PNNL-24826

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Energy Savings of Low-E Storm Windows and Panels across US Climate Zones

October 2015

TD Culp
KA Cort, Project Manager

U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC05-76RL01830

Printed in the United States of America

Available to DOE and DOE contractors from the
Office of Scientific and Technical Information,
P.O. Box 62, Oak Ridge, TN 37831-0062;
ph: (865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov

Available to the public from the National Technical Information Service
5301 Shawnee Rd., Alexandria, VA 22312
ph: (800) 553-NTIS (6847)
email: orders@ntis.gov <http://www.ntis.gov/about/form.aspx>
Online ordering: http://www.ntis.gov

This document was printed on recycled paper.
(8/2010)

PNNL-24826

Energy Savings of Low-E Storm Windows and Panels across US Climate Zones

TD Culp[1]
KA Cort, Project Lead

October 2015

Pacific Northwest National Laboratory
Richland, Washington 99352

[1] Birch Point Consulting, LLC, La Crosse, Wisconsin.

Summary

The energy savings and cost-effectiveness of installing low-emissivity (low-E) storm windows and panels over existing windows in residential homes were evaluated across a broad range of US climate zones. Calculations of energy savings and cost-effectiveness of low-E storm windows were conducted with RESFEN software to compare the annual energy performance of different window options in single-family homes. This work updates a similar previous analysis of low-E storm windows and panels, using new fuel costs and examining the separate contributions of reduced air leakage and reduced U-factors and solar heat gain coefficients to the total energy savings.

Both exterior and interior low-E storm windows / panels installed over three different types of primary windows were evaluated in two model homes in 22 different US cities across all eight International Energy Conservation Code climate zones. The analysis included both regular low-E glass and solar control low-E glass, which decreases solar heat gain in addition to decreasing heat transfer through the glass.

The conclusions and recommendations are consistent with the prior analysis, showing that low-E storm windows and panels are a cost-effective measure for improving the energy efficiency of existing windows across a wide range of climate zones and primary window types.

The incremental cost of using low-E glass versus clear glass was found to always be cost effective, with short payback periods of 2 to 5 years in all climate zones and over all window types. This indicates that when a homeowner chooses to install a storm window or interior window panel for reasons other than just energy savings (e.g., increased comfort, noise reduction, window protection, reduced drafts), the use of low-E glass is recommended regardless of location.

Even when considering total installed product payback period, low-E storm windows and panels are cost effective and recommended in climate zones 3 through 8 when installed over single-pane windows and double-pane, metal-framed windows. The use of solar control low-E storm windows is recommended in climate zone 3, and may also be considered in warmer parts of zone 4 where cooling degree days exceed heating degree days, and on a case-by-case basis in zones 1 and 2. The use of regular low-E storm windows is recommended in zones 4 through 8. The average source heating and cooling energy savings ranged from 21 to 36% with a simple payback period of 4.3 to 13.5 years across climate zones 4 through 8. The reduction of air leakage accounts for approximately 1/4 to 1/3 of the total energy savings for low-E storm windows and panels installed over single-pane windows, and roughly 1/6 of the savings over double-pane metal-framed windows.

Low-E storm windows and panels are also cost effective and recommended over double-pane wood- and vinyl-framed windows in climate zones 6 through 8, as well as eastern parts of zone 5 that have higher heating fuel costs, and other regions where propane or electrical resistance heating are used. The average source heating and cooling energy savings ranged from 16 to 19% with a simple payback period of 10.5 to 14 years in these zones. The reduction of air leakage accounts for approximately 1/5 to 1/4 of the total energy savings for low-E storm windows and panels installed over double-pane wood-framed windows.

Acronyms and Abbreviations

AL	air leakage
DOE	U.S. Department of Energy
IECC	International Energy Conserservation Code
LBNL	Lawrence Berkeley National Laboratory
Low-E	low-emissivity
NEAT	National Energy Audit Tool
PNNL	Pacific Northwest National Laboratory
RECS	Residential Energy Consumption Survey
SHGC	solar heat gain coefficient
VT	visible light transmittance

Contents

Figures

Tables

1.0 Introduction and Background

Retrofit projects to reduce energy consumption in existing buildings often focus on improvements to the mechanical systems, insulation, and air leakage but ignore the windows, even though old, inefficient windows are a major contributor to energy loss. Despite the fact that approximately 30 million windows are replaced each year with higher-performing, insulated low-emissivity (low-E) windows, an estimated 47 million homes still have single glazing, and an estimated 46 million homes have older double-pane windows with lower-performing clear glass (i.e., not modern high-performance low-E windows) (Cort 2013). However, low-E storm windows and panels have gained recent interest as a promising cost-effective method to improve the energy efficiency of older, inefficient windows in existing buildings, particularly where window replacement is impractical, too expensive, or (in historic properties) prohibited (Drumheller, Kohler, and Minen 2007; Cort 2013; Culp and Cort 2014; Culp, Drumheller, and Wiehagen 2013; Knox and Widder 2014).

Modern low-E storm windows and panels insulate and air-seal existing windows and reduce both conductive and convective heat loss. The addition of a durable low-E coating to the glass also reduces radiative heat loss, further lowering the overall heat transfer coefficient (U-factor). Certain low-E coatings, known as *solar selective* or *solar control* low-E coatings, can also be designed to lower solar heat gain through the glazing. Reducing the solar heat gain is beneficial in hot climates where cooling is the dominant building energy use, but can be a detriment in colder climates where the solar gain reduces heating demands during the winter. Thus, the appropriate low-E coating should be selected based on the climate and application. Because the primary application of low-E storm windows and panels is to reduce the energy use related to older windows with high heat loss in colder climates, high–solar gain low-E coatings are most commonly used. Finally, storm windows or panels help to reduce air leakage of the existing windows, decreasing unintended air flow through and around the window sashes and frame. Modern low-E storm windows and panels are designed to be permanently installed on the exterior or interior of the existing window, and are available in both fixed and operable versions.

Energy simulations can be used to evaluate the improvements in energy efficiency that result from installing low-E storm windows and panels in existing buildings with different building characteristics, locations, and climates. To accurately simulate the predicted energy savings, it is necessary to estimate the key energy performance properties for the combined assembly of the panel installed over different types of primary windows as an input to the simulation. These performance properties include the U-factor (overall heat transfer coefficient including conductive, convective, and radiative heat transfer), solar heat gain coefficient (SHGC), and visible transmittance (VT) for the overall window assembly including both glazing and framing. In addition, an estimate of the air leakage (AL) of the combined assembly is important to characterizing overall energy performance in the building.

A separate paper provides the basis for representative U-factor, SHGC, VT, and AL properties for various combinations of different types of storm windows and panels installed over different primary windows (Culp, Widder, and Cort 2015). Using RESFEN software from Lawrence Berkeley National Laboratory (LBNL), these same properties were previously used to estimate the energy savings of both exterior and interior low-E storm windows / panels installed over three different primary window types in two model homes in 22 different cities across all eight International Energy Conservation Code climate zones (Culp and Cort 2014). This paper also included results from the National Energy Audit Tool (NEAT) software used by state weatherization programs, assessing low-E storm windows in 39 model homes. Together, these analyses showed that low-E storm windows were cost effective when installed over single-pane windows and double-pane metal-framed windows in climate zones 3 through 8, even when including full product and installation costs. Additionally, the incremental cost for using low-E glass versus clear glass

was found to be cost effective in all climate zones over all window types with an average payback period of 2 to 5 years.

One question that has been posed by energy efficiency program administrators is what portion of the total energy savings comes from improved airtightness versus the base energy savings from improvements in U-factor and/or SHGC. This paper updates the previous RESFEN analysis to identify these separate contributions to the total energy savings, and also takes the opportunity to update the fuel prices used in the analysis.

2.0 RESFEN Analysis Methodology

RESFEN software developed by LBNL is the standard software program used for calculating the impact of windows on heating and cooling costs for new and existing residential homes. RESFEN standardizes many characteristics of the baseline home such as internal loads, thermostat settings, HVAC efficiencies, etc., which then allows a more direct comparison of the performance of different window options. Basic housing and window characteristics are entered along with the location, and then an hourly annual energy simulation is performed using the appropriate local weather data file to determine the annual heating and cooling energy use and compare performance of different window options. RESFEN is frequently used by consumers and manufacturers to compare energy performance of window products, and RESFEN has also been used to help establish qualifying criteria for the ENERGY STAR® program for windows, doors, and skylights.

Other than separating out the energy savings from reduced air leakage and updating fuel and product costs, the RESFEN analysis was conducted in the same manner as the previous analysis (Culp and Cort 2014) as outlined below:

- RESFEN version 6.0 was used, including the standardized assumptions for the baseline building as outlined in Appendix A.
- RESFEN calculations were run for cities shown in Figure 1, plus two additional cities (Anchorage and Fairbanks) in climate zones 7 and 8 in Alaska. This is a total of 22 cities across all eight IECC (International Energy Conservation Code) climate zones.
- The following two homes were modeled: a smaller, older, one-story 1700 ft^2 home representative of existing construction, and a larger, newer, two-story 2800 ft^2 home representative of newer construction. The older home had minimal insulation, and the newer home was insulated to the 2006 IECC requirements. Details are shown in Appendix A.
- Natural gas heating was used in most cities, but a heat pump was used in climate zones 1 and 2 and certain zone 3 locations where Residential Energy Consumption Survey (RECS) data show that heat pumps are more dominant (DOE-EIA 2009). Central air conditioning cooling was included in all locations.
- The natural gas and electricity prices used were based on 2014 state average prices taken from the DOE Energy Information Administration *Natural Gas Monthly* and *Electric Power Monthly* reports (DOE-EIA 2015).
- The window area was assumed to be 15% of equally distributed floor area, which is the same as the analysis for the ENERGY STAR® program. This is 255 ft^2 for the smaller, older one-story home, and 420 ft^2 for the larger, newer two-story home, or approximately 17 and 28 windows, respectively.

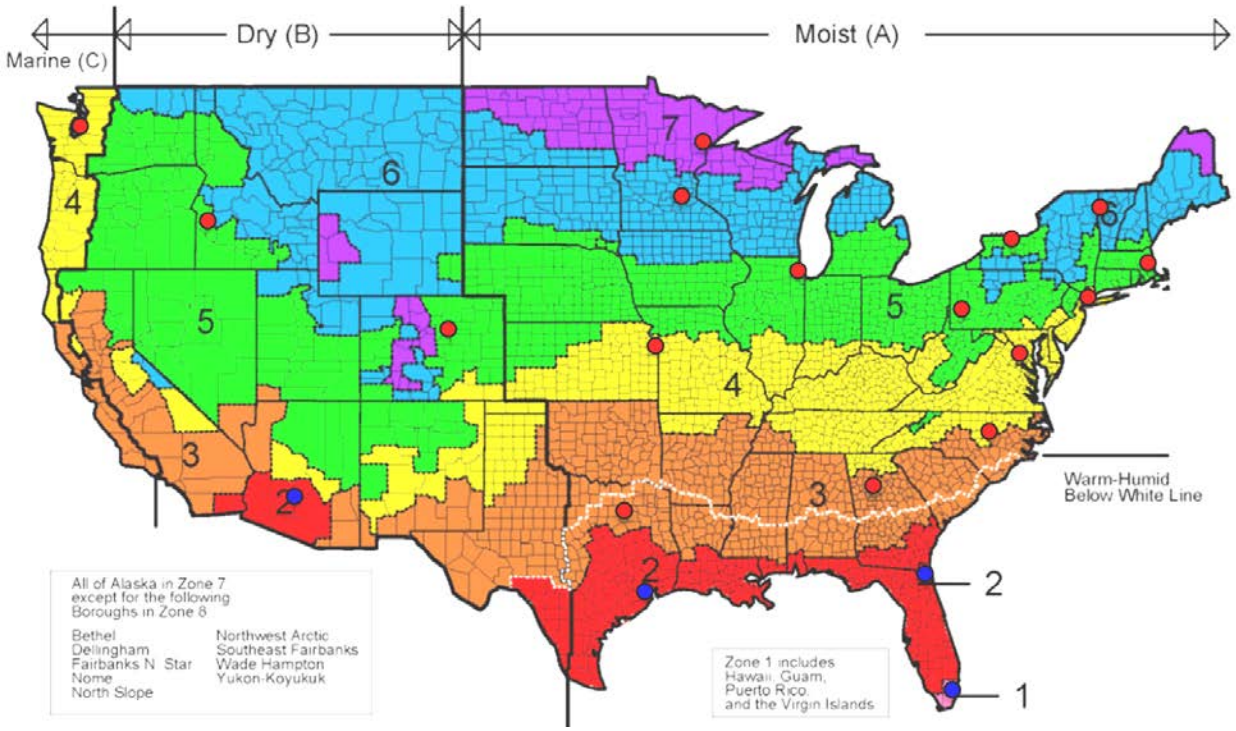


Figure 1. Map of IECC climate zones and cities modeled

- Both exterior and interior low-E storm windows and panels were evaluated when installed over three different primary window types (single-pane wood-frame, double-pane wood-frame, and double-pane metal-frame, all with clear glass). Single-pane metal-framed windows were not included, but will be qualified for cases in which single-pane wood/vinyl windows or double-pane metal-framed windows are used, because the energy savings and cost-effectiveness will always be higher. This is because the single-pane, metal-framed window will have the worst U-factor of all the primary window types; therefore, the relative improvement in U-factor and energy performance from adding a low-E storm window will be even higher than with the other primary window types.
- The U-factor and SHGC properties used in the RESFEN analysis for different combinations of low-E panels installed over various primary windows are shown in Table 1 and Table 2, as described in PNNL-24444 (Culp, Widder, and Cort 2015).
- Standard pyrolytic low-E glass used in low-E storm windows was modeled in all locations. In addition, solar-control low-E glass also was modeled in southern locations (climate zones 1 through 3, and certain warmer zone 4 locations where cooling degree days exceed heating degree days). The SHGC of the solar control low-E glass was 27% lower than the standard low-E glass. Solar-control low-E storm windows are designed for exterior application, so interior panels with solar-control low-E windows were not modeled. Clear glass storm windows also were modeled for comparison.
- The most accurate method for modeling windows in RESFEN is to import the detailed solar angle–dependent properties from WINDOW, rather than just inputting the simple U-factor and SHGC numbers. However, RESFEN and its underlying DOE2.1E software can only use generic frames rather than the detailed frame mounting modeled in PNNL-24444. Therefore, after consultation with the RESFEN developers at LBNL, the window and solar angle properties were imported by creating windows with generic frames and adjusting the frame properties until the whole window U-factor and SHGC matched the same values shown in Table 1 and Table 2.

- For simple payback period calculations, the product cost used was \$7.00/ft^2 of window area for exterior low-E storm windows and \$8.00/ft^2 of window area for interior low-E panels, plus \$30 per window for installation. To calculate the incremental payback period of low-E glass versus clear glass, the product cost was lowered by \$1/ft^2 of window area for clear glass storm windows and panels, or 12-14% less than the low-E storm window. The installation cost was the same (Cort 2013).
- To separate out the energy savings associated with reduced air leakage, two sets of simulations were conducted. The first set calculated the energy savings that result from only changing the U-factor and SHGC (the "base savings") while keeping the air leakage fixed at the same value both with and without the storm window installed. The second set calculated the total energy savings including both the change in U-factor and SHGC along with the reduction in air leakage. In this latter case, the air leakage was modeled as 3 cfm/ft^2 for single-pane base windows, 1 cfm/ft^2 for double-pane base windows, 0.3 cfm/ft^2 with exterior storm windows installed, and 0.1 cfm/ft^2 with interior panels installed. These values are considered reasonable but conservative for predicting the reduction in air leakage for storm windows and panels over existing windows in older buildings, and were derived from case study measurements as described in PNNL-24444 (Culp, Widder, and Cort 2015).

Altogether, over 1800 simulations were conducted.

Table 1. U-Factor, SHGC, VT of Storm Windows and Panels over Non-Metal-Framed Primary Windows

Base Window	Storm Type	U-Factor (Btu/hr ft^{2}F)	SHGC	VT
Wood Double Hung, Single Glazed	--	0.88	0.61	0.66
	Clear, Exterior	0.47	0.54	0.57
	Clear, Interior	0.46	0.54	0.59
	Low-E, Exterior	0.36	0.46	0.52
	Low-E, Interior	0.34	0.50	0.54
Wood Double Hung, Double Glazed	--	0.51	0.57	0.61
	Clear, Exterior	0.34	0.49	0.53
	Clear, Interior	0.32	0.51	0.55
	Low-E, Exterior	0.28	0.42	0.48
	Low-E, Interior	0.26	0.47	0.50
Wood Fixed, Single Glazed	--	0.87	0.64	0.69
	Clear, Exterior	0.46	0.58	0.62
	Clear, Interior	0.45	0.56	0.62
	Low-E, Exterior	0.34	0.50	0.56
	Low-E, Interior	0.34	0.52	0.57
Wood Fixed, Double Glazed	--	0.47	0.60	0.64
	Clear, Exterior	0.32	0.53	0.57
	Clear, Interior	0.32	0.54	0.58
	Low-E, Exterior	0.27	0.46	0.52
	Low-E, Interior	0.25	0.50	0.53

Table 2. U-Factor, SHGC, VT of Storm Windows and Panels over Metal-Framed Primary Windows

Base Window	Storm Type	U-Factor (Btu/hr ft^{2}F)	SHGC	VT
Aluminum Double Hung, Single Glazed	--	1.12	0.61	0.65
Worst-case mounting	Clear, Exterior	0.67	0.56	0.58
Thermally broken mounting (recommended)	Clear, Exterior	0.58	0.56	0.59
	Clear, Interior	0.53	0.53	0.59
Worst-case mounting	Low-E, Exterior	0.57	0.47	0.53
Thermally broken mounting (recommended)	Low-E, Exterior	0.44	0.48	0.54
	Low-E, Interior	0.41	0.50	0.54
Aluminum Double Hung, Double Glazed	--	0.75	0.58	0.60
Worst-case mounting	Clear, Exterior	0.55	0.51	0.54
Thermally broken mounting (recommended)	Clear, Exterior	0.45	0.52	0.55
	Clear, Interior	0.41	0.51	0.55
Worst-case mounting	Low-E, Exterior	0.49	0.44	0.49
Thermally broken mounting (recommended)	Low-E, Exterior	0.36	0.44	0.50
	Low-E, Interior	0.32	0.47	0.50
Aluminum Fixed, Single Glazed	--	1.06	0.72	0.77
Worst-case mounting	Clear, Exterior	0.62	0.59	0.62
Thermally broken mounting (recommended)	Clear, Exterior	0.55	0.61	0.65
	Clear, Interior	0.51	0.60	0.66
Worst-case mounting	Low-E, Exterior	0.51	0.50	0.57
Thermally broken mounting (recommended)	Low-E, Exterior	0.42	0.52	0.59
	Low-E, Interior	0.38	0.56	0.60
Aluminum Fixed, Double Glazed	--	0.62	0.67	0.71
Worst-case mounting	Clear, Exterior	0.47	0.54	0.58
Thermally broken mounting (recommended)	Clear, Exterior	0.40	0.56	0.60
	Clear, Interior	0.36	0.57	0.61
Worst-case mounting	Low-E, Exterior	0.42	0.47	0.52
Thermally broken mounting (recommended)	Low-E, Exterior	0.33	0.48	0.55
	Low-E, Interior	0.29	0.53	0.56

3.0 RESFEN Results

The detailed results for each home type, city, and window combination are shown in Appendix B, RESFEN Results (Total Energy Savings), which accounts for U-factor, SHGC, and air leakage; and Appendix C, RESFEN Results (Base Energy Savings, Not Including Air Leakage Reduction), which accounts for only U-factor and SHGC.

Aggregated results for each climate zone are shown in figures 2 through 6, and Tables 2 and 3. The results are averaged over both home types, all cities modeled in each climate zone, and both interior and exterior low-E panels. The results are reported in the following formats:

a) Percent annual source energy savings, using site-to-source conversion factors of 3.365 for electricity and 1.092 for natural gas (Deru and Tercellini 2007). Note that the energy use calculated by RESFEN and this percentage are for the whole home heating and cooling energy use, but do not include the energy use for hot water, appliances, lighting, and plug loads.

b) Annual site HVAC energy savings in kBtu per year per square foot of window area.

c) Annual energy cost savings in dollars per year per square foot of window area.

d) Total installed product simple payback period in years, including both product and installation costs.

e) Incremental payback period for using low-E glass instead of clear glass, in years.

The aggregated results for zone 1 through 3 are reported using the solar control low-E glass. As seen in the detailed results in Appendices B and C, regular low-E glass provides higher energy savings in climate zones 4 through 8, and solar control low-E glass provides higher energy savings in climate zones 1 through 3.

The overall trends are consistent with the previous analysis (Culp and Cort 2014):

- Low-E storm windows and panels show significant percent energy savings in all climate zones (Figure 2), although the magnitude of energy savings is higher in the north than in the south.
- As expected, the absolute site HVAC energy savings increase steadily from warmer to colder climate zones (Figure 3). Energy cost savings show the same trend (Figure 4), although with some variation zone to zone, due to the variations in fuel costs across different states and regions.
- The energy savings are highest for use of low-E storm windows installed over single-pane windows, followed by the metal-frame, double-pane windows, and the wood-frame, double-pane windows. Essentially, the lower performing the primary windows, the higher relative improvement from using low-E storm windows.
- In the detailed results (Appendices B and C), interior low-E panels showed slightly higher energy savings than exterior low-E storm windows, due to both somewhat lower U-factor and air leakage.
- The reduction of air leakage accounts for roughly 1/4 to 1/3 of the total energy and energy cost savings for low-E storm windows and panels over single-pane windows, roughly 1/5 to 1/4 of the savings over double-pane wood-framed windows, and 1/6 of the savings over double-pane metal-framed windows. Of course, this amount will vary depending on how leaky the existing windows are in the actual application.

The definition of cost-effectiveness will vary depending upon the consumer or program viewpoint. One possible criterion is to use a return-on-investment of greater than 7 to 10%, which corresponds to a simple payback period of 10 to 14 year or less. Two types of simple payback periods were calculated. First, a total installed product payback period was calculated, including both product and installation costs. However, total installed product payback period is often not the most appropriate metric for comparing products when the product is being selected for multiple reasons beyond just energy savings, such as increased comfort, noise reduction, window protection, reduced drafts, etc. For instance, an Energy Star refrigerator is not selected based on the energy cost savings compared to the total product cost—it is the comparison of the incremental costs and energy savings between models that is important. Similarly, the total payback period of replacement windows, including removal and installation costs, can be very long (25–50 years), but what is important is the incremental cost and payback for choosing a more efficient window versus a base model. Nonetheless, the total installed product payback is presented here for low-E storm windows, as they represent a rare case where the payback can be short even with the fully loaded costs.

Additionally, the incremental payback period for using low-E glass storm windows instead of clear glass storm windows was calculated. This is useful when the homeowner has chosen to install a storm window or panel for other reasons (e.g., increased comfort, noise reduction, window protection, reduced drafts,

etc.) regardless of the total product payback period, and it is the incremental payback period that is important in determining whether the homeowner uses low-E glass or clear glass.

Observations regarding cost-effectiveness include:

- The incremental cost for using low-E glass versus clear glass is always cost effective with short payback periods in *all* climate zones and over *all* window types (Figure 6). In other words, when a homeowner has already decided to install a storm window or interior panel, regardless of location, it should always be a low-E storm window or panel. The low-E coating generates short incremental payback periods compared to clear glass in the northern zones due to the decreased U-factor, and the solar control low-E coating provides short incremental payback periods compared to clear glass in the southern zones due to the decreased SHGC.
- Even when considering the total installed product payback period (Figure 5), low-E storm windows and panels are cost effective when installed over single-pane windows in all climate zones when including the savings from reduced air leakage, and climate zones 3 through 8 even without including the savings from reduced air leakage. Low-E storm windows are cost effective when installed over double-pane, metal-framed windows in climate zones 4 through 8.
- Low-E storm windows also are cost effective when installed over double-pane wood or vinyl-framed windows in climate zones 6 through 8, as well as eastern parts of zone 5 where heating fuel costs are higher. They will also be cost effective in more zones when propane or electrical-resistance heating is used and in cases where the primary window is particularly leaky.
- Solar control low-E glass is more cost effective in climate zone 3, whereas regular low-E glass is more cost effective in zones 4 through 8. Solar control low-E glass may also be considered in warmer parts of zone 4 where cooling degree days exceed heating degree days.
- In climate zones 1 and 2, storm windows with solar control low-E glass can be cost effective, but should be evaluated on a case-by-case basis, depending on gas/electricity rates and the specific needs of the home. In these regions, the reduced SHGC and air leakage are more important than the reduced U-factor.
- The RESFEN analysis was performed with either a natural gas furnace or electrical heat pump depending on location. For homes using propane or electrical-resistance heating, the energy cost savings and cost-effectiveness of low-E storm windows will be even higher than the results presented here, because the effective heating fuel cost and the savings from using low-E storm windows will be higher.

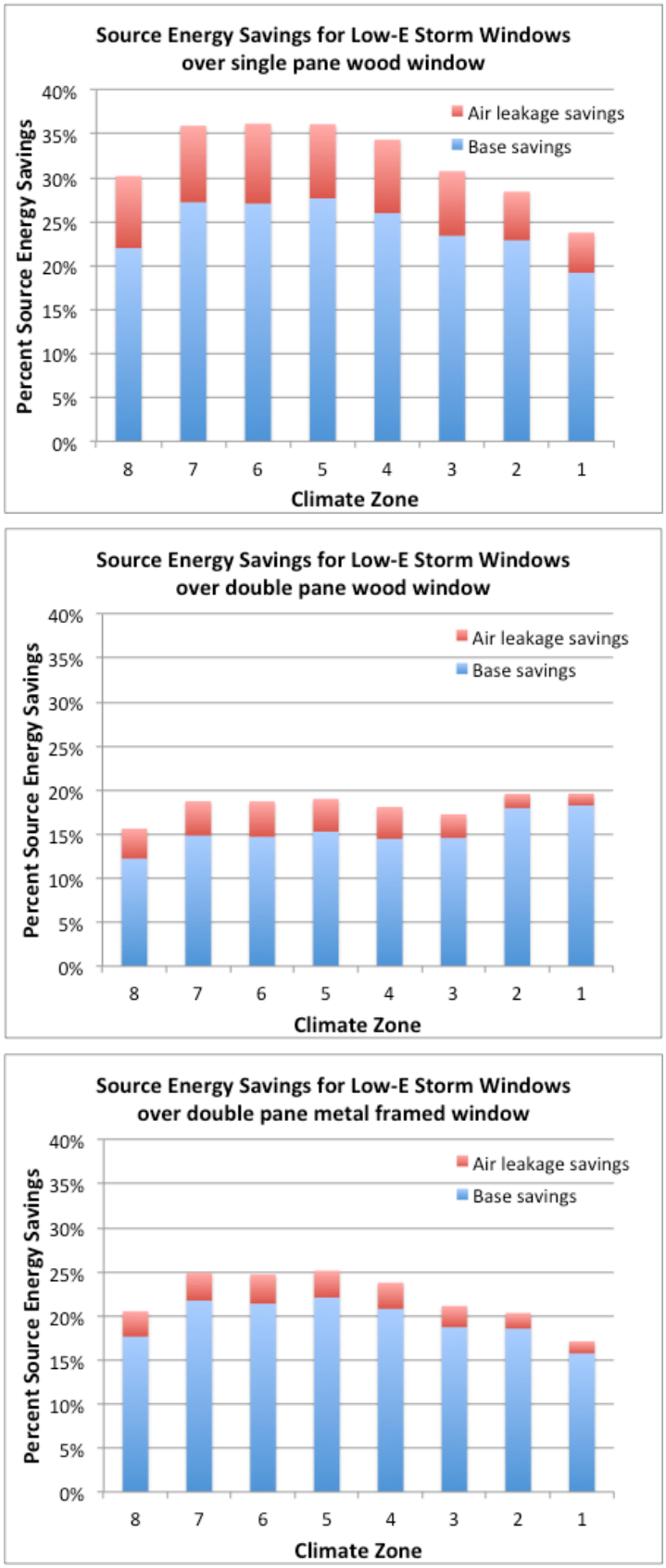


Figure 2. Source Energy Savings for Low-E Storm Windows and Panels

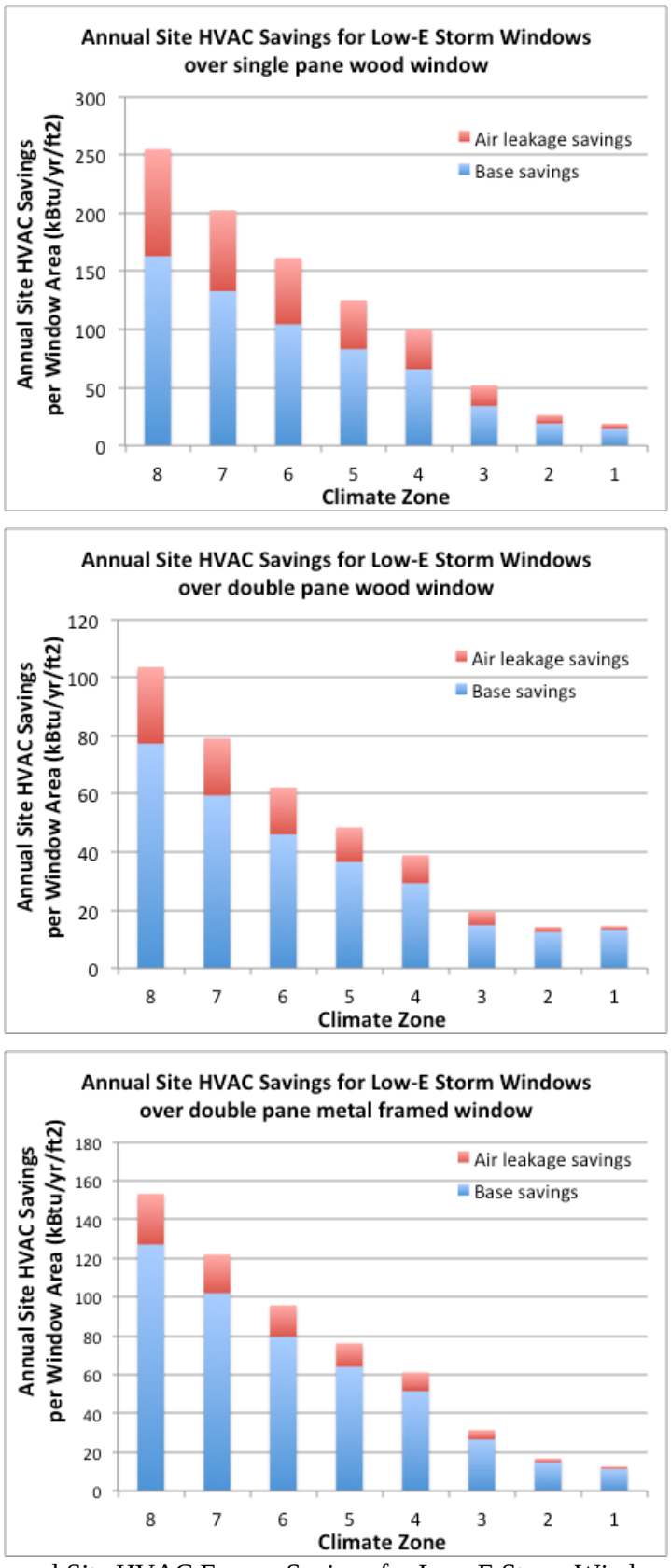


Figure 3. Annual Site HVAC Energy Savings for Low-E Storm Windows and Panels

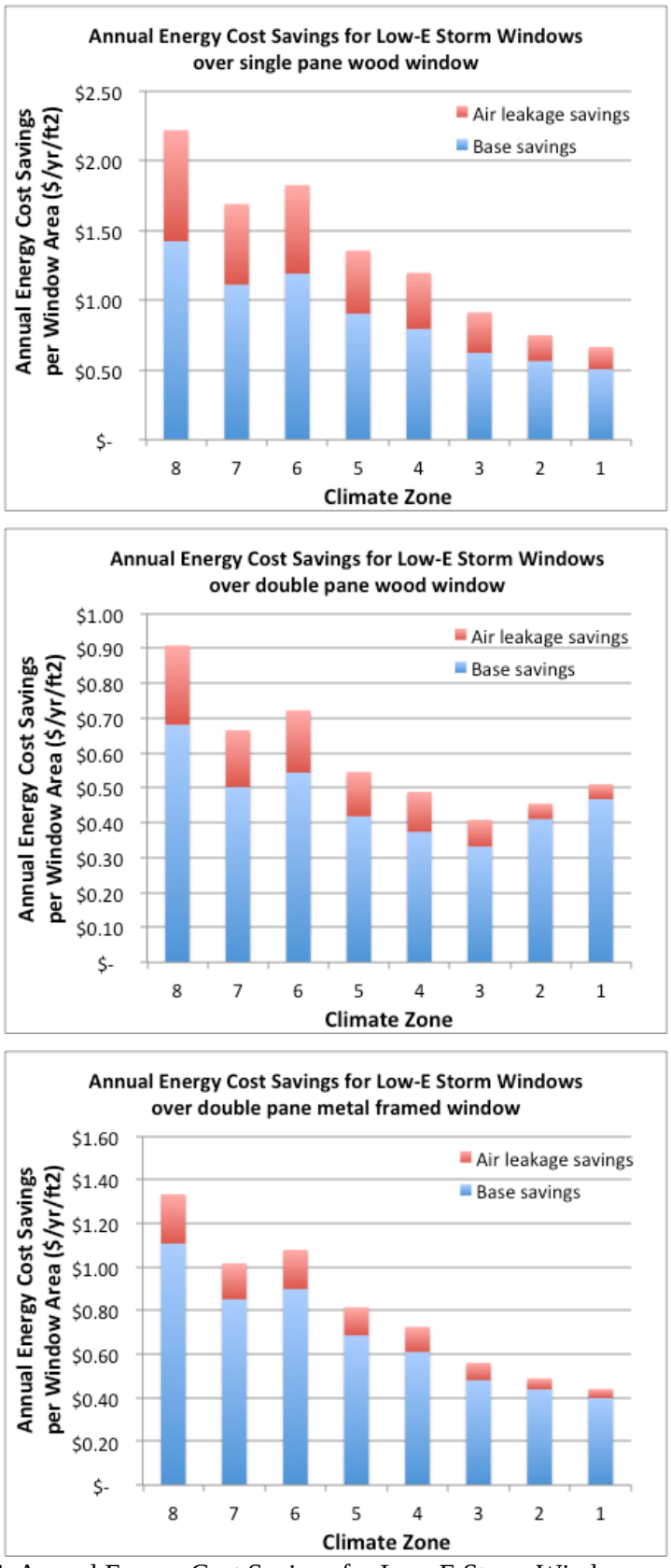


Figure 4. Annual Energy Cost Savings for Low-E Storm Windows and Panels

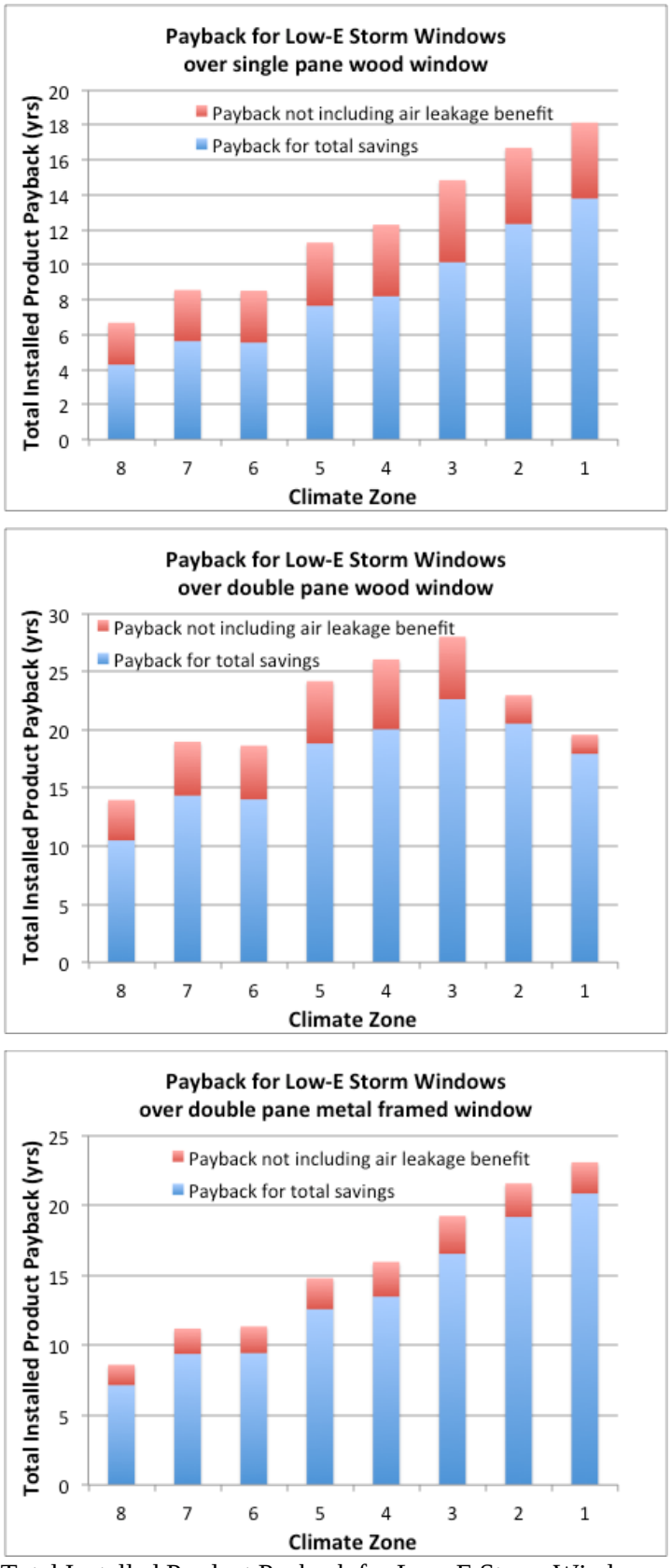


Figure 5. Total Installed Product Payback for Low-E Storm Windows and Panels

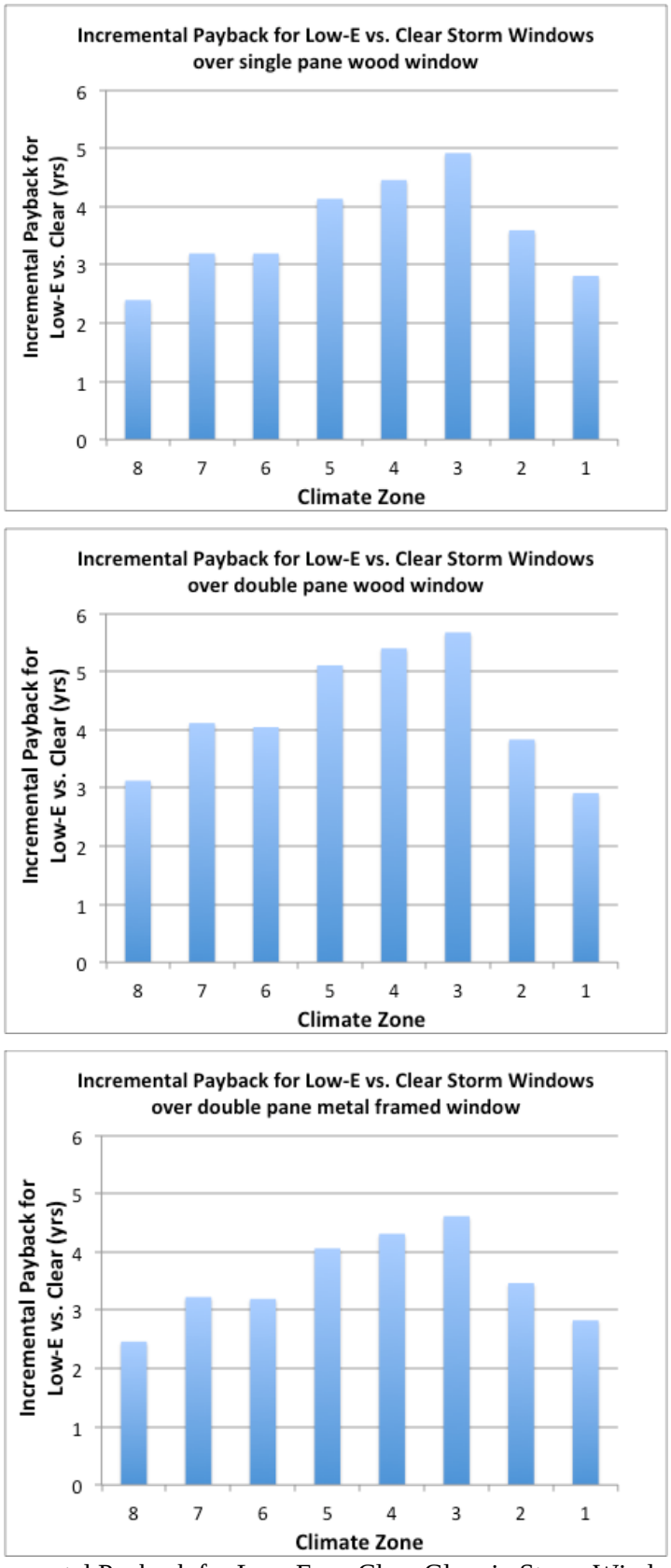


Figure 6. Incremental Payback for Low-E vs. Clear Glass in Storm Windows and Panels

Table 3. Total Energy Savings, including Air Leakage Reduction
(Averaged over both homes, all cities in each zone, exterior and interior panels; solar control low-E results used for zones 1–3)

Low-E storm window / panel over single-pane wood-framed window

	Source Energy Savings		Site HVAC Energy Savings (kBtu/yr/ft^2)		Energy Cost Savings ($/yr/ft^2 window area)		Simple Payback for Total Product (yrs)		Incremental Simple Payback for Low-E (yrs)	
Zone	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev
8	30%	13%	254.8	17.1	$2.22	$0.15	4.3	0.2	2.4	0.3
7	36%	12%	202.3	16.5	$1.69	$0.11	5.6	0.3	3.2	0.4
6	36%	10%	161.3	12.4	$1.82	$0.49	5.5	1.5	3.2	0.9
5	36%	10%	125.2	16.1	$1.35	$0.41	7.7	2.3	4.1	1.1
4	34%	10%	99.8	15.9	$1.20	$0.22	8.2	1.5	4.5	0.8
3	31%	6%	51.8	16.1	$0.91	$0.09	10.1	0.9	4.9	0.8
2	28%	5%	26.2	9.7	$0.75	$0.14	12.3	2.1	3.6	0.8
1	24%	4%	18.9	3.3	$0.66	$0.12	13.8	2.4	2.8	0.5

Low-E storm window / panel over double-pane wood-framed window

	Source Energy Savings		Site HVAC Energy Savings (kBtu/yr/ft^2)		Energy Cost Savings ($/yr/ft^2 window area)		Simple Payback for Total Product (yrs)		Incremental Simple Payback for Low-E (yrs)	
Zone	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev
8	16%	8%	103.6	10.4	$0.91	$0.09	10.5	0.5	3.1	0.2
7	19%	8%	79.1	8.3	$0.67	$0.07	14.3	0.8	4.1	0.4
6	19%	7%	62.2	7.0	$0.72	$0.20	14.0	3.7	4.0	1.1
5	19%	7%	48.5	7.1	$0.55	$0.16	18.8	5.3	5.1	1.3
4	18%	7%	38.9	6.6	$0.49	$0.09	20.0	3.6	5.4	0.9
3	17%	4%	19.6	5.5	$0.41	$0.04	22.6	1.9	5.7	1.1
2	20%	4%	14.2	3.3	$0.45	$0.10	20.5	4.0	3.8	0.8
1	20%	4%	14.5	2.7	$0.51	$0.09	17.9	3.3	2.9	0.5

Low-E storm window / panel over double-pane metal-framed window

	Source Energy Savings		Site HVAC Energy Savings (kBtu/yr/ft^2)		Energy Cost Savings ($/yr/ft^2 window area)		Simple Payback for Total Product (yrs)		Incremental Simple Payback for Low-E (yrs)	
Zone	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev
8	21%	10%	153.3	11.7	$1.33	$0.10	7.1	0.4	2.5	0.1
7	25%	9%	121.9	9.6	$1.02	$0.08	9.4	0.5	3.2	0.2
6	25%	8%	95.8	8.1	$1.08	$0.30	9.4	2.6	3.2	0.9
5	25%	8%	76.2	8.7	$0.82	$0.23	12.6	3.5	4.1	1.0
4	24%	8%	61.1	9.2	$0.73	$0.13	13.5	2.4	4.3	0.7
3	21%	5%	31.4	10.1	$0.56	$0.06	16.5	1.4	4.6	0.7
2	20%	4%	16.7	5.6	$0.49	$0.11	19.2	3.8	3.5	0.8
1	17%	3%	12.5	2.5	$0.44	$0.09	20.8	4.1	2.8	0.5

Table 4. Base Energy Savings, *Not* Including Air Leakage Reduction
(Averaged over both homes, all cities in each zone, exterior and interior panels; solar control low-E results used for zones 1–3)

Low-E storm window / panel over single-pane wood-framed window

	Source Energy Savings		Site HVAC Energy Savings (kBtu/yr/ft²)		Energy Cost Savings ($/yr/ft² window area)		Simple Payback for Total Product (yrs)		Incremental Simple Payback for Low-E (yrs)	
Zone	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev
8	22%	10%	162.9	11.1	$1.42	$0.09	6.7	0.3	2.4	0.3
7	27%	10%	132.8	10.0	$1.11	$0.07	8.6	0.4	3.2	0.4
6	27%	9%	104.4	8.3	$1.19	$0.33	8.5	2.3	3.2	0.9
5	28%	9%	82.9	9.0	$0.90	$0.25	11.3	3.0	4.1	1.1
4	26%	8%	65.7	9.9	$0.79	$0.14	12.3	2.1	4.4	0.8
3	23%	5%	34.0	10.3	$0.62	$0.05	14.8	1.0	4.9	0.8
2	23%	5%	19.0	6.1	$0.56	$0.14	16.7	3.6	3.6	0.8
1	19%	3%	14.4	2.8	$0.51	$0.10	18.1	3.5	2.8	0.5

Low-E storm window / panel over double-pane wood-framed window

	Source Energy Savings		Site HVAC Energy Savings (kBtu/yr/ft²)		Energy Cost Savings ($/yr/ft² window area)		Simple Payback for Total Product (yrs)		Incremental Simple Payback for Low-E (yrs)	
Zone	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev
8	12%	7%	77.3	6.2	$0.68	$0.05	14.0	0.5	3.1	0.2
7	15%	7%	59.4	5.3	$0.50	$0.05	19.0	1.0	4.1	0.4
6	15%	6%	46.0	4.5	$0.54	$0.15	18.6	5.0	4.0	1.2
5	15%	6%	36.6	4.6	$0.42	$0.11	24.2	6.2	5.1	1.3
4	14%	5%	29.2	4.5	$0.37	$0.06	26.1	4.4	5.4	0.9
3	15%	3%	14.9	4.0	$0.33	$0.04	28.0	3.3	5.7	1.1
2	18%	4%	12.5	2.9	$0.41	$0.10	23.0	5.0	3.8	0.8
1	18%	3%	13.3	2.5	$0.47	$0.09	19.6	3.7	2.9	0.5

Low-E storm window / panel over double-pane metal-framed window

	Source Energy Savings		Site HVAC Energy Savings (kBtu/yr/ft²)		Energy Cost Savings ($/yr/ft² window area)		Simple Payback for Total Product (yrs)		Incremental Simple Payback for Low-E (yrs)	
Zone	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev	Avg	Std Dev
8	18%	8%	127.1	8.3	$1.11	$0.07	8.6	0.5	2.5	0.1
7	22%	8%	102.0	6.8	$0.85	$0.06	11.2	0.7	3.2	0.2
6	21%	7%	79.6	6.0	$0.90	$0.26	11.3	3.2	3.2	0.9
5	22%	7%	64.1	6.3	$0.69	$0.18	14.8	3.9	4.1	1.0
4	21%	7%	51.5	7.2	$0.61	$0.10	16.0	2.7	4.3	0.7
3	19%	4%	26.5	8.4	$0.48	$0.04	19.2	1.5	4.6	0.7
2	19%	4%	14.7	4.7	$0.44	$0.11	21.6	4.8	3.5	0.8
1	16%	3%	11.3	2.3	$0.40	$0.08	23.1	4.8	2.8	0.5

4.0 Conclusions and Recommendations

This report updates the prior analysis of energy savings from installing low-E storm windows and panels over existing windows (Culp and Cort 2014), using new fuel costs and examining the separate contributions of reduced air leakage and reduced U-factor and SHGC to the total energy savings. The conclusions and recommendations are consistent with the prior analysis, showing that low-E storm windows and panels are a cost-effective measure for improving the energy efficiency of existing windows.

