. With a monthly heating bill of $200 dollars, this equates to an estimated savings of $60-80 per month. Some large homes cost as much as $600 per month to heat, and the savings for these homes could approach $240 per month.

The value of new windows depends upon how much glass area you have in your home and upon local climate. The National Weather Service provides an historical record (http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html) of departures of average daily temperatures from a reference temperature of 65 degrees F. This information is available as Heating Degree-Days per Year and provides a very useful estimate of how much energy can leak through windows.

Issues:
For new homes, getting efficient glass is simply a matter of working with a builder or architect to specify performance glass. With older homes, the choice of retrofit is a little more problematic. It is unlikely that the glass in your house will suddenly conk out or reach the end of its useful life like a failed furnace or hot water heater. Therefore, you will be faced with the prospect of switching out older intact glass panels for newer glass panels. Nonetheless, this can improve comfort and lower operating expenses. Capital costs can be $5,000 to $10,000 or more, and still make sound economic sense when combined with a program of debt consolidation and/or refinancing.

Regional Issues:
Selection of glass may depend on local climates. Windows can be tuned by the manufacturer for southern or northern exposures and for different climates. Be sure that you get the right glass for you.

Installation (Getting It Done):
In addition to considering new windows throughout, also consider supplementary performance windows that can be treated as storm windows, in *addition* to your existing glass. Particularly if your house has period architecture, this option allows you to retain the original glazing and sash while enjoying economic savings and the enhanced comfort of performance windows. Be sure to get bids from two or three (or more) window manufacturers, installers and/or glazing contractors to gain immediate perspective on the true costs of windows and installation in your area.

More Information On This Topic:

U.S. Department of Energy's Building Technologies Program: Windows, Doors, and Skylights
http://www.eere.energy.gov/buildings/info/components/envelope/fenestration.html

National Fenestration Rating Council (NFRC): Window Energy Performance Label
http://www.nfrc.org/label.aspx

Energy Star Purchasing Tips
http://www.energystar.gov/index.cfm?c=windows_doors.pr_tips_windows

Energy Star Program Requirements for Windows
http://www.ecobroker.com/userdef/articles/Energy.Efficient.Windows/Energy.Star.windows.prog_req.pdf