The choice to use low-E glass over clear glass was found to always be cost effective in all climate zones over all window types, based on the short incremental payback period.

Even when considering total installed product payback, the updated RESFEN analysis in this report together with the NEAT analysis in the prior report indicate that low-E storm windows and panels are recommended in climate zones 3 through 8 when installed over single-pane windows and double-pane, metal-framed windows. The use of solar control low-E storm windows is recommended in climate zone 3, and may also be considered in warmer parts of zone 4 where cooling degree days exceed heating degree days. The use of regular low-E storm windows is recommended in zones 4 through 8, although solar control low-E windows can sometimes be beneficial in specific applications even in northern zones (e.g., large west-facing windows in areas with hot summers). Low-E storm windows and panels are also recommended over double-pane wood and vinyl-framed windows in climate zones 6 through 8, as well as eastern parts of zone 5 which have higher heating fuel costs, and other regions where propane or electrical resistance heating are used.

Maps showing these general recommendations are shown in Figures 7 and 8.

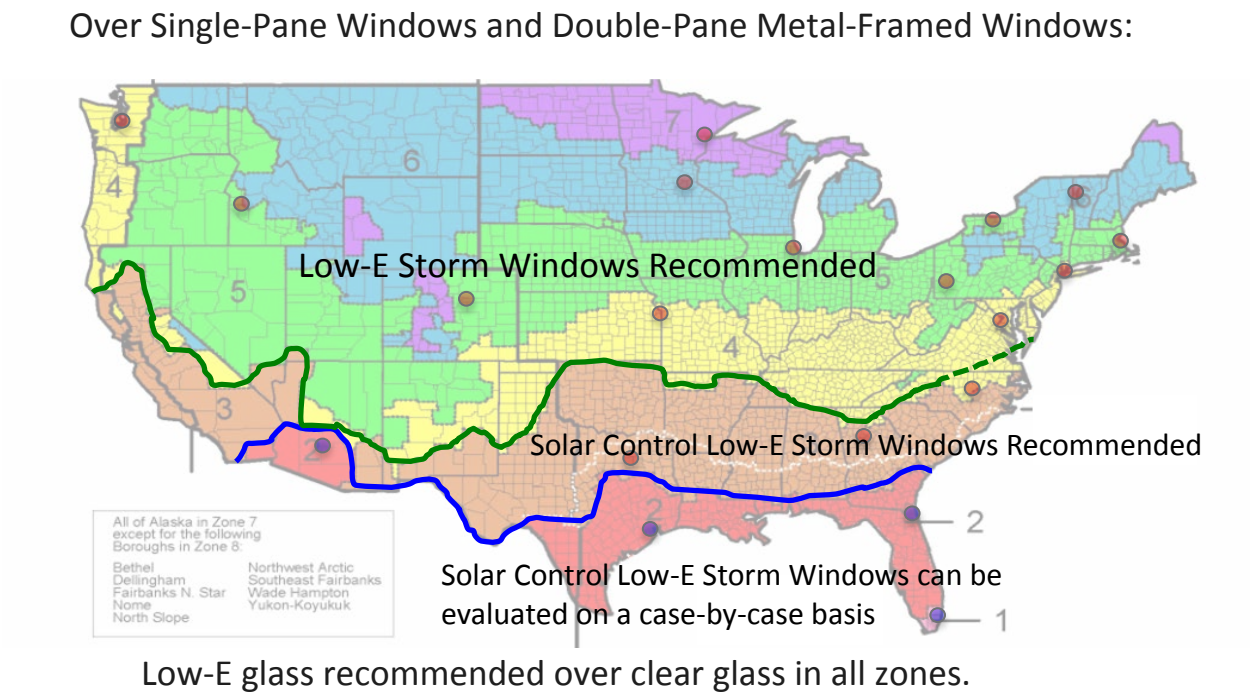
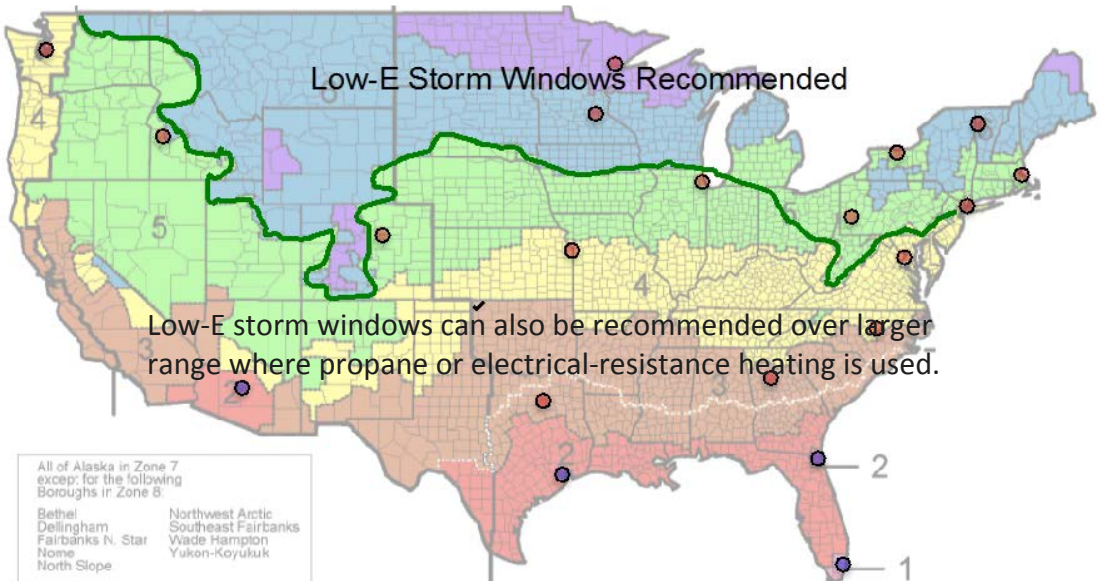


Figure 7. Overall Recommended Regions for the Use of Low-E and Solar Control Low-E Storm Windows Installed Over Single-Pane Windows and Double-Pane Metal-Framed Windows

Over Double-Pane Wood and Vinyl-Framed Windows:



Low-E glass recommended over clear glass in all zones.

Figure 8. Overall Recommended Regions for the Use of Low-E Storm Windows Installed Over Double-Pane Wood and Vinyl-Framed Windows

5.0 References

Cort KA. 2013. *Low-E Storm Windows: Market Assessment and Pathways to Market Transformation*. PNNL-22565, Pacific Northwest National Laboratory, Richland, Washington.

Culp TD and KA Cort. 2014. *Database of Low-E Storm Window Energy Performance across U.S. Climate Zones*. PNNL-22864, Rev.2, Pacific Northwest National Laboratory, Richland, Washington.

Culp TD, SC Drumheller, and J Wiehagen. 2013. *Low-E Retrofit Demonstration and Education Program*. Final Report, U.S. DOE project #DE-EE0004015, Quanta Technologies, Malvern, Pennsylvania.

Culp TD, SH Widder, and KA Cort. 2015. *Thermal and Optical Properties of Low-E Storm Windows and Panels*. PNNL-24444, Pacific Northwest National Laboratory, Richland, Washington.

Deru M and Torcellini P. 2007. *Source Energy and Emission Factors for Energy Use in Buildings.* NREL/TP-550-38617, National Renewable Energy Laboratory, Golden, Colorado.

DOE-EIA. 2009. *2009 Residential Energy Consumption Survey: Housing Characteristics*. U.S. Department of Energy/Energy Information Administration, Washington, D.C.

DOE-EIA. 2015. *Natural Gas Monthly* and *Electric Power Monthly.* April 2015 issues released June 2015. U.S. Department of Energy/Energy Information Administration, Washington, D.C.

Drumheller SC, C Kohler, and S Minen. 2007. *Field Evaluation of Low-E Storm Windows*. LBNL-1940E, Lawrence Berkley National Laboratory, Berkeley, California.

Knox JR and SH Widder. 2014. *Evaluation of Low-E Storm Windows in the PNNL Lab Homes.* PNNL-23355, Pacific Northwest National Laboratory, Richland, Washington.

LBNL 2013. *International Glazing Database.* http://windowoptics.lbl.gov/data/igdb Lawrence Berkley National Laboratory, Berkeley, California.

Appendix A

RESFEN 6 Modeling Assumptions

The following table captures the differences in modeling assumptions for the Energy Star analysis reference house between RESFEN 5 and RESFEN 6 (in development).

Table A.1. RESFEN 6 Assumptions – Reference House for Energy Star Analysis

PARAMETER	RESFEN 5	RESFEN 6 - DRAFT	Notes on changes
Floor Area (ft^2 & dimensions)	Reference House: 2000 sf Specific House: Variable, from 1,000 to 4,000 square feet, input by user.	Reference House: New – 1 Story: 1700sf New – 2 Story: 2800sf Existing 1 Story: 1700sf Existing 2 Story: 2600sf	NFRC noted the following: New Construction: 2005 U.S. Census Bureau Characteristics Median New house size is 2200sf; Average is 2400. Existing Construction: Keep same default as RESFEN 5 unless new data to the contrary is presented. LBNL decided to keep with these basic numbers, but differentiate between smaller single story homes and larger two story homes. [For the Energy Star analysis, results for both 1 and 2 story homes will be generated. End results will be based on appropriate regional weightings of 1 and 2 story homes.] Using RECS 2001, an analysis of public use microdata, we came up with the following, at a national level: - For existing homes (defined as pre-1990), RECS supports an average house size of 2000 sf, as NFRC had agreed upon. Single story homes (65% of existing homes nationally) are 1700sf and Two+ story homes (35%) are 2600sf. When weighted by fractions of the population, the average comes out to 2000. - For New (after 1990) homes, NFRC had chosen to go with the census data Median of 2200, not the average of 2400. We agree that it makes sense to use a Median so that the size is not skewed by the small number of very large houses. RECS comes up with a slightly different average of 2600 (2000sf for single and 3400 Sf for 2+ story). We decided we should keep the NFRC value of 2200 as the normalized area but use RECS data on 1 and 2 story to modify this average number. This leads to using 1700 sf for New - 1 story (58%) and 2800 sf for New 2-story (42%).
House Type	New Construction Existing Construction	Reference House: New Construction is frame. Existing Construction is frame. Both 1 and 2 story houses are modeled in all climates. National or regional energy	For reference, see census map: http://www.eia.doe.gov/emeu/recs/census_map.htm l IECC Climate map at: www.energycodes.gov/implement/pdfs/color_**map_ climate_zone**s_Mar03.pdf

PARAMETER	RESFEN 5	RESFEN 6 - DRAFT	Notes on changes
		impact studies will be based on the fractions of 1 and 2 story homes in each climate, for New and Existing.	Data on New Construction; From http://www.census.gov/const/www/charindex.html #singlecomplete Look at Number of Stories Data on Existing Construction Source: RECS 2001 Microdata, http://www.eia.doe.gov/emeu/recs/recs2001/publicuse2001.html
Foundation	Foundation is based on location based on NAHB data. There are a maximum of three options per climate zone, chosen from: Basement Slab-on-Grade Crawlspace	Default foundation based on location as with RESFEN 5.	What is in RESFEN is very similar to NFRC. NFRC proposed: New and Existing Construction: Basement in climate zone 5-8; Crawlspace in climate zone 4; Slab-on-grade in climate zones 1-3. What is in RESFEN is essentially this, except that some southern Zone 4 cities have slabs and some northern Zone 4 cities have basements to better represent current practice. Foundation modeling process updated based on 1998 research: Winkelmann, FC. 1998. ″Underground Surfaces: How to Get a Better Underground Surface Heat Transfer Calculation in DOE-2.1E″, Building Energy Simulation Users′ News, Vol. 19, No. 1 (Spring 1998), pp. 6-12, Lawrence Berkeley National Laboratory, Berkeley CA, Electronic versions of the Users′ News are available at http://gundog.lbl.gov.
Insulation (a)	Envelope insulation levels are based on location. See RESFEN 5 documentation, Table 6-1 for a list of Packages that correspond to each location. See Tables 6-3 and 6-4 for a list of R-values for each building component for each location. See Table 6-_ for a list of U-factors that correspond to the R-value constructions. **New construction:** See Table 6-4. (Council of American Building Officials, 1993) **Existing construction:** See Table 6-5. (Ritschard, et al. 1992)	New Construction: Envelope insulation levels based on location using 2006 IECC requirements in Table 402.1.1 (except for fenestration). Existing: Same as RESFEN 5.0.	
Infiltration	**New Construction:** ELA=0.77 ft^2 (0.58 ACH)	New Construction: SLA = 0.00036	As proposed by NFRC. Consistent with 2006 IECC reference home Table 404.5.2(1). SLA is EA/total sf.

PARAMETER	RESFEN 5	RESFEN 6 - DRAFT	Notes on changes
	Existing Construction: ELA=1.00 ft^2 (0.70 ACH)	Existing Construction: SLA = 0.00054	[Note: inconsistency between RESFEN 3.1/5.0 documentation and code; infiltration in code was set to SLA=.00057.]
Structural Mass (lb/ft^2)	This is a parameter used in programs that don't explicitly model internal walls. In RESFEN, we use a simple equation to estimate the amount of internal walls per floor area: interior wall area = 0.527 * floor area RESFEN then models the amount of internal walls. Since interior walls are typically 2x4 16″ oc with 0.5″ of gypboard on each side, the amount of material per square foot of wall is • 1″ x 12″ x 12″ or 0.08333 ft3 of gypboard • 3.5″ x 1.625″ x 12″ /16 or 0.002469 ft3 of wood The total weight per floor area of floor adds up to 2.24 lbs/ft2, which is somewhat lower than the the 3.5 lb/ft2 cited. But in a 2- story, there's also the floor that would add another 2.20 lbs/ft2, for a total of 4.44 lbs/ft2. This is consistent with the average value of 3.5 lb/ft2 in the IECC. Basement walls and slabs are modeled separately.	Internal walls are modeled explicitly as with RESFEN 5. Where masonry floors are used: 80% of floor area covered by R-2 carpet and pad, and 20% of floor directly exposed to room air. This is in addition to the 3.5 lb/ft2/ Basement walls: masonry, and include insulation located on the exterior of the walls (new construction) and the interior side of the walls (existing construction). This is in addition to above.	Consistent with 2006 IECC reference home Table 404.5.2(1) average value.
Internal Mass Furniture (lb/ft^2)	8.0 lb/ft^2 of floor area, in accordance with the Model Energy Code and NFRC Annual Energy Performance Subcommittee recommendation (September 1998).	8.0 lb/ft^2 of floor area	Consistent with 2006 IECC reference home Table 404.5.2(1).

PARAMETER	RESFEN 5	RESFEN 6 - DRAFT	Notes on changes
Solar Gain Reduction	**Options:** **None:** No solar gain reduction **Overhang:** 2' Exterior Overhangs **Obstruction:** Exterior Obstructions, a completely opaque (□=0.0), same-height obstruction 20 feet away, intended to represent adjacent buildings. **Interior:** Interior shades with a Seasonal SHGC multiplier, summer value = 0.80, winter value = 0.90. **Int+Ovh:** Interior shades & 2′ overhangs **Ovh+Obs:** 2′ overhangs & obstructions **All:** Interior shades, 2′ overhangs, & obstructions **Typical**[b]**:** to represent a statistically average solar gain reduction for a generic house, this option includes: Interior shades (Seasonal SHGC multiplier, summer value = 0.80, winter value = 0.90); 1′ overhang; a 67% transmitting same-height obstruction 20′ away intended to represent adjacent buildings. To account for other sources of solar heat gain reduction (insect screens, trees, dirt, building & window self- shading), the SHGC multiplier was further reduced by 0.1. This results in a final winter SHGC multiplier of 0.8 and a final summer SHGC multiplier of 0.7. (Note these factors are multipliers; i.e. a window with a SHGC of 0.5 is reduced to 0.4 in the winter and 0.35 in the summer.)	**Same as RESFEN 5.** **Reference House uses Typical.**	RESFEN assumptions of typical should be maintained unless there is valid data to the contrary; otherwise impacts of windows are overstated
Window Area (% Floor Area)	Variable	Specific House: Variable Reference House: 15%	18% is too high. A recent DOE/PNNL study from a few years ago found 13.5% to be average. IECC implies that below 12% is low and above 18% is

PARAMETER	RESFEN 5	RESFEN 6 - DRAFT	Notes on changes
			high….which implies 15% (as used in RESFEN) is appropriate.
Window Type	Variable	Variable	
Window Distribution	Variable	Specific House: Variable Reference House: Evenly Distributed on All four orientations.	
HVAC System	Furnace & A/C, Heat Pump	Gas furnace & A/C. Heat Pump with A/C in South and SW	There are a significant number of Heat Pumps in the South (half of new construction in the south) and some in the West (presumably the SW). From http://www.census.gov/const/www/charindex.html #singlecomplete Look at Type of Heating Fuel; Data on Existing Construction There is also Oil Heating in the NorthEast (49% in New England and 24% in Mid-Atlantic) in Existing Homes. Rather than model Oil homes in the NE region in Existing houses; or we can account for this later in the speadsheet part of this project. (Not much in New Construction.)
HVAC System Sizing	For each climate, system sizes are fixed for all window options. Fixed sizes are based on the use of DOE-2 auto-sizing for the same house as defined in the analysis, with the most representative window for that specific climate. An auto-sizing multiplier of 1.3 used to account for a typical safety factor. (e)	Same as RESFEN 5 for Existing homes. Autosizing is used for New homes – they are sized with the specific windows chosen.	Consistent with 2006 IECC reference home Table 404.5.2(1). Section M1401.3 of the International Residential Code says " Heating and cooling equipment shall be sized based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies."
HVAC Efficiency	**New Construction:** AFUE = 0.78, A/C SEER=10.0 **Existing Construction:** AFUE = 0.70, A/C SEER= 8.0	**New:** Gas furnace: AFUE = 0.80 in climate zones 1-3, 0.90 in climate zones 4-8. A/C SEER = 13. Heat pump HSPF = 7.7; Oil furnace AFUE = 0.80 **Existing**: Gas furnace AFUE = 0.78; A/C (& Heat Pump) SEER = 10; Heat pump HSPF = 6.8	**For New, as per NFRC:** Gas furnace: 2005 Gas Appliance Manufacturers Association data showed 34% of all U.S. furnaces sold are condensing (AFUE 90+%). We assume most of these are used in the north, so use new federal minimum (0.80) in zones 1-3, and condensing furnace (0.90) in zones 4-8. A/C: New federal minimum. Heat pump: New federal minimum. Conversion from SEER or HPSF to COP (1/CEIR) for use in DOE2 using updated research: http://www.fsec.ucf.edu/en/publications/html/FSEC -PF-413-04/
Duct Losses	Heating: 10% (fixed) Cooling: 10% (fixed)	12% for basement foundation	Consistent with 2006 IECC proposed design default distribution efficiencies (Table 404.5.2(2). As proposed by NFRC.

PARAMETER	RESFEN 5	RESFEN 6 - DRAFT	Notes on changes
		20% for crawlspace and slab-on-grade foundations	Duct losses entered into DOE2 by modifying efficiencies.
Part-Load Performance	New part-load curves for DOE2 (Henderson 1998) for both new and existing house types	Same as RESFEN 5.	
Thermostat Settings	Heating: 70^{o}F, Cooling: 78^{o}F Basement (partially conditioned): Heating 62^{o}F, Cooling 85^{o}F	Heating: 70^{o}F, Cooling: 78^{o}F Basement (partially conditioned): Heating 62^{o}F, Cooling 85^{o}F	
Night Heating Setback	65^{o}F (11 PM – 6 AM[(d)])	65^{o}F (11 PM – 6 AM)	
Cooling Setup	N/A	N/A	
Internal Loads	Sensible: 43,033 Btu/day + (floor area * 8.42 Btu/ft^{2}-day for lighting) Latent: 12.2 kBtu/day	Use IECC [Table 404.5.2(1)] proposal of: Internal gain (Btu/day) = 17,900 + 23.8×floor area + 4104×number of bedrooms. 3 bedrooms shall be used.	This includes latent as well as sensible, as well as lighting loads (per conversation with Phil Fairey, 1/11/08). The way FSEC uses the equation is for the total internal loads of the house. They then subtract out the people heat gain, which they model as per standard DOE-2/ASHRAE assumption (255 sensible/200 latent per person per hour, etc.). The remainder is then assumed to be 0.80 sensible and 0.20 latent. The hourly profile is based on modeling assumptions developed by the California Energy Commission in 1980 (Mickey Horn and Cynthia Helmich 1980. ″Assumptions Used with Energy Performance Computer Programs″, Project Report No. 7 for ″1980 Residential Building Standard Development Project″, June 1980, P400-80-026, pp. 33-48).
Natural Ventilation	Enthalpic – Sherman-Grimsrud (78^{o}F / 72^{o}F based on 4 days′ history[(e)]) Windows closed from 11pm to 6am. Only 25% of window area can be open for ventilation. Windows will only open if outdoor temperature has been below the setpoint for prior 4 days.	Maximum operable window area reduced from 25% to 12.5%. Max ACH capped at 10. Based on California research on use of windows for ventilation.	RESFEN 6 algorithm updated based on the reported operation of windows in the recent Sherman and Price report, “Study of Ventilation Practices and Household Characteristics in New California Homes:” http://www.arb.ca.gov/research/apr/past/03-326.pdf
Weather Data	All TMY2[(f)]		
Number of Locations	239 US cities[(f)] 4 Canadian cities	For E* analysis: 97 EWC climates plus Charlotte NC, Amarillo TX, and Prescott AZ	
Calculation Tool	DOE-2.1E	DOE 2.1E version 1.14	

Footnotes

(a) Insulation values do not include exterior siding, structural sheathing, and interior drywall. For examples, an R-19 requirement could be met EITHER by R-19 cavity insulation OR R-13 cavity insulation plus R-6 insulating sheathing. Wall requirements apply to wood-frame or mass (concrete, masonry, log) wall constructions, but do not apply to metal-frame construction."

(b) These assumptions are intended to represent the average solar heat gain reduction for a large sample of houses. A one-foot overhang is assumed on all four orientations in order to represent the average of a two-foot overhang and no overhang. A 67% transmitting obstruction 20 feet away on all four orientations represents the average of obstructions (such as neighboring buildings and trees) 20 feet away on one-third of the total windows and no obstructions in front of the remaining two-thirds of windows. An interior shade is assumed to have a Solar Heat Gain Coefficient multiplier of 0.9 during the winter and 0.8 during the summer. To account for solar heat gain reducing effects from other sources such as screens, trees, dirt, and self-shading of the building, the SHGC multiplier was further reduced by 0.1 throughout the year. This amounts to a 12.5% decrease in the summer and an 11.1% decrease in the winter. The final SHGC multipliers (0.8 in the winter and 0.7 in the summer) thus reflect the combined effects of shading devices and other sources.

(c) RESFEN 5: For each climate, DOE-2's auto-sizing feature was used with the window most likely to be installed in new construction (assumed to be the MEC default). Tables 6.4 and 6.5 show the required prescriptive U-factors for windows for the 52 climates. For climates where the U-factor requirement is greater than or equal to 1.0, an aluminum frame window with single glazing (U-factor = 1.30; SHGC = 0.74) is used. For climates where the U-factor requirement is between 0.65 and 1.0, an aluminum frame window with double glazing (U-factor = 0.87; SHGC = 0.66) is used. For climates where the U-factor requirements are below 0.65, as well as in the four Canadian climates, a vinyl frame window with double glazing (U-factor = 0.49; SHGC = 0.57) is used for the sizing calculation.

(d) RESFEN models a moderate setback of 65^{o} F in recognition that some but not all houses may use night setbacks. Recent studies of residential indoor conditions have shown that, during the heating season, nighttime temperatures are significantly lower than daytime temperatures (Ref: "Occupancy Patterns and Energy Consumption in New California Houses," Berkeley Solar Group for the California Energy Commission, 1990).

(e) RESFEN uses a feature in DOE-2 that allows the ventilation temperature to switch between a higher heating (or winter) and a lower cooling (or summer) temperature based on the cooling load over the previous four days.

(f) RESFEN uses Typical Meteorologcal Year (TMY2) weather tapes from the National Renewable Energy Laboratory. There are 239 TMY2 locations with average weather data compiled from 30+ years of historical weather data. (National Renewable Energy Laboratory, 1995).

This work was supported by the Assistant Secretary for Energy Efficiency and Renewable Energy, Office of Building Technology, State and Community Programs, Office of Building Systems of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098.

Appendix B

RESFEN Results (Total Energy Savings)

Notes: Bold numbers in tables highlight results with low-E panels
Red numbers in tables highlight results with solar control low-E panels

SMALLER, OLDER HOME (1-story, 1700 ft^2)

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
8	AK Fairbanks	Wood frame, single pane	Furnace / AC	72	kWh	354.1	MBtu	387.5	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	59	kWh	301	MBtu	329.4	MBtu	15.0%
8	AK Fairbanks	with interior clear panel	Furnace / AC	59	kWh	297.8	MBtu	325.9	MBtu	15.9%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	45	kWh	289.7	MBtu	316.9	MBtu	**18.2%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	56	kWh	283.5	MBtu	310.2	MBtu	**19.9%**
8	AK Fairbanks	Wood frame, double pane	Furnace / AC	66	kWh	313.5	MBtu	343.1	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	53	kWh	297.6	MBtu	325.6	MBtu	5.1%
8	AK Fairbanks	with interior clear panel	Furnace / AC	58	kWh	294.2	MBtu	321.9	MBtu	6.2%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	40	kWh	288.6	MBtu	315.6	MBtu	**8.0%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	52	kWh	283.8	MBtu	310.5	MBtu	**9.5%**
8	AK Fairbanks	Metal frame, double pane	Furnace / AC	58	kWh	332.3	MBtu	363.5	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	57	kWh	305.5	MBtu	334.3	MBtu	8.1%
8	AK Fairbanks	with interior clear panel	Furnace / AC	55	kWh	301.9	MBtu	330.3	MBtu	9.1%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	44	kWh	293.3	MBtu	320.8	MBtu	**11.8%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	49	kWh	289.4	MBtu	316.6	MBtu	**12.9%**
8	AK Fairbanks	with exterior clear panel, worst case mounting	Furnace / AC	52	kWh	314.8	MBtu	344.4	MBtu	5.3%
8	AK Fairbanks	with exterior low-E panel, worst case mounting	Furnace / AC	39	kWh	307.5	MBtu	336.2	MBtu	7.5%
7	AK Anchorage	Wood frame, single pane	Furnace / AC	12	kWh	213.8	MBtu	233.6	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	10	kWh	173.9	MBtu	190.0	MBtu	18.7%
7	AK Anchorage	with interior clear panel	Furnace / AC	10	kWh	171.6	MBtu	187.5	MBtu	19.7%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	7	kWh	165	MBtu	180.3	MBtu	**22.8%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	9	kWh	160.2	MBtu	175.0	MBtu	**25.1%**
7	AK Anchorage	Wood frame, double pane	Furnace / AC	11	kWh	183.1	MBtu	200.1	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	9	kWh	171.6	MBtu	187.5	MBtu	6.3%
7	AK Anchorage	with interior clear panel	Furnace / AC	9	kWh	169.1	MBtu	184.8	MBtu	7.7%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	7	kWh	164.3	MBtu	179.5	MBtu	**10.3%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	9	kWh	160.6	MBtu	175.5	MBtu	**12.3%**
7	AK Anchorage	Metal frame, double pane	Furnace / AC	9	kWh	198.2	MBtu	216.5	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	9	kWh	177.8	MBtu	194.3	MBtu	10.3%
7	AK Anchorage	with interior clear panel	Furnace / AC	9	kWh	175.1	MBtu	191.3	MBtu	11.6%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	7	kWh	167.9	MBtu	183.4	MBtu	**15.3%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	8	kWh	164.9	MBtu	180.2	MBtu	**16.8%**
7	AK Anchorage	with exterior clear panel, worst case mounting	Furnace / AC	9	kWh	185.2	MBtu	202.3	MBtu	6.6%
7	AK Anchorage	with exterior low-E panel, worst case mounting	Furnace / AC	6	kWh	179.1	MBtu	195.6	MBtu	9.6%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
8	AK Fairbanks	Wood frame, single pane	13.90	3062.97	3076.87	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	11.39	2603.65	2615.04	$461.83	15.0%	$1.81	4.4	
8	AK Fairbanks	with interior clear panel	11.39	2575.97	2587.36	$489.51	15.9%	$1.92	4.7	
8	AK Fairbanks	with exterior low-E panel	8.69	2505.91	2514.59	$562.27	**18.3%**	$2.20	**4.1**	**2.5**
8	AK Fairbanks	with interior low-E panel	10.81	2452.28	2463.09	$613.78	**19.9%**	$2.41	**4.2**	**2.1**
8	AK Fairbanks	Wood frame, double pane	12.74	2711.78	2724.52	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	10.23	2574.24	2584.47	$140.05	5.1%	$0.55	14.6	
8	AK Fairbanks	with interior clear panel	11.20	2544.83	2556.03	$168.49	6.2%	$0.66	13.6	
8	AK Fairbanks	with exterior low-E panel	7.72	2496.39	2504.11	$220.41	**8.1%**	$0.86	**10.4**	**3.2**
8	AK Fairbanks	with interior low-E panel	10.04	2454.87	2464.91	$259.61	**9.5%**	$1.02	**9.8**	**2.8**
8	AK Fairbanks	Metal frame, double pane	11.20	2874.40	2885.59	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	11.01	2642.58	2653.58	$232.01	8.0%	$0.91	8.8	
8	AK Fairbanks	with interior clear panel	10.62	2611.44	2622.06	$263.54	9.1%	$1.03	8.7	
8	AK Fairbanks	with exterior low-E panel	8.50	2537.05	2545.54	$340.05	**11.8%**	$1.33	**6.7**	**2.4**
8	AK Fairbanks	with interior low-E panel	9.46	2503.31	2512.77	$372.82	**12.9%**	$1.46	**6.8**	**2.3**
8	AK Fairbanks	with exterior clear panel, worst case mounting	10.04	2723.02	2733.06	$152.53	5.3%	$0.60	13.4	
8	AK Fairbanks	with exterior low-E panel, worst case mounting	7.53	2659.88	2667.41	$218.19	7.6%	$0.86	10.5	
7	AK Anchorage	Wood frame, single pane	2.32	1849.37	1851.69	--	--	--	--	
7	AK Anchorage	with exterior clear panel	1.93	1504.24	1506.17	$345.52	18.7%	$1.35	5.9	
7	AK Anchorage	with interior clear panel	1.93	1484.34	1486.27	$365.42	19.7%	$1.43	6.3	
7	AK Anchorage	with exterior low-E panel	1.35	1427.25	1428.60	$423.09	**22.8%**	$1.66	**5.4**	**3.3**
7	AK Anchorage	with interior low-E panel	1.74	1385.73	1387.47	$464.22	**25.1%**	$1.82	**5.5**	**2.6**
7	AK Anchorage	Wood frame, double pane	2.12	1583.82	1585.94	--	--	--	--	
7	AK Anchorage	with exterior clear panel	1.74	1484.34	1486.08	$99.86	6.3%	$0.39	20.4	
7	AK Anchorage	with interior clear panel	1.74	1462.72	1464.45	$121.49	7.7%	$0.48	18.9	
7	AK Anchorage	with exterior low-E panel	1.35	1421.20	1422.55	$163.39	**10.3%**	$0.64	**14.0**	**4.0**
7	AK Anchorage	with interior low-E panel	1.74	1389.19	1390.93	$195.01	**12.3%**	$0.76	**13.1**	**3.5**
7	AK Anchorage	Metal frame, double pane	1.74	1714.43	1716.17	--	--	--	--	
7	AK Anchorage	with exterior clear panel	1.74	1537.97	1539.71	$176.46	10.3%	$0.69	11.6	
7	AK Anchorage	with interior clear panel	1.74	1514.62	1516.35	$199.82	11.6%	$0.78	11.5	
7	AK Anchorage	with exterior low-E panel	1.35	1452.34	1453.69	$262.48	**15.3%**	$1.03	**8.7**	**3.0**
7	AK Anchorage	with interior low-E panel	1.54	1426.39	1427.93	$288.24	**16.8%**	$1.13	**8.8**	**2.9**
7	AK Anchorage	with exterior clear panel, worst case mounting	1.74	1601.98	1603.72	$112.45	6.6%	$0.44	18.1	
7	AK Anchorage	with exterior low-E panel, worst case mounting	1.16	1549.22	1550.37	$165.79	9.7%	$0.65	13.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
7	MN Duluth	Wood frame, single pane	Furnace / AC	194	kWh	220.6	MBtu	243.1	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	161	kWh	176	MBtu	194.0	MBtu	20.2%
7	MN Duluth	with interior clear panel	Furnace / AC	167	kWh	173.5	MBtu	191.4	MBtu	21.3%
7	MN Duluth	with exterior low-E panel	Furnace / AC	137	kWh	167.3	MBtu	184.3	MBtu	**24.2%**
7	MN Duluth	with interior low-E panel	Furnace / AC	159	kWh	162	MBtu	178.7	MBtu	**26.5%**
7	MN Duluth	Wood frame, double pane	Furnace / AC	181	kWh	185.9	MBtu	205.1	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	147	kWh	173.7	MBtu	191.4	MBtu	6.7%
7	MN Duluth	with interior clear panel	Furnace / AC	157	kWh	170.9	MBtu	188.4	MBtu	8.1%
7	MN Duluth	with exterior low-E panel	Furnace / AC	128	kWh	166.8	MBtu	183.6	MBtu	**10.5%**
7	MN Duluth	with interior low-E panel	Furnace / AC	147	kWh	162.5	MBtu	179.1	MBtu	**12.7%**
7	MN Duluth	Metal frame, double pane	Furnace / AC	159	kWh	202.1	MBtu	222.5	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	154	kWh	180.1	MBtu	198.4	MBtu	10.8%
7	MN Duluth	with interior clear panel	Furnace / AC	150	kWh	177.1	MBtu	195.1	MBtu	12.3%
7	MN Duluth	with exterior low-E panel	Furnace / AC	138	kWh	170.5	MBtu	187.8	MBtu	**15.6%**
7	MN Duluth	with interior low-E panel	Furnace / AC	143	kWh	167	MBtu	184.0	MBtu	**17.3%**
7	MN Duluth	with exterior clear panel, worst case mounting	Furnace / AC	147	kWh	188	MBtu	207.0	MBtu	7.0%
7	MN Duluth	with exterior low-E panel, worst case mounting	Furnace / AC	124	kWh	182.3	MBtu	200.5	MBtu	9.9%
6	MN Minneapolis	Wood frame, single pane	Furnace / AC	800	kWh	163.3	MBtu	187.5	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	691	kWh	128.3	MBtu	148.0	MBtu	21.1%
6	MN Minneapolis	with interior clear panel	Furnace / AC	690	kWh	126.4	MBtu	146.0	MBtu	22.2%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	619	kWh	121.5	MBtu	139.8	MBtu	**25.5%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	671	kWh	117.4	MBtu	135.9	MBtu	**27.5%**
6	MN Minneapolis	Wood frame, double pane	Furnace / AC	739	kWh	136.1	MBtu	157.1	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	658	kWh	126.5	MBtu	145.7	MBtu	7.3%
6	MN Minneapolis	with interior clear panel	Furnace / AC	679	kWh	124.3	MBtu	143.5	MBtu	8.6%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	590	kWh	121.1	MBtu	139.0	MBtu	**11.5%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	648	kWh	117.7	MBtu	136.0	MBtu	**13.5%**
6	MN Minneapolis	Metal frame, double pane	Furnace / AC	700	kWh	148.7	MBtu	170.4	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	682	kWh	131.5	MBtu	151.4	MBtu	11.1%
6	MN Minneapolis	with interior clear panel	Furnace / AC	669	kWh	129.2	MBtu	148.8	MBtu	12.7%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	610	kWh	124	MBtu	142.4	MBtu	**16.4%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	635	kWh	121.2	MBtu	139.6	MBtu	**18.1%**
6	MN Minneapolis	with exterior clear panel, worst case mounting	Furnace / AC	656	kWh	137.6	MBtu	157.8	MBtu	7.4%
6	MN Minneapolis	with exterior low-E panel, worst case mounting	Furnace / AC	583	kWh	133.2	MBtu	152.1	MBtu	10.7%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
7	MN Duluth	Wood frame, single pane	23.55	1767.01	1790.56	--	--	--	--	
7	MN Duluth	with exterior clear panel	19.55	1409.76	1429.31	$361.25	20.2%	$1.42	5.6	
7	MN Duluth	with interior clear panel	20.27	1389.74	1410.01	$380.55	21.3%	$1.49	6.0	
7	MN Duluth	with exterior low-E panel	16.63	1340.07	1356.70	$433.85	**24.2%**	$1.70	**5.3**	**3.5**
7	MN Duluth	with interior low-E panel	19.30	1297.62	1316.92	$473.64	**26.5%**	$1.86	**5.4**	**2.7**
7	MN Duluth	Wood frame, double pane	21.97	1489.06	1511.03	--	--	--	--	
7	MN Duluth	with exterior clear panel	17.85	1391.34	1409.18	$101.85	6.7%	$0.40	20.0	
7	MN Duluth	with interior clear panel	19.06	1368.91	1387.97	$123.06	8.1%	$0.48	18.6	
7	MN Duluth	with exterior low-E panel	15.54	1336.07	1351.61	$159.43	**10.6%**	$0.63	**14.4**	**4.4**
7	MN Duluth	with interior low-E panel	17.85	1301.63	1319.47	$191.56	**12.7%**	$0.75	**13.3**	**3.7**
7	MN Duluth	Metal frame, double pane	19.30	1618.82	1638.12	--	--	--	--	
7	MN Duluth	with exterior clear panel	18.70	1442.60	1461.30	$176.83	10.8%	$0.69	11.5	
7	MN Duluth	with interior clear panel	18.21	1418.57	1436.78	$201.34	12.3%	$0.79	11.4	
7	MN Duluth	with exterior low-E panel	16.75	1365.71	1382.46	$255.67	**15.6%**	$1.00	**9.0**	**3.2**
7	MN Duluth	with interior low-E panel	17.36	1337.67	1355.03	$283.09	**17.3%**	$1.11	**9.0**	**3.1**
7	MN Duluth	with exterior clear panel, worst case mounting	17.85	1505.88	1523.73	$114.40	7.0%	$0.45	17.8	
7	MN Duluth	with exterior low-E panel, worst case mounting	15.05	1460.22	1475.28	$162.85	9.9%	$0.64	14.1	
6	MN Minneapolis	Wood frame, single pane	97.12	1308.03	1405.15	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	83.89	1027.68	1111.57	$293.58	20.9%	$1.15	6.9	
6	MN Minneapolis	with interior clear panel	83.77	1012.46	1096.23	$308.92	22.0%	$1.21	7.4	
6	MN Minneapolis	with exterior low-E panel	75.15	973.22	1048.36	$356.79	**25.4%**	$1.40	**6.4**	**4.0**
6	MN Minneapolis	with interior low-E panel	81.46	940.37	1021.83	$383.32	**27.3%**	$1.50	**6.7**	**3.4**
6	MN Minneapolis	Wood frame, double pane	89.71	1090.16	1179.88	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	79.88	1013.27	1093.15	$86.73	7.4%	$0.34	23.5	
6	MN Minneapolis	with interior clear panel	82.43	995.64	1078.07	$101.80	8.6%	$0.40	22.5	
6	MN Minneapolis	with exterior low-E panel	71.63	970.01	1041.64	$138.24	**11.7%**	$0.54	**16.6**	**5.0**
6	MN Minneapolis	with interior low-E panel	78.67	942.78	1021.44	$158.43	**13.4%**	$0.62	**16.1**	**4.5**
6	MN Minneapolis	Metal frame, double pane	84.98	1191.09	1276.07	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	82.79	1053.32	1136.11	$139.96	11.0%	$0.55	14.6	
6	MN Minneapolis	with interior clear panel	81.22	1034.89	1116.11	$159.96	12.5%	$0.63	14.3	
6	MN Minneapolis	with exterior low-E panel	74.05	993.24	1067.29	$208.77	**16.4%**	$0.82	**11.0**	**3.7**
6	MN Minneapolis	with interior low-E panel	77.09	970.81	1047.90	$228.17	**17.9%**	$0.89	**11.2**	**3.7**
6	MN Minneapolis	with exterior clear panel, worst case mounting	79.64	1102.18	1181.81	$94.25	7.4%	$0.37	21.6	
6	MN Minneapolis	with exterior low-E panel, worst case mounting	70.78	1066.93	1137.71	$138.36	10.8%	$0.54	16.6	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
6	VT Burlington	Wood frame, single pane	Furnace / AC	454	kWh	155	MBtu	174.5	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	388	kWh	122.2	MBtu	137.9	MBtu	21.0%
6	VT Burlington	with interior clear panel	Furnace / AC	389	kWh	120.3	MBtu	135.8	MBtu	22.1%
6	VT Burlington	with exterior low-E panel	Furnace / AC	340	kWh	115.6	MBtu	130.1	MBtu	**25.4%**
6	VT Burlington	with interior low-E panel	Furnace / AC	377	kWh	111.6	MBtu	126.2	MBtu	**27.7%**
6	VT Burlington	Wood frame, double pane	Furnace / AC	418	kWh	129.5	MBtu	146.2	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	367	kWh	120.6	MBtu	135.9	MBtu	7.0%
6	VT Burlington	with interior clear panel	Furnace / AC	380	kWh	118.4	MBtu	133.7	MBtu	8.6%
6	VT Burlington	with exterior low-E panel	Furnace / AC	320	kWh	115.2	MBtu	129.5	MBtu	**11.4%**
6	VT Burlington	with interior low-E panel	Furnace / AC	362	kWh	112	MBtu	126.5	MBtu	**13.5%**
6	VT Burlington	Metal frame, double pane	Furnace / AC	391	kWh	141.7	MBtu	159.2	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	381	kWh	125.3	MBtu	141.2	MBtu	11.3%
6	VT Burlington	with interior clear panel	Furnace / AC	372	kWh	123.2	MBtu	138.8	MBtu	12.8%
6	VT Burlington	with exterior low-E panel	Furnace / AC	334	kWh	118	MBtu	132.7	MBtu	**16.7%**
6	VT Burlington	with interior low-E panel	Furnace / AC	352	kWh	115.4	MBtu	130.1	MBtu	**18.3%**
6	VT Burlington	with exterior clear panel, worst case mounting	Furnace / AC	363	kWh	131.3	MBtu	147.5	MBtu	7.3%
6	VT Burlington	with exterior low-E panel, worst case mounting	Furnace / AC	317	kWh	126.9	MBtu	142.2	MBtu	10.7%
5	CO Denver	Wood frame, single pane	Furnace / AC	973	kWh	109.3	MBtu	130.5	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	865	kWh	87	MBtu	104.9	MBtu	19.6%
5	CO Denver	with interior clear panel	Furnace / AC	867	kWh	85.8	MBtu	103.6	MBtu	20.6%
5	CO Denver	with exterior low-E panel	Furnace / AC	779	kWh	82.3	MBtu	98.8	MBtu	**24.3%**
5	CO Denver	with interior low-E panel	Furnace / AC	842	kWh	79	MBtu	95.9	MBtu	**26.5%**
5	CO Denver	Wood frame, double pane	Furnace / AC	917	kWh	91.8	MBtu	110.8	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	827	kWh	86.1	MBtu	103.5	MBtu	6.6%
5	CO Denver	with interior clear panel	Furnace / AC	853	kWh	84.5	MBtu	102.1	MBtu	7.9%
5	CO Denver	with exterior low-E panel	Furnace / AC	745	kWh	82.3	MBtu	98.4	MBtu	**11.1%**
5	CO Denver	with interior low-E panel	Furnace / AC	813	kWh	79.5	MBtu	96.1	MBtu	**13.2%**
5	CO Denver	Metal frame, double pane	Furnace / AC	879	kWh	101.7	MBtu	121.1	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	856	kWh	89.7	MBtu	107.8	MBtu	11.0%
5	CO Denver	with interior clear panel	Furnace / AC	841	kWh	88.3	MBtu	106.1	MBtu	12.4%
5	CO Denver	with exterior low-E panel	Furnace / AC	771	kWh	84.3	MBtu	100.9	MBtu	**16.7%**
5	CO Denver	with interior low-E panel	Furnace / AC	800	kWh	82.2	MBtu	98.9	MBtu	**18.3%**
5	CO Denver	with exterior clear panel, worst case mounting	Furnace / AC	830	kWh	94.6	MBtu	112.8	MBtu	6.9%
5	CO Denver	with exterior low-E panel, worst case mounting	Furnace / AC	746	kWh	91.6	MBtu	108.6	MBtu	10.4%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
6	VT Burlington	Wood frame, single pane	79.45	2224.25	2303.70	--	--	--	--	
6	VT Burlington	with exterior clear panel	67.90	1753.57	1821.47	$482.23	20.9%	$1.89	4.2	
6	VT Burlington	with interior clear panel	68.08	1726.31	1794.38	$509.32	22.1%	$2.00	4.5	
6	VT Burlington	with exterior low-E panel	59.50	1658.86	1718.36	$585.34	**25.4%**	$2.30	**3.9**	**2.5**
6	VT Burlington	with interior low-E panel	65.98	1601.46	1667.44	$636.27	**27.6%**	$2.50	**4.0**	**2.0**
6	VT Burlington	Wood frame, double pane	73.15	1858.33	1931.48	--	--	--	--	
6	VT Burlington	with exterior clear panel	64.23	1730.61	1794.84	$136.64	7.1%	$0.54	14.9	
6	VT Burlington	with interior clear panel	66.50	1699.04	1765.54	$165.94	8.6%	$0.65	13.8	
6	VT Burlington	with exterior low-E panel	56.00	1653.12	1709.12	$222.36	**11.5%**	$0.87	**10.3**	**3.0**
6	VT Burlington	with interior low-E panel	63.35	1607.20	1670.55	$260.93	**13.5%**	$1.02	**9.8**	**2.7**
6	VT Burlington	Metal frame, double pane	68.43	2033.40	2101.82	--	--	--	--	
6	VT Burlington	with exterior clear panel	66.68	1798.06	1864.73	$237.09	11.3%	$0.93	8.6	
6	VT Burlington	with interior clear panel	65.10	1767.92	1833.02	$268.80	12.8%	$1.05	8.5	
6	VT Burlington	with exterior low-E panel	58.45	1693.30	1751.75	$350.07	**16.7%**	$1.37	**6.6**	**2.3**
6	VT Burlington	with interior low-E panel	61.60	1655.99	1717.59	$384.23	**18.3%**	$1.51	**6.6**	**2.2**
6	VT Burlington	with exterior clear panel, worst case mounting	63.53	1884.16	1947.68	$154.14	7.3%	$0.60	13.2	
6	VT Burlington	with exterior low-E panel, worst case mounting	55.48	1821.02	1876.49	$225.33	10.7%	$0.88	10.2	
5	CO Denver	Wood frame, single pane	118.51	835.05	953.56	--	--	--	--	
5	CO Denver	with exterior clear panel	105.36	664.68	770.04	$183.53	19.2%	$0.72	11.1	
5	CO Denver	with interior clear panel	105.60	655.51	761.11	$192.45	20.2%	$0.75	11.9	
5	CO Denver	with exterior low-E panel	94.88	628.77	723.65	$229.91	**24.1%**	$0.90	**10.0**	**5.5**
5	CO Denver	with interior low-E panel	102.56	603.56	706.12	$247.45	**25.9%**	$0.97	**10.3**	**4.6**
5	CO Denver	Wood frame, double pane	111.69	701.35	813.04	--	--	--	--	
5	CO Denver	with exterior clear panel	100.73	657.80	758.53	$54.51	6.7%	$0.21	37.4	
5	CO Denver	with interior clear panel	103.90	645.58	749.48	$63.57	7.8%	$0.25	36.1	
5	CO Denver	with exterior low-E panel	90.74	628.77	719.51	$93.53	**11.5%**	$0.37	**24.5**	**6.5**
5	CO Denver	with interior low-E panel	99.02	607.38	706.40	$106.64	**13.1%**	$0.42	**23.9**	**5.9**
5	CO Denver	Metal frame, double pane	107.06	776.99	884.05	--	--	--	--	
5	CO Denver	with exterior clear panel	104.26	685.31	789.57	$94.48	10.7%	$0.37	21.6	
5	CO Denver	with interior clear panel	102.43	674.61	777.05	$107.00	12.1%	$0.42	21.4	
5	CO Denver	with exterior low-E panel	93.91	644.05	737.96	$146.09	**16.5%**	$0.57	**15.7**	**4.9**
5	CO Denver	with interior low-E panel	97.44	628.01	725.45	$158.60	**17.9%**	$0.62	**16.1**	**4.9**
5	CO Denver	with exterior clear panel, worst case mounting	101.09	722.74	823.84	$60.21	6.8%	$0.24	33.9	
5	CO Denver	with exterior low-E panel, worst case mounting	90.86	699.82	790.69	$93.36	10.6%	$0.37	24.6	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	ID Boise	Wood frame, single pane	Furnace / AC	1184	kWh	110.4	MBtu	134.2	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1041	kWh	87.3	MBtu	107.3	MBtu	20.0%
5	ID Boise	with interior clear panel	Furnace / AC	1042	kWh	86.1	MBtu	106.0	MBtu	21.0%
5	ID Boise	with exterior low-E panel	Furnace / AC	945	kWh	82.5	MBtu	100.9	MBtu	**24.8%**
5	ID Boise	with interior low-E panel	Furnace / AC	1006	kWh	79.2	MBtu	98.0	MBtu	**26.9%**
5	ID Boise	Wood frame, double pane	Furnace / AC	1101	kWh	92.4	MBtu	113.5	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1003	kWh	86.4	MBtu	105.9	MBtu	6.8%
5	ID Boise	with interior clear panel	Furnace / AC	1026	kWh	84.8	MBtu	104.4	MBtu	8.1%
5	ID Boise	with exterior low-E panel	Furnace / AC	905	kWh	82.4	MBtu	100.4	MBtu	**11.6%**
5	ID Boise	with interior low-E panel	Furnace / AC	977	kWh	79.7	MBtu	98.3	MBtu	**13.5%**
5	ID Boise	Metal frame, double pane	Furnace / AC	1075	kWh	102.1	MBtu	123.8	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1039	kWh	90	MBtu	110.2	MBtu	11.0%
5	ID Boise	with interior clear panel	Furnace / AC	1021	kWh	88.5	MBtu	108.4	MBtu	12.5%
5	ID Boise	with exterior low-E panel	Furnace / AC	937	kWh	84.4	MBtu	102.9	MBtu	**16.9%**
5	ID Boise	with interior low-E panel	Furnace / AC	968	kWh	82.4	MBtu	101.1	MBtu	**18.4%**
5	ID Boise	with exterior clear panel, worst case mounting	Furnace / AC	1017	kWh	94.7	MBtu	115.1	MBtu	7.1%
5	ID Boise	with exterior low-E panel, worst case mounting	Furnace / AC	919	kWh	91.5	MBtu	110.5	MBtu	10.8%
5	IL Chicago	Wood frame, single pane	Furnace / AC	979	kWh	134.6	MBtu	158.2	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	862	kWh	105.9	MBtu	125.5	MBtu	20.7%
5	IL Chicago	with interior clear panel	Furnace / AC	864	kWh	104.3	MBtu	123.8	MBtu	21.7%
5	IL Chicago	with exterior low-E panel	Furnace / AC	787	kWh	100.2	MBtu	118.5	MBtu	**25.1%**
5	IL Chicago	with interior low-E panel	Furnace / AC	847	kWh	96.7	MBtu	115.3	MBtu	**27.1%**
5	IL Chicago	Wood frame, double pane	Furnace / AC	912	kWh	112.3	MBtu	133.1	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	831	kWh	104.5	MBtu	123.7	MBtu	7.1%
5	IL Chicago	with interior clear panel	Furnace / AC	851	kWh	102.7	MBtu	121.9	MBtu	8.4%
5	IL Chicago	with exterior low-E panel	Furnace / AC	750	kWh	99.9	MBtu	117.7	MBtu	**11.6%**
5	IL Chicago	with interior low-E panel	Furnace / AC	820	kWh	97.1	MBtu	115.4	MBtu	**13.3%**
5	IL Chicago	Metal frame, double pane	Furnace / AC	875	kWh	123	MBtu	144.4	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	852	kWh	108.7	MBtu	128.5	MBtu	11.0%
5	IL Chicago	with interior clear panel	Furnace / AC	842	kWh	106.8	MBtu	126.3	MBtu	12.5%
5	IL Chicago	with exterior low-E panel	Furnace / AC	777	kWh	102.2	MBtu	120.5	MBtu	**16.5%**
5	IL Chicago	with interior low-E panel	Furnace / AC	807	kWh	100	MBtu	118.5	MBtu	**17.9%**
5	IL Chicago	with exterior clear panel, worst case mounting	Furnace / AC	827	kWh	113.9	MBtu	133.9	MBtu	7.3%
5	IL Chicago	with exterior low-E panel, worst case mounting	Furnace / AC	751	kWh	110	MBtu	128.7	MBtu	10.8%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	ID Boise	Wood frame, single pane	115.56	937.30	1052.85	--	--	--	--	
5	ID Boise	with exterior clear panel	101.60	741.18	842.78	$210.08	20.0%	$0.82	9.7	
5	ID Boise	with interior clear panel	101.70	730.99	832.69	$220.17	20.9%	$0.86	10.4	
5	ID Boise	with exterior low-E panel	92.23	700.43	792.66	$260.20	**24.7%**	$1.02	**8.8**	**5.1**
5	ID Boise	with interior low-E panel	98.19	672.41	770.59	$282.26	**26.8%**	$1.11	**9.0**	**4.1**
5	ID Boise	Wood frame, double pane	107.46	784.48	891.93	--	--	--	--	
5	ID Boise	with exterior clear panel	97.89	733.54	831.43	$60.50	6.8%	$0.24	33.7	
5	ID Boise	with interior clear panel	100.14	719.95	820.09	$71.84	8.1%	$0.28	31.9	
5	ID Boise	with exterior low-E panel	88.33	699.58	787.90	$104.03	**11.7%**	$0.41	**22.1**	**5.9**
5	ID Boise	with interior low-E panel	95.36	676.65	772.01	$119.93	**13.4%**	$0.47	**21.3**	**5.3**
5	ID Boise	Metal frame, double pane	104.92	866.83	971.75	--	--	--	--	
5	ID Boise	with exterior clear panel	101.41	764.10	865.51	$106.24	10.9%	$0.42	19.2	
5	ID Boise	with interior clear panel	99.65	751.37	851.01	$120.73	12.4%	$0.47	19.0	
5	ID Boise	with exterior low-E panel	91.45	716.56	808.01	$163.74	**16.9%**	$0.64	**14.0**	**4.4**
5	ID Boise	with interior low-E panel	94.48	699.58	794.05	$177.70	**18.3%**	$0.70	**14.4**	**4.5**
5	ID Boise	with exterior clear panel, worst case mounting	99.26	804.00	903.26	$68.49	7.0%	$0.27	29.8	
5	ID Boise	with exterior low-E panel, worst case mounting	89.69	776.84	866.53	$105.22	10.8%	$0.41	21.8	
5	IL Chicago	Wood frame, single pane	111.70	1079.49	1191.20	--	--	--	--	
5	IL Chicago	with exterior clear panel	98.35	849.32	947.67	$243.52	20.4%	$0.95	8.4	
5	IL Chicago	with interior clear panel	98.58	836.49	935.07	$256.13	21.5%	$1.00	9.0	
5	IL Chicago	with exterior low-E panel	89.80	803.60	893.40	$297.80	**25.0%**	$1.17	**7.7**	**4.7**
5	IL Chicago	with interior low-E panel	96.64	775.53	872.18	$319.02	**26.8%**	$1.25	**8.0**	**4.1**
5	IL Chicago	Wood frame, double pane	104.06	900.65	1004.71	--	--	--	--	
5	IL Chicago	with exterior clear panel	94.82	838.09	932.91	$71.80	7.1%	$0.28	28.4	
5	IL Chicago	with interior clear panel	97.10	823.65	920.75	$83.95	8.4%	$0.33	27.3	
5	IL Chicago	with exterior low-E panel	85.58	801.20	886.77	$117.93	**11.7%**	$0.46	**19.5**	**5.5**
5	IL Chicago	with interior low-E panel	93.56	778.74	872.30	$132.40	**13.2%**	$0.52	**19.3**	**5.3**
5	IL Chicago	Metal frame, double pane	99.84	986.46	1086.30	--	--	--	--	
5	IL Chicago	with exterior clear panel	97.21	871.77	968.99	$117.31	10.8%	$0.46	17.4	
5	IL Chicago	with interior clear panel	96.07	856.54	952.61	$133.69	12.3%	$0.52	17.2	
5	IL Chicago	with exterior low-E panel	88.66	819.64	908.30	$178.00	**16.4%**	$0.70	**12.9**	**4.2**
5	IL Chicago	with interior low-E panel	92.08	802.00	894.08	$192.22	**17.7%**	$0.75	**13.3**	**4.4**
5	IL Chicago	with exterior clear panel, worst case mounting	94.36	913.48	1007.84	$78.46	7.2%	$0.31	26.0	
5	IL Chicago	with exterior low-E panel, worst case mounting	85.69	882.20	967.89	$118.41	10.9%	$0.46	19.4	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	MA Boston	Wood frame, single pane	Furnace / AC	613	kWh	119.5	MBtu	137.5	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	546	kWh	91.3	MBtu	106.0	MBtu	23.0%
5	MA Boston	with interior clear panel	Furnace / AC	547	kWh	89.7	MBtu	104.2	MBtu	24.2%
5	MA Boston	with exterior low-E panel	Furnace / AC	493	kWh	86.1	MBtu	99.7	MBtu	**27.5%**
5	MA Boston	with interior low-E panel	Furnace / AC	539	kWh	82.5	MBtu	96.3	MBtu	**30.0%**
5	MA Boston	Wood frame, double pane	Furnace / AC	580	kWh	97.4	MBtu	113.0	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	522	kWh	90.1	MBtu	104.4	MBtu	7.6%
5	MA Boston	with interior clear panel	Furnace / AC	539	kWh	88.2	MBtu	102.5	MBtu	9.3%
5	MA Boston	with exterior low-E panel	Furnace / AC	467	kWh	85.9	MBtu	99.2	MBtu	**12.3%**
5	MA Boston	with interior low-E panel	Furnace / AC	521	kWh	82.9	MBtu	96.5	MBtu	**14.6%**
5	MA Boston	Metal frame, double pane	Furnace / AC	550	kWh	107.9	MBtu	124.1	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	537	kWh	94	MBtu	108.8	MBtu	12.3%
5	MA Boston	with interior clear panel	Furnace / AC	527	kWh	92.1	MBtu	106.6	MBtu	14.1%
5	MA Boston	with exterior low-E panel	Furnace / AC	483	kWh	88.1	MBtu	101.8	MBtu	**18.0%**
5	MA Boston	with interior low-E panel	Furnace / AC	506	kWh	85.7	MBtu	99.4	MBtu	**19.9%**
5	MA Boston	with exterior clear panel, worst case mounting	Furnace / AC	520	kWh	99.1	MBtu	114.2	MBtu	8.0%
5	MA Boston	with exterior low-E panel, worst case mounting	Furnace / AC	468	kWh	95.6	MBtu	109.8	MBtu	11.6%
5	NY Rochester	Wood frame, single pane	Furnace / AC	852	kWh	147.3	MBtu	170.6	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	753	kWh	117.4	MBtu	136.8	MBtu	19.8%
5	NY Rochester	with interior clear panel	Furnace / AC	754	kWh	115.8	MBtu	135.1	MBtu	20.8%
5	NY Rochester	with exterior low-E panel	Furnace / AC	683	kWh	111.4	MBtu	129.5	MBtu	**24.1%**
5	NY Rochester	with interior low-E panel	Furnace / AC	737	kWh	107.9	MBtu	126.3	MBtu	**26.0%**
5	NY Rochester	Wood frame, double pane	Furnace / AC	800	kWh	124.1	MBtu	144.7	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	721	kWh	116	MBtu	135.0	MBtu	6.7%
5	NY Rochester	with interior clear panel	Furnace / AC	742	kWh	114.2	MBtu	133.2	MBtu	7.9%
5	NY Rochester	with exterior low-E panel	Furnace / AC	655	kWh	111.1	MBtu	128.8	MBtu	**11.0%**
5	NY Rochester	with interior low-E panel	Furnace / AC	715	kWh	108.3	MBtu	126.5	MBtu	**12.6%**
5	NY Rochester	Metal frame, double pane	Furnace / AC	762	kWh	135	MBtu	156.2	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	744	kWh	120.4	MBtu	140.0	MBtu	10.3%
5	NY Rochester	with interior clear panel	Furnace / AC	731	kWh	118.3	MBtu	137.6	MBtu	11.9%
5	NY Rochester	with exterior low-E panel	Furnace / AC	675	kWh	113.6	MBtu	131.8	MBtu	**15.6%**
5	NY Rochester	with interior low-E panel	Furnace / AC	701	kWh	111.3	MBtu	129.6	MBtu	**17.0%**
5	NY Rochester	with exterior clear panel, worst case mounting	Furnace / AC	720	kWh	125.6	MBtu	145.4	MBtu	6.9%
5	NY Rochester	with exterior low-E panel, worst case mounting	Furnace / AC	650	kWh	121.4	MBtu	140.0	MBtu	10.3%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	MA Boston	Wood frame, single pane	106.66	1689.73	1796.39	--	--	--	--	
5	MA Boston	with exterior clear panel	95.00	1290.98	1385.99	$410.41	22.8%	$1.61	5.0	
5	MA Boston	with interior clear panel	95.18	1268.36	1363.54	$432.86	24.1%	$1.70	5.3	
5	MA Boston	with exterior low-E panel	85.78	1217.45	1303.24	$493.16	**27.5%**	$1.93	**4.7**	**3.1**
5	MA Boston	with interior low-E panel	93.79	1166.55	1260.34	$536.06	**29.8%**	$2.10	**4.8**	**2.5**
5	MA Boston	Wood frame, double pane	100.92	1377.24	1478.16	--	--	--	--	
5	MA Boston	with exterior clear panel	90.83	1274.01	1364.84	$113.31	7.7%	$0.44	18.0	
5	MA Boston	with interior clear panel	93.79	1247.15	1340.93	$137.22	9.3%	$0.54	16.7	
5	MA Boston	with exterior low-E panel	81.26	1214.63	1295.88	$182.27	**12.3%**	$0.71	**12.6**	**3.7**
5	MA Boston	with interior low-E panel	90.65	1172.21	1262.86	$215.30	**14.6%**	$0.84	**11.8**	**3.3**
5	MA Boston	Metal frame, double pane	95.70	1525.71	1621.41	--	--	--	--	
5	MA Boston	with exterior clear panel	93.44	1329.16	1422.60	$198.81	12.3%	$0.78	10.3	
5	MA Boston	with interior clear panel	91.70	1302.29	1393.99	$227.41	14.0%	$0.89	10.1	
5	MA Boston	with exterior low-E panel	84.04	1245.73	1329.78	$291.63	**18.0%**	$1.14	**7.9**	**2.7**
5	MA Boston	with interior low-E panel	88.04	1211.80	1299.84	$321.56	**19.8%**	$1.26	**7.9**	**2.7**
5	MA Boston	with exterior clear panel, worst case mounting	90.48	1401.27	1491.75	$129.65	8.0%	$0.51	15.7	
5	MA Boston	with exterior low-E panel, worst case mounting	81.43	1351.78	1433.22	$188.19	11.6%	$0.74	12.2	
5	NY Rochester	Wood frame, single pane	170.83	1805.90	1976.72	--	--	--	--	
5	NY Rochester	with exterior clear panel	150.98	1439.32	1590.30	$386.42	19.5%	$1.52	5.3	
5	NY Rochester	with interior clear panel	151.18	1419.71	1570.89	$405.84	20.5%	$1.59	5.7	
5	NY Rochester	with exterior low-E panel	136.94	1365.76	1502.71	$474.02	**24.0%**	$1.86	**4.8**	**2.9**
5	NY Rochester	with interior low-E panel	147.77	1322.85	1470.62	$506.10	**25.6%**	$1.98	**5.0**	**2.5**
5	NY Rochester	Wood frame, double pane	160.40	1521.47	1681.87	--	--	--	--	
5	NY Rochester	with exterior clear panel	144.56	1422.16	1566.72	$115.15	6.8%	$0.45	17.7	
5	NY Rochester	with interior clear panel	148.77	1400.09	1548.86	$133.00	7.9%	$0.52	17.3	
5	NY Rochester	with exterior low-E panel	131.33	1362.09	1493.41	$188.45	**11.2%**	$0.74	**12.2**	**3.5**
5	NY Rochester	with interior low-E panel	143.36	1327.76	1471.12	$210.75	**12.5%**	$0.83	**12.1**	**3.3**
5	NY Rochester	Metal frame, double pane	152.78	1655.10	1807.88	--	--	--	--	
5	NY Rochester	with exterior clear panel	149.17	1476.10	1625.28	$182.61	10.1%	$0.72	11.2	
5	NY Rochester	with interior clear panel	146.57	1450.36	1596.92	$210.96	11.7%	$0.83	10.9	
5	NY Rochester	with exterior low-E panel	135.34	1392.74	1528.07	$279.81	**15.5%**	$1.10	**8.2**	**2.6**
5	NY Rochester	with interior low-E panel	140.55	1364.54	1505.09	$302.79	**16.7%**	$1.19	**8.4**	**2.8**
5	NY Rochester	with exterior clear panel, worst case mounting	144.36	1539.86	1684.22	$123.67	6.8%	$0.48	16.5	
5	NY Rochester	with exterior low-E panel, worst case mounting	130.33	1488.36	1618.69	$189.19	10.5%	$0.74	12.1	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	PA Pittsburgh	Wood frame, single pane	Furnace / AC	916	kWh	122.6	MBtu	144.4	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	818	kWh	97.6	MBtu	116.0	MBtu	19.7%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	818	kWh	96.2	MBtu	114.4	MBtu	20.7%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	745	kWh	92.4	MBtu	109.5	MBtu	**24.2%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	801	kWh	89.2	MBtu	106.6	MBtu	**26.2%**
5	PA Pittsburgh	Wood frame, double pane	Furnace / AC	863	kWh	103.2	MBtu	122.6	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	784	kWh	96.4	MBtu	114.3	MBtu	6.8%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	806	kWh	94.8	MBtu	112.8	MBtu	8.0%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	715	kWh	92.1	MBtu	108.8	MBtu	**11.3%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	775	kWh	89.6	MBtu	106.7	MBtu	**12.9%**
5	PA Pittsburgh	Metal frame, double pane	Furnace / AC	825	kWh	112.9	MBtu	132.8	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	809	kWh	100.2	MBtu	118.7	MBtu	10.6%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	794	kWh	98.5	MBtu	116.7	MBtu	12.1%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	736	kWh	94.3	MBtu	111.4	MBtu	**16.1%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	763	kWh	92.3	MBtu	109.6	MBtu	**17.5%**
5	PA Pittsburgh	with exterior clear panel, worst case mounting	Furnace / AC	779	kWh	104.9	MBtu	123.5	MBtu	7.0%
5	PA Pittsburgh	with exterior low-E panel, worst case mounting	Furnace / AC	710	kWh	101.4	MBtu	118.9	MBtu	10.5%
4	NY New York City	Wood frame, single pane	Furnace / AC	1185	kWh	109.7	MBtu	133.4	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1073	kWh	85.5	MBtu	105.7	MBtu	20.8%
4	NY New York City	with interior clear panel	Furnace / AC	1073	kWh	84.1	MBtu	104.2	MBtu	21.9%
4	NY New York City	with exterior low-E panel	Furnace / AC	996	kWh	81	MBtu	99.9	MBtu	**25.1%**
4	NY New York City	with interior low-E panel	Furnace / AC	1052	kWh	77.9	MBtu	97.1	MBtu	**27.2%**
4	NY New York City	Wood frame, double pane	Furnace / AC	1128	kWh	90.8	MBtu	112.1	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1041	kWh	84.6	MBtu	104.3	MBtu	6.9%
4	NY New York City	with interior clear panel	Furnace / AC	1064	kWh	82.9	MBtu	102.7	MBtu	8.4%
4	NY New York City	with exterior low-E panel	Furnace / AC	964	kWh	80.9	MBtu	99.4	MBtu	**11.3%**
4	NY New York City	with interior low-E panel	Furnace / AC	1028	kWh	78.3	MBtu	97.3	MBtu	**13.2%**
4	NY New York City	Metal frame, double pane	Furnace / AC	1089	kWh	100	MBtu	121.7	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1065	kWh	88	MBtu	108.3	MBtu	11.0%
4	NY New York City	with interior clear panel	Furnace / AC	1050	kWh	86.4	MBtu	106.4	MBtu	12.6%
4	NY New York City	with exterior low-E panel	Furnace / AC	989	kWh	82.8	MBtu	101.8	MBtu	**16.4%**
4	NY New York City	with interior low-E panel	Furnace / AC	1016	kWh	80.8	MBtu	99.9	MBtu	**17.9%**
4	NY New York City	with exterior clear panel, worst case mounting	Furnace / AC	1039	kWh	92.4	MBtu	112.8	MBtu	7.3%
4	NY New York City	with exterior low-E panel, worst case mounting	Furnace / AC	964	kWh	89.4	MBtu	108.7	MBtu	10.7%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	PA Pittsburgh	Wood frame, single pane	122.19	1400.09	1522.29	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	109.12	1114.59	1223.71	$298.57	19.6%	$1.17	6.8	
5	PA Pittsburgh	with interior clear panel	109.12	1098.60	1207.73	$314.56	20.7%	$1.23	7.3	
5	PA Pittsburgh	with exterior low-E panel	99.38	1055.21	1154.59	$367.70	**24.2%**	$1.44	**6.2**	**3.7**
5	PA Pittsburgh	with interior low-E panel	106.85	1018.66	1125.52	$396.77	**26.1%**	$1.56	**6.4**	**3.1**
5	PA Pittsburgh	Wood frame, double pane	115.12	1178.54	1293.67	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	104.59	1100.89	1205.47	$88.19	6.8%	$0.35	23.1	
5	PA Pittsburgh	with interior clear panel	107.52	1082.62	1190.14	$103.53	8.0%	$0.41	22.2	
5	PA Pittsburgh	with exterior low-E panel	95.38	1051.78	1147.16	$146.51	**11.3%**	$0.57	**15.7**	**4.4**
5	PA Pittsburgh	with interior low-E panel	103.39	1023.23	1126.62	$167.05	**12.9%**	$0.66	**15.3**	**4.0**
5	PA Pittsburgh	Metal frame, double pane	110.06	1289.32	1399.37	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	107.92	1144.28	1252.20	$147.17	10.5%	$0.58	13.9	
5	PA Pittsburgh	with interior clear panel	105.92	1124.87	1230.79	$168.58	12.0%	$0.66	13.6	
5	PA Pittsburgh	with exterior low-E panel	98.18	1076.91	1175.09	$224.28	**16.0%**	$0.88	**10.2**	**3.3**
5	PA Pittsburgh	with interior low-E panel	101.78	1054.07	1155.85	$243.52	**17.4%**	$0.95	**10.5**	**3.4**
5	PA Pittsburgh	with exterior clear panel, worst case mounting	103.92	1197.96	1301.88	$97.50	7.0%	$0.38	20.9	
5	PA Pittsburgh	with exterior low-E panel, worst case mounting	94.71	1157.99	1252.70	$146.67	10.5%	$0.58	15.6	
4	NY NewYork City	Wood frame, single pane	237.59	1344.92	1582.51	--	--	--	--	
4	NY NewYork City	with exterior clear panel	215.14	1048.23	1263.37	$319.15	20.2%	$1.25	6.4	
4	NY NewYork City	with interior clear panel	215.14	1031.07	1246.20	$336.31	21.3%	$1.32	6.8	
4	NY NewYork City	with exterior low-E panel	199.70	993.06	1192.76	$389.76	**24.6%**	$1.53	**5.9**	**3.6**
4	NY NewYork City	with interior low-E panel	210.93	955.05	1165.98	$416.53	**26.3%**	$1.63	**6.1**	**3.2**
4	NY NewYork City	Wood frame, double pane	226.16	1113.21	1339.37	--	--	--	--	
4	NY NewYork City	with exterior clear panel	208.72	1037.20	1245.92	$93.46	7.0%	$0.37	21.8	
4	NY NewYork City	with interior clear panel	213.33	1016.35	1229.69	$109.69	8.2%	$0.43	20.9	
4	NY NewYork City	with exterior low-E panel	193.28	991.83	1185.12	$154.26	**11.5%**	$0.60	**14.9**	**4.2**
4	NY NewYork City	with interior low-E panel	206.11	959.96	1166.07	$173.30	**12.9%**	$0.68	**14.7**	**4.0**
4	NY NewYork City	Metal frame, double pane	218.34	1226.00	1444.34	--	--	--	--	
4	NY NewYork City	with exterior clear panel	213.53	1078.88	1292.41	$151.93	10.5%	$0.60	13.4	
4	NY NewYork City	with interior clear panel	210.53	1059.26	1269.79	$174.56	12.1%	$0.68	13.1	
4	NY NewYork City	with exterior low-E panel	198.29	1015.13	1213.42	$230.92	**16.0%**	$0.91	**9.9**	**3.2**
4	NY NewYork City	with interior low-E panel	203.71	990.61	1194.32	$250.03	**17.3%**	$0.98	**10.2**	**3.4**
4	NY NewYork City	with exterior clear panel, worst case mounting	208.32	1132.82	1341.14	$103.20	7.1%	$0.40	19.8	
4	NY NewYork City	with exterior low-E panel, worst case mounting	193.28	1096.04	1289.33	$155.02	10.7%	$0.61	14.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
4	WA Seattle	Wood frame, single pane	Furnace / AC	184	kWh	85.9	MBtu	95.9	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	160	kWh	65.4	MBtu	73.3	MBtu	23.6%
4	WA Seattle	with interior clear panel	Furnace / AC	162	kWh	64.3	MBtu	72.1	MBtu	24.9%
4	WA Seattle	with exterior low-E panel	Furnace / AC	141	kWh	60.9	MBtu	68.1	MBtu	**29.0%**
4	WA Seattle	with interior low-E panel	Furnace / AC	161	kWh	58.2	MBtu	65.4	MBtu	**31.8%**
4	WA Seattle	Wood frame, double pane	Furnace / AC	173	kWh	70	MBtu	78.4	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	150	kWh	64.6	MBtu	72.3	MBtu	7.9%
4	WA Seattle	with interior clear panel	Furnace / AC	159	kWh	63.3	MBtu	70.9	MBtu	9.5%
4	WA Seattle	with exterior low-E panel	Furnace / AC	130	kWh	60.7	MBtu	67.8	MBtu	**13.6%**
4	WA Seattle	with interior low-E panel	Furnace / AC	152	kWh	58.6	MBtu	65.7	MBtu	**16.2%**
4	WA Seattle	Metal frame, double pane	Furnace / AC	158	kWh	78.4	MBtu	87.4	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	158	kWh	67.9	MBtu	76.0	MBtu	13.1%
4	WA Seattle	with interior clear panel	Furnace / AC	155	kWh	66.5	MBtu	74.4	MBtu	14.9%
4	WA Seattle	with exterior low-E panel	Furnace / AC	137	kWh	62.6	MBtu	69.9	MBtu	**20.0%**
4	WA Seattle	with interior low-E panel	Furnace / AC	147	kWh	60.9	MBtu	68.2	MBtu	**22.0%**
4	WA Seattle	with exterior clear panel, worst case mounting	Furnace / AC	148	kWh	71.9	MBtu	80.2	MBtu	8.3%
4	WA Seattle	with exterior low-E panel, worst case mounting	Furnace / AC	124	kWh	68.7	MBtu	76.4	MBtu	12.6%
4	DC Washington	Wood frame, single pane	Furnace / AC	1593	kWh	100.4	MBtu	127.9	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1420	kWh	79.6	MBtu	103.2	MBtu	19.3%
4	DC Washington	with interior clear panel	Furnace / AC	1419	kWh	78.4	MBtu	101.9	MBtu	20.3%
4	DC Washington	with exterior low-E panel	Furnace / AC	1316	kWh	75.5	MBtu	97.6	MBtu	**23.7%**
4	DC Washington	with interior low-E panel	Furnace / AC	1381	kWh	72.5	MBtu	95.0	MBtu	**25.7%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1119	kWh	79.1	MBtu	99.2	MBtu	**22.4%**
4	DC Washington	Wood frame, double pane	Furnace / AC	1494	kWh	84.2	MBtu	109.1	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1376	kWh	78.8	MBtu	101.8	MBtu	6.6%
4	DC Washington	with interior clear panel	Furnace / AC	1401	kWh	77.4	MBtu	100.6	MBtu	7.8%
4	DC Washington	with exterior low-E panel	Furnace / AC	1277	kWh	75.4	MBtu	97.0	MBtu	**11.1%**
4	DC Washington	with interior low-E panel	Furnace / AC	1351	kWh	73	MBtu	95.2	MBtu	**12.7%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1091	kWh	78.9	MBtu	98.7	MBtu	**9.5%**
4	DC Washington	Metal frame, double pane	Furnace / AC	1452	kWh	92.7	MBtu	117.9	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1411	kWh	82	MBtu	105.7	MBtu	10.3%
4	DC Washington	with interior clear panel	Furnace / AC	1390	kWh	80.6	MBtu	104.0	MBtu	11.8%
4	DC Washington	with exterior low-E panel	Furnace / AC	1309	kWh	77.2	MBtu	99.3	MBtu	**15.7%**
4	DC Washington	with interior low-E panel	Furnace / AC	1341	kWh	75.3	MBtu	97.6	MBtu	**17.2%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1116	kWh	80.8	MBtu	101.0	MBtu	**14.3%**
4	DC Washington	with exterior clear panel, worst case mounting	Furnace / AC	1383	kWh	86.1	MBtu	109.9	MBtu	6.8%
4	DC Washington	with exterior low-E panel, worst case mounting	Furnace / AC	1284	kWh	83.4	MBtu	105.8	MBtu	10.2%
4	DC Washington	with exterior solar-E panel, worst case mount	Furnace / AC	1121	kWh	86.4	MBtu	107.2	MBtu	9.1%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
4	WA Seattle	Wood frame, single pane	16.03	895.94	911.96	--	--	--	--	
4	WA Seattle	with exterior clear panel	13.94	682.12	696.06	$215.91	23.7%	$0.85	9.4	
4	WA Seattle	with interior clear panel	14.11	670.65	684.76	$227.20	24.9%	$0.89	10.1	
4	WA Seattle	with exterior low-E panel	12.28	635.19	647.47	$264.50	**29.0%**	$1.04	**8.7**	**5.2**
4	WA Seattle	with interior low-E panel	14.02	607.03	621.05	$290.91	**31.9%**	$1.14	**8.8**	**4.0**
4	WA Seattle	Wood frame, double pane	15.07	730.10	745.17	--	--	--	--	
4	WA Seattle	with exterior clear panel	13.07	673.78	686.84	$58.33	7.8%	$0.23	35.0	
4	WA Seattle	with interior clear panel	13.85	660.22	674.07	$71.10	9.5%	$0.28	32.3	
4	WA Seattle	with exterior low-E panel	11.32	633.10	644.42	$100.74	**13.5%**	$0.40	**22.8**	**6.0**
4	WA Seattle	with interior low-E panel	13.24	611.20	624.44	$120.73	**16.2%**	$0.47	**21.1**	**5.1**
4	WA Seattle	Metal frame, double pane	13.76	817.71	831.47	--	--	--	--	
4	WA Seattle	with exterior clear panel	13.76	708.20	721.96	$109.52	13.2%	$0.43	18.6	
4	WA Seattle	with interior clear panel	13.50	693.60	707.10	$124.38	15.0%	$0.49	18.5	
4	WA Seattle	with exterior low-E panel	11.93	652.92	664.85	$166.62	**20.0%**	$0.65	**13.8**	**4.5**
4	WA Seattle	with interior low-E panel	12.80	635.19	647.99	$183.48	**22.1%**	$0.72	**13.9**	**4.3**
4	WA Seattle	with exterior clear panel, worst case mounting	12.89	749.92	762.81	$68.67	8.3%	$0.27	29.7	
4	WA Seattle	with exterior low-E panel, worst case mounting	10.80	716.54	727.34	$104.13	12.5%	$0.41	22.0	
4	DC Washington	Wood frame, single pane	203.59	1221.87	1425.45	--	--	--	--	
4	DC Washington	with exterior clear panel	181.48	968.73	1150.21	$275.25	19.3%	$1.08	7.4	
4	DC Washington	with interior clear panel	181.35	954.13	1135.48	$289.98	20.3%	$1.14	7.9	
4	DC Washington	with exterior low-E panel	168.18	918.84	1087.02	$338.43	**23.7%**	$1.33	**6.8**	**4.0**
4	DC Washington	with interior low-E panel	176.49	882.33	1058.82	$366.64	**25.7%**	$1.44	**7.0**	**3.3**
4	DC Washington	with exterior solar-E panel	143.01	962.65	1105.66	$319.80	**22.4%**	$1.25	**7.2**	**5.7**
4	DC Washington	Wood frame, double pane	190.93	1024.71	1215.65	--	--	--	--	
4	DC Washington	with exterior clear panel	175.85	959.00	1134.85	$80.80	6.6%	$0.32	25.2	
4	DC Washington	with interior clear panel	179.05	941.96	1121.01	$94.64	7.8%	$0.37	24.2	
4	DC Washington	with exterior low-E panel	163.20	917.62	1080.82	$134.83	**11.1%**	$0.53	**17.0**	**4.7**
4	DC Washington	with interior low-E panel	172.66	888.41	1061.07	$154.58	**12.7%**	$0.61	**16.5**	**4.3**
4	DC Washington	with exterior solar-E panel	139.43	960.21	1099.64	$116.00	**9.5%**	$0.45	**19.8**	**7.2**
4	DC Washington	Metal frame, double pane	185.57	1128.16	1313.72	--	--	--	--	
4	DC Washington	with exterior clear panel	180.33	997.94	1178.27	$135.46	10.3%	$0.53	15.1	
4	DC Washington	with interior clear panel	177.64	980.90	1158.54	$155.18	11.8%	$0.61	14.8	
4	DC Washington	with exterior low-E panel	167.29	939.52	1106.81	$206.91	**15.7%**	$0.81	**11.1**	**3.6**
4	DC Washington	with interior low-E panel	171.38	916.40	1087.78	$225.94	**17.2%**	$0.89	**11.3**	**3.6**
4	DC Washington	with exterior solar-E panel	142.62	983.34	1125.96	$187.76	**14.3%**	$0.74	**12.2**	**4.9**
4	DC Washington	with exterior clear panel, worst case mounting	176.75	1047.84	1224.58	$89.14	6.8%	$0.35	22.9	
4	DC Washington	with exterior low-E panel, worst case mounting	164.10	1014.98	1179.07	$134.65	10.2%	$0.53	17.0	
4	DC Washington	with exterior solar-E panel, worst case mounting	143.26	1051.49	1194.75	$118.97	9.1%	$0.47	19.3	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
4	MO Kansas City	Wood frame, single pane	Furnace / AC	2235	kWh	95.7	MBtu	130.2	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	1955	kWh	73	MBtu	102.2	MBtu	21.5%
4	MO Kansas City	with interior clear panel	Furnace / AC	1947	kWh	71.8	MBtu	100.8	MBtu	22.6%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	1815	kWh	68.6	MBtu	95.8	MBtu	**26.4%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	1895	kWh	65.6	MBtu	93.4	MBtu	**28.3%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1561	kWh	72.2	MBtu	96.8	MBtu	**25.7%**
4	MO Kansas City	Wood frame, double pane	Furnace / AC	2061	kWh	78	MBtu	108.8	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	1900	kWh	72.1	MBtu	100.5	MBtu	7.6%
4	MO Kansas City	with interior clear panel	Furnace / AC	1928	kWh	70.5	MBtu	99.1	MBtu	8.9%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	1764	kWh	68.5	MBtu	95.1	MBtu	**12.7%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	1858	kWh	66	MBtu	93.4	MBtu	**14.2%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1525	kWh	71.9	MBtu	96.0	MBtu	**11.8%**
4	MO Kansas City	Metal frame, double pane	Furnace / AC	2021	kWh	86.8	MBtu	118.0	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	1950	kWh	75.4	MBtu	104.7	MBtu	11.2%
4	MO Kansas City	with interior clear panel	Furnace / AC	1919	kWh	73.9	MBtu	102.7	MBtu	12.9%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	1807	kWh	70.4	MBtu	97.6	MBtu	**17.3%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	1843	kWh	68.4	MBtu	95.9	MBtu	**18.8%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1560	kWh	73.9	MBtu	98.6	MBtu	**16.4%**
4	MO Kansas City	with exterior clear panel, worst case mounting	Furnace / AC	1919	kWh	79.7	MBtu	109.1	MBtu	7.6%
4	MO Kansas City	with exterior low-E panel, worst case mounting	Furnace / AC	1780	kWh	76.8	MBtu	104.3	MBtu	11.6%
4	MO Kansas City	with exterior solar-E panel, worst case mountin	Furnace / AC	1574	kWh	79.8	MBtu	105.2	MBtu	10.8%
4	NC Raleigh	Wood frame, single pane	Furnace / AC	2682	kWh	88.9	MBtu	127.9	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2444	kWh	73.4	MBtu	108.2	MBtu	15.4%
4	NC Raleigh	with interior clear panel	Furnace / AC	2438	kWh	72.4	MBtu	107.1	MBtu	16.3%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2312	kWh	70.3	MBtu	103.3	MBtu	**19.2%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2397	kWh	67.8	MBtu	101.6	MBtu	**20.6%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	2066	kWh	73.5	MBtu	104.0	MBtu	**18.7%**
4	NC Raleigh	Wood frame, double pane	Furnace / AC	2545	kWh	76.8	MBtu	113.1	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2390	kWh	72.9	MBtu	107.0	MBtu	5.3%
4	NC Raleigh	with interior clear panel	Furnace / AC	2420	kWh	71.7	MBtu	106.1	MBtu	6.2%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2262	kWh	70.4	MBtu	102.8	MBtu	**9.1%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2360	kWh	68.3	MBtu	101.7	MBtu	**10.1%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	2031	kWh	73.5	MBtu	103.6	MBtu	**8.4%**
4	NC Raleigh	Metal frame, double pane	Furnace / AC	2497	kWh	83.7	MBtu	120.1	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2438	kWh	75.4	MBtu	110.3	MBtu	8.1%
4	NC Raleigh	with interior clear panel	Furnace / AC	2408	kWh	74.4	MBtu	108.9	MBtu	9.3%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2303	kWh	71.7	MBtu	104.7	MBtu	**12.8%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2344	kWh	70.2	MBtu	103.6	MBtu	**13.7%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	2064	kWh	75	MBtu	105.6	MBtu	**12.1%**
4	NC Raleigh	with exterior clear panel, worst case mounting	Furnace / AC	2402	kWh	78.8	MBtu	113.6	MBtu	5.4%
4	NC Raleigh	with exterior low-E panel, worst case mounting	Furnace / AC	2276	kWh	76.8	MBtu	110.0	MBtu	8.4%
4	NC Raleigh	with exterior solar-E panel, worst case mountin	Furnace / AC	2073	kWh	79.5	MBtu	110.6	MBtu	7.9%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
4	MO Kansas City	Wood frame, single pane	236.69	987.62	1224.31	--	--	--	--	
4	MO Kansas City	with exterior clear panel	207.03	753.36	960.39	$263.92	21.6%	$1.03	7.7	
4	MO Kansas City	with interior clear panel	206.19	740.98	947.16	$277.15	22.6%	$1.09	8.3	
4	MO Kansas City	with exterior low-E panel	192.21	707.95	900.16	$324.15	**26.5%**	$1.27	**7.1**	**4.2**
4	MO Kansas City	with interior low-E panel	200.68	676.99	877.67	$346.64	**28.3%**	$1.36	**7.4**	**3.7**
4	MO Kansas City	with exterior solar-E panel	165.31	745.10	910.41	$313.90	**25.6%**	$1.23	**7.3**	**5.1**
4	MO Kansas City	Wood frame, double pane	218.26	804.96	1023.22	--	--	--	--	
4	MO Kansas City	with exterior clear panel	201.21	744.07	945.28	$77.94	7.6%	$0.31	26.2	
4	MO Kansas City	with interior clear panel	204.18	727.56	931.74	$91.48	8.9%	$0.36	25.1	
4	MO Kansas City	with exterior low-E panel	186.81	706.92	893.73	$129.49	**12.7%**	$0.51	**17.7**	**4.9**
4	MO Kansas City	with interior low-E panel	196.76	681.12	877.88	$145.34	**14.2%**	$0.57	**17.5**	**4.7**
4	MO Kansas City	with exterior solar-E panel	161.50	742.01	903.51	$119.71	**11.7%**	$0.47	**19.2**	**6.1**
4	MO Kansas City	Metal frame, double pane	214.02	895.78	1109.80	--	--	--	--	
4	MO Kansas City	with exterior clear panel	206.51	778.13	984.63	$125.17	11.3%	$0.49	16.3	
4	MO Kansas City	with interior clear panel	203.22	762.65	965.87	$143.93	13.0%	$0.56	15.9	
4	MO Kansas City	with exterior low-E panel	191.36	726.53	917.89	$191.91	**17.3%**	$0.75	**12.0**	**3.8**
4	MO Kansas City	with interior low-E panel	195.17	705.89	901.06	$208.74	**18.8%**	$0.82	**12.2**	**3.9**
4	MO Kansas City	with exterior solar-E panel	165.20	762.65	927.85	$181.95	**16.4%**	$0.71	**12.6**	**4.5**
4	MO Kansas City	with exterior clear panel, worst case mounting	203.22	822.50	1025.73	$84.07	7.6%	$0.33	24.3	
4	MO Kansas City	with exterior low-E panel, worst case mounting	188.50	792.58	981.08	$128.72	11.6%	$0.50	17.8	
4	MO Kansas City	with exterior solar-E panel, worst case mounting	166.69	823.54	990.22	$119.58	10.8%	$0.47	19.2	
4	NC Raleigh	Wood frame, single pane	298.24	1027.68	1325.92	--	--	--	--	
4	NC Raleigh	with exterior clear panel	271.77	848.50	1120.28	$205.65	15.5%	$0.81	9.9	
4	NC Raleigh	with interior clear panel	271.11	836.94	1108.05	$217.87	16.4%	$0.85	10.5	
4	NC Raleigh	with exterior low-E panel	257.09	812.67	1069.76	$256.16	**19.3%**	$1.00	**9.0**	**5.0**
4	NC Raleigh	with interior low-E panel	266.55	783.77	1050.31	$275.61	**20.8%**	$1.08	**9.3**	**4.4**
4	NC Raleigh	with exterior solar-E panel	229.74	849.66	1079.40	$246.52	**18.6%**	$0.97	**9.3**	**6.2**
4	NC Raleigh	Wood frame, double pane	283.00	887.81	1170.81	--	--	--	--	
4	NC Raleigh	with exterior clear panel	265.77	842.72	1108.49	$62.32	5.3%	$0.24	32.7	
4	NC Raleigh	with interior clear panel	269.10	828.85	1097.96	$72.86	6.2%	$0.29	31.5	
4	NC Raleigh	with exterior low-E panel	251.53	813.82	1065.36	$105.45	**9.0%**	$0.41	**21.8**	**5.9**
4	NC Raleigh	with interior low-E panel	262.43	789.55	1051.98	$118.83	**10.1%**	$0.47	**21.5**	**5.5**
4	NC Raleigh	with exterior solar-E panel	225.85	849.66	1075.51	$95.30	**8.1%**	$0.37	**24.1**	**7.7**
4	NC Raleigh	Metal frame, double pane	277.67	967.57	1245.24	--	--	--	--	
4	NC Raleigh	with exterior clear panel	271.11	871.62	1142.73	$102.51	8.2%	$0.40	19.9	
4	NC Raleigh	with interior clear panel	267.77	860.06	1127.83	$117.40	9.4%	$0.46	19.5	
4	NC Raleigh	with exterior low-E panel	256.09	828.85	1084.95	$160.29	**12.9%**	$0.63	**14.3**	**4.4**
4	NC Raleigh	with interior low-E panel	260.65	811.51	1072.16	$173.07	**13.9%**	$0.68	**14.7**	**4.6**
4	NC Raleigh	with exterior solar-E panel	229.52	867.00	1096.52	$148.72	**11.9%**	$0.58	**15.4**	**5.5**
4	NC Raleigh	with exterior clear panel, worst case mounting	267.10	910.93	1178.03	$67.21	5.4%	$0.26	30.4	
4	NC Raleigh	with exterior low-E panel, worst case mounting	253.09	887.81	1140.90	$104.34	8.4%	$0.41	22.0	
4	NC Raleigh	with exterior solar-E panel, worst case mounting	230.52	919.02	1149.54	$95.70	7.7%	$0.38	24.0	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
3	GA Atlanta	Wood frame, single pane	Furnace / AC	2904	kWh	43.9	MBtu	81.3	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2696	kWh	31.7	MBtu	65.6	MBtu	19.3%
3	GA Atlanta	with interior clear panel	Furnace / AC	2689	kWh	31	MBtu	64.7	MBtu	20.4%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2566	kWh	29.3	MBtu	61.5	MBtu	**24.4%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2665	kWh	27.4	MBtu	60.5	MBtu	**25.5%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	2288	kWh	31.8	MBtu	61.0	MBtu	**25.0%**
3	GA Atlanta	Wood frame, double pane	Furnace / AC	2790	kWh	34.3	MBtu	69.5	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2640	kWh	31.3	MBtu	64.5	MBtu	7.2%
3	GA Atlanta	with interior clear panel	Furnace / AC	2674	kWh	30.3	MBtu	63.8	MBtu	8.2%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2512	kWh	29.3	MBtu	60.8	MBtu	**12.5%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2621	kWh	27.7	MBtu	60.3	MBtu	**13.2%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	2251	kWh	31.6	MBtu	60.4	MBtu	**13.1%**
3	GA Atlanta	Metal frame, double pane	Furnace / AC	2729	kWh	39.6	MBtu	74.6	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2685	kWh	33.2	MBtu	67.1	MBtu	10.0%
3	GA Atlanta	with interior clear panel	Furnace / AC	2657	kWh	32.4	MBtu	65.9	MBtu	11.7%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2558	kWh	30.3	MBtu	62.5	MBtu	**16.3%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2605	kWh	29.1	MBtu	61.7	MBtu	**17.3%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	2285	kWh	32.8	MBtu	62.1	MBtu	**16.8%**
3	GA Atlanta	with exterior clear panel, worst case mounting	Furnace / AC	2644	kWh	35.8	MBtu	69.5	MBtu	6.9%
3	GA Atlanta	with exterior low-E panel, worst case mounting	Furnace / AC	2513	kWh	34.1	MBtu	66.1	MBtu	11.4%
3	GA Atlanta	with exterior solar-E panel, worst case mountin	Furnace / AC	2283	kWh	36.4	MBtu	66.0	MBtu	11.6%
3	TX Fort Worth	Wood frame, single pane	Furnace / AC	4607	kWh	33.7	MBtu	89.7	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	4130	kWh	22.9	MBtu	72.4	MBtu	19.3%
3	TX Fort Worth	with interior clear panel	Furnace / AC	4112	kWh	22.3	MBtu	71.6	MBtu	20.2%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3910	kWh	20.9	MBtu	67.7	MBtu	**24.5%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3990	kWh	19.3	MBtu	66.9	MBtu	**25.4%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3544	kWh	23.2	MBtu	66.0	MBtu	**26.4%**
3	TX Fort Worth	Wood frame, double pane	Furnace / AC	4304	kWh	25.2	MBtu	76.9	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	4054	kWh	22.6	MBtu	71.2	MBtu	7.4%
3	TX Fort Worth	with interior clear panel	Furnace / AC	4091	kWh	21.8	MBtu	70.8	MBtu	8.0%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3839	kWh	20.9	MBtu	66.9	MBtu	**13.0%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3943	kWh	19.6	MBtu	66.7	MBtu	**13.3%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3492	kWh	23.1	MBtu	65.3	MBtu	**15.1%**
3	TX Fort Worth	Metal frame, double pane	Furnace / AC	4285	kWh	29.7	MBtu	81.6	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	4141	kWh	24.2	MBtu	74.0	MBtu	9.4%
3	TX Fort Worth	with interior clear panel	Furnace / AC	4086	kWh	23.5	MBtu	72.6	MBtu	11.1%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3910	kWh	21.8	MBtu	68.7	MBtu	**15.8%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3960	kWh	20.8	MBtu	68.2	MBtu	**16.5%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3553	kWh	24.1	MBtu	67.1	MBtu	**17.8%**
3	TX Fort Worth	with exterior clear panel, worst case mounting	Furnace / AC	4112	kWh	26.4	MBtu	76.0	MBtu	6.8%
3	TX Fort Worth	with exterior low-E panel, worst case mounting	Furnace / AC	3892	kWh	25.1	MBtu	72.1	MBtu	11.7%
3	TX Fort Worth	with exterior solar-E panel, worst case mountin	Furnace / AC	3591	kWh	27.1	MBtu	70.8	MBtu	13.2%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
3	GA Atlanta	Wood frame, single pane	335.99	630.40	966.40	--	--	--	--	
3	GA Atlanta	with exterior clear panel	311.93	455.21	767.14	$199.26	20.6%	$0.78	10.2	
3	GA Atlanta	with interior clear panel	311.12	445.16	756.28	$210.12	21.7%	$0.82	10.9	
3	GA Atlanta	with exterior low-E panel	296.89	420.75	717.63	$248.76	**25.7%**	$0.98	**9.2**	**5.2**
3	GA Atlanta	with interior low-E panel	308.34	393.46	701.80	$264.59	**27.4%**	$1.04	**9.6**	**4.7**
3	GA Atlanta	with exterior solar-E panel	264.72	456.65	721.37	$245.03	**25.4%**	$0.96	**9.4**	**5.6**
3	GA Atlanta	Wood frame, double pane	322.80	492.55	815.35	--	--	--	--	
3	GA Atlanta	with exterior clear panel	305.45	449.47	754.92	$60.44	7.4%	$0.24	33.8	
3	GA Atlanta	with interior clear panel	309.38	435.11	744.49	$70.86	8.7%	$0.28	32.4	
3	GA Atlanta	with exterior low-E panel	290.64	420.75	711.39	$103.96	**12.8%**	$0.41	**22.1**	**5.9**
3	GA Atlanta	with interior low-E panel	303.25	397.77	701.02	$114.33	**14.0%**	$0.45	**22.3**	**5.9**
3	GA Atlanta	with exterior solar-E panel	260.44	453.78	714.22	$101.13	**12.4%**	$0.40	**22.7**	**6.3**
3	GA Atlanta	Metal frame, double pane	315.75	568.66	884.40	--	--	--	--	
3	GA Atlanta	with exterior clear panel	310.65	476.75	787.41	$96.99	11.0%	$0.38	21.0	
3	GA Atlanta	with interior clear panel	307.41	465.26	772.68	$111.72	12.6%	$0.44	20.5	
3	GA Atlanta	with exterior low-E panel	295.96	435.11	731.07	$153.33	**17.3%**	$0.60	**15.0**	**4.5**
3	GA Atlanta	with interior low-E panel	301.40	417.88	719.27	$165.13	**18.7%**	$0.65	**15.4**	**4.8**
3	GA Atlanta	with exterior solar-E panel	264.37	471.01	735.38	$149.02	**16.8%**	$0.58	**15.4**	**4.9**
3	GA Atlanta	with exterior clear panel, worst case mounting	305.91	514.09	820.00	$64.40	7.3%	$0.25	31.7	
3	GA Atlanta	with exterior low-E panel, worst case mounting	290.75	489.68	780.43	$103.97	11.8%	$0.41	22.1	
3	GA Atlanta	with exterior solar-E panel, worst case mounting	264.14	522.70	786.85	$97.55	11.0%	$0.38	23.5	
3	TX Fort Worth	Wood frame, single pane – Natural Gas Heating	544.55	362.95	907.50	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	488.17	246.63	734.80	$172.70	19.0%	$0.68	11.8	
3	TX Fort Worth	with interior clear panel	486.04	240.17	726.21	$181.29	20.0%	$0.71	12.7	
3	TX Fort Worth	with exterior low-E panel	462.16	225.09	687.26	$220.24	**24.3%**	$0.86	**10.4**	**5.4**
3	TX Fort Worth	with interior low-E panel	471.62	207.86	679.48	$228.02	**25.1%**	$0.89	**11.2**	**5.5**
3	TX Fort Worth	with exterior solar-E panel	418.90	249.86	668.76	$238.73	**26.3%**	$0.94	**9.6**	**3.9**
3	TX Fort Worth	Wood frame, double pane – Natural Gas Heating	508.73	271.40	780.14	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	479.18	243.40	722.58	$57.55	7.4%	$0.23	35.4	
3	TX Fort Worth	with interior clear panel	483.56	234.79	718.34	$61.79	7.9%	$0.24	37.1	
3	TX Fort Worth	with exterior low-E panel	453.77	225.09	678.86	$101.27	**13.0%**	$0.40	**22.7**	**5.8**
3	TX Fort Worth	with interior low-E panel	466.06	211.09	677.15	$102.98	**13.2%**	$0.40	**24.8**	**6.2**
3	TX Fort Worth	with exterior solar-E panel	412.75	248.79	661.54	$118.60	**15.2%**	$0.47	**19.4**	**4.2**
3	TX Fort Worth	Metal frame, double pane – Natural Gas Heating	506.49	319.87	826.36	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	489.47	260.63	750.10	$76.26	9.2%	$0.30	26.8	
3	TX Fort Worth	with interior clear panel	482.97	253.10	736.06	$90.30	10.9%	$0.35	25.4	
3	TX Fort Worth	with exterior low-E panel	462.16	234.79	696.95	$129.41	**15.7%**	$0.51	**17.7**	**4.8**
3	TX Fort Worth	with interior low-E panel	468.07	224.02	692.09	$134.27	**16.2%**	$0.53	**19.0**	**5.8**
3	TX Fort Worth	with exterior solar-E panel	419.96	259.56	679.52	$146.83	**17.8%**	$0.58	**15.6**	**3.6**
3	TX Fort Worth	with exterior clear panel, worst case mounting	486.04	284.33	770.37	$55.99	6.8%	$0.22	36.4	
3	TX Fort Worth	with exterior low-E panel, worst case mounting	460.03	270.33	730.36	$95.99	11.6%	$0.38	23.9	
3	TX Fort Worth	with exterior solar-E panel, worst case mounting	424.46	291.87	716.32	$110.03	13.3%	$0.43	20.9	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
3	TX Fort Worth	Wood frame, single pane	Heat pump / AC	4607	kWh	2857	kWh	85.7	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	4130	kWh	2115	kWh	71.7	MBtu	16.3%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	4112	kWh	2074	kWh	71.0	MBtu	17.1%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3910	kWh	1970	kWh	67.5	MBtu	**21.2%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3990	kWh	1841	kWh	67.0	MBtu	**21.9%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3544	kWh	2123	kWh	65.1	MBtu	**24.1%**
3	TX Fort Worth	Wood frame, double pane	Heat pump / AC	4304	kWh	2279	kWh	75.6	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	4054	kWh	2087	kWh	70.5	MBtu	6.7%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	4091	kWh	2037	kWh	70.4	MBtu	6.9%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3839	kWh	1970	kWh	66.7	MBtu	**11.8%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3943	kWh	1856	kWh	66.6	MBtu	**11.9%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3492	kWh	2117	kWh	64.4	MBtu	**14.8%**
3	TX Fort Worth	Metal frame, double pane	Heat pump / AC	4285	kWh	2569	kWh	78.7	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	4141	kWh	2202	kWh	72.8	MBtu	7.5%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	4086	kWh	2152	kWh	71.6	MBtu	9.0%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3910	kWh	2032	kWh	68.2	MBtu	**13.3%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3960	kWh	1961	kWh	68.0	MBtu	**13.6%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3553	kWh	2186	kWh	65.9	MBtu	**16.3%**
3	TX Fort Worth	with exterior clear panel, worst case mounting	Heat pump / AC	4112	kWh	2345	kWh	74.1	MBtu	5.8%
3	TX Fort Worth	with exterior low-E panel, worst case mounting	Heat pump / AC	3892	kWh	2251	kWh	70.5	MBtu	10.4%
3	TX Fort Worth	with exterior solar-E panel, worst case mountin	Heat pump / AC	3591	kWh	2382	kWh	68.6	MBtu	12.9%
2	AZ Phoenix	Wood frame, single pane	Heat pump / AC	8512	kWh	1105	kWh	110.4	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	7591	kWh	791	kWh	96.2	MBtu	12.8%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	7559	kWh	775	kWh	95.7	MBtu	13.3%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	7157	kWh	724	kWh	90.5	MBtu	**18.1%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	7295	kWh	677	kWh	91.5	MBtu	**17.1%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	6634	kWh	800	kWh	85.4	MBtu	**22.7%**
2	AZ Phoenix	Wood frame, double pane	Heat pump / AC	7903	kWh	860	kWh	100.6	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	7470	kWh	782	kWh	94.7	MBtu	5.8%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	7516	kWh	756	kWh	95.0	MBtu	5.6%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	7042	kWh	725	kWh	89.2	MBtu	**11.4%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	7225	kWh	685	kWh	90.8	MBtu	**9.7%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	6549	kWh	799	kWh	84.4	MBtu	**16.1%**
2	AZ Phoenix	Metal frame, double pane	Heat pump / AC	8016	kWh	1002	kWh	103.5	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	7669	kWh	834	kWh	97.6	MBtu	5.7%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	7571	kWh	813	kWh	96.3	MBtu	7.0%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	7191	kWh	752	kWh	91.2	MBtu	**11.9%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	7249	kWh	722	kWh	91.5	MBtu	**11.6%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	6679	kWh	834	kWh	86.3	MBtu	**16.7%**
2	AZ Phoenix	with exterior clear panel, worst case mounting	Heat pump / AC	7691	kWh	905	kWh	98.7	MBtu	4.7%
2	AZ Phoenix	with exterior low-E panel, worst case mounting	Heat pump / AC	7277	kWh	858	kWh	93.4	MBtu	9.8%
2	AZ Phoenix	with exterior solar-E panel, worst case mountin	Heat pump / AC	6841	kWh	929	kWh	89.2	MBtu	13.8%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
3	TX Fort Worth	Wood frame, single pane – Heat Pump Heating	544.55	337.70	882.24	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	488.17	249.99	738.16	$144.09	16.3%	$0.57	14.2	
3	TX Fort Worth	with interior clear panel	486.04	245.15	731.19	$151.06	17.1%	$0.59	15.2	
3	TX Fort Worth	with exterior low-E panel	462.16	232.85	695.02	$187.23	**21.2%**	$0.73	**12.3**	**5.9**
3	TX Fort Worth	with interior low-E panel	471.62	217.61	689.22	$193.02	**21.9%**	$0.76	**13.2**	**6.1**
3	TX Fort Worth	with exterior solar-E panel	418.90	250.94	669.84	$212.41	**24.1%**	$0.83	**10.8**	**3.7**
3	TX Fort Worth	Wood frame, double pane – Heat Pump Heating	508.73	269.38	778.11	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	479.18	246.68	725.87	$52.24	6.7%	$0.20	39.0	
3	TX Fort Worth	with interior clear panel	483.56	240.77	724.33	$53.78	6.9%	$0.21	42.7	
3	TX Fort Worth	with exterior low-E panel	453.77	232.85	686.62	$91.49	**11.8%**	$0.36	**25.1**	**6.5**
3	TX Fort Worth	with interior low-E panel	466.06	219.38	685.44	$92.67	**11.9%**	$0.36	**27.5**	**6.6**
3	TX Fort Worth	with exterior solar-E panel	412.75	250.23	662.98	$115.13	**14.8%**	$0.45	**19.9**	**4.1**
3	TX Fort Worth	Metal frame, double pane – Heat Pump Heating	506.49	303.66	810.14	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	489.47	260.28	749.74	$60.40	7.5%	$0.24	33.8	
3	TX Fort Worth	with interior clear panel	482.97	254.37	737.33	$72.81	9.0%	$0.29	31.5	
3	TX Fort Worth	with exterior low-E panel	462.16	240.18	702.34	$107.80	**13.3%**	$0.42	**21.3**	**5.4**
3	TX Fort Worth	with interior low-E panel	468.07	231.79	699.86	$110.28	**13.6%**	$0.43	**23.1**	**6.8**
3	TX Fort Worth	with exterior solar-E panel	419.96	258.39	678.35	$131.79	**16.3%**	$0.52	**17.4**	**3.6**
3	TX Fort Worth	with exterior clear panel, worst case mounting	486.04	277.18	763.22	$46.93	5.8%	$0.18	43.5	
3	TX Fort Worth	with exterior low-E panel, worst case mounting	460.03	266.07	726.10	$84.04	10.4%	$0.33	27.3	
3	TX Fort Worth	with exterior solar-E panel, worst case mounting	424.46	281.55	706.01	$104.13	12.9%	$0.41	22.0	
2	AZ Phoenix	Wood frame, single pane	1019.74	132.38	1152.12	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	909.40	94.76	1004.16	$147.95	12.8%	$0.58	13.8	
2	AZ Phoenix	with interior clear panel	905.57	92.85	998.41	$153.70	13.3%	$0.60	14.9	
2	AZ Phoenix	with exterior low-E panel	857.41	86.74	944.14	$207.97	**18.1%**	$0.82	**11.0**	**4.2**
2	AZ Phoenix	with interior low-E panel	873.94	81.10	955.05	$197.07	**17.1%**	$0.77	**12.9**	**5.9**
2	AZ Phoenix	with exterior solar-E panel	794.75	95.84	890.59	$261.52	**22.7%**	$1.03	**8.8**	**2.2**
2	AZ Phoenix	Wood frame, double pane	946.78	103.03	1049.81	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	894.91	93.68	988.59	$61.22	5.8%	$0.24	33.3	
2	AZ Phoenix	with interior clear panel	900.42	90.57	990.99	$58.82	5.6%	$0.23	39.0	
2	AZ Phoenix	with exterior low-E panel	843.63	86.86	930.49	$119.32	**11.4%**	$0.47	**19.2**	**4.4**
2	AZ Phoenix	with interior low-E panel	865.56	82.06	947.62	$102.19	**9.7%**	$0.40	**25.0**	**5.9**
2	AZ Phoenix	with exterior solar-E panel	784.57	95.72	880.29	$169.52	**16.1%**	$0.66	**13.5**	**2.4**
2	AZ Phoenix	Metal frame, double pane	960.32	120.04	1080.36	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	918.75	99.91	1018.66	$61.70	5.7%	$0.24	33.1	
2	AZ Phoenix	with interior clear panel	907.01	97.40	1004.40	$75.95	7.0%	$0.30	30.2	
2	AZ Phoenix	with exterior low-E panel	861.48	90.09	951.57	$128.79	**11.9%**	$0.51	**17.8**	**3.8**
2	AZ Phoenix	with interior low-E panel	868.43	86.50	954.93	$125.43	**11.6%**	$0.49	**20.3**	**5.2**
2	AZ Phoenix	with exterior solar-E panel	800.14	99.91	900.06	$180.30	**16.7%**	$0.71	**12.7**	**2.2**
2	AZ Phoenix	with exterior clear panel, worst case mounting	921.38	108.42	1029.80	$50.56	4.7%	$0.20	40.4	
2	AZ Phoenix	with exterior low-E panel, worst case mounting	871.78	102.79	974.57	$105.78	9.8%	$0.41	21.7	
2	AZ Phoenix	with exterior solar-E panel, worst case mounting	819.55	111.29	930.85	$149.51	13.8%	$0.59	15.4	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
2	FL Jacksonville	Wood frame, single pane	Heat pump / AC	4829	kWh	1635	kWh	74.2	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4379	kWh	1207	kWh	64.1	MBtu	13.6%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	4363	kWh	1184	kWh	63.7	MBtu	14.2%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	4171	kWh	1122	kWh	60.8	MBtu	**18.1%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	4304	kWh	1053	kWh	61.5	MBtu	**17.1%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3782	kWh	1223	kWh	57.5	MBtu	**22.6%**
2	FL Jacksonville	Wood frame, double pane	Heat pump / AC	4553	kWh	1301	kWh	67.2	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4300	kWh	1195	kWh	63.1	MBtu	6.1%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	4338	kWh	1163	kWh	63.2	MBtu	6.0%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	4101	kWh	1123	kWh	60.0	MBtu	**10.8%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	4248	kWh	1065	kWh	61.0	MBtu	**9.2%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3731	kWh	1221	kWh	56.9	MBtu	**15.4%**
2	FL Jacksonville	Metal frame, double pane	Heat pump / AC	4491	kWh	1487	kWh	68.6	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4375	kWh	1264	kWh	64.7	MBtu	5.7%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	4324	kWh	1235	kWh	63.8	MBtu	7.0%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	4168	kWh	1162	kWh	61.2	MBtu	**10.8%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	4224	kWh	1116	kWh	61.3	MBtu	**10.7%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3783	kWh	1262	kWh	57.9	MBtu	**15.6%**
2	FL Jacksonville	with exterior clear panel, worst case mounting	Heat pump / AC	4327	kWh	1353	kWh	65.2	MBtu	5.0%
2	FL Jacksonville	with exterior low-E panel, worst case mounting	Heat pump / AC	4127	kWh	1297	kWh	62.3	MBtu	9.3%
2	FL Jacksonville	with exterior solar-E panel, worst case mountin	Heat pump / AC	3805	kWh	1384	kWh	59.6	MBtu	13.2%
2	TX Houston	Wood frame, single pane	Furnace / AC	4945	kWh	21.4	MBtu	80.1	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4459	kWh	14.4	MBtu	66.9	MBtu	16.5%
2	TX Houston	with interior clear panel	Furnace / AC	4437	kWh	14	MBtu	66.2	MBtu	17.4%
2	TX Houston	with exterior low-E panel	Furnace / AC	4245	kWh	13	MBtu	62.9	MBtu	**21.5%**
2	TX Houston	with interior low-E panel	Furnace / AC	4371	kWh	12	MBtu	63.3	MBtu	**21.0%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3839	kWh	14.3	MBtu	59.7	MBtu	**25.5%**
2	TX Houston	Wood frame, double pane	Furnace / AC	4646	kWh	15.9	MBtu	70.7	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4378	kWh	14.2	MBtu	65.8	MBtu	7.0%
2	TX Houston	with interior clear panel	Furnace / AC	4415	kWh	13.7	MBtu	65.7	MBtu	7.1%
2	TX Houston	with exterior low-E panel	Furnace / AC	4164	kWh	13	MBtu	62.0	MBtu	**12.3%**
2	TX Houston	with interior low-E panel	Furnace / AC	4317	kWh	12.2	MBtu	62.9	MBtu	**11.1%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3783	kWh	14.2	MBtu	58.9	MBtu	**16.6%**
2	TX Houston	Metal frame, double pane	Furnace / AC	4589	kWh	18.8	MBtu	73.2	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4457	kWh	15.2	MBtu	67.8	MBtu	7.4%
2	TX Houston	with interior clear panel	Furnace / AC	4401	kWh	14.7	MBtu	66.6	MBtu	9.1%
2	TX Houston	with exterior low-E panel	Furnace / AC	4237	kWh	13.6	MBtu	63.5	MBtu	**13.3%**
2	TX Houston	with interior low-E panel	Furnace / AC	4290	kWh	12.9	MBtu	63.3	MBtu	**13.5%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3840	kWh	14.9	MBtu	60.4	MBtu	**17.6%**
2	TX Houston	with exterior clear panel, worst case mounting	Furnace / AC	4412	kWh	16.6	MBtu	68.8	MBtu	6.1%
2	TX Houston	with exterior low-E panel, worst case mounting	Furnace / AC	4197	kWh	15.7	MBtu	65.3	MBtu	10.8%
2	TX Houston	with exterior solar-E panel, worst case mountin	Furnace / AC	3863	kWh	16.8	MBtu	62.7	MBtu	14.4%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
2	FL Jacksonville	Wood frame, single pane	578.51	195.87	774.39	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	524.60	144.60	669.20	$105.18	13.6%	$0.41	19.4	
2	FL Jacksonville	with interior clear panel	522.69	141.84	664.53	$109.86	14.2%	$0.43	20.9	
2	FL Jacksonville	with exterior low-E panel	499.69	134.42	634.10	$140.29	**18.1%**	$0.55	**16.4**	**7.3**
2	FL Jacksonville	with interior low-E panel	515.62	126.15	641.77	$132.62	**17.1%**	$0.52	**19.2**	**11.2**
2	FL Jacksonville	with exterior solar-E panel	453.08	146.52	599.60	$174.79	**22.6%**	$0.69	**13.1**	**3.7**
2	FL Jacksonville	Wood frame, double pane	545.45	155.86	701.31	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	515.14	143.16	658.30	$43.01	6.1%	$0.17	47.4	
2	FL Jacksonville	with interior clear panel	519.69	139.33	659.02	$42.29	6.0%	$0.17	54.3	
2	FL Jacksonville	with exterior low-E panel	491.30	134.54	625.84	$75.47	**10.8%**	$0.30	**30.4**	**7.9**
2	FL Jacksonville	with interior low-E panel	508.91	127.59	636.50	$64.81	**9.2%**	$0.25	**39.3**	**11.3**
2	FL Jacksonville	with exterior solar-E panel	446.97	146.28	593.25	$108.06	**15.4%**	$0.42	**21.2**	**3.9**
2	FL Jacksonville	Metal frame, double pane	538.02	178.14	716.16	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	524.13	151.43	675.55	$40.61	5.7%	$0.16	50.2	
2	FL Jacksonville	with interior clear panel	518.02	147.95	665.97	$50.20	7.0%	$0.20	45.7	
2	FL Jacksonville	with exterior low-E panel	499.33	139.21	638.53	$77.63	**10.8%**	$0.30	**29.6**	**6.9**
2	FL Jacksonville	with interior low-E panel	506.04	133.70	639.73	$76.43	**10.7%**	$0.30	**33.4**	**9.7**
2	FL Jacksonville	with exterior solar-E panel	453.20	151.19	604.39	$111.77	**15.6%**	$0.44	**20.5**	**3.6**
2	FL Jacksonville	with exterior clear panel, worst case mounting	518.37	162.09	680.46	$35.70	5.0%	$0.14	57.1	
2	FL Jacksonville	with exterior low-E panel, worst case mounting	494.41	155.38	649.80	$66.37	9.3%	$0.26	34.6	
2	FL Jacksonville	with exterior solar-E panel, worst case mounting	455.84	165.80	621.64	$94.52	13.2%	$0.37	24.3	
2	TX Houston	Wood frame, single pane – Natural Gas Heating	584.50	230.48	814.98	--	--	--	--	
2	TX Houston	with exterior clear panel	527.05	155.09	682.14	$132.84	16.3%	$0.52	15.4	
2	TX Houston	with interior clear panel	524.45	150.78	675.23	$139.74	17.1%	$0.55	16.4	
2	TX Houston	with exterior low-E panel	501.76	140.01	641.77	$173.21	**21.3%**	$0.68	**13.2**	**6.3**
2	TX Houston	with interior low-E panel	516.65	129.24	645.89	$169.08	**20.7%**	$0.66	**15.1**	**8.7**
2	TX Houston	with exterior solar-E panel	453.77	154.01	607.78	$207.20	**25.4%**	$0.81	**11.1**	**3.4**
2	TX Houston	Wood frame, double pane – Natural Gas Heating	549.16	171.24	720.40	--	--	--	--	
2	TX Houston	with exterior clear panel	517.48	152.93	670.41	$49.99	6.9%	$0.20	40.8	
2	TX Houston	with interior clear panel	521.85	147.55	669.40	$51.00	7.1%	$0.20	45.0	
2	TX Houston	with exterior low-E panel	492.18	140.01	632.19	$88.21	**12.2%**	$0.35	**26.0**	**6.7**
2	TX Houston	with interior low-E panel	510.27	131.39	641.66	$78.74	**10.9%**	$0.31	**32.4**	**9.2**
2	TX Houston	with exterior solar-E panel	447.15	152.93	600.08	$120.32	**16.7%**	$0.47	**19.1**	**3.6**
2	TX Houston	Metal frame, double pane – Natural Gas Heating	542.42	202.48	744.90	--	--	--	--	
2	TX Houston	with exterior clear panel	526.82	163.70	690.52	$54.37	7.3%	$0.21	37.5	
2	TX Houston	with interior clear panel	520.20	158.32	678.52	$66.38	8.9%	$0.26	34.6	
2	TX Houston	with exterior low-E panel	500.81	146.47	647.29	$97.61	**13.1%**	$0.38	**23.5**	**5.9**
2	TX Houston	with interior low-E panel	507.08	138.93	646.01	$98.88	**13.3%**	$0.39	**25.8**	**7.8**
2	TX Houston	with exterior solar-E panel	453.89	160.47	614.36	$130.53	**17.5%**	$0.51	**17.6**	**3.3**
2	TX Houston	with exterior clear panel, worst case mounting	521.50	178.78	700.28	$44.62	6.0%	$0.17	45.7	
2	TX Houston	with exterior low-E panel, worst case mounting	496.09	169.09	665.17	$79.72	10.7%	$0.31	28.8	
2	TX Houston	with exterior solar-E panel, worst case mounting	456.61	180.94	637.54	$107.35	14.4%	$0.42	21.4	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
2	TX Houston	Wood frame, single pane	Heat pump / AC	4945	kWh	1913	kWh	78.7	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4459	kWh	1420	kWh	67.5	MBtu	14.3%
2	TX Houston	with interior clear panel	Heat pump / AC	4437	kWh	1396	kWh	67.0	MBtu	14.9%
2	TX Houston	with exterior low-E panel	Heat pump / AC	4245	kWh	1313	kWh	63.8	MBtu	**19.0%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4371	kWh	1243	kWh	64.5	MBtu	**18.1%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3839	kWh	1404	kWh	60.2	MBtu	**23.5%**
2	TX Houston	Wood frame, double pane	Heat pump / AC	4646	kWh	1530	kWh	70.9	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4378	kWh	1397	kWh	66.3	MBtu	6.5%
2	TX Houston	with interior clear panel	Heat pump / AC	4415	kWh	1368	kWh	66.4	MBtu	6.4%
2	TX Houston	with exterior low-E panel	Heat pump / AC	4165	kWh	1311	kWh	62.9	MBtu	**11.3%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4317	kWh	1252	kWh	63.9	MBtu	**9.8%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3783	kWh	1397	kWh	59.5	MBtu	**16.1%**
2	TX Houston	Metal frame, double pane	Heat pump / AC	4589	kWh	1723	kWh	72.5	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4457	kWh	1475	kWh	68.1	MBtu	6.0%
2	TX Houston	with interior clear panel	Heat pump / AC	4401	kWh	1440	kWh	67.1	MBtu	7.5%
2	TX Houston	with exterior low-E panel	Heat pump / AC	4237	kWh	1356	kWh	64.2	MBtu	**11.4%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4290	kWh	1307	kWh	64.3	MBtu	**11.3%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3840	kWh	1443	kWh	60.7	MBtu	**16.3%**
2	TX Houston	with exterior clear panel, worst case mounting	Heat pump / AC	4412	kWh	1568	kWh	68.7	MBtu	5.3%
2	TX Houston	with exterior low-E panel, worst case mounting	Heat pump / AC	4197	kWh	1497	kWh	65.4	MBtu	9.8%
2	TX Houston	with exterior solar-E panel, worst case mountin	Heat pump / AC	3863	kWh	1576	kWh	62.4	MBtu	13.8%
1	FL Miami	Wood frame, single pane	Heat pump / AC	7601	kWh	79	kWh	88.2	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6920	kWh	43	kWh	79.9	MBtu	9.3%
1	FL Miami	with interior clear panel	Heat pump / AC	6890	kWh	41	kWh	79.6	MBtu	9.8%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6625	kWh	36	kWh	76.5	MBtu	**13.3%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6797	kWh	32	kWh	78.4	MBtu	**11.1%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	6051	kWh	41	kWh	69.9	MBtu	**20.7%**
1	FL Miami	Wood frame, double pane	Heat pump / AC	7193	kWh	50	kWh	83.2	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6813	kWh	42	kWh	78.7	MBtu	5.4%
1	FL Miami	with interior clear panel	Heat pump / AC	6862	kWh	40	kWh	79.2	MBtu	4.7%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6517	kWh	35	kWh	75.2	MBtu	**9.5%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6724	kWh	33	kWh	77.6	MBtu	**6.7%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	5972	kWh	41	kWh	69.0	MBtu	**17.0%**
1	FL Miami	Metal frame, double pane	Heat pump / AC	7100	kWh	65	kWh	82.3	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6921	kWh	47	kWh	80.0	MBtu	2.7%
1	FL Miami	with interior clear panel	Heat pump / AC	6842	kWh	44	kWh	79.1	MBtu	3.9%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6613	kWh	38	kWh	76.4	MBtu	**7.2%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6690	kWh	36	kWh	77.2	MBtu	**6.1%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	6052	kWh	44	kWh	70.0	MBtu	**14.9%**
1	FL Miami	with exterior clear panel, worst case mounting	Heat pump / AC	6855	kWh	54	kWh	79.3	MBtu	3.6%
1	FL Miami	with exterior low-E panel, worst case mounting	Heat pump / AC	6554	kWh	48	kWh	75.8	MBtu	7.9%
1	FL Miami	with exterior solar-E panel, worst case mountin	Heat pump / AC	6068	kWh	55	kWh	70.3	MBtu	14.5%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
2	TX Houston	Wood frame, single pane – Heat Pump Heating	584.50	226.12	810.62	--	--	--	--	
2	TX Houston	with exterior clear panel	527.05	167.84	694.90	$115.72	14.3%	$0.45	17.6	
2	TX Houston	with interior clear panel	524.45	165.01	689.46	$121.16	14.9%	$0.48	18.9	
2	TX Houston	with exterior low-E panel	501.76	155.20	656.96	$153.66	**19.0%**	$0.60	**14.9**	**6.7**
2	TX Houston	with interior low-E panel	516.65	146.92	663.57	$147.04	**18.1%**	$0.58	**17.3**	**9.9**
2	TX Houston	with exterior solar-E panel	453.77	165.95	619.72	$190.89	**23.5%**	$0.75	**12.0**	**3.4**
2	TX Houston	Wood frame, double pane – Heat Pump Heating	549.16	180.85	730.00	--	--	--	--	
2	TX Houston	with exterior clear panel	517.48	165.13	682.61	$47.40	6.5%	$0.19	43.0	
2	TX Houston	with interior clear panel	521.85	161.70	683.55	$46.45	6.4%	$0.18	49.4	
2	TX Houston	with exterior low-E panel	492.30	154.96	647.26	$82.74	**11.3%**	$0.32	**27.7**	**7.2**
2	TX Houston	with interior low-E panel	510.27	147.99	658.26	$71.75	**9.8%**	$0.28	**35.5**	**10.1**
2	TX Houston	with exterior solar-E panel	447.15	165.13	612.28	$117.73	**16.1%**	$0.46	**19.5**	**3.6**
2	TX Houston	Metal frame, double pane – Heat Pump Heating	542.42	203.66	746.08	--	--	--	--	
2	TX Houston	with exterior clear panel	526.82	174.35	701.16	$44.92	6.0%	$0.18	45.4	
2	TX Houston	with interior clear panel	520.20	170.21	690.41	$55.67	7.5%	$0.22	41.2	
2	TX Houston	with exterior low-E panel	500.81	160.28	661.09	$84.99	**11.4%**	$0.33	**27.0**	**6.4**
2	TX Houston	with interior low-E panel	507.08	154.49	661.57	$84.51	**11.3%**	$0.33	**30.2**	**8.8**
2	TX Houston	with exterior solar-E panel	453.89	170.56	624.45	$121.63	**16.3%**	$0.48	**18.9**	**3.3**
2	TX Houston	with exterior clear panel, worst case mounting	521.50	185.34	706.84	$39.24	5.3%	$0.15	52.0	
2	TX Houston	with exterior low-E panel, worst case mounting	496.09	176.95	673.03	$73.05	9.8%	$0.29	31.4	
2	TX Houston	with exterior solar-E panel, worst case mounting	456.61	186.28	642.89	$103.19	13.8%	$0.40	22.2	
1	FL Miami	Wood frame, single pane	910.60	9.46	920.06	--	--	--	--	
1	FL Miami	with exterior clear panel	829.02	5.15	834.17	$85.90	9.3%	$0.34	23.7	
1	FL Miami	with interior clear panel	825.42	4.91	830.33	$89.73	9.8%	$0.35	25.6	
1	FL Miami	with exterior low-E panel	793.68	4.31	797.99	$122.08	**13.3%**	$0.48	**18.8**	**7.0**
1	FL Miami	with interior low-E panel	814.28	3.83	818.11	$101.95	**11.1%**	$0.40	**25.0**	**20.9**
1	FL Miami	with exterior solar-E panel	724.91	4.91	729.82	$190.24	**20.7%**	$0.75	**12.1**	**2.4**
1	FL Miami	Wood frame, double pane	861.72	5.99	867.71	--	--	--	--	
1	FL Miami	with exterior clear panel	816.20	5.03	821.23	$46.48	5.4%	$0.18	43.9	
1	FL Miami	with interior clear panel	822.07	4.79	826.86	$40.85	4.7%	$0.16	56.2	
1	FL Miami	with exterior low-E panel	780.74	4.19	784.93	$82.78	**9.5%**	$0.32	**27.7**	**7.0**
1	FL Miami	with interior low-E panel	805.54	3.95	809.49	$58.22	**6.7%**	$0.23	**43.8**	**14.7**
1	FL Miami	with exterior solar-E panel	715.45	4.91	720.36	$147.35	**17.0%**	$0.58	**15.6**	**2.5**
1	FL Miami	Metal frame, double pane	850.58	7.79	858.37	--	--	--	--	
1	FL Miami	with exterior clear panel	829.14	5.63	834.77	$23.60	2.7%	$0.09	86.4	
1	FL Miami	with interior clear panel	819.67	5.27	824.94	$33.42	3.9%	$0.13	68.7	
1	FL Miami	with exterior low-E panel	792.24	4.55	796.79	$61.58	**7.2%**	$0.24	**37.3**	**6.7**
1	FL Miami	with interior low-E panel	801.46	4.31	805.77	$52.59	**6.1%**	$0.21	**48.5**	**13.3**
1	FL Miami	with exterior solar-E panel	725.03	5.27	730.30	$128.07	**14.9%**	$0.50	**17.9**	**2.4**
1	FL Miami	with exterior clear panel, worst case mounting	821.23	6.47	827.70	$30.67	3.6%	$0.12	66.5	
1	FL Miami	with exterior low-E panel, worst case mounting	785.17	5.75	790.92	$67.45	7.9%	$0.26	34.0	
1	FL Miami	with exterior solar-E panel, worst case mounting	726.95	6.59	733.54	$124.83	14.5%	$0.49	18.4	

LARGER, NEWER HOME (2-story, 2800 ft^2)

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
8	AK Fairbanks	Wood frame, single pane	Furnace / AC	137	kWh	247.8	MBtu	272.2	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	117	kWh	166.7	MBtu	183.4	MBtu	32.6%
8	AK Fairbanks	with interior clear panel	Furnace / AC	119	kWh	162.2	MBtu	178.5	MBtu	34.4%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	98	kWh	149.1	MBtu	163.9	MBtu	**39.8%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	113	kWh	141.2	MBtu	155.5	MBtu	**42.9%**
8	AK Fairbanks	Wood frame, double pane	Furnace / AC	129	kWh	185.7	MBtu	204.3	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	108	kWh	160.8	MBtu	176.8	MBtu	13.4%
8	AK Fairbanks	with interior clear panel	Furnace / AC	115	kWh	156.2	MBtu	171.9	MBtu	15.8%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	90	kWh	146.8	MBtu	161.3	MBtu	**21.0%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	106	kWh	141	MBtu	155.2	MBtu	**24.0%**
8	AK Fairbanks	Metal frame, double pane	Furnace / AC	118	kWh	212.5	MBtu	233.4	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	112	kWh	172.6	MBtu	189.8	MBtu	18.7%
8	AK Fairbanks	with interior clear panel	Furnace / AC	110	kWh	167.2	MBtu	183.8	MBtu	21.2%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	95	kWh	153.9	MBtu	169.1	MBtu	**27.5%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	102	kWh	148.7	MBtu	163.6	MBtu	**29.9%**
8	AK Fairbanks	with exterior clear panel, worst case mounting	Furnace / AC	108	kWh	185.7	MBtu	204.0	MBtu	12.6%
8	AK Fairbanks	with exterior low-E panel, worst case mounting	Furnace / AC	92	kWh	173.9	MBtu	191.0	MBtu	18.2%
7	AK Anchorage	Wood frame, single pane	Furnace / AC	24	kWh	166.7	MBtu	182.3	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	18	kWh	105.8	MBtu	115.7	MBtu	36.5%
7	AK Anchorage	with interior clear panel	Furnace / AC	22	kWh	102.7	MBtu	112.4	MBtu	38.3%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	14	kWh	92.2	MBtu	100.8	MBtu	**44.7%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	19	kWh	86.5	MBtu	94.7	MBtu	**48.1%**
7	AK Anchorage	Wood frame, double pane	Furnace / AC	24	kWh	119.6	MBtu	130.9	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	16	kWh	101.9	MBtu	111.5	MBtu	14.8%
7	AK Anchorage	with interior clear panel	Furnace / AC	19	kWh	98.7	MBtu	108.0	MBtu	17.5%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	14	kWh	90.7	MBtu	99.2	MBtu	**24.2%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	16	kWh	86.5	MBtu	94.6	MBtu	**27.7%**
7	AK Anchorage	Metal frame, double pane	Furnace / AC	17	kWh	141.3	MBtu	154.5	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	17	kWh	111	MBtu	121.4	MBtu	21.4%
7	AK Anchorage	with interior clear panel	Furnace / AC	16	kWh	106.9	MBtu	116.9	MBtu	24.3%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	14	kWh	96	MBtu	105.0	MBtu	**32.0%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	15	kWh	92.2	MBtu	100.9	MBtu	**34.7%**
7	AK Anchorage	with exterior clear panel, worst case mounting	Furnace / AC	16	kWh	121.4	MBtu	132.8	MBtu	14.1%
7	AK Anchorage	with exterior low-E panel, worst case mounting	Furnace / AC	12	kWh	111.8	MBtu	122.2	MBtu	20.9%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
8	AK Fairbanks	Wood frame, single pane	26.45	2143.47	2169.92	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	22.59	1441.96	1464.55	$705.38	32.5%	$1.68	4.8	
8	AK Fairbanks	with interior clear panel	22.98	1403.03	1426.01	$743.92	34.3%	$1.77	5.1	
8	AK Fairbanks	with exterior low-E panel	18.92	1289.72	1308.64	$861.29	**39.7%**	$2.05	**4.4**	**2.7**
8	AK Fairbanks	with interior low-E panel	21.82	1221.38	1243.20	$926.72	**42.7%**	$2.21	**4.5**	**2.3**
8	AK Fairbanks	Wood frame, double pane	24.91	1606.31	1631.21	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	20.85	1390.92	1411.77	$219.44	13.5%	$0.52	15.3	
8	AK Fairbanks	with interior clear panel	22.21	1351.13	1373.34	$257.88	15.8%	$0.61	14.7	
8	AK Fairbanks	with exterior low-E panel	17.38	1269.82	1287.20	$344.02	**21.1%**	$0.82	**11.0**	**3.4**
8	AK Fairbanks	with interior low-E panel	20.47	1219.65	1240.12	$391.10	**24.0%**	$0.93	**10.7**	**3.2**
8	AK Fairbanks	Metal frame, double pane	22.79	1838.13	1860.91	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	21.63	1492.99	1514.62	$346.29	18.6%	$0.82	9.7	
8	AK Fairbanks	with interior clear panel	21.24	1446.28	1467.52	$393.39	21.1%	$0.94	9.6	
8	AK Fairbanks	with exterior low-E panel	18.34	1331.24	1349.58	$511.33	**27.5%**	$1.22	**7.4**	**2.5**
8	AK Fairbanks	with interior low-E panel	19.70	1286.26	1305.95	$554.96	**29.8%**	$1.32	**7.6**	**2.6**
8	AK Fairbanks	with exterior clear panel, worst case mounting	20.85	1606.31	1627.16	$233.75	12.6%	$0.56	14.4	
8	AK Fairbanks	with exterior low-E panel, worst case mounting	17.77	1504.24	1522.00	$338.91	18.2%	$0.81	11.2	
7	AK Anchorage	Wood frame, single pane	4.63	1441.96	1446.59	--	--	--	--	
7	AK Anchorage	with exterior clear panel	3.48	915.17	918.65	$527.94	36.5%	$1.26	6.4	
7	AK Anchorage	with interior clear panel	4.25	888.36	892.60	$553.99	38.3%	$1.32	6.8	
7	AK Anchorage	with exterior low-E panel	2.70	797.53	800.23	$646.36	**44.7%**	$1.54	**5.8**	**3.5**
7	AK Anchorage	with interior low-E panel	3.67	748.23	751.89	$694.70	**48.0%**	$1.65	**6.0**	**3.0**
7	AK Anchorage	Wood frame, double pane	4.63	1034.54	1039.17	--	--	--	--	
7	AK Anchorage	with exterior clear panel	3.09	881.44	884.52	$154.65	14.9%	$0.37	21.7	
7	AK Anchorage	with interior clear panel	3.67	853.76	857.42	$181.75	17.5%	$0.43	20.8	
7	AK Anchorage	with exterior low-E panel	2.70	784.56	787.26	$251.92	**24.2%**	$0.60	**15.0**	**4.3**
7	AK Anchorage	with interior low-E panel	3.09	748.23	751.31	$287.86	**27.7%**	$0.69	**14.6**	**4.0**
7	AK Anchorage	Metal frame, double pane	3.28	1222.25	1225.53	--	--	--	--	
7	AK Anchorage	with exterior clear panel	3.28	960.15	963.43	$262.10	21.4%	$0.62	12.8	
7	AK Anchorage	with interior clear panel	3.09	924.69	927.77	$297.75	24.3%	$0.71	12.7	
7	AK Anchorage	with exterior low-E panel	2.70	830.40	833.10	$392.42	**32.0%**	$0.93	**9.6**	**3.2**
7	AK Anchorage	with interior low-E panel	2.90	797.53	800.43	$425.10	**34.7%**	$1.01	**9.9**	**3.3**
7	AK Anchorage	with exterior clear panel, worst case mounting	3.09	1050.11	1053.20	$172.33	14.1%	$0.41	19.5	
7	AK Anchorage	with exterior low-E panel, worst case mounting	2.32	967.07	969.39	$256.14	20.9%	$0.61	14.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
7	MN Duluth	Wood frame, single pane	Furnace / AC	337	kWh	175.2	MBtu	195.2	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	319	kWh	106.6	MBtu	120.1	MBtu	38.5%
7	MN Duluth	with interior clear panel	Furnace / AC	322	kWh	103	MBtu	116.2	MBtu	40.5%
7	MN Duluth	with exterior low-E panel	Furnace / AC	289	kWh	93.2	MBtu	105.1	MBtu	**46.2%**
7	MN Duluth	with interior low-E panel	Furnace / AC	331	kWh	86.1	MBtu	97.8	MBtu	**49.9%**
7	MN Duluth	Wood frame, double pane	Furnace / AC	331	kWh	121.6	MBtu	136.6	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	301	kWh	102.6	MBtu	115.5	MBtu	15.4%
7	MN Duluth	with interior clear panel	Furnace / AC	319	kWh	98.7	MBtu	111.4	MBtu	18.4%
7	MN Duluth	with exterior low-E panel	Furnace / AC	280	kWh	91.9	MBtu	103.6	MBtu	**24.2%**
7	MN Duluth	with interior low-E panel	Furnace / AC	318	kWh	86.4	MBtu	98.0	MBtu	**28.3%**
7	MN Duluth	Metal frame, double pane	Furnace / AC	296	kWh	145.2	MBtu	162.0	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	307	kWh	112	MBtu	125.8	MBtu	22.3%
7	MN Duluth	with interior clear panel	Furnace / AC	297	kWh	107.6	MBtu	120.9	MBtu	25.3%
7	MN Duluth	with exterior low-E panel	Furnace / AC	286	kWh	97.4	MBtu	109.6	MBtu	**32.3%**
7	MN Duluth	with interior low-E panel	Furnace / AC	307	kWh	92.7	MBtu	104.8	MBtu	**35.3%**
7	MN Duluth	with exterior clear panel, worst case mounting	Furnace / AC	284	kWh	123.4	MBtu	138.0	MBtu	14.8%
7	MN Duluth	with exterior low-E panel, worst case mounting	Furnace / AC	258	kWh	114.4	MBtu	127.9	MBtu	21.0%
6	MN Minneapolis	Wood frame, single pane	Furnace / AC	1161	kWh	137.4	MBtu	163.4	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	1064	kWh	84	MBtu	103.9	MBtu	36.4%
6	MN Minneapolis	with interior clear panel	Furnace / AC	1067	kWh	81.2	MBtu	100.9	MBtu	38.2%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	987	kWh	73.6	MBtu	91.7	MBtu	**43.9%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	1064	kWh	68.1	MBtu	86.6	MBtu	**47.0%**
6	MN Minneapolis	Wood frame, double pane	Furnace / AC	1116	kWh	95.7	MBtu	117.3	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	1025	kWh	81	MBtu	100.2	MBtu	14.6%
6	MN Minneapolis	with interior clear panel	Furnace / AC	1056	kWh	77.9	MBtu	97.2	MBtu	17.2%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	948	kWh	72.7	MBtu	90.3	MBtu	**23.1%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	1030	kWh	68.3	MBtu	86.4	MBtu	**26.3%**
6	MN Minneapolis	Metal frame, double pane	Furnace / AC	1040	kWh	114.2	MBtu	136.6	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	1043	kWh	88.3	MBtu	108.4	MBtu	20.7%
6	MN Minneapolis	with interior clear panel	Furnace / AC	1031	kWh	84.9	MBtu	104.5	MBtu	23.5%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	971	kWh	77	MBtu	95.2	MBtu	**30.3%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	1005	kWh	73.2	MBtu	91.5	MBtu	**33.1%**
6	MN Minneapolis	with exterior clear panel, worst case mounting	Furnace / AC	994	kWh	97.2	MBtu	117.6	MBtu	14.0%
6	MN Minneapolis	with exterior low-E panel, worst case mounting	Furnace / AC	914	kWh	90.2	MBtu	109.0	MBtu	20.2%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
7	MN Duluth	Wood frame, single pane	40.91	1403.35	1444.26	--	--	--	--	
7	MN Duluth	with exterior clear panel	38.73	853.87	892.59	$551.67	38.2%	$1.31	6.1	
7	MN Duluth	with interior clear panel	39.09	825.03	864.12	$580.14	40.2%	$1.38	6.5	
7	MN Duluth	with exterior low-E panel	35.08	746.53	781.62	$662.65	**45.9%**	$1.58	**5.7**	**3.8**
7	MN Duluth	with interior low-E panel	40.18	689.66	729.84	$714.42	**49.5%**	$1.70	**5.9**	**3.1**
7	MN Duluth	Wood frame, double pane	40.18	974.02	1014.20	--	--	--	--	
7	MN Duluth	with exterior clear panel	36.54	821.83	858.37	$155.83	15.4%	$0.37	21.6	
7	MN Duluth	with interior clear panel	38.73	790.59	829.31	$184.89	18.2%	$0.44	20.4	
7	MN Duluth	with exterior low-E panel	33.99	736.12	770.11	$244.09	**24.1%**	$0.58	**15.5**	**4.8**
7	MN Duluth	with interior low-E panel	38.61	692.06	730.67	$283.53	**28.0%**	$0.68	**14.8**	**4.3**
7	MN Duluth	Metal frame, double pane	35.93	1163.05	1198.99	--	--	--	--	
7	MN Duluth	with exterior clear panel	37.27	897.12	934.39	$264.60	22.1%	$0.63	12.7	
7	MN Duluth	with interior clear panel	36.06	861.88	897.93	$301.05	25.1%	$0.72	12.6	
7	MN Duluth	with exterior low-E panel	34.72	780.17	814.89	$384.09	**32.0%**	$0.91	**9.8**	**3.5**
7	MN Duluth	with interior low-E panel	37.27	742.53	779.80	$419.19	**35.0%**	$1.00	**10.0**	**3.6**
7	MN Duluth	with exterior clear panel, worst case mounting	34.48	988.43	1022.91	$176.07	14.7%	$0.42	19.1	
7	MN Duluth	with exterior low-E panel, worst case mounting	31.32	916.34	947.67	$251.32	21.0%	$0.60	15.0	
6	MN Minneapolis	Wood frame, single pane	140.95	1100.57	1241.52	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	129.17	672.84	802.01	$439.51	35.4%	$1.05	7.6	
6	MN Minneapolis	with interior clear panel	129.53	650.41	779.95	$461.57	37.2%	$1.10	8.2	
6	MN Minneapolis	with exterior low-E panel	119.82	589.54	709.36	$532.16	**42.9%**	$1.27	**7.1**	**4.5**
6	MN Minneapolis	with interior low-E panel	129.17	545.48	674.65	$566.87	**45.7%**	$1.35	**7.4**	**4.0**
6	MN Minneapolis	Wood frame, double pane	135.48	766.56	902.04	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	124.44	648.81	773.25	$128.79	14.3%	$0.31	26.1	
6	MN Minneapolis	with interior clear panel	128.20	623.98	752.18	$149.86	16.6%	$0.36	25.2	
6	MN Minneapolis	with exterior low-E panel	115.09	582.33	697.41	$204.63	**22.7%**	$0.49	**18.5**	**5.5**
6	MN Minneapolis	with interior low-E panel	125.04	547.08	672.13	$229.91	**25.5%**	$0.55	**18.3**	**5.2**
6	MN Minneapolis	Metal frame, double pane	126.26	914.74	1041.00	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	126.62	707.28	833.90	$207.09	19.9%	$0.49	16.2	
6	MN Minneapolis	with interior clear panel	125.16	680.05	805.21	$235.79	22.6%	$0.56	16.0	
6	MN Minneapolis	with exterior low-E panel	117.88	616.77	734.65	$306.35	**29.4%**	$0.73	**12.3**	**4.2**
6	MN Minneapolis	with interior low-E panel	122.01	586.33	708.34	$332.66	**32.0%**	$0.79	**12.6**	**4.3**
6	MN Minneapolis	with exterior clear panel, worst case mounting	120.67	778.57	899.24	$141.75	13.6%	$0.34	23.7	
6	MN Minneapolis	with exterior low-E panel, worst case mounting	110.96	722.50	833.46	$207.54	19.9%	$0.49	18.2	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
6	VT Burlington	Wood frame, single pane	Furnace / AC	714	kWh	128.1	MBtu	148.1	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	675	kWh	78.7	MBtu	93.7	MBtu	36.7%
6	VT Burlington	with interior clear panel	Furnace / AC	679	kWh	76.1	MBtu	90.9	MBtu	38.6%
6	VT Burlington	with exterior low-E panel	Furnace / AC	628	kWh	68.7	MBtu	82.2	MBtu	**44.5%**
6	VT Burlington	with interior low-E panel	Furnace / AC	681	kWh	63.5	MBtu	77.2	MBtu	**47.9%**
6	VT Burlington	Wood frame, double pane	Furnace / AC	703	kWh	89.5	MBtu	105.8	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	648	kWh	75.9	MBtu	90.3	MBtu	14.6%
6	VT Burlington	with interior clear panel	Furnace / AC	672	kWh	73.1	MBtu	87.5	MBtu	17.3%
6	VT Burlington	with exterior low-E panel	Furnace / AC	605	kWh	67.8	MBtu	81.0	MBtu	**23.5%**
6	VT Burlington	with interior low-E panel	Furnace / AC	659	kWh	63.7	MBtu	77.1	MBtu	**27.1%**
6	VT Burlington	Metal frame, double pane	Furnace / AC	637	kWh	106.8	MBtu	123.9	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	660	kWh	82.9	MBtu	98.1	MBtu	20.8%
6	VT Burlington	with interior clear panel	Furnace / AC	655	kWh	79.7	MBtu	94.6	MBtu	23.7%
6	VT Burlington	with exterior low-E panel	Furnace / AC	616	kWh	71.8	MBtu	85.5	MBtu	**31.0%**
6	VT Burlington	with interior low-E panel	Furnace / AC	639	kWh	68.4	MBtu	82.0	MBtu	**33.8%**
6	VT Burlington	with exterior clear panel, worst case mounting	Furnace / AC	622	kWh	91.1	MBtu	106.6	MBtu	14.0%
6	VT Burlington	with exterior low-E panel, worst case mounting	Furnace / AC	568	kWh	84.3	MBtu	98.6	MBtu	20.5%
5	CO Denver	Wood frame, single pane	Furnace / AC	1078	kWh	77.8	MBtu	97.3	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	983	kWh	45.4	MBtu	60.9	MBtu	37.5%
5	CO Denver	with interior clear panel	Furnace / AC	989	kWh	43.7	MBtu	59.1	MBtu	39.3%
5	CO Denver	with exterior low-E panel	Furnace / AC	886	kWh	38.3	MBtu	52.0	MBtu	**46.6%**
5	CO Denver	with interior low-E panel	Furnace / AC	966	kWh	34.2	MBtu	48.4	MBtu	**50.2%**
5	CO Denver	Wood frame, double pane	Furnace / AC	1040	kWh	52.2	MBtu	68.9	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	942	kWh	43.6	MBtu	58.4	MBtu	15.3%
5	CO Denver	with interior clear panel	Furnace / AC	973	kWh	41.5	MBtu	56.5	MBtu	18.1%
5	CO Denver	with exterior low-E panel	Furnace / AC	847	kWh	37.9	MBtu	51.1	MBtu	**25.9%**
5	CO Denver	with interior low-E panel	Furnace / AC	929	kWh	34.6	MBtu	48.4	MBtu	**29.7%**
5	CO Denver	Metal frame, double pane	Furnace / AC	972	kWh	65.9	MBtu	83.1	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	968	kWh	48.8	MBtu	64.4	MBtu	22.5%
5	CO Denver	with interior clear panel	Furnace / AC	954	kWh	46.7	MBtu	62.0	MBtu	25.5%
5	CO Denver	with exterior low-E panel	Furnace / AC	879	kWh	40.8	MBtu	54.6	MBtu	**34.3%**
5	CO Denver	with interior low-E panel	Furnace / AC	917	kWh	38.2	MBtu	52.2	MBtu	**37.1%**
5	CO Denver	with exterior clear panel, worst case mounting	Furnace / AC	925	kWh	55.4	MBtu	71.1	MBtu	14.4%
5	CO Denver	with exterior low-E panel, worst case mounting	Furnace / AC	827	kWh	50.6	MBtu	64.8	MBtu	22.1%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
6	VT Burlington	Wood frame, single pane	124.95	1838.24	1963.19	--	--	--	--	
6	VT Burlington	with exterior clear panel	118.13	1129.35	1247.47	$715.72	36.5%	$1.70	4.7	
6	VT Burlington	with interior clear panel	118.83	1092.04	1210.86	$752.33	38.3%	$1.79	5.0	
6	VT Burlington	with exterior low-E panel	109.90	985.85	1095.75	$867.44	**44.2%**	$2.07	**4.4**	**2.8**
6	VT Burlington	with interior low-E panel	119.18	911.23	1030.40	$932.79	**47.5%**	$2.22	**4.5**	**2.3**
6	VT Burlington	Wood frame, double pane	123.03	1284.33	1407.35	--	--	--	--	
6	VT Burlington	with exterior clear panel	113.40	1089.17	1202.57	$204.79	14.6%	$0.49	16.4	
6	VT Burlington	with interior clear panel	117.60	1048.99	1166.59	$240.77	17.1%	$0.57	15.7	
6	VT Burlington	with exterior low-E panel	105.88	972.93	1078.81	$328.55	**23.3%**	$0.78	**11.5**	**3.4**
6	VT Burlington	with interior low-E panel	115.33	914.10	1029.42	$377.93	**26.9%**	$0.90	**11.1**	**3.1**
6	VT Burlington	Metal frame, double pane	111.48	1532.58	1644.06	--	--	--	--	
6	VT Burlington	with exterior clear panel	115.50	1189.62	1305.12	$338.94	20.6%	$0.81	9.9	
6	VT Burlington	with interior clear panel	114.63	1143.70	1258.32	$385.74	23.5%	$0.92	9.8	
6	VT Burlington	with exterior low-E panel	107.80	1030.33	1138.13	$505.93	**30.8%**	$1.20	**7.5**	**2.5**
6	VT Burlington	with interior low-E panel	111.83	981.54	1093.37	$550.69	**33.5%**	$1.31	**7.6**	**2.5**
6	VT Burlington	with exterior clear panel, worst case mounting	108.85	1307.29	1416.14	$227.92	13.9%	$0.54	14.7	
6	VT Burlington	with exterior low-E panel, worst case mounting	99.40	1209.71	1309.11	$334.95	20.4%	$0.80	11.3	
5	CO Denver	Wood frame, single pane	131.30	594.39	725.69	--	--	--	--	
5	CO Denver	with exterior clear panel	119.73	346.86	466.59	$259.11	35.7%	$0.62	13.0	
5	CO Denver	with interior clear panel	120.46	333.87	454.33	$271.36	37.4%	$0.65	13.9	
5	CO Denver	with exterior low-E panel	107.91	292.61	400.53	$325.17	**44.8%**	$0.77	**11.6**	**6.4**
5	CO Denver	with interior low-E panel	117.66	261.29	378.95	$346.75	**47.8%**	$0.83	**12.1**	**5.6**
5	CO Denver	Wood frame, double pane	126.67	398.81	525.48	--	--	--	--	
5	CO Denver	with exterior clear panel	114.74	333.10	447.84	$77.64	14.8%	$0.18	43.3	
5	CO Denver	with interior clear panel	118.51	317.06	435.57	$89.91	17.1%	$0.21	42.0	
5	CO Denver	with exterior low-E panel	103.16	289.56	392.72	$132.76	**25.3%**	$0.32	**28.5**	**7.6**
5	CO Denver	with interior low-E panel	113.15	264.34	377.50	$147.98	**28.2%**	$0.35	**28.4**	**7.2**
5	CO Denver	Metal frame, double pane	118.39	503.48	621.87	--	--	--	--	
5	CO Denver	with exterior clear panel	117.90	372.83	490.73	$131.13	21.1%	$0.31	25.6	
5	CO Denver	with interior clear panel	116.20	356.79	472.99	$148.88	23.9%	$0.35	25.4	
5	CO Denver	with exterior low-E panel	107.06	311.71	418.77	$203.09	**32.7%**	$0.48	**18.6**	**5.8**
5	CO Denver	with interior low-E panel	111.69	291.85	403.54	$218.33	**35.1%**	$0.52	**19.2**	**6.0**
5	CO Denver	with exterior clear panel, worst case mounting	112.67	423.26	535.92	$85.94	13.8%	$0.20	39.1	
5	CO Denver	with exterior low-E panel, worst case mounting	100.73	386.58	487.31	$134.55	21.6%	$0.32	28.1	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	ID Boise	Wood frame, single pane	Furnace / AC	1348	kWh	84.3	MBtu	107.5	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1180	kWh	50.2	MBtu	68.4	MBtu	36.4%
5	ID Boise	with interior clear panel	Furnace / AC	1183	kWh	48.5	MBtu	66.5	MBtu	38.1%
5	ID Boise	with exterior low-E panel	Furnace / AC	1067	kWh	42.9	MBtu	59.1	MBtu	**45.0%**
5	ID Boise	with interior low-E panel	Furnace / AC	1139	kWh	38.9	MBtu	55.6	MBtu	**48.3%**
5	ID Boise	Wood frame, double pane	Furnace / AC	1258	kWh	57.6	MBtu	77.3	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1143	kWh	48.4	MBtu	66.0	MBtu	14.7%
5	ID Boise	with interior clear panel	Furnace / AC	1165	kWh	46.4	MBtu	64.0	MBtu	17.2%
5	ID Boise	with exterior low-E panel	Furnace / AC	1023	kWh	42.4	MBtu	58.0	MBtu	**24.9%**
5	ID Boise	with interior low-E panel	Furnace / AC	1105	kWh	39.2	MBtu	55.5	MBtu	**28.3%**
5	ID Boise	Metal frame, double pane	Furnace / AC	1218	kWh	71.2	MBtu	91.7	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1183	kWh	53.7	MBtu	72.2	MBtu	21.3%
5	ID Boise	with interior clear panel	Furnace / AC	1163	kWh	51.5	MBtu	69.6	MBtu	24.1%
5	ID Boise	with exterior low-E panel	Furnace / AC	1059	kWh	45.3	MBtu	61.6	MBtu	**32.8%**
5	ID Boise	with interior low-E panel	Furnace / AC	1095	kWh	42.8	MBtu	59.3	MBtu	**35.3%**
5	ID Boise	with exterior clear panel, worst case mounting	Furnace / AC	1152	kWh	60.2	MBtu	79.0	MBtu	13.9%
5	ID Boise	with exterior low-E panel, worst case mounting	Furnace / AC	1041	kWh	55.1	MBtu	72.1	MBtu	21.4%
5	IL Chicago	Wood frame, single pane	Furnace / AC	1303	kWh	110.9	MBtu	136.1	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	1207	kWh	67.1	MBtu	87.1	MBtu	36.0%
5	IL Chicago	with interior clear panel	Furnace / AC	1214	kWh	64.9	MBtu	84.8	MBtu	37.7%
5	IL Chicago	with exterior low-E panel	Furnace / AC	1126	kWh	58.4	MBtu	76.7	MBtu	**43.6%**
5	IL Chicago	with interior low-E panel	Furnace / AC	1219	kWh	53.8	MBtu	72.7	MBtu	**46.5%**
5	IL Chicago	Wood frame, double pane	Furnace / AC	1261	kWh	76.6	MBtu	98.1	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	1162	kWh	64.9	MBtu	84.2	MBtu	14.2%
5	IL Chicago	with interior clear panel	Furnace / AC	1200	kWh	62.3	MBtu	81.8	MBtu	16.6%
5	IL Chicago	with exterior low-E panel	Furnace / AC	1078	kWh	57.7	MBtu	75.4	MBtu	**23.2%**
5	IL Chicago	with interior low-E panel	Furnace / AC	1183	kWh	54.1	MBtu	72.7	MBtu	**26.0%**
5	IL Chicago	Metal frame, double pane	Furnace / AC	1178	kWh	92.2	MBtu	114.2	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	1180	kWh	71	MBtu	91.1	MBtu	20.3%
5	IL Chicago	with interior clear panel	Furnace / AC	1166	kWh	68.1	MBtu	87.8	MBtu	23.2%
5	IL Chicago	with exterior low-E panel	Furnace / AC	1102	kWh	61.2	MBtu	79.5	MBtu	**30.4%**
5	IL Chicago	with interior low-E panel	Furnace / AC	1151	kWh	58.1	MBtu	76.7	MBtu	**32.9%**
5	IL Chicago	with exterior clear panel, worst case mounting	Furnace / AC	1131	kWh	78.3	MBtu	98.5	MBtu	13.8%
5	IL Chicago	with exterior low-E panel, worst case mounting	Furnace / AC	1042	kWh	72.3	MBtu	90.9	MBtu	20.4%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	ID Boise	Wood frame, single pane	131.56	715.71	847.27	--	--	--	--	
5	ID Boise	with exterior clear panel	115.17	426.20	541.37	$305.91	36.1%	$0.73	11.0	
5	ID Boise	with interior clear panel	115.46	411.77	527.23	$320.05	37.8%	$0.76	11.8	
5	ID Boise	with exterior low-E panel	104.14	364.22	468.36	$378.91	**44.7%**	$0.90	**10.0**	**5.8**
5	ID Boise	with interior low-E panel	111.17	330.26	441.43	$405.84	**47.9%**	$0.97	**10.3**	**4.9**
5	ID Boise	Wood frame, double pane	122.78	489.02	611.80	--	--	--	--	
5	ID Boise	with exterior clear panel	111.56	410.92	522.47	$89.33	14.6%	$0.21	37.6	
5	ID Boise	with interior clear panel	113.70	393.94	507.64	$104.16	17.0%	$0.25	36.3	
5	ID Boise	with exterior low-E panel	99.84	359.98	459.82	$151.98	**24.8%**	$0.36	**24.9**	**6.7**
5	ID Boise	with interior low-E panel	107.85	332.81	440.66	$171.15	**28.0%**	$0.41	**24.5**	**6.3**
5	ID Boise	Metal frame, double pane	118.88	604.49	723.36	--	--	--	--	
5	ID Boise	with exterior clear panel	115.46	455.91	571.37	$151.99	21.0%	$0.36	22.1	
5	ID Boise	with interior clear panel	113.51	437.24	550.74	$172.62	23.9%	$0.41	21.9	
5	ID Boise	with exterior low-E panel	103.36	384.60	487.96	$235.41	**32.5%**	$0.56	**16.1**	**5.0**
5	ID Boise	with interior low-E panel	106.87	363.37	470.24	$253.12	**35.0%**	$0.60	**16.6**	**5.2**
5	ID Boise	with exterior clear panel, worst case mounting	112.44	511.10	623.53	$99.83	13.8%	$0.24	33.7	
5	ID Boise	with exterior low-E panel, worst case mounting	101.60	467.80	569.40	$153.96	21.3%	$0.37	24.6	
5	IL Chicago	Wood frame, single pane	148.67	889.42	1038.09	--	--	--	--	
5	IL Chicago	with exterior clear panel	137.72	538.14	675.86	$362.23	34.9%	$0.86	9.3	
5	IL Chicago	with interior clear panel	138.52	520.50	659.02	$379.07	36.5%	$0.90	10.0	
5	IL Chicago	with exterior low-E panel	128.48	468.37	596.84	$441.25	**42.5%**	$1.05	**8.6**	**5.3**
5	IL Chicago	with interior low-E panel	139.09	431.48	570.56	$467.53	**45.0%**	$1.11	**9.0**	**4.7**
5	IL Chicago	Wood frame, double pane	143.88	614.33	758.21	--	--	--	--	
5	IL Chicago	with exterior clear panel	132.58	520.50	653.08	$105.13	13.9%	$0.25	32.0	
5	IL Chicago	with interior clear panel	136.92	499.65	636.57	$121.65	16.0%	$0.29	31.1	
5	IL Chicago	with exterior low-E panel	123.00	462.75	585.75	$172.46	**22.7%**	$0.41	**21.9**	**6.2**
5	IL Chicago	with interior low-E panel	134.98	433.88	568.86	$189.35	**25.0%**	$0.45	**22.2**	**6.2**
5	IL Chicago	Metal frame, double pane	134.41	739.44	873.85	--	--	--	--	
5	IL Chicago	with exterior clear panel	134.64	569.42	704.06	$169.80	19.4%	$0.40	19.8	
5	IL Chicago	with interior clear panel	133.04	546.16	679.20	$194.65	22.3%	$0.46	19.4	
5	IL Chicago	with exterior low-E panel	125.74	490.82	616.56	$257.29	**29.4%**	$0.61	**14.7**	**4.8**
5	IL Chicago	with interior low-E panel	131.33	465.96	597.29	$276.56	**31.6%**	$0.66	**15.2**	**5.1**
5	IL Chicago	with exterior clear panel, worst case mounting	129.05	627.97	757.01	$116.84	13.4%	$0.28	28.8	
5	IL Chicago	with exterior low-E panel, worst case mounting	118.89	579.85	698.74	$175.12	20.0%	$0.42	21.6	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	MA Boston	Wood frame, single pane	Furnace / AC	888	kWh	102.6	MBtu	122.2	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	876	kWh	60.3	MBtu	75.9	MBtu	37.9%
5	MA Boston	with interior clear panel	Furnace / AC	884	kWh	58.1	MBtu	73.6	MBtu	39.8%
5	MA Boston	with exterior low-E panel	Furnace / AC	813	kWh	52.5	MBtu	66.7	MBtu	**45.5%**
5	MA Boston	with interior low-E panel	Furnace / AC	886	kWh	47.8	MBtu	62.4	MBtu	**49.0%**
5	MA Boston	Wood frame, double pane	Furnace / AC	915	kWh	69.3	MBtu	86.2	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	844	kWh	58.4	MBtu	73.5	MBtu	14.8%
5	MA Boston	with interior clear panel	Furnace / AC	875	kWh	55.8	MBtu	71.0	MBtu	17.6%
5	MA Boston	with exterior low-E panel	Furnace / AC	777	kWh	52	MBtu	65.7	MBtu	**23.8%**
5	MA Boston	with interior low-E panel	Furnace / AC	863	kWh	48.2	MBtu	62.5	MBtu	**27.4%**
5	MA Boston	Metal frame, double pane	Furnace / AC	815	kWh	84.3	MBtu	101.4	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	848	kWh	64	MBtu	79.6	MBtu	21.5%
5	MA Boston	with interior clear panel	Furnace / AC	847	kWh	61.3	MBtu	76.7	MBtu	24.4%
5	MA Boston	with exterior low-E panel	Furnace / AC	803	kWh	55.2	MBtu	69.5	MBtu	**31.5%**
5	MA Boston	with interior low-E panel	Furnace / AC	829	kWh	52	MBtu	66.3	MBtu	**34.6%**
5	MA Boston	with exterior clear panel, worst case mounting	Furnace / AC	797	kWh	71.2	MBtu	86.9	MBtu	14.3%
5	MA Boston	with exterior low-E panel, worst case mounting	Furnace / AC	734	kWh	65.8	MBtu	80.3	MBtu	20.8%
5	NY Rochester	Wood frame, single pane	Furnace / AC	1123	kWh	116.6	MBtu	140.2	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	1047	kWh	71.8	MBtu	90.4	MBtu	35.5%
5	NY Rochester	with interior clear panel	Furnace / AC	1053	kWh	69.4	MBtu	87.9	MBtu	37.3%
5	NY Rochester	with exterior low-E panel	Furnace / AC	976	kWh	62.6	MBtu	79.6	MBtu	**43.3%**
5	NY Rochester	with interior low-E panel	Furnace / AC	1055	kWh	58	MBtu	75.4	MBtu	**46.2%**
5	NY Rochester	Wood frame, double pane	Furnace / AC	1093	kWh	81.7	MBtu	101.8	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	1006	kWh	69.3	MBtu	87.2	MBtu	14.3%
5	NY Rochester	with interior clear panel	Furnace / AC	1040	kWh	66.8	MBtu	84.9	MBtu	16.6%
5	NY Rochester	with exterior low-E panel	Furnace / AC	938	kWh	61.8	MBtu	78.3	MBtu	**23.1%**
5	NY Rochester	with interior low-E panel	Furnace / AC	1028	kWh	58.3	MBtu	75.5	MBtu	**25.8%**
5	NY Rochester	Metal frame, double pane	Furnace / AC	1011	kWh	97.3	MBtu	117.9	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	1023	kWh	75.7	MBtu	94.4	MBtu	19.9%
5	NY Rochester	with interior clear panel	Furnace / AC	1010	kWh	72.7	MBtu	91.0	MBtu	22.8%
5	NY Rochester	with exterior low-E panel	Furnace / AC	956	kWh	65.5	MBtu	82.5	MBtu	**30.0%**
5	NY Rochester	with interior low-E panel	Furnace / AC	998	kWh	62.4	MBtu	79.6	MBtu	**32.5%**
5	NY Rochester	with exterior clear panel, worst case mounting	Furnace / AC	976	kWh	83.1	MBtu	102.0	MBtu	13.5%
5	NY Rochester	with exterior low-E panel, worst case mounting	Furnace / AC	897	kWh	76.7	MBtu	94.1	MBtu	20.2%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	MA Boston	Wood frame, single pane	154.51	1450.76	1605.28	--	--	--	--	
5	MA Boston	with exterior clear panel	152.42	852.64	1005.07	$600.21	37.4%	$1.43	5.6	
5	MA Boston	with interior clear panel	153.82	821.53	975.35	$629.93	39.2%	$1.50	6.0	
5	MA Boston	with exterior low-E panel	141.46	742.35	883.81	$721.46	**44.9%**	$1.72	**5.2**	**3.5**
5	MA Boston	with interior low-E panel	154.16	675.89	830.06	$775.22	**48.3%**	$1.85	**5.4**	**2.9**
5	MA Boston	Wood frame, double pane	159.21	979.90	1139.11	--	--	--	--	
5	MA Boston	with exterior clear panel	146.86	825.78	972.63	$166.48	14.6%	$0.40	20.2	
5	MA Boston	with interior clear panel	152.25	789.01	941.26	$197.85	17.4%	$0.47	19.1	
5	MA Boston	with exterior low-E panel	135.20	735.28	870.48	$268.63	**23.6%**	$0.64	**14.1**	**4.1**
5	MA Boston	with interior low-E panel	150.16	681.55	831.71	$307.40	**27.0%**	$0.73	**13.7**	**3.8**
5	MA Boston	Metal frame, double pane	141.81	1192.00	1333.81	--	--	--	--	
5	MA Boston	with exterior clear panel	147.55	904.96	1052.51	$281.30	21.1%	$0.67	11.9	
5	MA Boston	with interior clear panel	147.38	866.78	1014.16	$319.65	24.0%	$0.76	11.8	
5	MA Boston	with exterior low-E panel	139.72	780.53	920.25	$413.56	**31.0%**	$0.98	**9.1**	**3.2**
5	MA Boston	with interior low-E panel	144.25	735.28	879.53	$454.29	**34.1%**	$1.08	**9.2**	**3.1**
5	MA Boston	with exterior clear panel, worst case mounting	138.68	1006.77	1145.45	$188.37	14.1%	$0.45	17.8	
5	MA Boston	with exterior low-E panel, worst case mounting	127.72	930.41	1058.13	$275.68	20.7%	$0.66	13.7	
5	NY Rochester	Wood frame, single pane	225.16	1429.52	1654.68	--	--	--	--	
5	NY Rochester	with exterior clear panel	209.92	880.27	1090.19	$564.49	34.1%	$1.34	6.0	
5	NY Rochester	with interior clear panel	211.13	850.84	1061.97	$592.71	35.8%	$1.41	6.4	
5	NY Rochester	with exterior low-E panel	195.69	767.48	963.16	$691.51	**41.8%**	$1.65	**5.5**	**3.3**
5	NY Rochester	with interior low-E panel	211.53	711.08	922.61	$732.07	**44.2%**	$1.74	**5.7**	**3.0**
5	NY Rochester	Wood frame, double pane	219.15	1001.64	1220.79	--	--	--	--	
5	NY Rochester	with exterior clear panel	201.70	849.62	1051.32	$169.47	13.9%	$0.40	19.8	
5	NY Rochester	with interior clear panel	208.52	818.97	1027.49	$193.30	15.8%	$0.46	19.6	
5	NY Rochester	with exterior low-E panel	188.07	757.67	945.74	$275.05	**22.5%**	$0.65	**13.7**	**4.0**
5	NY Rochester	with interior low-E panel	206.11	714.76	920.87	$299.92	**24.6%**	$0.71	**14.0**	**3.9**
5	NY Rochester	Metal frame, double pane	202.71	1192.90	1395.60	--	--	--	--	
5	NY Rochester	with exterior clear panel	205.11	928.08	1133.19	$262.41	18.8%	$0.62	12.8	
5	NY Rochester	with interior clear panel	202.51	891.30	1093.81	$301.80	21.6%	$0.72	12.5	
5	NY Rochester	with exterior low-E panel	191.68	803.03	994.71	$400.90	**28.7%**	$0.95	**9.4**	**3.0**
5	NY Rochester	with interior low-E panel	200.10	765.02	965.12	$430.48	**30.8%**	$1.02	**9.8**	**3.3**
5	NY Rochester	with exterior clear panel, worst case mounting	195.69	1018.81	1214.49	$181.11	13.0%	$0.43	18.6	
5	NY Rochester	with exterior low-E panel, worst case mounting	179.85	940.34	1120.19	$275.41	19.7%	$0.66	13.7	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	PA Pittsburgh	Wood frame, single pane	Furnace / AC	1172	kWh	95.6	MBtu	117.9	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	1092	kWh	58.4	MBtu	76.3	MBtu	35.2%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	1094	kWh	56.4	MBtu	74.1	MBtu	37.1%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	1020	kWh	50.5	MBtu	66.9	MBtu	**43.3%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	1104	kWh	46.6	MBtu	63.6	MBtu	**46.1%**
5	PA Pittsburgh	Wood frame, double pane	Furnace / AC	1143	kWh	66.5	MBtu	85.7	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	1052	kWh	56.3	MBtu	73.6	MBtu	14.2%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	1084	kWh	54.2	MBtu	71.6	MBtu	16.5%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	985	kWh	49.8	MBtu	65.7	MBtu	**23.4%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	1072	kWh	46.8	MBtu	63.4	MBtu	**26.0%**
5	PA Pittsburgh	Metal frame, double pane	Furnace / AC	1055	kWh	80.2	MBtu	99.7	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	1075	kWh	61.8	MBtu	79.8	MBtu	19.9%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	1062	kWh	59.3	MBtu	76.9	MBtu	22.8%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	1005	kWh	53	MBtu	69.4	MBtu	**30.4%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	1043	kWh	50.4	MBtu	67.0	MBtu	**32.8%**
5	PA Pittsburgh	with exterior clear panel, worst case mounting	Furnace / AC	1021	kWh	68.3	MBtu	86.3	MBtu	13.4%
5	PA Pittsburgh	with exterior low-E panel, worst case mounting	Furnace / AC	948	kWh	62.8	MBtu	79.5	MBtu	20.3%
4	NY New York City	Wood frame, single pane	Furnace / AC	1453	kWh	91.5	MBtu	116.6	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1330	kWh	55.2	MBtu	75.5	MBtu	35.2%
4	NY New York City	with interior clear panel	Furnace / AC	1329	kWh	53.3	MBtu	73.5	MBtu	37.0%
4	NY New York City	with exterior low-E panel	Furnace / AC	1242	kWh	48.3	MBtu	67.0	MBtu	**42.5%**
4	NY New York City	with interior low-E panel	Furnace / AC	1318	kWh	44.3	MBtu	63.5	MBtu	**45.5%**
4	NY New York City	Wood frame, double pane	Furnace / AC	1393	kWh	63	MBtu	84.8	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1290	kWh	53.6	MBtu	73.3	MBtu	13.5%
4	NY New York City	with interior clear panel	Furnace / AC	1317	kWh	51.4	MBtu	71.3	MBtu	16.0%
4	NY New York City	with exterior low-E panel	Furnace / AC	1201	kWh	47.9	MBtu	66.1	MBtu	**22.0%**
4	NY New York City	with interior low-E panel	Furnace / AC	1284	kWh	44.6	MBtu	63.4	MBtu	**25.2%**
4	NY New York City	Metal frame, double pane	Furnace / AC	1331	kWh	76.1	MBtu	98.4	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1316	kWh	58.6	MBtu	79.1	MBtu	19.6%
4	NY New York City	with interior clear panel	Furnace / AC	1300	kWh	56.2	MBtu	76.3	MBtu	22.4%
4	NY New York City	with exterior low-E panel	Furnace / AC	1230	kWh	50.7	MBtu	69.5	MBtu	**29.4%**
4	NY New York City	with interior low-E panel	Furnace / AC	1266	kWh	48	MBtu	67.0	MBtu	**31.9%**
4	NY New York City	with exterior clear panel, worst case mounting	Furnace / AC	1278	kWh	64.8	MBtu	85.4	MBtu	13.2%
4	NY New York City	with exterior low-E panel, worst case mounting	Furnace / AC	1187	kWh	60.1	MBtu	79.3	MBtu	19.4%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	PA Pittsburgh	Wood frame, single pane	156.34	1091.75	1248.10	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	145.67	666.93	812.60	$435.50	34.9%	$1.04	7.7	
5	PA Pittsburgh	with interior clear panel	145.94	644.09	790.03	$458.07	36.7%	$1.09	8.3	
5	PA Pittsburgh	with exterior low-E panel	136.07	576.71	712.78	$535.32	**42.9%**	$1.27	**7.1**	**4.2**
5	PA Pittsburgh	with interior low-E panel	147.27	532.17	679.45	$568.65	**45.6%**	$1.35	**7.4**	**3.8**
5	PA Pittsburgh	Wood frame, double pane	152.48	759.43	911.91	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	140.34	642.95	783.28	$128.62	14.1%	$0.31	26.1	
5	PA Pittsburgh	with interior clear panel	144.61	618.96	763.57	$148.34	16.3%	$0.35	25.5	
5	PA Pittsburgh	with exterior low-E panel	131.40	568.72	700.12	$211.79	**23.2%**	$0.50	**17.8**	**5.1**
5	PA Pittsburgh	with interior low-E panel	143.00	534.46	677.46	$234.45	**25.7%**	$0.56	**17.9**	**4.9**
5	PA Pittsburgh	Metal frame, double pane	140.74	915.88	1056.62	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	143.41	705.76	849.16	$207.46	19.6%	$0.49	16.2	
5	PA Pittsburgh	with interior clear panel	141.67	677.21	818.88	$237.74	22.5%	$0.57	15.9	
5	PA Pittsburgh	with exterior low-E panel	134.07	605.26	739.33	$317.29	**30.0%**	$0.76	**11.9**	**3.8**
5	PA Pittsburgh	with interior low-E panel	139.14	575.57	714.70	$341.92	**32.4%**	$0.81	**12.3**	**4.0**
5	PA Pittsburgh	with exterior clear panel, worst case mounting	136.20	779.99	916.19	$140.43	13.3%	$0.33	23.9	
5	PA Pittsburgh	with exterior low-E panel, worst case mounting	126.46	717.18	843.64	$212.98	20.2%	$0.51	17.7	
4	NY NewYork City	Wood frame, single pane	291.33	1121.79	1413.12	--	--	--	--	
4	NY NewYork City	with exterior clear panel	266.67	676.75	943.42	$469.70	33.2%	$1.12	7.2	
4	NY NewYork City	with interior clear panel	266.46	653.46	919.92	$493.19	34.9%	$1.17	7.7	
4	NY NewYork City	with exterior low-E panel	249.02	592.16	841.18	$571.94	**40.5%**	$1.36	**6.6**	**4.1**
4	NY NewYork City	with interior low-E panel	264.26	543.12	807.38	$605.74	**42.9%**	$1.44	**6.9**	**3.7**
4	NY NewYork City	Wood frame, double pane	279.30	772.38	1051.68	--	--	--	--	
4	NY NewYork City	with exterior clear panel	258.65	657.14	915.78	$135.90	12.9%	$0.32	24.7	
4	NY NewYork City	with interior clear panel	264.06	630.16	894.22	$157.45	15.0%	$0.37	24.0	
4	NY NewYork City	with exterior low-E panel	240.80	587.25	828.05	$223.62	**21.3%**	$0.53	**16.9**	**4.8**
4	NY NewYork City	with interior low-E panel	257.44	546.80	804.24	$247.44	**23.5%**	$0.59	**17.0**	**4.7**
4	NY NewYork City	Metal frame, double pane	266.87	932.99	1199.85	--	--	--	--	
4	NY NewYork City	with exterior clear panel	263.86	718.44	982.29	$217.56	18.1%	$0.52	15.4	
4	NY NewYork City	with interior clear panel	260.65	689.01	949.66	$250.19	20.9%	$0.60	15.1	
4	NY NewYork City	with exterior low-E panel	246.62	621.58	868.20	$331.65	**27.6%**	$0.79	**11.4**	**3.7**
4	NY NewYork City	with interior low-E panel	253.83	588.48	842.31	$357.54	**29.8%**	$0.85	**11.7**	**3.9**
4	NY NewYork City	with exterior clear panel, worst case mounting	256.24	794.45	1050.69	$149.16	12.4%	$0.36	22.5	
4	NY NewYork City	with exterior low-E panel, worst case mounting	237.99	736.83	974.82	$225.03	18.8%	$0.54	16.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
4	WA Seattle	Wood frame, single pane	Furnace / AC	257	kWh	72.1	MBtu	81.7	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	239	kWh	42.5	MBtu	49.2	MBtu	39.8%
4	WA Seattle	with interior clear panel	Furnace / AC	239	kWh	40.9	MBtu	47.4	MBtu	42.0%
4	WA Seattle	with exterior low-E panel	Furnace / AC	213	kWh	35.8	MBtu	41.5	MBtu	**49.1%**
4	WA Seattle	with interior low-E panel	Furnace / AC	230	kWh	32.7	MBtu	38.3	MBtu	**53.1%**
4	WA Seattle	Wood frame, double pane	Furnace / AC	251	kWh	49	MBtu	56.4	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	225	kWh	40.9	MBtu	47.2	MBtu	16.2%
4	WA Seattle	with interior clear panel	Furnace / AC	235	kWh	39.3	MBtu	45.6	MBtu	19.1%
4	WA Seattle	with exterior low-E panel	Furnace / AC	201	kWh	35.3	MBtu	40.9	MBtu	**27.5%**
4	WA Seattle	with interior low-E panel	Furnace / AC	217	kWh	32.9	MBtu	38.4	MBtu	**31.9%**
4	WA Seattle	Metal frame, double pane	Furnace / AC	221	kWh	60.4	MBtu	68.5	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	232	kWh	45.5	MBtu	52.3	MBtu	23.6%
4	WA Seattle	with interior clear panel	Furnace / AC	228	kWh	43.5	MBtu	50.1	MBtu	26.8%
4	WA Seattle	with exterior low-E panel	Furnace / AC	208	kWh	37.9	MBtu	43.8	MBtu	**36.1%**
4	WA Seattle	with interior low-E panel	Furnace / AC	215	kWh	35.8	MBtu	41.6	MBtu	**39.3%**
4	WA Seattle	with exterior clear panel, worst case mounting	Furnace / AC	217	kWh	50.9	MBtu	58.1	MBtu	15.2%
4	WA Seattle	with exterior low-E panel, worst case mounting	Furnace / AC	189	kWh	46	MBtu	52.4	MBtu	23.5%
4	DC Washington	Wood frame, single pane	Furnace / AC	1860	kWh	79.8	MBtu	108.5	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1676	kWh	49.1	MBtu	72.9	MBtu	32.8%
4	DC Washington	with interior clear panel	Furnace / AC	1676	kWh	47.4	MBtu	71.0	MBtu	34.6%
4	DC Washington	with exterior low-E panel	Furnace / AC	1574	kWh	42.8	MBtu	64.8	MBtu	**40.3%**
4	DC Washington	with interior low-E panel	Furnace / AC	1671	kWh	39.1	MBtu	61.9	MBtu	**43.0%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1313	kWh	46.8	MBtu	66.2	MBtu	**39.0%**
4	DC Washington	Wood frame, double pane	Furnace / AC	1760	kWh	55.9	MBtu	81.3	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1626	kWh	47.6	MBtu	70.6	MBtu	13.0%
4	DC Washington	with interior clear panel	Furnace / AC	1664	kWh	45.6	MBtu	68.9	MBtu	15.2%
4	DC Washington	with exterior low-E panel	Furnace / AC	1526	kWh	42.4	MBtu	63.8	MBtu	**21.5%**
4	DC Washington	with interior low-E panel	Furnace / AC	1629	kWh	39.4	MBtu	61.7	MBtu	**24.0%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1281	kWh	46.2	MBtu	65.2	MBtu	**19.8%**
4	DC Washington	Metal frame, double pane	Furnace / AC	1687	kWh	67.8	MBtu	93.4	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1657	kWh	52.2	MBtu	76.0	MBtu	18.6%
4	DC Washington	with interior clear panel	Furnace / AC	1635	kWh	50.2	MBtu	73.6	MBtu	21.2%
4	DC Washington	with exterior low-E panel	Furnace / AC	1558	kWh	45	MBtu	67.0	MBtu	**28.2%**
4	DC Washington	with interior low-E panel	Furnace / AC	1597	kWh	42.6	MBtu	64.9	MBtu	**30.6%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1305	kWh	49.1	MBtu	68.6	MBtu	**26.6%**
4	DC Washington	with exterior clear panel, worst case mounting	Furnace / AC	1612	kWh	58	MBtu	81.8	MBtu	12.4%
4	DC Washington	with exterior low-E panel, worst case mounting	Furnace / AC	1499	kWh	53.6	MBtu	75.7	MBtu	18.9%
4	DC Washington	with exterior solar-E panel, worst case mount	Furnace / AC	1290	kWh	57.2	MBtu	77.3	MBtu	17.3%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
4	WA Seattle	Wood frame, single pane	22.38	752.00	774.39	--	--	--	--	
4	WA Seattle	with exterior clear panel	20.82	443.28	464.09	$310.30	40.1%	$0.74	10.8	
4	WA Seattle	with interior clear panel	20.82	426.59	447.40	$326.98	42.2%	$0.78	11.6	
4	WA Seattle	with exterior low-E panel	18.55	373.39	391.95	$382.44	**49.4%**	$0.91	**9.9**	**5.8**
4	WA Seattle	with interior low-E panel	20.03	341.06	361.09	$413.29	**53.4%**	$0.98	**10.2**	**4.9**
4	WA Seattle	Wood frame, double pane	21.86	511.07	532.93	--	--	--	--	
4	WA Seattle	with exterior clear panel	19.60	426.59	446.18	$86.75	16.3%	$0.21	38.7	
4	WA Seattle	with interior clear panel	20.47	409.90	430.37	$102.56	19.2%	$0.24	36.9	
4	WA Seattle	with exterior low-E panel	17.51	368.18	385.69	$147.25	**27.6%**	$0.35	**25.7**	**6.9**
4	WA Seattle	with interior low-E panel	18.90	343.15	362.05	$170.88	**32.1%**	$0.41	**24.6**	**6.1**
4	WA Seattle	Metal frame, double pane	19.25	629.97	649.22	--	--	--	--	
4	WA Seattle	with exterior clear panel	20.21	474.57	494.77	$154.45	23.8%	$0.37	21.8	
4	WA Seattle	with interior clear panel	19.86	453.71	473.56	$175.66	27.1%	$0.42	21.5	
4	WA Seattle	with exterior low-E panel	18.12	395.30	413.41	$235.81	**36.3%**	$0.56	**16.0**	**5.2**
4	WA Seattle	with interior low-E panel	18.73	373.39	392.12	$257.10	**39.6%**	$0.61	**16.3**	**5.2**
4	WA Seattle	with exterior clear panel, worst case mounting	18.90	530.89	549.79	$99.43	15.3%	$0.24	33.8	
4	WA Seattle	with exterior low-E panel, worst case mounting	16.46	479.78	496.24	$152.98	23.6%	$0.36	24.7	
4	DC Washington	Wood frame, single pane	237.71	971.17	1208.87	--	--	--	--	
4	DC Washington	with exterior clear panel	214.19	597.55	811.74	$397.13	32.9%	$0.95	8.5	
4	DC Washington	with interior clear panel	214.19	576.86	791.05	$417.82	34.6%	$0.99	9.0	
4	DC Washington	with exterior low-E panel	201.16	520.88	722.03	$486.84	**40.3%**	$1.16	**7.8**	**4.7**
4	DC Washington	with interior low-E panel	213.55	475.85	689.40	$519.47	**43.0%**	$1.24	**8.1**	**4.1**
4	DC Washington	with exterior solar-E panel	167.80	569.56	737.36	$471.52	**39.0%**	$1.12	**8.0**	**5.6**
4	DC Washington	Wood frame, double pane	224.93	680.30	905.23	--	--	--	--	
4	DC Washington	with exterior clear panel	207.80	579.29	787.09	$118.14	13.1%	$0.28	28.4	
4	DC Washington	with interior clear panel	212.66	554.95	767.61	$137.62	15.2%	$0.33	27.5	
4	DC Washington	with exterior low-E panel	195.02	516.01	711.03	$194.20	**21.5%**	$0.46	**19.5**	**5.5**
4	DC Washington	with interior low-E panel	208.19	479.50	687.68	$217.55	**24.0%**	$0.52	**19.3**	**5.3**
4	DC Washington	with exterior solar-E panel	163.71	562.25	725.97	$179.27	**19.8%**	$0.43	**21.1**	**6.9**
4	DC Washington	Metal frame, double pane	215.60	825.13	1040.72	--	--	--	--	
4	DC Washington	with exterior clear panel	211.76	635.27	847.04	$193.69	18.6%	$0.46	17.3	
4	DC Washington	with interior clear panel	208.95	610.93	819.89	$220.84	21.2%	$0.53	17.1	
4	DC Washington	with exterior low-E panel	199.11	547.65	746.76	$293.96	**28.2%**	$0.70	**12.9**	**4.2**
4	DC Washington	with interior low-E panel	204.10	518.44	722.54	$318.19	**30.6%**	$0.76	**13.2**	**4.3**
4	DC Washington	with exterior solar-E panel	166.78	597.55	764.33	$276.40	**26.6%**	$0.66	**13.7**	**5.1**
4	DC Washington	with exterior clear panel, worst case mounting	206.01	705.86	911.87	$128.85	12.4%	$0.31	26.1	
4	DC Washington	with exterior low-E panel, worst case mounting	191.57	652.31	843.88	$196.84	18.9%	$0.47	19.2	
4	DC Washington	with exterior solar-E panel, worst case mounting	164.86	696.12	860.99	$179.74	17.3%	$0.43	21.0	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
4	MO Kansas City	Wood frame, single pane	Furnace / AC	2692	kWh	86	MBtu	124.8	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	2357	kWh	52.8	MBtu	84.7	MBtu	32.1%
4	MO Kansas City	with interior clear panel	Furnace / AC	2356	kWh	51	MBtu	82.7	MBtu	33.7%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	2200	kWh	46.1	MBtu	75.6	MBtu	**39.4%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	2317	kWh	42.2	MBtu	72.7	MBtu	**41.8%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1890	kWh	50.1	MBtu	76.4	MBtu	**38.8%**
4	MO Kansas City	Wood frame, double pane	Furnace / AC	2510	kWh	60	MBtu	94.3	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	2291	kWh	51.1	MBtu	82.1	MBtu	13.0%
4	MO Kansas City	with interior clear panel	Furnace / AC	2335	kWh	49.1	MBtu	80.4	MBtu	14.7%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	2137	kWh	45.6	MBtu	74.3	MBtu	**21.2%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	2265	kWh	42.5	MBtu	72.4	MBtu	**23.2%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1844	kWh	49.5	MBtu	75.2	MBtu	**20.3%**
4	MO Kansas City	Metal frame, double pane	Furnace / AC	2425	kWh	72.4	MBtu	106.9	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	2342	kWh	56	MBtu	88.0	MBtu	17.6%
4	MO Kansas City	with interior clear panel	Furnace / AC	2309	kWh	53.8	MBtu	85.3	MBtu	20.2%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	2185	kWh	48.4	MBtu	77.9	MBtu	**27.1%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	2239	kWh	45.8	MBtu	75.7	MBtu	**29.2%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1883	kWh	52.4	MBtu	78.8	MBtu	**26.3%**
4	MO Kansas City	with exterior clear panel, worst case mounting	Furnace / AC	2299	kWh	62	MBtu	94.1	MBtu	12.0%
4	MO Kansas City	with exterior low-E panel, worst case mounting	Furnace / AC	2141	kWh	57.3	MBtu	87.2	MBtu	18.5%
4	MO Kansas City	with exterior solar-E panel, worst case mountin	Furnace / AC	1873	kWh	60.9	MBtu	88.0	MBtu	17.7%
4	NC Raleigh	Wood frame, single pane	Furnace / AC	2635	kWh	56.5	MBtu	92.0	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2422	kWh	34.1	MBtu	65.0	MBtu	29.3%
4	NC Raleigh	with interior clear panel	Furnace / AC	2416	kWh	32.8	MBtu	63.6	MBtu	30.9%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2283	kWh	29.4	MBtu	58.3	MBtu	**36.6%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2393	kWh	26.6	MBtu	56.5	MBtu	**38.5%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	1940	kWh	33.1	MBtu	58.4	MBtu	**36.5%**
4	NC Raleigh	Wood frame, double pane	Furnace / AC	2525	kWh	38.9	MBtu	71.5	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2353	kWh	33.1	MBtu	63.2	MBtu	11.6%
4	NC Raleigh	with interior clear panel	Furnace / AC	2393	kWh	31.6	MBtu	62.0	MBtu	13.3%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2222	kWh	29.2	MBtu	57.4	MBtu	**19.7%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2342	kWh	26.8	MBtu	56.2	MBtu	**21.4%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	1898	kWh	32.7	MBtu	57.5	MBtu	**19.5%**
4	NC Raleigh	Metal frame, double pane	Furnace / AC	2414	kWh	48.1	MBtu	80.2	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2397	kWh	36.5	MBtu	67.4	MBtu	16.0%
4	NC Raleigh	with interior clear panel	Furnace / AC	2366	kWh	35	MBtu	65.4	MBtu	18.5%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2262	kWh	31.2	MBtu	60.0	MBtu	**25.2%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2318	kWh	29.3	MBtu	58.6	MBtu	**27.0%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	1926	kWh	34.8	MBtu	60.1	MBtu	**25.1%**
4	NC Raleigh	with exterior clear panel, worst case mounting	Furnace / AC	2325	kWh	40.9	MBtu	71.4	MBtu	11.1%
4	NC Raleigh	with exterior low-E panel, worst case mounting	Furnace / AC	2186	kWh	37.8	MBtu	66.4	MBtu	17.3%
4	NC Raleigh	with exterior solar-E panel, worst case mountin	Furnace / AC	1903	kWh	41.2	MBtu	66.8	MBtu	16.7%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
4	MO Kansas City	Wood frame, single pane	285.08	887.52	1172.60	--	--	--	--	
4	MO Kansas City	with exterior clear panel	249.61	544.90	794.50	$378.10	32.2%	$0.90	8.9	
4	MO Kansas City	with interior clear panel	249.50	526.32	775.82	$396.78	33.8%	$0.94	9.5	
4	MO Kansas City	with exterior low-E panel	232.98	475.75	708.73	$463.87	**39.6%**	$1.10	**8.1**	**4.9**
4	MO Kansas City	with interior low-E panel	245.37	435.50	680.87	$491.73	**41.9%**	$1.17	**8.5**	**4.4**
4	MO Kansas City	with exterior solar-E panel	200.15	517.03	717.18	$455.42	**38.8%**	$1.08	**8.3**	**5.4**
4	MO Kansas City	Wood frame, double pane	265.81	619.20	885.01	--	--	--	--	
4	MO Kansas City	with exterior clear panel	242.62	527.35	769.97	$115.04	13.0%	$0.27	29.2	
4	MO Kansas City	with interior clear panel	247.28	506.71	753.99	$131.02	14.8%	$0.31	28.9	
4	MO Kansas City	with exterior low-E panel	226.31	470.59	696.90	$188.11	**21.3%**	$0.45	**20.1**	**5.7**
4	MO Kansas City	with interior low-E panel	239.86	438.60	678.46	$206.55	**23.3%**	$0.49	**20.3**	**5.6**
4	MO Kansas City	with exterior solar-E panel	195.28	510.84	706.12	$178.89	**20.2%**	$0.43	**21.1**	**6.6**
4	MO Kansas City	Metal frame, double pane	256.81	747.17	1003.98	--	--	--	--	
4	MO Kansas City	with exterior clear panel	248.02	577.92	825.94	$178.04	17.7%	$0.42	18.9	
4	MO Kansas City	with interior clear panel	244.52	555.22	799.74	$204.24	20.3%	$0.49	18.5	
4	MO Kansas City	with exterior low-E panel	231.39	499.49	730.88	$273.10	**27.2%**	$0.65	**13.8**	**4.4**
4	MO Kansas City	with interior low-E panel	237.11	472.66	709.77	$294.21	**29.3%**	$0.70	**14.3**	**4.7**
4	MO Kansas City	with exterior solar-E panel	199.41	540.77	740.18	$263.80	**26.3%**	$0.63	**14.3**	**4.9**
4	MO Kansas City	with exterior clear panel, worst case mounting	243.46	639.84	883.30	$120.67	12.0%	$0.29	27.8	
4	MO Kansas City	with exterior low-E panel, worst case mounting	226.73	591.34	818.07	$185.91	18.5%	$0.44	20.3	
4	MO Kansas City	with exterior solar-E panel, worst case mounting	198.35	628.49	826.84	$177.14	17.6%	$0.42	21.3	
4	NC Raleigh	Wood frame, single pane	293.01	653.14	946.15	--	--	--	--	
4	NC Raleigh	with exterior clear panel	269.33	394.20	663.52	$282.63	29.9%	$0.67	11.9	
4	NC Raleigh	with interior clear panel	268.66	379.17	647.83	$298.32	31.5%	$0.71	12.7	
4	NC Raleigh	with exterior low-E panel	253.87	339.86	593.73	$352.42	**37.2%**	$0.84	**10.7**	**6.0**
4	NC Raleigh	with interior low-E panel	266.10	307.50	573.60	$372.55	**39.4%**	$0.89	**11.3**	**5.7**
4	NC Raleigh	with exterior solar-E panel	215.73	382.64	598.36	$347.79	**36.8%**	$0.83	**10.9**	**6.4**
4	NC Raleigh	Wood frame, double pane	280.78	449.68	730.46	--	--	--	--	
4	NC Raleigh	with exterior clear panel	261.65	382.64	644.29	$86.17	11.8%	$0.21	39.0	
4	NC Raleigh	with interior clear panel	266.10	365.30	631.40	$99.07	13.6%	$0.24	38.2	
4	NC Raleigh	with exterior low-E panel	247.09	337.55	584.64	$145.83	**20.0%**	$0.35	**25.9**	**7.0**
4	NC Raleigh	with interior low-E panel	260.43	309.81	570.24	$160.23	**21.9%**	$0.38	**26.2**	**6.9**
4	NC Raleigh	with exterior solar-E panel	211.06	378.01	589.07	$141.39	**19.4%**	$0.34	**26.7**	**7.6**
4	NC Raleigh	Metal frame, double pane	268.44	556.04	824.47	--	--	--	--	
4	NC Raleigh	with exterior clear panel	266.55	421.94	688.49	$135.99	16.5%	$0.32	24.7	
4	NC Raleigh	with interior clear panel	263.10	404.60	667.70	$156.77	19.0%	$0.37	24.1	
4	NC Raleigh	with exterior low-E panel	251.53	360.67	612.21	$212.27	**25.7%**	$0.51	**17.8**	**5.5**
4	NC Raleigh	with interior low-E panel	257.76	338.71	596.47	$228.00	**27.7%**	$0.54	**18.4**	**5.9**
4	NC Raleigh	with exterior solar-E panel	214.17	402.29	616.46	$208.01	**25.2%**	$0.50	**18.2**	**5.8**
4	NC Raleigh	with exterior clear panel, worst case mounting	258.54	472.80	731.34	$93.13	11.3%	$0.22	36.1	
4	NC Raleigh	with exterior low-E panel, worst case mounting	243.08	436.97	680.05	$144.42	17.5%	$0.34	26.2	
4	NC Raleigh	with exterior solar-E panel, worst case mounting	211.61	476.27	687.89	$136.59	16.6%	$0.33	27.7	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
3	GA Atlanta	Wood frame, single pane	Furnace / AC	2670	kWh	49	MBtu	84.2	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2417	kWh	29.2	MBtu	59.6	MBtu	29.1%
3	GA Atlanta	with interior clear panel	Furnace / AC	2416	kWh	28.1	MBtu	58.4	MBtu	30.6%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2268	kWh	25.2	MBtu	53.6	MBtu	**36.4%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2396	kWh	22.5	MBtu	52.1	MBtu	**38.1%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	1897	kWh	28.8	MBtu	53.2	MBtu	**36.8%**
3	GA Atlanta	Wood frame, double pane	Furnace / AC	2534	kWh	33.3	MBtu	65.5	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2344	kWh	28.4	MBtu	57.9	MBtu	11.5%
3	GA Atlanta	with interior clear panel	Furnace / AC	2394	kWh	27	MBtu	57.0	MBtu	13.0%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2196	kWh	25.1	MBtu	52.6	MBtu	**19.6%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2339	kWh	22.8	MBtu	51.8	MBtu	**20.9%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	1851	kWh	28.6	MBtu	52.5	MBtu	**19.8%**
3	GA Atlanta	Metal frame, double pane	Furnace / AC	2437	kWh	41.8	MBtu	73.6	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2395	kWh	31.4	MBtu	61.8	MBtu	16.1%
3	GA Atlanta	with interior clear panel	Furnace / AC	2362	kWh	30.1	MBtu	60.0	MBtu	18.5%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2248	kWh	26.7	MBtu	55.0	MBtu	**25.3%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2310	kWh	25	MBtu	53.8	MBtu	**26.9%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	1891	kWh	30.5	MBtu	55.0	MBtu	**25.3%**
3	GA Atlanta	with exterior clear panel, worst case mounting	Furnace / AC	2332	kWh	35.5	MBtu	65.5	MBtu	11.0%
3	GA Atlanta	with exterior low-E panel, worst case mounting	Furnace / AC	2173	kWh	32.8	MBtu	60.8	MBtu	17.5%
3	GA Atlanta	with exterior solar-E panel, worst case mountin	Furnace / AC	1882	kWh	36.2	MBtu	61.1	MBtu	17.0%
3	TX Fort Worth	Wood frame, single pane	Furnace / AC	4526	kWh	40.2	MBtu	95.9	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	3911	kWh	22.9	MBtu	69.9	MBtu	27.1%
3	TX Fort Worth	with interior clear panel	Furnace / AC	3893	kWh	21.9	MBtu	68.6	MBtu	28.4%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3639	kWh	19.6	MBtu	63.2	MBtu	**34.1%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3788	kWh	17.3	MBtu	62.4	MBtu	**34.9%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3173	kWh	22.8	MBtu	61.3	MBtu	**36.0%**
3	TX Fort Worth	Wood frame, double pane	Furnace / AC	4139	kWh	26.5	MBtu	76.5	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	3811	kWh	22.3	MBtu	68.1	MBtu	10.9%
3	TX Fort Worth	with interior clear panel	Furnace / AC	3860	kWh	21.1	MBtu	67.4	MBtu	11.9%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3545	kWh	19.5	MBtu	62.0	MBtu	**18.9%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3719	kWh	17.6	MBtu	61.9	MBtu	**19.0%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3099	kWh	22.7	MBtu	60.4	MBtu	**21.0%**
3	TX Fort Worth	Metal frame, double pane	Furnace / AC	4085	kWh	33.7	MBtu	83.7	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	3916	kWh	24.8	MBtu	72.0	MBtu	13.9%
3	TX Fort Worth	with interior clear panel	Furnace / AC	3847	kWh	23.7	MBtu	70.1	MBtu	16.3%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3633	kWh	20.9	MBtu	64.5	MBtu	**22.9%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3693	kWh	19.4	MBtu	63.6	MBtu	**24.0%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3174	kWh	24.2	MBtu	62.9	MBtu	**24.9%**
3	TX Fort Worth	with exterior clear panel, worst case mounting	Furnace / AC	3864	kWh	28.3	MBtu	75.3	MBtu	10.1%
3	TX Fort Worth	with exterior low-E panel, worst case mounting	Furnace / AC	3599	kWh	26.1	MBtu	69.8	MBtu	16.6%
3	TX Fort Worth	with exterior solar-E panel, worst case mountin	Furnace / AC	3213	kWh	29.1	MBtu	68.7	MBtu	18.0%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
3	GA Atlanta	Wood frame, single pane	308.92	703.64	1012.56	--	--	--	--	
3	GA Atlanta	with exterior clear panel	279.65	419.31	698.96	$313.60	31.0%	$0.75	10.7	
3	GA Atlanta	with interior clear panel	279.53	403.52	683.05	$329.51	32.5%	$0.78	11.5	
3	GA Atlanta	with exterior low-E panel	262.41	361.87	624.28	$388.28	**38.3%**	$0.92	**9.7**	**5.6**
3	GA Atlanta	with interior low-E panel	277.22	323.10	600.32	$412.24	**40.7%**	$0.98	**10.2**	**5.1**
3	GA Atlanta	with exterior solar-E panel	219.48	413.57	633.05	$379.51	**37.5%**	$0.90	**10.0**	**6.4**
3	GA Atlanta	Wood frame, double pane	293.18	478.19	771.37	--	--	--	--	
3	GA Atlanta	with exterior clear panel	271.20	407.82	679.02	$92.35	12.0%	$0.22	36.4	
3	GA Atlanta	with interior clear panel	276.99	387.72	664.71	$106.67	13.8%	$0.25	35.4	
3	GA Atlanta	with exterior low-E panel	254.08	360.44	614.51	$156.86	**20.3%**	$0.37	**24.1**	**6.5**
3	GA Atlanta	with interior low-E panel	270.62	327.41	598.03	$173.34	**22.5%**	$0.41	**24.2**	**6.3**
3	GA Atlanta	with exterior solar-E panel	214.16	410.70	624.86	$146.52	**19.0%**	$0.35	**25.8**	**7.8**
3	GA Atlanta	Metal frame, double pane	281.96	600.25	882.21	--	--	--	--	
3	GA Atlanta	with exterior clear panel	277.10	450.90	728.01	$154.20	17.5%	$0.37	21.8	
3	GA Atlanta	with interior clear panel	273.28	432.24	705.52	$176.69	20.0%	$0.42	21.4	
3	GA Atlanta	with exterior low-E panel	260.09	383.41	643.51	$238.70	**27.1%**	$0.57	**15.8**	**5.0**
3	GA Atlanta	with interior low-E panel	267.27	359.00	626.27	$255.94	**29.0%**	$0.61	**16.4**	**5.3**
3	GA Atlanta	with exterior solar-E panel	218.79	437.98	656.77	$225.44	**25.6%**	$0.54	**16.8**	**5.9**
3	GA Atlanta	with exterior clear panel, worst case mounting	269.81	509.78	779.59	$102.62	11.6%	$0.24	32.7	
3	GA Atlanta	with exterior low-E panel, worst case mounting	251.42	471.01	722.42	$159.78	18.1%	$0.38	23.7	
3	GA Atlanta	with exterior solar-E panel, worst case mounting	217.75	519.83	737.58	$144.63	16.4%	$0.34	26.1	
3	TX Fort Worth	Wood frame, single pane – Natural Gas Heating	534.97	432.95	967.93	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	462.28	246.63	708.91	$259.01	26.8%	$0.62	13.0	
3	TX Fort Worth	with interior clear panel	460.15	235.86	696.02	$271.91	28.1%	$0.65	13.9	
3	TX Fort Worth	with exterior low-E panel	430.13	211.09	641.22	$326.71	**33.8%**	$0.78	**11.6**	**6.2**
3	TX Fort Worth	with interior low-E panel	447.74	186.32	634.06	$333.86	**34.5%**	$0.79	**12.6**	**6.8**
3	TX Fort Worth	with exterior solar-E panel	375.05	245.56	620.60	$347.32	**35.9%**	$0.83	**10.9**	**4.8**
3	TX Fort Worth	Wood frame, double pane – Natural Gas Heating	489.23	285.41	774.63	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	450.46	240.17	690.63	$84.00	10.8%	$0.20	40.0	
3	TX Fort Worth	with interior clear panel	456.25	227.25	683.50	$91.14	11.8%	$0.22	41.5	
3	TX Fort Worth	with exterior low-E panel	419.02	210.02	629.03	$145.60	**18.8%**	$0.35	**26.0**	**6.8**
3	TX Fort Worth	with interior low-E panel	439.59	189.55	629.14	$145.50	**18.8%**	$0.35	**28.9**	**7.7**
3	TX Fort Worth	with exterior solar-E panel	366.30	244.48	610.78	$163.85	**21.2%**	$0.39	**23.1**	**5.3**
3	TX Fort Worth	Metal frame, double pane – Natural Gas Heating	482.85	362.95	845.80	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	462.87	267.10	729.97	$115.83	13.7%	$0.28	29.0	
3	TX Fort Worth	with interior clear panel	454.72	255.25	709.96	$135.83	16.1%	$0.32	27.8	
3	TX Fort Worth	with exterior low-E panel	429.42	225.09	654.51	$191.28	**22.6%**	$0.46	**19.8**	**5.6**
3	TX Fort Worth	with interior low-E panel	436.51	208.94	645.45	$200.35	**23.7%**	$0.48	**21.0**	**6.5**
3	TX Fort Worth	with exterior solar-E panel	375.17	260.63	635.80	$210.00	**24.8%**	$0.50	**18.0**	**4.5**
3	TX Fort Worth	with exterior clear panel, worst case mounting	456.72	304.79	761.52	$84.28	10.0%	$0.20	39.9	
3	TX Fort Worth	with exterior low-E panel, worst case mounting	425.40	281.10	706.50	$139.30	16.5%	$0.33	27.1	
3	TX Fort Worth	with exterior solar-E panel, worst case mounting	379.78	313.41	693.18	$152.61	18.0%	$0.36	24.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
3	TX Fort Worth	Wood frame, single pane	Heat pump / AC	4526	kWh	3079	kWh	87.3	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	3911	kWh	1856	kWh	66.2	MBtu	24.2%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	3893	kWh	1788	kWh	65.2	MBtu	25.3%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3639	kWh	1603	kWh	60.2	MBtu	**31.1%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3788	kWh	1455	kWh	60.2	MBtu	**31.1%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3173	kWh	1777	kWh	56.8	MBtu	**34.9%**
3	TX Fort Worth	Wood frame, double pane	Heat pump / AC	4139	kWh	2125	kWh	71.9	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	3811	kWh	1802	kWh	64.4	MBtu	10.4%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	3860	kWh	1725	kWh	64.1	MBtu	10.8%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3545	kWh	1591	kWh	59.0	MBtu	**18.0%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3719	kWh	1468	kWh	59.6	MBtu	**17.2%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3099	kWh	1757	kWh	55.8	MBtu	**22.5%**
3	TX Fort Worth	Metal frame, double pane	Heat pump / AC	4085	kWh	2603	kWh	76.8	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	3916	kWh	1991	kWh	67.8	MBtu	11.7%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	3847	kWh	1905	kWh	66.0	MBtu	14.0%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3633	kWh	1693	kWh	61.2	MBtu	**20.4%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3693	kWh	1594	kWh	60.7	MBtu	**20.9%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3174	kWh	1868	kWh	57.9	MBtu	**24.6%**
3	TX Fort Worth	with exterior clear panel, worst case mounting	Heat pump / AC	3864	kWh	2219	kWh	69.8	MBtu	9.0%
3	TX Fort Worth	with exterior low-E panel, worst case mounting	Heat pump / AC	3599	kWh	2044	kWh	64.8	MBtu	15.6%
3	TX Fort Worth	with exterior solar-E panel, worst case mountin	Heat pump / AC	3213	kWh	2199	kWh	62.1	MBtu	19.1%
2	AZ Phoenix	Wood frame, single pane	Heat pump / AC	7873	kWh	948	kWh	101.3	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	6707	kWh	477	kWh	82.5	MBtu	18.6%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	6673	kWh	453	kWh	81.8	MBtu	19.2%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	6197	kWh	375	kWh	75.5	MBtu	**25.5%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	6363	kWh	320	kWh	76.7	MBtu	**24.2%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	5552	kWh	450	kWh	68.9	MBtu	**32.0%**
2	AZ Phoenix	Wood frame, double pane	Heat pump / AC	7089	kWh	572	kWh	88.0	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	6550	kWh	457	kWh	80.5	MBtu	8.5%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	6608	kWh	424	kWh	80.7	MBtu	8.2%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	6042	kWh	370	kWh	73.6	MBtu	**16.3%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	6268	kWh	324	kWh	75.7	MBtu	**14.0%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	5442	kWh	444	kWh	67.6	MBtu	**23.2%**
2	AZ Phoenix	Metal frame, double pane	Heat pump / AC	7305	kWh	804	kWh	93.1	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	6888	kWh	550	kWh	85.4	MBtu	8.3%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	6768	kWh	517	kWh	83.6	MBtu	10.2%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	6223	kWh	408	kWh	76.1	MBtu	**18.2%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	6298	kWh	372	kWh	76.6	MBtu	**17.7%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	5596	kWh	487	kWh	69.8	MBtu	**25.0%**
2	AZ Phoenix	with exterior clear panel, worst case mounting	Heat pump / AC	6903	kWh	646	kWh	86.7	MBtu	6.9%
2	AZ Phoenix	with exterior low-E panel, worst case mounting	Heat pump / AC	6299	kWh	549	kWh	78.6	MBtu	15.6%
2	AZ Phoenix	with exterior solar-E panel, worst case mountin	Heat pump / AC	5779	kWh	624	kWh	73.5	MBtu	21.0%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
3	TX Fort Worth	Wood frame, single pane – Heat Pump Heating	534.97	363.94	898.91	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	462.28	219.38	681.66	$217.25	24.2%	$0.52	15.5	
3	TX Fort Worth	with interior clear panel	460.15	211.34	671.49	$227.42	25.3%	$0.54	16.6	
3	TX Fort Worth	with exterior low-E panel	430.13	189.47	619.60	$279.31	**31.1%**	$0.67	**13.5**	**6.8**
3	TX Fort Worth	with interior low-E panel	447.74	171.98	619.72	$279.19	**31.1%**	$0.66	**15.0**	**8.1**
3	TX Fort Worth	with exterior solar-E panel	375.05	210.04	585.09	$313.82	**34.9%**	$0.75	**12.0**	**4.3**
3	TX Fort Worth	Wood frame, double pane – Heat Pump Heating	489.23	251.18	740.40	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	450.46	213.00	663.46	$76.95	10.4%	$0.18	43.7	
3	TX Fort Worth	with interior clear panel	456.25	203.90	660.15	$80.26	10.8%	$0.19	47.1	
3	TX Fort Worth	with exterior low-E panel	419.02	188.06	607.08	$133.33	**18.0%**	$0.32	**28.4**	**7.4**
3	TX Fort Worth	with interior low-E panel	439.59	173.52	613.10	$127.30	**17.2%**	$0.30	**33.0**	**8.9**
3	TX Fort Worth	with exterior solar-E panel	366.30	207.68	573.98	$166.43	**22.5%**	$0.40	**22.7**	**4.7**
3	TX Fort Worth	Metal frame, double pane – Heat Pump Heating	482.85	307.67	790.52	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	462.87	235.34	698.21	$92.31	11.7%	$0.22	36.4	
3	TX Fort Worth	with interior clear panel	454.72	225.17	679.89	$110.64	14.0%	$0.26	34.2	
3	TX Fort Worth	with exterior low-E panel	429.42	200.11	629.53	$160.99	**20.4%**	$0.38	**23.5**	**6.1**
3	TX Fort Worth	with interior low-E panel	436.51	188.41	624.92	$165.60	**20.9%**	$0.39	**25.4**	**7.6**
3	TX Fort Worth	with exterior solar-E panel	375.17	220.80	595.96	$194.56	**24.6%**	$0.46	**19.4**	**4.1**
3	TX Fort Worth	with exterior clear panel, worst case mounting	456.72	262.29	719.01	$71.51	9.0%	$0.17	47.0	
3	TX Fort Worth	with exterior low-E panel, worst case mounting	425.40	241.60	667.00	$123.52	15.6%	$0.29	30.6	
3	TX Fort Worth	with exterior solar-E panel, worst case mounting	379.78	259.92	639.70	$150.82	19.1%	$0.36	25.1	
2	AZ Phoenix	Wood frame, single pane	943.19	113.57	1056.76	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	803.50	57.14	860.64	$196.11	18.6%	$0.47	17.1	
2	AZ Phoenix	with interior clear panel	799.43	54.27	853.69	$203.06	19.2%	$0.48	18.6	
2	AZ Phoenix	with exterior low-E panel	742.40	44.93	787.33	$269.43	**25.5%**	$0.64	**14.0**	**5.7**
2	AZ Phoenix	with interior low-E panel	762.29	38.34	800.62	$256.13	**24.2%**	$0.61	**16.4**	**7.9**
2	AZ Phoenix	with exterior solar-E panel	665.13	53.91	719.04	$337.72	**32.0%**	$0.80	**11.2**	**3.0**
2	AZ Phoenix	Wood frame, double pane	849.26	68.53	917.79	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	784.69	54.75	839.44	$78.35	8.5%	$0.19	42.9	
2	AZ Phoenix	with interior clear panel	791.64	50.80	842.43	$75.35	8.2%	$0.18	50.2	
2	AZ Phoenix	with exterior low-E panel	723.83	44.33	768.16	$149.63	**16.3%**	$0.36	**25.3**	**5.9**
2	AZ Phoenix	with interior low-E panel	750.91	38.82	789.72	$128.07	**14.0%**	$0.30	**32.8**	**8.0**
2	AZ Phoenix	with exterior solar-E panel	651.95	53.19	705.14	$212.65	**23.2%**	$0.51	**17.8**	**3.1**
2	AZ Phoenix	Metal frame, double pane	875.14	96.32	971.46	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	825.18	65.89	891.07	$80.39	8.3%	$0.19	41.8	
2	AZ Phoenix	with interior clear panel	810.81	61.94	872.74	$98.72	10.2%	$0.24	38.3	
2	AZ Phoenix	with exterior low-E panel	745.52	48.88	794.39	$177.06	**18.2%**	$0.42	**21.3**	**4.3**
2	AZ Phoenix	with interior low-E panel	754.50	44.57	799.07	$172.39	**17.7%**	$0.41	**24.4**	**5.7**
2	AZ Phoenix	with exterior solar-E panel	670.40	58.34	728.74	$242.71	**25.0%**	$0.58	**15.6**	**2.6**
2	AZ Phoenix	with exterior clear panel, worst case mounting	826.98	77.39	904.37	$67.09	6.9%	$0.16	50.1	
2	AZ Phoenix	with exterior low-E panel, worst case mounting	754.62	65.77	820.39	$151.07	15.6%	$0.36	25.0	
2	AZ Phoenix	with exterior solar-E panel, worst case mounting	692.32	74.76	767.08	$204.38	21.0%	$0.49	18.5	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
2	FL Jacksonville	Wood frame, single pane	Heat pump / AC	4599	kWh	1504	kWh	70.1	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4022	kWh	823	kWh	55.6	MBtu	20.6%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	4004	kWh	786	kWh	55.0	MBtu	21.5%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	3774	kWh	680	kWh	51.1	MBtu	**27.0%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	3947	kWh	594	kWh	52.1	MBtu	**25.6%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3274	kWh	804	kWh	46.8	MBtu	**33.2%**
2	FL Jacksonville	Wood frame, double pane	Heat pump / AC	4234	kWh	968	kWh	59.7	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	3918	kWh	798	kWh	54.1	MBtu	9.3%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	3975	kWh	749	kWh	54.2	MBtu	9.2%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	3673	kWh	674	kWh	49.9	MBtu	**16.4%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	3866	kWh	602	kWh	51.3	MBtu	**14.1%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3202	kWh	794	kWh	45.9	MBtu	**23.2%**
2	FL Jacksonville	Metal frame, double pane	Heat pump / AC	4143	kWh	1255	kWh	62.0	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4005	kWh	900	kWh	56.3	MBtu	9.1%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	3938	kWh	855	kWh	55.0	MBtu	11.2%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	3753	kWh	735	kWh	51.5	MBtu	**16.9%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	3826	kWh	675	kWh	51.7	MBtu	**16.6%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3269	kWh	857	kWh	47.4	MBtu	**23.6%**
2	FL Jacksonville	with exterior clear panel, worst case mounting	Heat pump / AC	3928	kWh	1039	kWh	57.0	MBtu	8.0%
2	FL Jacksonville	with exterior low-E panel, worst case mounting	Heat pump / AC	3679	kWh	940	kWh	53.0	MBtu	14.4%
2	FL Jacksonville	with exterior solar-E panel, worst case mountin	Heat pump / AC	3281	kWh	1052	kWh	49.8	MBtu	19.7%
2	TX Houston	Wood frame, single pane	Furnace / AC	4865	kWh	25.1	MBtu	83.3	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4236	kWh	14.1	MBtu	64.0	MBtu	23.1%
2	TX Houston	with interior clear panel	Furnace / AC	4218	kWh	13.5	MBtu	63.2	MBtu	24.1%
2	TX Houston	with exterior low-E panel	Furnace / AC	3976	kWh	11.8	MBtu	58.5	MBtu	**29.7%**
2	TX Houston	with interior low-E panel	Furnace / AC	4145	kWh	10.4	MBtu	58.9	MBtu	**29.2%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3461	kWh	13.6	MBtu	54.6	MBtu	**34.4%**
2	TX Houston	Wood frame, double pane	Furnace / AC	4475	kWh	16.4	MBtu	69.3	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4132	kWh	13.6	MBtu	62.3	MBtu	10.1%
2	TX Houston	with interior clear panel	Furnace / AC	4185	kWh	12.9	MBtu	62.1	MBtu	10.3%
2	TX Houston	with exterior low-E panel	Furnace / AC	3874	kWh	11.7	MBtu	57.3	MBtu	**17.4%**
2	TX Houston	with interior low-E panel	Furnace / AC	4071	kWh	10.6	MBtu	58.3	MBtu	**15.8%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3391	kWh	13.4	MBtu	53.6	MBtu	**22.7%**
2	TX Houston	Metal frame, double pane	Furnace / AC	4380	kWh	21	MBtu	73.2	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4230	kWh	15.3	MBtu	65.3	MBtu	10.9%
2	TX Houston	with interior clear panel	Furnace / AC	4160	kWh	14.5	MBtu	63.6	MBtu	13.1%
2	TX Houston	with exterior low-E panel	Furnace / AC	3959	kWh	12.6	MBtu	59.2	MBtu	**19.1%**
2	TX Houston	with interior low-E panel	Furnace / AC	4031	kWh	11.7	MBtu	59.1	MBtu	**19.3%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3460	kWh	14.4	MBtu	55.5	MBtu	**24.3%**
2	TX Houston	with exterior clear panel, worst case mounting	Furnace / AC	4156	kWh	17.4	MBtu	66.7	MBtu	8.9%
2	TX Houston	with exterior low-E panel, worst case mounting	Furnace / AC	3892	kWh	15.9	MBtu	62.1	MBtu	15.3%
2	TX Houston	with exterior solar-E panel, worst case mountin	Furnace / AC	3480	kWh	17.5	MBtu	59.1	MBtu	19.3%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
2	FL Jacksonville	Wood frame, single pane	550.96	180.18	731.14	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	481.84	98.60	580.43	$150.71	20.6%	$0.36	22.3	
2	FL Jacksonville	with interior clear panel	479.68	94.16	573.84	$157.30	21.5%	$0.37	24.0	
2	FL Jacksonville	with exterior low-E panel	452.13	81.46	533.59	$197.55	**27.0%**	$0.47	**19.1**	**9.0**
2	FL Jacksonville	with interior low-E panel	472.85	71.16	544.01	$187.13	**25.6%**	$0.45	**22.4**	**14.1**
2	FL Jacksonville	with exterior solar-E panel	392.23	96.32	488.54	$242.60	**33.2%**	$0.58	**15.6**	**4.6**
2	FL Jacksonville	Wood frame, double pane	507.23	115.97	623.20	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	469.38	95.60	564.98	$58.22	9.3%	$0.14	57.7	
2	FL Jacksonville	with interior clear panel	476.21	89.73	565.94	$57.26	9.2%	$0.14	66.0	
2	FL Jacksonville	with exterior low-E panel	440.03	80.75	520.77	$102.43	**16.4%**	$0.24	**36.9**	**9.5**
2	FL Jacksonville	with interior low-E panel	463.15	72.12	535.27	$87.93	**14.1%**	$0.21	**47.8**	**13.7**
2	FL Jacksonville	with exterior solar-E panel	383.60	95.12	478.72	$144.48	**23.2%**	$0.34	**26.2**	**4.9**
2	FL Jacksonville	Metal frame, double pane	496.33	150.35	646.68	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	479.80	107.82	587.62	$59.06	9.1%	$0.14	56.9	
2	FL Jacksonville	with interior clear panel	471.77	102.43	574.20	$72.48	11.2%	$0.17	52.2	
2	FL Jacksonville	with exterior low-E panel	449.61	88.05	537.66	$109.02	**16.9%**	$0.26	**34.7**	**8.4**
2	FL Jacksonville	with interior low-E panel	458.35	80.87	539.22	$107.46	**16.6%**	$0.26	**39.1**	**12.0**
2	FL Jacksonville	with exterior solar-E panel	391.63	102.67	494.29	$152.39	**23.6%**	$0.36	**24.8**	**4.5**
2	FL Jacksonville	with exterior clear panel, worst case mounting	470.57	124.47	595.05	$51.63	8.0%	$0.12	65.1	
2	FL Jacksonville	with exterior low-E panel, worst case mounting	440.74	112.61	553.36	$93.32	14.4%	$0.22	40.5	
2	FL Jacksonville	with exterior solar-E panel, worst case mounting	393.06	126.03	519.09	$127.59	19.7%	$0.30	29.6	
2	TX Houston	Wood frame, single pane – Natural Gas Heating	575.04	270.33	845.37	--	--	--	--	
2	TX Houston	with exterior clear panel	500.70	151.86	652.55	$192.82	22.8%	$0.46	17.4	
2	TX Houston	with interior clear panel	498.57	145.40	643.96	$201.41	23.8%	$0.48	18.8	
2	TX Houston	with exterior low-E panel	469.96	127.09	597.05	$248.32	**29.4%**	$0.59	**15.2**	**7.6**
2	TX Houston	with interior low-E panel	489.94	112.01	601.95	$243.42	**28.8%**	$0.58	**17.3**	**10.0**
2	TX Houston	with exterior solar-E panel	409.09	146.47	555.56	$289.81	**34.3%**	$0.69	**13.0**	**4.3**
2	TX Houston	Wood frame, double pane – Natural Gas Heating	528.95	176.63	705.57	--	--	--	--	
2	TX Houston	with exterior clear panel	488.40	146.47	634.87	$70.70	10.0%	$0.17	47.5	
2	TX Houston	with interior clear panel	494.67	138.93	633.60	$71.97	10.2%	$0.17	52.5	
2	TX Houston	with exterior low-E panel	457.91	126.01	583.92	$121.66	**17.2%**	$0.29	**31.1**	**8.2**
2	TX Houston	with interior low-E panel	481.19	114.16	595.35	$110.22	**15.6%**	$0.26	**38.1**	**11.0**
2	TX Houston	with exterior solar-E panel	400.82	144.32	545.13	$160.44	**22.7%**	$0.38	**23.6**	**4.7**
2	TX Houston	Metal frame, double pane – Natural Gas Heating	517.72	226.17	743.89	--	--	--	--	
2	TX Houston	with exterior clear panel	499.99	164.78	664.77	$79.12	10.6%	$0.19	42.5	
2	TX Houston	with interior clear panel	491.71	156.17	647.88	$96.01	12.9%	$0.23	39.4	
2	TX Houston	with exterior low-E panel	467.95	135.70	603.66	$140.23	**18.9%**	$0.33	**27.0**	**6.9**
2	TX Houston	with interior low-E panel	476.46	126.01	602.47	$141.41	**19.0%**	$0.34	**29.7**	**9.3**
2	TX Houston	with exterior solar-E panel	408.97	155.09	564.06	$179.83	**24.2%**	$0.43	**21.0**	**4.2**
2	TX Houston	with exterior clear panel, worst case mounting	491.24	187.40	678.64	$65.25	8.8%	$0.16	51.5	
2	TX Houston	with exterior low-E panel, worst case mounting	460.03	171.24	631.28	$112.61	15.1%	$0.27	33.6	
2	TX Houston	with exterior solar-E panel, worst case mounting	411.34	188.48	599.81	$144.08	19.4%	$0.34	26.2	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
2	TX Houston	Wood frame, single pane	Heat pump / AC	4865	kWh	2035	kWh	79.2	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4236	kWh	1214	kWh	62.6	MBtu	21.0%
2	TX Houston	with interior clear panel	Heat pump / AC	4218	kWh	1168	kWh	61.8	MBtu	21.9%
2	TX Houston	with exterior low-E panel	Heat pump / AC	3976	kWh	1034	kWh	57.5	MBtu	**27.4%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4145	kWh	941	kWh	58.4	MBtu	**26.3%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3461	kWh	1131	kWh	52.7	MBtu	**33.4%**
2	TX Houston	Wood frame, double pane	Heat pump / AC	4475	kWh	1400	kWh	67.5	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4132	kWh	1174	kWh	60.9	MBtu	9.7%
2	TX Houston	with interior clear panel	Heat pump / AC	4185	kWh	1124	kWh	61.0	MBtu	9.6%
2	TX Houston	with exterior low-E panel	Heat pump / AC	3874	kWh	1020	kWh	56.2	MBtu	**16.7%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4071	kWh	947	kWh	57.6	MBtu	**14.6%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3391	kWh	1117	kWh	51.8	MBtu	**23.3%**
2	TX Houston	Metal frame, double pane	Heat pump / AC	4380	kWh	1714	kWh	70.0	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4230	kWh	1301	kWh	63.5	MBtu	9.2%
2	TX Houston	with interior clear panel	Heat pump / AC	4160	kWh	1245	kWh	62.1	MBtu	11.3%
2	TX Houston	with exterior low-E panel	Heat pump / AC	3959	kWh	1091	kWh	58.0	MBtu	**17.1%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4031	kWh	1030	kWh	58.1	MBtu	**17.0%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3460	kWh	1191	kWh	53.4	MBtu	**23.7%**
2	TX Houston	with exterior clear panel, worst case mounting	Heat pump / AC	4156	kWh	1453	kWh	64.4	MBtu	8.0%
2	TX Houston	with exterior low-E panel, worst case mounting	Heat pump / AC	3892	kWh	1322	kWh	59.9	MBtu	14.4%
2	TX Houston	with exterior solar-E panel, worst case mountin	Heat pump / AC	3480	kWh	1413	kWh	56.2	MBtu	19.7%
1	FL Miami	Wood frame, single pane	Heat pump / AC	7514	kWh	60	kWh	87.0	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6627	kWh	18	kWh	76.3	MBtu	12.3%
1	FL Miami	with interior clear panel	Heat pump / AC	6589	kWh	16	kWh	75.8	MBtu	12.8%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6265	kWh	11	kWh	72.1	MBtu	**17.1%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6489	kWh	8	kWh	74.6	MBtu	**14.2%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	5527	kWh	14	kWh	63.6	MBtu	**26.8%**
1	FL Miami	Wood frame, double pane	Heat pump / AC	6968	kWh	24	kWh	80.3	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6485	kWh	16	kWh	74.6	MBtu	7.0%
1	FL Miami	with interior clear panel	Heat pump / AC	6550	kWh	14	kWh	75.4	MBtu	6.1%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6120	kWh	11	kWh	70.4	MBtu	**12.3%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6388	kWh	8	kWh	73.4	MBtu	**8.5%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	5423	kWh	14	kWh	62.4	MBtu	**22.2%**
1	FL Miami	Metal frame, double pane	Heat pump / AC	6829	kWh	40	kWh	78.9	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6612	kWh	21	kWh	76.2	MBtu	3.4%
1	FL Miami	with interior clear panel	Heat pump / AC	6510	kWh	19	kWh	75.0	MBtu	4.9%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6240	kWh	13	kWh	71.8	MBtu	**9.0%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6338	kWh	11	kWh	72.9	MBtu	**7.6%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	5525	kWh	16	kWh	63.6	MBtu	**19.3%**
1	FL Miami	with exterior clear panel, worst case mounting	Heat pump / AC	6507	kWh	27	kWh	75.0	MBtu	4.9%
1	FL Miami	with exterior low-E panel, worst case mounting	Heat pump / AC	6141	kWh	21	kWh	70.8	MBtu	10.3%
1	FL Miami	with exterior solar-E panel, worst case mountin	Heat pump / AC	5538	kWh	26	kWh	63.9	MBtu	19.0%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
2	TX Houston	Wood frame, single pane – Heat Pump Heating	575.04	240.54	815.58	--	--	--	--	
2	TX Houston	with exterior clear panel	500.70	143.49	644.19	$171.39	21.0%	$0.41	19.6	
2	TX Houston	with interior clear panel	498.57	138.06	636.63	$178.95	21.9%	$0.43	21.1	
2	TX Houston	with exterior low-E panel	469.96	122.22	592.18	$223.40	**27.4%**	$0.53	**16.9**	**8.1**
2	TX Houston	with interior low-E panel	489.94	111.23	601.17	$214.41	**26.3%**	$0.51	**19.6**	**11.8**
2	TX Houston	with exterior solar-E panel	409.09	133.68	542.77	$272.81	**33.4%**	$0.65	**13.9**	**4.1**
2	TX Houston	Wood frame, double pane – Heat Pump Heating	528.95	165.48	694.43	--	--	--	--	
2	TX Houston	with exterior clear panel	488.40	138.77	627.17	$67.26	9.7%	$0.16	50.0	
2	TX Houston	with interior clear panel	494.67	132.86	627.52	$66.90	9.6%	$0.16	56.5	
2	TX Houston	with exterior low-E panel	457.91	120.56	578.47	$115.95	**16.7%**	$0.28	**32.6**	**8.6**
2	TX Houston	with interior low-E panel	481.19	111.94	593.13	$101.30	**14.6%**	$0.24	**41.5**	**12.2**
2	TX Houston	with exterior solar-E panel	400.82	132.03	532.85	$161.58	**23.3%**	$0.38	**23.4**	**4.5**
2	TX Houston	Metal frame, double pane – Heat Pump Heating	517.72	202.59	720.31	--	--	--	--	
2	TX Houston	with exterior clear panel	499.99	153.78	653.76	$66.55	9.2%	$0.16	50.5	
2	TX Houston	with interior clear panel	491.71	147.16	638.87	$81.44	11.3%	$0.19	46.4	
2	TX Houston	with exterior low-E panel	467.95	128.96	596.91	$123.40	**17.1%**	$0.29	**30.6**	**7.4**
2	TX Houston	with interior low-E panel	476.46	121.75	598.21	$122.10	**17.0%**	$0.29	**34.4**	**10.3**
2	TX Houston	with exterior solar-E panel	408.97	140.78	549.75	$170.56	**23.7%**	$0.41	**22.2**	**4.0**
2	TX Houston	with exterior clear panel, worst case mounting	491.24	171.74	662.98	$57.33	8.0%	$0.14	58.6	
2	TX Houston	with exterior low-E panel, worst case mounting	460.03	156.26	616.29	$104.02	14.4%	$0.25	36.3	
2	TX Houston	with exterior solar-E panel, worst case mounting	411.34	167.02	578.35	$141.96	19.7%	$0.34	26.6	
1	FL Miami	Wood frame, single pane	900.18	7.19	907.37	--	--	--	--	
1	FL Miami	with exterior clear panel	793.91	2.16	796.07	$111.29	12.3%	$0.26	30.2	
1	FL Miami	with interior clear panel	789.36	1.92	791.28	$116.09	12.8%	$0.28	32.6	
1	FL Miami	with exterior low-E panel	750.55	1.32	751.86	$155.50	**17.1%**	$0.37	**24.3**	**9.5**
1	FL Miami	with interior low-E panel	777.38	0.96	778.34	$129.02	**14.2%**	$0.31	**32.6**	**32.5**
1	FL Miami	with exterior solar-E panel	662.13	1.68	663.81	$243.55	**26.8%**	$0.58	**15.5**	**3.2**
1	FL Miami	Wood frame, double pane	834.77	2.88	837.64	--	--	--	--	
1	FL Miami	with exterior clear panel	776.90	1.92	778.82	$58.82	7.0%	$0.14	57.1	
1	FL Miami	with interior clear panel	784.69	1.68	786.37	$51.27	6.1%	$0.12	73.7	
1	FL Miami	with exterior low-E panel	733.18	1.32	734.49	$103.15	**12.3%**	$0.25	**36.6**	**9.5**
1	FL Miami	with interior low-E panel	765.28	0.96	766.24	$71.40	**8.5%**	$0.17	**58.8**	**20.9**
1	FL Miami	with exterior solar-E panel	649.68	1.68	651.35	$186.29	**22.2%**	$0.44	**20.3**	**3.3**
1	FL Miami	Metal frame, double pane	818.11	4.79	822.91	--	--	--	--	
1	FL Miami	with exterior clear panel	792.12	2.52	794.63	$28.27	3.4%	$0.07	118.8	
1	FL Miami	with interior clear panel	779.90	2.28	782.17	$40.73	4.9%	$0.10	92.8	
1	FL Miami	with exterior low-E panel	747.55	1.56	749.11	$73.80	**9.0%**	$0.18	**51.2**	**9.2**
1	FL Miami	with interior low-E panel	759.29	1.32	760.61	$62.30	**7.6%**	$0.15	**67.4**	**19.5**
1	FL Miami	with exterior solar-E panel	661.90	1.92	663.81	$159.09	**19.3%**	$0.38	**23.8**	**3.2**
1	FL Miami	with exterior clear panel, worst case mounting	779.54	3.23	782.77	$40.13	4.9%	$0.10	83.7	
1	FL Miami	with exterior low-E panel, worst case mounting	735.69	2.52	738.21	$84.70	10.3%	$0.20	44.6	
1	FL Miami	with exterior solar-E panel, worst case mounting	663.45	3.11	666.57	$156.34	19.0%	$0.37	24.2	

Appendix C

RESFEN Results
(Base Energy Savings, Not Including Air Leakage Reduction)

Notes: Bold numbers in tables highlight results with low-E panels
Red numbers in tables highlight results with solar control low-E panels

SMALLER, OLDER HOME (1-story, 1700 ft^2)

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
8	AK Fairbanks	Wood frame, single pane	Furnace / AC	73	kWh	330.5	MBtu	361.7	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	59	kWh	301	MBtu	329.4	MBtu	8.9%
8	AK Fairbanks	with interior clear panel	Furnace / AC	59	kWh	299.6	MBtu	327.8	MBtu	9.4%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	45	kWh	289.7	MBtu	316.9	MBtu	**12.4%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	56	kWh	285.3	MBtu	312.2	MBtu	**13.7%**
8	AK Fairbanks	Wood frame, double pane	Furnace / AC	67	kWh	307.3	MBtu	336.3	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	53	kWh	297.6	MBtu	325.6	MBtu	3.2%
8	AK Fairbanks	with interior clear panel	Furnace / AC	57	kWh	295.9	MBtu	323.8	MBtu	3.7%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	40	kWh	288.6	MBtu	315.6	MBtu	**6.2%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	52	kWh	285.6	MBtu	312.5	MBtu	**7.1%**
8	AK Fairbanks	Metal frame, double pane	Furnace / AC	59	kWh	326.2	MBtu	356.9	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	57	kWh	305.5	MBtu	334.3	MBtu	6.3%
8	AK Fairbanks	with interior clear panel	Furnace / AC	54	kWh	303.7	MBtu	332.3	MBtu	6.9%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	44	kWh	293.3	MBtu	320.8	MBtu	**10.1%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	49	kWh	291.2	MBtu	318.6	MBtu	**10.7%**
8	AK Fairbanks	with exterior clear panel, worst case mounting	Furnace / AC	52	kWh	314.8	MBtu	344.4	MBtu	3.5%
8	AK Fairbanks	with exterior low-E panel, worst case mounting	Furnace / AC	39	kWh	307.5	MBtu	336.2	MBtu	5.8%
7	AK Anchorage	Wood frame, single pane	Furnace / AC	12	kWh	197.3	MBtu	215.6	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	10	kWh	173.9	MBtu	190.0	MBtu	11.9%
7	AK Anchorage	with interior clear panel	Furnace / AC	12	kWh	172.8	MBtu	188.8	MBtu	12.4%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	7	kWh	165	MBtu	180.3	MBtu	**16.4%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	9	kWh	161.5	MBtu	176.5	MBtu	**18.1%**
7	AK Anchorage	Wood frame, double pane	Furnace / AC	11	kWh	178.8	MBtu	195.4	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	9	kWh	171.6	MBtu	187.5	MBtu	4.0%
7	AK Anchorage	with interior clear panel	Furnace / AC	9	kWh	170.4	MBtu	186.2	MBtu	4.7%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	7	kWh	164.3	MBtu	179.5	MBtu	**8.1%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	9	kWh	161.8	MBtu	176.8	MBtu	**9.5%**
7	AK Anchorage	Metal frame, double pane	Furnace / AC	9	kWh	193.9	MBtu	211.8	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	9	kWh	177.8	MBtu	194.3	MBtu	8.3%
7	AK Anchorage	with interior clear panel	Furnace / AC	9	kWh	176.3	MBtu	192.6	MBtu	9.1%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	7	kWh	167.9	MBtu	183.4	MBtu	**13.4%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	8	kWh	166.1	MBtu	181.5	MBtu	**14.3%**
7	AK Anchorage	with exterior clear panel, worst case mounting	Furnace / AC	9	kWh	185.2	MBtu	202.3	MBtu	4.5%
7	AK Anchorage	with exterior low-E panel, worst case mounting	Furnace / AC	6	kWh	179.1	MBtu	195.6	MBtu	7.6%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
8	AK Fairbanks	Wood frame, single pane	14.10	2858.83	2872.92	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	11.39	2603.65	2615.04	$257.88	9.0%	$1.01	7.9	
8	AK Fairbanks	with interior clear panel	11.39	2591.54	2602.93	$269.99	9.4%	$1.06	8.5	
8	AK Fairbanks	with exterior low-E panel	8.69	2505.91	2514.59	$358.33	**12.5%**	$1.41	**6.4**	**2.5**
8	AK Fairbanks	with interior low-E panel	10.81	2467.85	2478.66	$394.26	**13.7%**	$1.55	**6.5**	**2.1**
8	AK Fairbanks	Wood frame, double pane	12.94	2658.15	2671.08	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	10.23	2574.24	2584.47	$86.61	3.2%	$0.34	23.6	
8	AK Fairbanks	with interior clear panel	11.01	2559.54	2570.54	$100.54	3.8%	$0.39	22.8	
8	AK Fairbanks	with exterior low-E panel	7.72	2496.39	2504.11	$166.97	**6.3%**	$0.65	**13.7**	**3.2**
8	AK Fairbanks	with interior low-E panel	10.04	2470.44	2480.48	$190.60	**7.1%**	$0.75	**13.4**	**2.8**
8	AK Fairbanks	Metal frame, double pane	11.39	2821.63	2833.02	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	11.01	2642.58	2653.58	$179.44	6.3%	$0.70	11.4	
8	AK Fairbanks	with interior clear panel	10.43	2627.01	2637.43	$195.59	6.9%	$0.77	11.7	
8	AK Fairbanks	with exterior low-E panel	8.50	2537.05	2545.54	$287.48	**10.1%**	$1.13	**8.0**	**2.4**
8	AK Fairbanks	with interior low-E panel	9.46	2518.88	2528.34	$304.68	**10.8%**	$1.19	**8.4**	**2.3**
8	AK Fairbanks	with exterior clear panel, worst case mounting	10.04	2723.02	2733.06	$99.96	3.5%	$0.39	20.4	
8	AK Fairbanks	with exterior low-E panel, worst case mounting	7.53	2659.88	2667.41	$165.62	5.8%	$0.65	13.9	
7	AK Anchorage	Wood frame, single pane	2.32	1706.65	1708.96	--	--	--	--	
7	AK Anchorage	with exterior clear panel	1.93	1504.24	1506.17	$202.80	11.9%	$0.80	10.1	
7	AK Anchorage	with interior clear panel	2.32	1494.72	1497.04	$211.93	12.4%	$0.83	10.8	
7	AK Anchorage	with exterior low-E panel	1.35	1427.25	1428.60	$280.36	**16.4%**	$1.10	**8.2**	**3.3**
7	AK Anchorage	with interior low-E panel	1.74	1396.98	1398.71	$310.25	**18.2%**	$1.22	**8.2**	**2.6**
7	AK Anchorage	Wood frame, double pane	2.12	1546.62	1548.74	--	--	--	--	
7	AK Anchorage	with exterior clear panel	1.74	1484.34	1486.08	$62.67	4.0%	$0.25	32.6	
7	AK Anchorage	with interior clear panel	1.74	1473.96	1475.70	$73.05	4.7%	$0.29	31.4	
7	AK Anchorage	with exterior low-E panel	1.35	1421.20	1422.55	$126.20	**8.1%**	$0.49	**18.2**	**4.0**
7	AK Anchorage	with interior low-E panel	1.74	1399.57	1401.31	$147.44	**9.5%**	$0.58	**17.3**	**3.4**
7	AK Anchorage	Metal frame, double pane	1.74	1677.24	1678.97	--	--	--	--	
7	AK Anchorage	with exterior clear panel	1.74	1537.97	1539.71	$139.27	8.3%	$0.55	14.6	
7	AK Anchorage	with interior clear panel	1.74	1525.00	1526.73	$152.24	9.1%	$0.60	15.1	
7	AK Anchorage	with exterior low-E panel	1.35	1452.34	1453.69	$225.29	**13.4%**	$0.88	**10.2**	**3.0**
7	AK Anchorage	with interior low-E panel	1.54	1436.77	1438.31	$240.66	**14.3%**	$0.94	**10.6**	**2.9**
7	AK Anchorage	with exterior clear panel, worst case mounting	1.74	1601.98	1603.72	$75.25	4.5%	$0.30	27.1	
7	AK Anchorage	with exterior low-E panel, worst case mounting	1.16	1549.22	1550.37	$128.60	7.7%	$0.50	17.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
7	MN Duluth	Wood frame, single pane	Furnace / AC	190	kWh	201.5	MBtu	222.2	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	161	kWh	176	MBtu	194.0	MBtu	12.7%
7	MN Duluth	with interior clear panel	Furnace / AC	162	kWh	174.9	MBtu	192.9	MBtu	13.2%
7	MN Duluth	with exterior low-E panel	Furnace / AC	137	kWh	167.3	MBtu	184.3	MBtu	**17.1%**
7	MN Duluth	with interior low-E panel	Furnace / AC	159	kWh	163.4	MBtu	180.3	MBtu	**18.9%**
7	MN Duluth	Wood frame, double pane	Furnace / AC	180	kWh	180.9	MBtu	199.6	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	147	kWh	173.7	MBtu	191.4	MBtu	4.1%
7	MN Duluth	with interior clear panel	Furnace / AC	158	kWh	172.3	MBtu	190.0	MBtu	4.8%
7	MN Duluth	with exterior low-E panel	Furnace / AC	128	kWh	166.8	MBtu	183.6	MBtu	**8.0%**
7	MN Duluth	with interior low-E panel	Furnace / AC	147	kWh	163.9	MBtu	180.7	MBtu	**9.5%**
7	MN Duluth	Metal frame, double pane	Furnace / AC	158	kWh	197.1	MBtu	217.0	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	154	kWh	180.1	MBtu	198.4	MBtu	8.6%
7	MN Duluth	with interior clear panel	Furnace / AC	150	kWh	178.6	MBtu	196.8	MBtu	9.3%
7	MN Duluth	with exterior low-E panel	Furnace / AC	138	kWh	170.5	MBtu	187.8	MBtu	**13.5%**
7	MN Duluth	with interior low-E panel	Furnace / AC	143	kWh	168.4	MBtu	185.5	MBtu	**14.5%**
7	MN Duluth	with exterior clear panel, worst case mounting	Furnace / AC	147	kWh	188	MBtu	207.0	MBtu	4.6%
7	MN Duluth	with exterior low-E panel, worst case mounting	Furnace / AC	124	kWh	182.3	MBtu	200.5	MBtu	7.6%
6	MN Minneapolis	Wood frame, single pane	Furnace / AC	775	kWh	148.2	MBtu	170.7	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	691	kWh	128.3	MBtu	148.0	MBtu	13.3%
6	MN Minneapolis	with interior clear panel	Furnace / AC	692	kWh	127.5	MBtu	147.2	MBtu	13.8%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	619	kWh	121.5	MBtu	139.8	MBtu	**18.1%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	672	kWh	118.5	MBtu	137.1	MBtu	**19.7%**
6	MN Minneapolis	Wood frame, double pane	Furnace / AC	732	kWh	132.1	MBtu	152.7	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	658	kWh	126.5	MBtu	145.7	MBtu	4.6%
6	MN Minneapolis	with interior clear panel	Furnace / AC	681	kWh	125.4	MBtu	144.8	MBtu	5.2%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	590	kWh	121.1	MBtu	139.0	MBtu	**8.9%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	650	kWh	118.9	MBtu	137.3	MBtu	**10.1%**
6	MN Minneapolis	Metal frame, double pane	Furnace / AC	693	kWh	144.8	MBtu	166.1	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	682	kWh	131.5	MBtu	151.4	MBtu	8.8%
6	MN Minneapolis	with interior clear panel	Furnace / AC	669	kWh	130.3	MBtu	150.0	MBtu	9.7%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	610	kWh	124	MBtu	142.4	MBtu	**14.3%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	637	kWh	122.4	MBtu	141.0	MBtu	**15.1%**
6	MN Minneapolis	with exterior clear panel, worst case mounting	Furnace / AC	656	kWh	137.6	MBtu	157.8	MBtu	5.0%
6	MN Minneapolis	with exterior low-E panel, worst case mounting	Furnace / AC	583	kWh	133.2	MBtu	152.1	MBtu	8.4%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
7	MN Duluth	Wood frame, single pane	23.07	1614.02	1637.08	--	--	--	--	
7	MN Duluth	with exterior clear panel	19.55	1409.76	1429.31	$207.78	12.7%	$0.81	9.8	
7	MN Duluth	with interior clear panel	19.67	1400.95	1420.62	$216.47	13.2%	$0.85	10.6	
7	MN Duluth	with exterior low-E panel	16.63	1340.07	1356.70	$280.38	**17.1%**	$1.10	**8.2**	**3.5**
7	MN Duluth	with interior low-E panel	19.30	1308.83	1328.14	$308.94	**18.9%**	$1.21	**8.3**	**2.8**
7	MN Duluth	Wood frame, double pane	21.85	1449.01	1470.86	--	--	--	--	
7	MN Duluth	with exterior clear panel	17.85	1391.34	1409.18	$61.68	4.2%	$0.24	33.1	
7	MN Duluth	with interior clear panel	19.18	1380.12	1399.30	$71.56	4.9%	$0.28	32.1	
7	MN Duluth	with exterior low-E panel	15.54	1336.07	1351.61	$119.25	**8.1%**	$0.47	**19.2**	**4.4**
7	MN Duluth	with interior low-E panel	17.85	1312.84	1330.68	$140.18	**9.5%**	$0.55	**18.2**	**3.7**
7	MN Duluth	Metal frame, double pane	19.18	1578.77	1597.95	--	--	--	--	
7	MN Duluth	with exterior clear panel	18.70	1442.60	1461.30	$136.66	8.6%	$0.54	14.9	
7	MN Duluth	with interior clear panel	18.21	1430.59	1448.80	$149.16	9.3%	$0.58	15.4	
7	MN Duluth	with exterior low-E panel	16.75	1365.71	1382.46	$215.49	**13.5%**	$0.85	**10.6**	**3.2**
7	MN Duluth	with interior low-E panel	17.36	1348.88	1366.24	$231.71	**14.5%**	$0.91	**11.0**	**3.1**
7	MN Duluth	with exterior clear panel, worst case mounting	17.85	1505.88	1523.73	$74.23	4.6%	$0.29	27.5	
7	MN Duluth	with exterior low-E panel, worst case mounting	15.05	1460.22	1475.28	$122.68	7.7%	$0.48	18.7	
6	MN Minneapolis	Wood frame, single pane	94.09	1187.08	1281.17	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	83.89	1027.68	1111.57	$169.60	13.2%	$0.67	12.0	
6	MN Minneapolis	with interior clear panel	84.01	1021.28	1105.28	$175.88	13.7%	$0.69	13.0	
6	MN Minneapolis	with exterior low-E panel	75.15	973.22	1048.36	$232.81	**18.2%**	$0.91	**9.9**	**4.0**
6	MN Minneapolis	with interior low-E panel	81.58	949.19	1030.77	$250.40	**19.5%**	$0.98	**10.2**	**3.4**
6	MN Minneapolis	Wood frame, double pane	88.86	1058.12	1146.99	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	79.88	1013.27	1093.15	$53.84	4.7%	$0.21	37.9	
6	MN Minneapolis	with interior clear panel	82.67	1004.45	1087.13	$59.86	5.2%	$0.23	38.3	
6	MN Minneapolis	with exterior low-E panel	71.63	970.01	1041.64	$105.35	**9.2%**	$0.41	**21.8**	**5.0**
6	MN Minneapolis	with interior low-E panel	78.91	952.39	1031.30	$115.69	**10.1%**	$0.45	**22.0**	**4.6**
6	MN Minneapolis	Metal frame, double pane	84.13	1159.85	1243.98	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	82.79	1053.32	1136.11	$107.87	8.7%	$0.42	18.9	
6	MN Minneapolis	with interior clear panel	81.22	1043.70	1124.92	$119.06	9.6%	$0.47	19.3	
6	MN Minneapolis	with exterior low-E panel	74.05	993.24	1067.29	$176.68	**14.2%**	$0.69	**13.0**	**3.7**
6	MN Minneapolis	with interior low-E panel	77.33	980.42	1057.76	$186.22	**15.0%**	$0.73	**13.7**	**3.8**
6	MN Minneapolis	with exterior clear panel, worst case mounting	79.64	1102.18	1181.81	$62.16	5.0%	$0.24	32.8	
6	MN Minneapolis	with exterior low-E panel, worst case mounting	70.78	1066.93	1137.71	$106.27	8.5%	$0.42	21.6	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
6	VT Burlington	Wood frame, single pane	Furnace / AC	445	kWh	141	MBtu	159.1	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	388	kWh	122.2	MBtu	137.9	MBtu	13.3%
6	VT Burlington	with interior clear panel	Furnace / AC	390	kWh	121.4	MBtu	137.0	MBtu	13.9%
6	VT Burlington	with exterior low-E panel	Furnace / AC	340	kWh	115.6	MBtu	130.1	MBtu	**18.2%**
6	VT Burlington	with interior low-E panel	Furnace / AC	377	kWh	112.6	MBtu	127.3	MBtu	**20.0%**
6	VT Burlington	Wood frame, double pane	Furnace / AC	418	kWh	125.9	MBtu	142.3	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	367	kWh	120.6	MBtu	135.9	MBtu	4.5%
6	VT Burlington	with interior clear panel	Furnace / AC	381	kWh	119.5	MBtu	134.9	MBtu	5.2%
6	VT Burlington	with exterior low-E panel	Furnace / AC	320	kWh	115.2	MBtu	129.5	MBtu	**9.0%**
6	VT Burlington	with interior low-E panel	Furnace / AC	361	kWh	113	MBtu	127.5	MBtu	**10.4%**
6	VT Burlington	Metal frame, double pane	Furnace / AC	389	kWh	138.1	MBtu	155.3	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	381	kWh	125.3	MBtu	141.2	MBtu	9.1%
6	VT Burlington	with interior clear panel	Furnace / AC	373	kWh	124.2	MBtu	139.9	MBtu	9.9%
6	VT Burlington	with exterior low-E panel	Furnace / AC	334	kWh	118	MBtu	132.7	MBtu	**14.5%**
6	VT Burlington	with interior low-E panel	Furnace / AC	351	kWh	116.4	MBtu	131.1	MBtu	**15.5%**
6	VT Burlington	with exterior clear panel, worst case mounting	Furnace / AC	363	kWh	131.3	MBtu	147.5	MBtu	5.0%
6	VT Burlington	with exterior low-E panel, worst case mounting	Furnace / AC	317	kWh	126.9	MBtu	142.2	MBtu	8.4%
5	CO Denver	Wood frame, single pane	Furnace / AC	970	kWh	100.8	MBtu	121.2	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	865	kWh	87	MBtu	104.9	MBtu	13.4%
5	CO Denver	with interior clear panel	Furnace / AC	867	kWh	86.4	MBtu	104.3	MBtu	13.9%
5	CO Denver	with exterior low-E panel	Furnace / AC	779	kWh	82.3	MBtu	98.8	MBtu	**18.5%**
5	CO Denver	with interior low-E panel	Furnace / AC	842	kWh	79.6	MBtu	96.6	MBtu	**20.3%**
5	CO Denver	Wood frame, double pane	Furnace / AC	916	kWh	89.6	MBtu	108.4	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	827	kWh	86.1	MBtu	103.5	MBtu	4.5%
5	CO Denver	with interior clear panel	Furnace / AC	853	kWh	85.1	MBtu	102.7	MBtu	5.2%
5	CO Denver	with exterior low-E panel	Furnace / AC	745	kWh	82.3	MBtu	98.4	MBtu	**9.2%**
5	CO Denver	with interior low-E panel	Furnace / AC	812	kWh	80.1	MBtu	96.8	MBtu	**10.7%**
5	CO Denver	Metal frame, double pane	Furnace / AC	878	kWh	99.5	MBtu	118.7	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	856	kWh	89.7	MBtu	107.8	MBtu	9.2%
5	CO Denver	with interior clear panel	Furnace / AC	841	kWh	88.9	MBtu	106.7	MBtu	10.1%
5	CO Denver	with exterior low-E panel	Furnace / AC	771	kWh	84.3	MBtu	100.9	MBtu	**15.0%**
5	CO Denver	with interior low-E panel	Furnace / AC	801	kWh	82.9	MBtu	99.7	MBtu	**16.0%**
5	CO Denver	with exterior clear panel, worst case mounting	Furnace / AC	830	kWh	94.6	MBtu	112.8	MBtu	5.0%
5	CO Denver	with exterior low-E panel, worst case mounting	Furnace / AC	746	kWh	91.6	MBtu	108.6	MBtu	8.5%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
6	VT Burlington	Wood frame, single pane	77.88	2023.35	2101.23	--	--	--	--	
6	VT Burlington	with exterior clear panel	67.90	1753.57	1821.47	$279.76	13.3%	$1.10	7.3	
6	VT Burlington	with interior clear panel	68.25	1742.09	1810.34	$290.89	13.8%	$1.14	7.9	
6	VT Burlington	with exterior low-E panel	59.50	1658.86	1718.36	$382.87	**18.2%**	$1.50	**6.0**	**2.5**
6	VT Burlington	with interior low-E panel	65.98	1615.81	1681.79	$419.44	**20.0%**	$1.64	**6.1**	**2.0**
6	VT Burlington	Wood frame, double pane	73.15	1806.67	1879.82	--	--	--	--	
6	VT Burlington	with exterior clear panel	64.23	1730.61	1794.84	$84.98	4.5%	$0.33	24.0	
6	VT Burlington	with interior clear panel	66.68	1714.83	1781.50	$98.32	5.2%	$0.39	23.3	
6	VT Burlington	with exterior low-E panel	56.00	1653.12	1709.12	$170.70	**9.1%**	$0.67	**13.4**	**3.0**
6	VT Burlington	with interior low-E panel	63.18	1621.55	1684.73	$195.09	**10.4%**	$0.77	**13.1**	**2.6**
6	VT Burlington	Metal frame, double pane	68.08	1981.74	2049.81	--	--	--	--	
6	VT Burlington	with exterior clear panel	66.68	1798.06	1864.73	$185.08	9.0%	$0.73	11.0	
6	VT Burlington	with interior clear panel	65.28	1782.27	1847.55	$202.27	9.9%	$0.79	11.3	
6	VT Burlington	with exterior low-E panel	58.45	1693.30	1751.75	$298.06	**14.5%**	$1.17	**7.7**	**2.3**
6	VT Burlington	with interior low-E panel	61.43	1670.34	1731.77	$318.05	**15.5%**	$1.25	**8.0**	**2.2**
6	VT Burlington	with exterior clear panel, worst case mounting	63.53	1884.16	1947.68	$102.13	5.0%	$0.40	20.0	
6	VT Burlington	with exterior low-E panel, worst case mounting	55.48	1821.02	1876.49	$173.32	8.5%	$0.68	13.2	
5	CO Denver	Wood frame, single pane	118.15	770.11	888.26	--	--	--	--	
5	CO Denver	with exterior clear panel	105.36	664.68	770.04	$118.22	13.3%	$0.46	17.3	
5	CO Denver	with interior clear panel	105.60	660.10	765.70	$122.56	13.8%	$0.48	18.7	
5	CO Denver	with exterior low-E panel	94.88	628.77	723.65	$164.60	**18.5%**	$0.65	**13.9**	**5.5**
5	CO Denver	with interior low-E panel	102.56	608.14	710.70	$177.56	**20.0%**	$0.70	**14.4**	**4.6**
5	CO Denver	Wood frame, double pane	111.57	684.54	796.11	--	--	--	--	
5	CO Denver	with exterior clear panel	100.73	657.80	758.53	$37.58	4.7%	$0.15	54.3	
5	CO Denver	with interior clear panel	103.90	650.16	754.06	$42.05	5.3%	$0.16	54.6	
5	CO Denver	with exterior low-E panel	90.74	628.77	719.51	$76.60	**9.6%**	$0.30	**30.0**	**6.5**
5	CO Denver	with interior low-E panel	98.90	611.96	710.87	$85.25	**10.7%**	$0.33	**29.9**	**5.9**
5	CO Denver	Metal frame, double pane	106.94	760.18	867.12	--	--	--	--	
5	CO Denver	with exterior clear panel	104.26	685.31	789.57	$77.55	8.9%	$0.30	26.3	
5	CO Denver	with interior clear panel	102.43	679.20	781.63	$85.49	9.9%	$0.34	26.8	
5	CO Denver	with exterior low-E panel	93.91	644.05	737.96	$129.16	**14.9%**	$0.51	**17.8**	**4.9**
5	CO Denver	with interior low-E panel	97.56	633.36	730.92	$136.20	**15.7%**	$0.53	**18.7**	**5.0**
5	CO Denver	with exterior clear panel, worst case mounting	101.09	722.74	823.84	$43.28	5.0%	$0.17	47.1	
5	CO Denver	with exterior low-E panel, worst case mounting	90.86	699.82	790.69	$76.43	8.8%	$0.30	30.0	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	ID Boise	Wood frame, single pane	Furnace / AC	1169	kWh	101.2	MBtu	123.9	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1041	kWh	87.3	MBtu	107.3	MBtu	13.4%
5	ID Boise	with interior clear panel	Furnace / AC	1042	kWh	86.7	MBtu	106.6	MBtu	14.0%
5	ID Boise	with exterior low-E panel	Furnace / AC	945	kWh	82.5	MBtu	100.9	MBtu	**18.6%**
5	ID Boise	with interior low-E panel	Furnace / AC	1007	kWh	79.9	MBtu	98.8	MBtu	**20.3%**
5	ID Boise	Wood frame, double pane	Furnace / AC	1097	kWh	90	MBtu	110.9	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1003	kWh	86.4	MBtu	105.9	MBtu	4.5%
5	ID Boise	with interior clear panel	Furnace / AC	1027	kWh	85.4	MBtu	105.0	MBtu	5.3%
5	ID Boise	with exterior low-E panel	Furnace / AC	905	kWh	82.4	MBtu	100.4	MBtu	**9.5%**
5	ID Boise	with interior low-E panel	Furnace / AC	977	kWh	80.4	MBtu	99.0	MBtu	**10.7%**
5	ID Boise	Metal frame, double pane	Furnace / AC	1071	kWh	99.7	MBtu	121.2	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1039	kWh	90	MBtu	110.2	MBtu	9.0%
5	ID Boise	with interior clear panel	Furnace / AC	1022	kWh	89.1	MBtu	109.0	MBtu	10.0%
5	ID Boise	with exterior low-E panel	Furnace / AC	937	kWh	84.4	MBtu	102.9	MBtu	**15.1%**
5	ID Boise	with interior low-E panel	Furnace / AC	969	kWh	83	MBtu	101.8	MBtu	**16.0%**
5	ID Boise	with exterior clear panel, worst case mounting	Furnace / AC	1017	kWh	94.7	MBtu	115.1	MBtu	5.0%
5	ID Boise	with exterior low-E panel, worst case mounting	Furnace / AC	919	kWh	91.5	MBtu	110.5	MBtu	8.8%
5	IL Chicago	Wood frame, single pane	Furnace / AC	955	kWh	122.3	MBtu	144.5	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	862	kWh	105.9	MBtu	125.5	MBtu	13.1%
5	IL Chicago	with interior clear panel	Furnace / AC	863	kWh	105.2	MBtu	124.8	MBtu	13.7%
5	IL Chicago	with exterior low-E panel	Furnace / AC	787	kWh	100.2	MBtu	118.5	MBtu	**18.0%**
5	IL Chicago	with interior low-E panel	Furnace / AC	848	kWh	97.6	MBtu	116.3	MBtu	**19.5%**
5	IL Chicago	Wood frame, double pane	Furnace / AC	907	kWh	109.1	MBtu	129.6	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	831	kWh	104.5	MBtu	123.7	MBtu	4.6%
5	IL Chicago	with interior clear panel	Furnace / AC	850	kWh	103.6	MBtu	122.9	MBtu	5.1%
5	IL Chicago	with exterior low-E panel	Furnace / AC	750	kWh	99.9	MBtu	117.7	MBtu	**9.1%**
5	IL Chicago	with interior low-E panel	Furnace / AC	822	kWh	98	MBtu	116.5	MBtu	**10.1%**
5	IL Chicago	Metal frame, double pane	Furnace / AC	869	kWh	119.8	MBtu	140.8	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	852	kWh	108.7	MBtu	128.5	MBtu	8.7%
5	IL Chicago	with interior clear panel	Furnace / AC	841	kWh	107.7	MBtu	127.3	MBtu	9.6%
5	IL Chicago	with exterior low-E panel	Furnace / AC	777	kWh	102.2	MBtu	120.5	MBtu	**14.4%**
5	IL Chicago	with interior low-E panel	Furnace / AC	809	kWh	100.9	MBtu	119.5	MBtu	**15.1%**
5	IL Chicago	with exterior clear panel, worst case mounting	Furnace / AC	827	kWh	113.9	MBtu	133.9	MBtu	4.9%
5	IL Chicago	with exterior low-E panel, worst case mounting	Furnace / AC	751	kWh	110	MBtu	128.7	MBtu	8.6%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	ID Boise	Wood frame, single pane	114.09	859.19	973.28	--	--	--	--	
5	ID Boise	with exterior clear panel	101.60	741.18	842.78	$130.50	13.4%	$0.51	15.6	
5	ID Boise	with interior clear panel	101.70	736.08	837.78	$135.50	13.9%	$0.53	16.9	
5	ID Boise	with exterior low-E panel	92.23	700.43	792.66	$180.63	**18.6%**	$0.71	**12.7**	**5.1**
5	ID Boise	with interior low-E panel	98.28	678.35	776.63	$196.65	**20.2%**	$0.77	**13.0**	**4.2**
5	ID Boise	Wood frame, double pane	107.07	764.10	871.17	--	--	--	--	
5	ID Boise	with exterior clear panel	97.89	733.54	831.43	$39.74	4.6%	$0.16	51.3	
5	ID Boise	with interior clear panel	100.24	725.05	825.28	$45.89	5.3%	$0.18	50.0	
5	ID Boise	with exterior low-E panel	88.33	699.58	787.90	$83.26	**9.6%**	$0.33	**27.6**	**5.9**
5	ID Boise	with interior low-E panel	95.36	682.60	777.95	$93.22	**10.7%**	$0.37	**27.4**	**5.4**
5	ID Boise	Metal frame, double pane	104.53	846.45	950.98	--	--	--	--	
5	ID Boise	with exterior clear panel	101.41	764.10	865.51	$85.48	9.0%	$0.34	23.9	
5	ID Boise	with interior clear panel	99.75	756.46	856.21	$94.78	10.0%	$0.37	24.2	
5	ID Boise	with exterior low-E panel	91.45	716.56	808.01	$142.98	**15.0%**	$0.56	**16.1**	**4.4**
5	ID Boise	with interior low-E panel	94.57	704.67	799.24	$151.74	**16.0%**	$0.60	**16.8**	**4.5**
5	ID Boise	with exterior clear panel, worst case mounting	99.26	804.00	903.26	$47.72	5.0%	$0.19	42.7	
5	ID Boise	with exterior low-E panel, worst case mounting	89.69	776.84	866.53	$84.45	8.9%	$0.33	27.2	
5	IL Chicago	Wood frame, single pane	108.97	980.85	1089.81	--	--	--	--	
5	IL Chicago	with exterior clear panel	98.35	849.32	947.67	$142.14	13.0%	$0.56	14.4	
5	IL Chicago	with interior clear panel	98.47	843.70	942.17	$147.64	13.5%	$0.58	15.5	
5	IL Chicago	with exterior low-E panel	89.80	803.60	893.40	$196.41	**18.0%**	$0.77	**11.7**	**4.7**
5	IL Chicago	with interior low-E panel	96.76	782.75	879.51	$210.30	**19.3%**	$0.82	**12.1**	**4.1**
5	IL Chicago	Wood frame, double pane	103.49	874.98	978.47	--	--	--	--	
5	IL Chicago	with exterior clear panel	94.82	838.09	932.91	$45.56	4.7%	$0.18	44.8	
5	IL Chicago	with interior clear panel	96.99	830.87	927.86	$50.61	5.2%	$0.20	45.3	
5	IL Chicago	with exterior low-E panel	85.58	801.20	886.77	$91.70	**9.4%**	$0.36	**25.0**	**5.5**
5	IL Chicago	with interior low-E panel	93.79	785.96	879.75	$98.72	**10.1%**	$0.39	**25.8**	**5.3**
5	IL Chicago	Metal frame, double pane	99.15	960.80	1059.95	--	--	--	--	
5	IL Chicago	with exterior clear panel	97.21	871.77	968.99	$90.96	8.6%	$0.36	22.4	
5	IL Chicago	with interior clear panel	95.96	863.75	959.71	$100.24	9.5%	$0.39	22.9	
5	IL Chicago	with exterior low-E panel	88.66	819.64	908.30	$151.65	**14.3%**	$0.59	**15.1**	**4.2**
5	IL Chicago	with interior low-E panel	92.31	809.22	901.52	$158.42	**14.9%**	$0.62	**16.1**	**4.4**
5	IL Chicago	with exterior clear panel, worst case mounting	94.36	913.48	1007.84	$52.11	4.9%	$0.20	39.1	
5	IL Chicago	with exterior low-E panel, worst case mounting	85.69	882.20	967.89	$92.06	8.7%	$0.36	24.9	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	MA Boston	Wood frame, single pane	Furnace / AC	607	kWh	107	MBtu	123.8	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	546	kWh	91.3	MBtu	106.0	MBtu	14.4%
5	MA Boston	with interior clear panel	Furnace / AC	547	kWh	90.6	MBtu	105.2	MBtu	15.0%
5	MA Boston	with exterior low-E panel	Furnace / AC	493	kWh	86.1	MBtu	99.7	MBtu	**19.5%**
5	MA Boston	with interior low-E panel	Furnace / AC	539	kWh	83.5	MBtu	97.4	MBtu	**21.4%**
5	MA Boston	Wood frame, double pane	Furnace / AC	578	kWh	94.1	MBtu	109.4	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	522	kWh	90.1	MBtu	104.4	MBtu	4.6%
5	MA Boston	with interior clear panel	Furnace / AC	539	kWh	89.2	MBtu	103.6	MBtu	5.3%
5	MA Boston	with exterior low-E panel	Furnace / AC	467	kWh	85.9	MBtu	99.2	MBtu	**9.4%**
5	MA Boston	with interior low-E panel	Furnace / AC	520	kWh	83.9	MBtu	97.6	MBtu	**10.8%**
5	MA Boston	Metal frame, double pane	Furnace / AC	548	kWh	104.6	MBtu	120.5	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	537	kWh	94	MBtu	108.8	MBtu	9.7%
5	MA Boston	with interior clear panel	Furnace / AC	527	kWh	93.1	MBtu	107.7	MBtu	10.6%
5	MA Boston	with exterior low-E panel	Furnace / AC	483	kWh	88.1	MBtu	101.8	MBtu	**15.6%**
5	MA Boston	with interior low-E panel	Furnace / AC	506	kWh	86.7	MBtu	100.5	MBtu	**16.6%**
5	MA Boston	with exterior clear panel, worst case mounting	Furnace / AC	520	kWh	99.1	MBtu	114.2	MBtu	5.3%
5	MA Boston	with exterior low-E panel, worst case mounting	Furnace / AC	468	kWh	95.6	MBtu	109.8	MBtu	8.9%
5	NY Rochester	Wood frame, single pane	Furnace / AC	833	kWh	134.5	MBtu	156.4	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	753	kWh	117.4	MBtu	136.8	MBtu	12.5%
5	NY Rochester	with interior clear panel	Furnace / AC	755	kWh	116.8	MBtu	136.2	MBtu	12.9%
5	NY Rochester	with exterior low-E panel	Furnace / AC	683	kWh	111.4	MBtu	129.5	MBtu	**17.2%**
5	NY Rochester	with interior low-E panel	Furnace / AC	738	kWh	108.9	MBtu	127.4	MBtu	**18.6%**
5	NY Rochester	Wood frame, double pane	Furnace / AC	794	kWh	120.8	MBtu	141.0	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	721	kWh	116	MBtu	135.0	MBtu	4.3%
5	NY Rochester	with interior clear panel	Furnace / AC	744	kWh	115.2	MBtu	134.3	MBtu	4.7%
5	NY Rochester	with exterior low-E panel	Furnace / AC	655	kWh	111.1	MBtu	128.8	MBtu	**8.6%**
5	NY Rochester	with interior low-E panel	Furnace / AC	714	kWh	109.3	MBtu	127.6	MBtu	**9.6%**
5	NY Rochester	Metal frame, double pane	Furnace / AC	757	kWh	131.7	MBtu	152.5	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	744	kWh	120.4	MBtu	140.0	MBtu	8.2%
5	NY Rochester	with interior clear panel	Furnace / AC	732	kWh	119.3	MBtu	138.7	MBtu	9.1%
5	NY Rochester	with exterior low-E panel	Furnace / AC	675	kWh	113.6	MBtu	131.8	MBtu	**13.6%**
5	NY Rochester	with interior low-E panel	Furnace / AC	702	kWh	112.2	MBtu	130.6	MBtu	**14.4%**
5	NY Rochester	with exterior clear panel, worst case mounting	Furnace / AC	720	kWh	125.6	MBtu	145.4	MBtu	4.6%
5	NY Rochester	with exterior low-E panel, worst case mounting	Furnace / AC	650	kWh	121.4	MBtu	140.0	MBtu	8.2%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	MA Boston	Wood frame, single pane	105.62	1512.98	1618.60	--	--	--	--	
5	MA Boston	with exterior clear panel	95.00	1290.98	1385.99	$232.61	14.4%	$0.91	8.8	
5	MA Boston	with interior clear panel	95.18	1281.08	1376.26	$242.34	15.0%	$0.95	9.5	
5	MA Boston	with exterior low-E panel	85.78	1217.45	1303.24	$315.36	**19.5%**	$1.24	**7.3**	**3.1**
5	MA Boston	with interior low-E panel	93.79	1180.69	1274.48	$344.12	**21.3%**	$1.35	**7.4**	**2.5**
5	MA Boston	Wood frame, double pane	100.57	1330.57	1431.15	--	--	--	--	
5	MA Boston	with exterior clear panel	90.83	1274.01	1364.84	$66.30	4.6%	$0.26	30.8	
5	MA Boston	with interior clear panel	93.79	1261.29	1355.07	$76.07	5.3%	$0.30	30.2	
5	MA Boston	with exterior low-E panel	81.26	1214.63	1295.88	$135.26	**9.5%**	$0.53	**17.0**	**3.7**
5	MA Boston	with interior low-E panel	90.48	1186.35	1276.83	$154.32	**10.8%**	$0.61	**16.5**	**3.3**
5	MA Boston	Metal frame, double pane	95.35	1479.04	1574.40	--	--	--	--	
5	MA Boston	with exterior clear panel	93.44	1329.16	1422.60	$151.80	9.6%	$0.60	13.4	
5	MA Boston	with interior clear panel	91.70	1316.43	1408.13	$166.26	10.6%	$0.65	13.8	
5	MA Boston	with exterior low-E panel	84.04	1245.73	1329.78	$244.62	**15.5%**	$0.96	**9.4**	**2.7**
5	MA Boston	with interior low-E panel	88.04	1225.94	1313.98	$260.41	**16.5%**	$1.02	**9.8**	**2.7**
5	MA Boston	with exterior clear panel, worst case mounting	90.48	1401.27	1491.75	$82.64	5.2%	$0.32	24.7	
5	MA Boston	with exterior low-E panel, worst case mounting	81.43	1351.78	1433.22	$141.18	9.0%	$0.55	16.3	
5	NY Rochester	Wood frame, single pane	167.02	1648.97	1815.99	--	--	--	--	
5	NY Rochester	with exterior clear panel	150.98	1439.32	1590.30	$225.69	12.4%	$0.89	9.0	
5	NY Rochester	with interior clear panel	151.38	1431.97	1583.35	$232.64	12.8%	$0.91	9.9	
5	NY Rochester	with exterior low-E panel	136.94	1365.76	1502.71	$313.28	**17.3%**	$1.23	**7.3**	**2.9**
5	NY Rochester	with interior low-E panel	147.97	1335.11	1483.08	$332.90	**18.3%**	$1.31	**7.7**	**2.5**
5	NY Rochester	Wood frame, double pane	159.20	1481.01	1640.21	--	--	--	--	
5	NY Rochester	with exterior clear panel	144.56	1422.16	1566.72	$73.48	4.5%	$0.29	27.8	
5	NY Rochester	with interior clear panel	149.17	1412.35	1561.52	$78.68	4.8%	$0.31	29.2	
5	NY Rochester	with exterior low-E panel	131.33	1362.09	1493.41	$146.79	**8.9%**	$0.58	**15.6**	**3.5**
5	NY Rochester	with interior low-E panel	143.16	1340.02	1483.18	$157.03	**9.6%**	$0.62	**16.2**	**3.3**
5	NY Rochester	Metal frame, double pane	151.78	1614.64	1766.42	--	--	--	--	
5	NY Rochester	with exterior clear panel	149.17	1476.10	1625.28	$141.14	8.0%	$0.55	14.5	
5	NY Rochester	with interior clear panel	146.77	1462.62	1609.38	$157.04	8.9%	$0.62	14.6	
5	NY Rochester	with exterior low-E panel	135.34	1392.74	1528.07	$238.35	**13.5%**	$0.93	**9.6**	**2.6**
5	NY Rochester	with interior low-E panel	140.75	1375.57	1516.32	$250.10	**14.2%**	$0.98	**10.2**	**2.7**
5	NY Rochester	with exterior clear panel, worst case mounting	144.36	1539.86	1684.22	$82.20	4.7%	$0.32	24.8	
5	NY Rochester	with exterior low-E panel, worst case mounting	130.33	1488.36	1618.69	$147.73	8.4%	$0.58	15.5	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	PA Pittsburgh	Wood frame, single pane	Furnace / AC	897	kWh	112.2	MBtu	132.8	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	818	kWh	97.6	MBtu	116.0	MBtu	12.7%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	819	kWh	97	MBtu	115.3	MBtu	13.2%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	745	kWh	92.4	MBtu	109.5	MBtu	**17.6%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	802	kWh	90	MBtu	107.5	MBtu	**19.1%**
5	PA Pittsburgh	Wood frame, double pane	Furnace / AC	859	kWh	100.5	MBtu	119.6	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	784	kWh	96.4	MBtu	114.3	MBtu	4.5%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	807	kWh	95.6	MBtu	113.7	MBtu	5.0%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	715	kWh	92.1	MBtu	108.8	MBtu	**9.1%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	778	kWh	90.4	MBtu	107.6	MBtu	**10.0%**
5	PA Pittsburgh	Metal frame, double pane	Furnace / AC	818	kWh	110.2	MBtu	129.7	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	809	kWh	100.2	MBtu	118.7	MBtu	8.5%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	795	kWh	99.3	MBtu	117.6	MBtu	9.4%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	736	kWh	94.3	MBtu	111.4	MBtu	**14.1%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	764	kWh	93.1	MBtu	110.4	MBtu	**14.9%**
5	PA Pittsburgh	with exterior clear panel, worst case mounting	Furnace / AC	779	kWh	104.9	MBtu	123.5	MBtu	4.8%
5	PA Pittsburgh	with exterior low-E panel, worst case mounting	Furnace / AC	710	kWh	101.4	MBtu	118.9	MBtu	8.4%
4	NY New York City	Wood frame, single pane	Furnace / AC	1164	kWh	99	MBtu	121.5	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1073	kWh	85.5	MBtu	105.7	MBtu	13.0%
4	NY New York City	with interior clear panel	Furnace / AC	1076	kWh	84.9	MBtu	105.1	MBtu	13.5%
4	NY New York City	with exterior low-E panel	Furnace / AC	996	kWh	81	MBtu	99.9	MBtu	**17.8%**
4	NY New York City	with interior low-E panel	Furnace / AC	1055	kWh	78.7	MBtu	98.1	MBtu	**19.3%**
4	NY New York City	Wood frame, double pane	Furnace / AC	1122	kWh	88	MBtu	109.0	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1041	kWh	84.6	MBtu	104.3	MBtu	4.3%
4	NY New York City	with interior clear panel	Furnace / AC	1063	kWh	83.7	MBtu	103.6	MBtu	4.9%
4	NY New York City	with exterior low-E panel	Furnace / AC	964	kWh	80.9	MBtu	99.4	MBtu	**8.8%**
4	NY New York City	with interior low-E panel	Furnace / AC	1030	kWh	79.1	MBtu	98.2	MBtu	**9.9%**
4	NY New York City	Metal frame, double pane	Furnace / AC	1081	kWh	97.2	MBtu	118.6	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1065	kWh	88	MBtu	108.3	MBtu	8.6%
4	NY New York City	with interior clear panel	Furnace / AC	1054	kWh	87.2	MBtu	107.3	MBtu	9.5%
4	NY New York City	with exterior low-E panel	Furnace / AC	989	kWh	82.8	MBtu	101.8	MBtu	**14.2%**
4	NY New York City	with interior low-E panel	Furnace / AC	1016	kWh	81.6	MBtu	100.8	MBtu	**15.0%**
4	NY New York City	with exterior clear panel, worst case mounting	Furnace / AC	1039	kWh	92.4	MBtu	112.8	MBtu	4.8%
4	NY New York City	with exterior low-E panel, worst case mounting	Furnace / AC	964	kWh	89.4	MBtu	108.7	MBtu	8.3%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
5	PA Pittsburgh	Wood frame, single pane	119.66	1281.32	1400.98	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	109.12	1114.59	1223.71	$177.27	12.7%	$0.70	11.5	
5	PA Pittsburgh	with interior clear panel	109.25	1107.74	1216.99	$183.99	13.1%	$0.72	12.5	
5	PA Pittsburgh	with exterior low-E panel	99.38	1055.21	1154.59	$246.39	**17.6%**	$0.97	**9.3**	**3.7**
5	PA Pittsburgh	with interior low-E panel	106.99	1027.80	1134.79	$266.20	**19.0%**	$1.04	**9.6**	**3.1**
5	PA Pittsburgh	Wood frame, double pane	114.59	1147.71	1262.30	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	104.59	1100.89	1205.47	$56.83	4.5%	$0.22	35.9	
5	PA Pittsburgh	with interior clear panel	107.65	1091.75	1199.41	$62.89	5.0%	$0.25	36.5	
5	PA Pittsburgh	with exterior low-E panel	95.38	1051.78	1147.16	$115.14	**9.1%**	$0.45	**19.9**	**4.4**
5	PA Pittsburgh	with interior low-E panel	103.79	1032.37	1136.15	$126.15	**10.0%**	$0.49	**20.2**	**4.0**
5	PA Pittsburgh	Metal frame, double pane	109.12	1258.48	1367.61	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	107.92	1144.28	1252.20	$115.40	8.4%	$0.45	17.7	
5	PA Pittsburgh	with interior clear panel	106.05	1134.01	1240.06	$127.55	9.3%	$0.50	18.0	
5	PA Pittsburgh	with exterior low-E panel	98.18	1076.91	1175.09	$192.52	**14.1%**	$0.75	**11.9**	**3.3**
5	PA Pittsburgh	with interior low-E panel	101.92	1063.20	1165.12	$202.49	**14.8%**	$0.79	**12.6**	**3.4**
5	PA Pittsburgh	with exterior clear panel, worst case mounting	103.92	1197.96	1301.88	$65.73	4.8%	$0.26	31.0	
5	PA Pittsburgh	with exterior low-E panel, worst case mounting	94.71	1157.99	1252.70	$114.90	8.4%	$0.45	20.0	
4	NY NewYork City	Wood frame, single pane	233.38	1213.74	1447.12	--	--	--	--	
4	NY NewYork City	with exterior clear panel	215.14	1048.23	1263.37	$183.76	12.7%	$0.72	11.1	
4	NY NewYork City	with interior clear panel	215.74	1040.87	1256.61	$190.51	13.2%	$0.75	12.0	
4	NY NewYork City	with exterior low-E panel	199.70	993.06	1192.76	$254.36	**17.6%**	$1.00	**9.0**	**3.6**
4	NY NewYork City	with interior low-E panel	211.53	964.86	1176.39	$270.73	**18.7%**	$1.06	**9.4**	**3.2**
4	NY NewYork City	Wood frame, double pane	224.96	1078.88	1303.84	--	--	--	--	
4	NY NewYork City	with exterior clear panel	208.72	1037.20	1245.92	$57.92	4.4%	$0.23	35.2	
4	NY NewYork City	with interior clear panel	213.13	1026.16	1239.29	$64.55	5.0%	$0.25	35.6	
4	NY NewYork City	with exterior low-E panel	193.28	991.83	1185.12	$118.73	**9.1%**	$0.47	**19.3**	**4.2**
4	NY NewYork City	with interior low-E panel	206.52	969.77	1176.28	$127.56	**9.8%**	$0.50	**20.0**	**4.0**
4	NY NewYork City	Metal frame, double pane	216.74	1191.67	1408.41	--	--	--	--	
4	NY NewYork City	with exterior clear panel	213.53	1078.88	1292.41	$116.00	8.2%	$0.45	17.6	
4	NY NewYork City	with interior clear panel	211.33	1069.07	1280.40	$128.01	9.1%	$0.50	17.9	
4	NY NewYork City	with exterior low-E panel	198.29	1015.13	1213.42	$194.99	**13.8%**	$0.76	**11.8**	**3.2**
4	NY NewYork City	with interior low-E panel	203.71	1000.42	1204.12	$204.29	**14.5%**	$0.80	**12.5**	**3.3**
4	NY NewYork City	with exterior clear panel, worst case mounting	208.32	1132.82	1341.14	$67.27	4.8%	$0.26	30.3	
4	NY NewYork City	with exterior low-E panel, worst case mounting	193.28	1096.04	1289.33	$119.09	8.5%	$0.47	19.3	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
4	WA Seattle	Wood frame, single pane	Furnace / AC	188	kWh	77.7	MBtu	87.0	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	160	kWh	65.4	MBtu	73.3	MBtu	15.8%
4	WA Seattle	with interior clear panel	Furnace / AC	161	kWh	64.9	MBtu	72.7	MBtu	16.4%
4	WA Seattle	with exterior low-E panel	Furnace / AC	141	kWh	60.9	MBtu	68.1	MBtu	**21.7%**
4	WA Seattle	with interior low-E panel	Furnace / AC	159	kWh	58.9	MBtu	66.1	MBtu	**24.0%**
4	WA Seattle	Wood frame, double pane	Furnace / AC	175	kWh	67.9	MBtu	76.2	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	150	kWh	64.6	MBtu	72.3	MBtu	5.1%
4	WA Seattle	with interior clear panel	Furnace / AC	159	kWh	63.9	MBtu	71.6	MBtu	6.0%
4	WA Seattle	with exterior low-E panel	Furnace / AC	130	kWh	60.7	MBtu	67.8	MBtu	**11.0%**
4	WA Seattle	with interior low-E panel	Furnace / AC	151	kWh	59.2	MBtu	66.4	MBtu	**12.8%**
4	WA Seattle	Metal frame, double pane	Furnace / AC	159	kWh	76.3	MBtu	85.1	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	158	kWh	67.9	MBtu	76.0	MBtu	10.8%
4	WA Seattle	with interior clear panel	Furnace / AC	154	kWh	67.1	MBtu	75.0	MBtu	11.9%
4	WA Seattle	with exterior low-E panel	Furnace / AC	137	kWh	62.6	MBtu	69.9	MBtu	**17.9%**
4	WA Seattle	with interior low-E panel	Furnace / AC	146	kWh	61.5	MBtu	68.8	MBtu	**19.2%**
4	WA Seattle	with exterior clear panel, worst case mounting	Furnace / AC	148	kWh	71.9	MBtu	80.2	MBtu	5.8%
4	WA Seattle	with exterior low-E panel, worst case mounting	Furnace / AC	124	kWh	68.7	MBtu	76.4	MBtu	10.2%
4	DC Washington	Wood frame, single pane	Furnace / AC	1546	kWh	91.5	MBtu	117.7	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1420	kWh	79.6	MBtu	103.2	MBtu	12.3%
4	DC Washington	with interior clear panel	Furnace / AC	1423	kWh	79.1	MBtu	102.7	MBtu	12.7%
4	DC Washington	with exterior low-E panel	Furnace / AC	1316	kWh	75.5	MBtu	97.6	MBtu	**17.1%**
4	DC Washington	with interior low-E panel	Furnace / AC	1385	kWh	73.2	MBtu	95.8	MBtu	**18.6%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1119	kWh	79.1	MBtu	99.2	MBtu	**15.7%**
4	DC Washington	Wood frame, double pane	Furnace / AC	1480	kWh	81.9	MBtu	106.4	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1376	kWh	78.8	MBtu	101.8	MBtu	4.3%
4	DC Washington	with interior clear panel	Furnace / AC	1404	kWh	78	MBtu	101.3	MBtu	4.8%
4	DC Washington	with exterior low-E panel	Furnace / AC	1277	kWh	75.4	MBtu	97.0	MBtu	**8.9%**
4	DC Washington	with interior low-E panel	Furnace / AC	1352	kWh	73.6	MBtu	95.9	MBtu	**9.9%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1091	kWh	78.9	MBtu	98.7	MBtu	**7.3%**
4	DC Washington	Metal frame, double pane	Furnace / AC	1440	kWh	90.4	MBtu	115.3	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1411	kWh	82	MBtu	105.7	MBtu	8.2%
4	DC Washington	with interior clear panel	Furnace / AC	1394	kWh	81.3	MBtu	104.8	MBtu	9.1%
4	DC Washington	with exterior low-E panel	Furnace / AC	1309	kWh	77.2	MBtu	99.3	MBtu	**13.8%**
4	DC Washington	with interior low-E panel	Furnace / AC	1343	kWh	76	MBtu	98.4	MBtu	**14.6%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1116	kWh	80.8	MBtu	101.0	MBtu	**12.3%**
4	DC Washington	with exterior clear panel, worst case mounting	Furnace / AC	1383	kWh	86.1	MBtu	109.9	MBtu	4.6%
4	DC Washington	with exterior low-E panel, worst case mounting	Furnace / AC	1284	kWh	83.4	MBtu	105.8	MBtu	8.2%
4	DC Washington	with exterior solar-E panel, worst case mount	Furnace / AC	1121	kWh	86.4	MBtu	107.2	MBtu	7.0%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft2)	Simple payback	Payback for low-E
4	WA Seattle	Wood frame, single pane	16.37	810.41	826.79	--	--	--	--	
4	WA Seattle	with exterior clear panel	13.94	682.12	696.06	$130.73	15.8%	$0.51	15.6	
4	WA Seattle	with interior clear panel	14.02	676.91	690.93	$135.86	16.4%	$0.53	16.9	
4	WA Seattle	with exterior low-E panel	12.28	635.19	647.47	$179.32	**21.7%**	$0.70	**12.8**	**5.2**
4	WA Seattle	with interior low-E panel	13.85	614.33	628.18	$198.61	**24.0%**	$0.78	**12.8**	**4.1**
4	WA Seattle	Wood frame, double pane	15.24	708.20	723.44	--	--	--	--	
4	WA Seattle	with exterior clear panel	13.07	673.78	686.84	$36.60	5.1%	$0.14	55.7	
4	WA Seattle	with interior clear panel	13.85	666.48	680.33	$43.11	6.0%	$0.17	53.2	
4	WA Seattle	with exterior low-E panel	11.32	633.10	644.42	$79.02	**10.9%**	$0.31	**29.0**	**6.0**
4	WA Seattle	with interior low-E panel	13.15	617.46	630.61	$92.83	**12.8%**	$0.36	**27.5**	**5.1**
4	WA Seattle	Metal frame, double pane	13.85	795.81	809.66	--	--	--	--	
4	WA Seattle	with exterior clear panel	13.76	708.20	721.96	$87.70	10.8%	$0.34	23.3	
4	WA Seattle	with interior clear panel	13.41	699.85	713.27	$96.39	11.9%	$0.38	23.8	
4	WA Seattle	with exterior low-E panel	11.93	652.92	664.85	$144.81	**17.9%**	$0.57	**15.8**	**4.5**
4	WA Seattle	with interior low-E panel	12.72	641.45	654.16	$155.50	**19.2%**	$0.61	**16.4**	**4.3**
4	WA Seattle	with exterior clear panel, worst case mounting	12.89	749.92	762.81	$46.85	5.8%	$0.18	43.5	
4	WA Seattle	with exterior low-E panel, worst case mounting	10.80	716.54	727.34	$82.32	10.2%	$0.32	27.9	
4	DC Washington	Wood frame, single pane	197.58	1113.56	1311.13	--	--	--	--	
4	DC Washington	with exterior clear panel	181.48	968.73	1150.21	$160.93	12.3%	$0.63	12.7	
4	DC Washington	with interior clear panel	181.86	962.65	1144.51	$166.63	12.7%	$0.65	13.8	
4	DC Washington	with exterior low-E panel	168.18	918.84	1087.02	$224.11	**17.1%**	$0.88	**10.2**	**4.0**
4	DC Washington	with interior low-E panel	177.00	890.84	1067.85	$243.29	**18.6%**	$0.95	**10.5**	**3.3**
4	DC Washington	with exterior solar-E panel	143.01	962.65	1105.66	$205.48	**15.7%**	$0.81	**11.2**	**5.7**
4	DC Washington	Wood frame, double pane	189.14	996.72	1185.87	--	--	--	--	
4	DC Washington	with exterior clear panel	175.85	959.00	1134.85	$51.02	4.3%	$0.20	40.0	
4	DC Washington	with interior clear panel	179.43	949.26	1128.69	$57.18	4.8%	$0.22	40.1	
4	DC Washington	with exterior low-E panel	163.20	917.62	1080.82	$105.05	**8.9%**	$0.41	**21.8**	**4.7**
4	DC Washington	with interior low-E panel	172.79	895.71	1068.50	$117.37	**9.9%**	$0.46	**21.7**	**4.2**
4	DC Washington	with exterior solar-E panel	139.43	960.21	1099.64	$86.22	**7.3%**	$0.34	**26.6**	**7.2**
4	DC Washington	Metal frame, double pane	184.03	1100.17	1284.20	--	--	--	--	
4	DC Washington	with exterior clear panel	180.33	997.94	1178.27	$105.93	8.2%	$0.42	19.3	
4	DC Washington	with interior clear panel	178.15	989.42	1167.57	$116.63	9.1%	$0.46	19.7	
4	DC Washington	with exterior low-E panel	167.29	939.52	1106.81	$177.39	**13.8%**	$0.70	**12.9**	**3.6**
4	DC Washington	with interior low-E panel	171.64	924.92	1096.56	$187.64	**14.6%**	$0.74	**13.6**	**3.6**
4	DC Washington	with exterior solar-E panel	142.62	983.34	1125.96	$158.24	**12.3%**	$0.62	**14.5**	**4.9**
4	DC Washington	with exterior clear panel, worst case mounting	176.75	1047.84	1224.58	$59.62	4.6%	$0.23	34.2	
4	DC Washington	with exterior low-E panel, worst case mounting	164.10	1014.98	1179.07	$105.13	8.2%	$0.41	21.8	
4	DC Washington	with exterior solar-E panel, worst case mounting	143.26	1051.49	1194.75	$89.45	7.0%	$0.35	25.7	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
4	MO Kansas City	Wood frame, single pane	Furnace / AC	2129	kWh	86.2	MBtu	118.6	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	1955	kWh	73	MBtu	102.2	MBtu	13.8%
4	MO Kansas City	with interior clear panel	Furnace / AC	1955	kWh	72.5	MBtu	101.6	MBtu	14.3%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	1815	kWh	68.6	MBtu	95.8	MBtu	**19.2%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	1903	kWh	66.3	MBtu	94.2	MBtu	**20.5%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1561	kWh	72.2	MBtu	96.8	MBtu	**18.4%**
4	MO Kansas City	Wood frame, double pane	Furnace / AC	2035	kWh	75.5	MBtu	105.8	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	1900	kWh	72.1	MBtu	100.5	MBtu	5.0%
4	MO Kansas City	with interior clear panel	Furnace / AC	1935	kWh	71.2	MBtu	100.0	MBtu	5.5%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	1764	kWh	68.5	MBtu	95.1	MBtu	**10.2%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	1866	kWh	66.7	MBtu	94.3	MBtu	**10.9%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1525	kWh	71.9	MBtu	96.0	MBtu	**9.2%**
4	MO Kansas City	Metal frame, double pane	Furnace / AC	1996	kWh	84.3	MBtu	115.0	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	1950	kWh	75.4	MBtu	104.7	MBtu	8.9%
4	MO Kansas City	with interior clear panel	Furnace / AC	1926	kWh	74.6	MBtu	103.6	MBtu	9.9%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	1807	kWh	70.4	MBtu	97.6	MBtu	**15.1%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	1851	kWh	69.1	MBtu	96.7	MBtu	**15.9%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1560	kWh	73.9	MBtu	98.6	MBtu	**14.2%**
4	MO Kansas City	with exterior clear panel, worst case mounting	Furnace / AC	1919	kWh	79.7	MBtu	109.1	MBtu	5.1%
4	MO Kansas City	with exterior low-E panel, worst case mounting	Furnace / AC	1780	kWh	76.8	MBtu	104.3	MBtu	9.3%
4	MO Kansas City	with exterior solar-E panel, worst case mountin	Furnace / AC	1574	kWh	79.8	MBtu	105.2	MBtu	8.5%
4	NC Raleigh	Wood frame, single pane	Furnace / AC	2604	kWh	82.4	MBtu	119.9	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2444	kWh	73.4	MBtu	108.2	MBtu	9.7%
4	NC Raleigh	with interior clear panel	Furnace / AC	2444	kWh	72.9	MBtu	107.7	MBtu	10.2%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2312	kWh	70.3	MBtu	103.3	MBtu	**13.8%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2404	kWh	68.3	MBtu	102.2	MBtu	**14.8%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	2066	kWh	73.5	MBtu	104.0	MBtu	**13.3%**
4	NC Raleigh	Wood frame, double pane	Furnace / AC	2522	kWh	75.1	MBtu	111.0	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2390	kWh	72.9	MBtu	107.0	MBtu	3.5%
4	NC Raleigh	with interior clear panel	Furnace / AC	2427	kWh	72.2	MBtu	106.7	MBtu	3.8%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2262	kWh	70.4	MBtu	102.8	MBtu	**7.3%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2366	kWh	68.8	MBtu	102.3	MBtu	**7.8%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	2031	kWh	73.5	MBtu	103.6	MBtu	**6.7%**
4	NC Raleigh	Metal frame, double pane	Furnace / AC	2476	kWh	82	MBtu	118.0	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2438	kWh	75.4	MBtu	110.3	MBtu	6.5%
4	NC Raleigh	with interior clear panel	Furnace / AC	2414	kWh	74.9	MBtu	109.5	MBtu	7.2%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2303	kWh	71.7	MBtu	104.7	MBtu	**11.2%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2350	kWh	70.7	MBtu	104.2	MBtu	**11.7%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	2064	kWh	75	MBtu	105.6	MBtu	**10.5%**
4	NC Raleigh	with exterior clear panel, worst case mounting	Furnace / AC	2402	kWh	78.8	MBtu	113.6	MBtu	3.7%
4	NC Raleigh	with exterior low-E panel, worst case mounting	Furnace / AC	2276	kWh	76.8	MBtu	110.0	MBtu	6.8%
4	NC Raleigh	with exterior solar-E panel, worst case mountin	Furnace / AC	2073	kWh	79.5	MBtu	110.6	MBtu	6.2%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
4	MO Kansas City	Wood frame, single pane	225.46	889.58	1115.05	--	--	--	--	
4	MO Kansas City	with exterior clear panel	207.03	753.36	960.39	$154.65	13.9%	$0.61	13.2	
4	MO Kansas City	with interior clear panel	207.03	748.20	955.23	$159.81	14.3%	$0.63	14.4	
4	MO Kansas City	with exterior low-E panel	192.21	707.95	900.16	$214.88	**19.3%**	$0.84	**10.7**	**4.2**
4	MO Kansas City	with interior low-E panel	201.53	684.22	885.74	$229.30	**20.6%**	$0.90	**11.1**	**3.7**
4	MO Kansas City	with exterior solar-E panel	165.31	745.10	910.41	$204.63	**18.4%**	$0.80	**11.2**	**5.1**
4	MO Kansas City	Wood frame, double pane	215.51	779.16	994.67	--	--	--	--	
4	MO Kansas City	with exterior clear panel	201.21	744.07	945.28	$49.38	5.0%	$0.19	41.3	
4	MO Kansas City	with interior clear panel	204.92	734.78	939.70	$54.97	5.5%	$0.22	41.8	
4	MO Kansas City	with exterior low-E panel	186.81	706.92	893.73	$100.94	**10.1%**	$0.40	**22.7**	**4.9**
4	MO Kansas City	with interior low-E panel	197.61	688.34	885.95	$108.71	**10.9%**	$0.43	**23.5**	**4.7**
4	MO Kansas City	with exterior solar-E panel	161.50	742.01	903.51	$91.16	**9.2%**	$0.36	**25.2**	**6.1**
4	MO Kansas City	Metal frame, double pane	211.38	869.98	1081.35	--	--	--	--	
4	MO Kansas City	with exterior clear panel	206.51	778.13	984.63	$96.72	8.9%	$0.38	21.1	
4	MO Kansas City	with interior clear panel	203.96	769.87	973.84	$107.52	9.9%	$0.42	21.3	
4	MO Kansas City	with exterior low-E panel	191.36	726.53	917.89	$163.46	**15.1%**	$0.64	**14.0**	**3.8**
4	MO Kansas City	with interior low-E panel	196.02	713.11	909.13	$172.22	**15.9%**	$0.68	**14.8**	**3.9**
4	MO Kansas City	with exterior solar-E panel	165.20	762.65	927.85	$153.50	**14.2%**	$0.60	**15.0**	**4.5**
4	MO Kansas City	with exterior clear panel, worst case mounting	203.22	822.50	1025.73	$55.63	5.1%	$0.22	36.7	
4	MO Kansas City	with exterior low-E panel, worst case mounting	188.50	792.58	981.08	$100.27	9.3%	$0.39	22.9	
4	MO Kansas City	with exterior solar-E panel, worst case mounting	166.69	823.54	990.22	$91.13	8.4%	$0.36	25.2	
4	NC Raleigh	Wood frame, single pane	289.56	952.54	1242.11	--	--	--	--	
4	NC Raleigh	with exterior clear panel	271.77	848.50	1120.28	$121.83	9.8%	$0.48	16.7	
4	NC Raleigh	with interior clear panel	271.77	842.72	1114.50	$127.61	10.3%	$0.50	18.0	
4	NC Raleigh	with exterior low-E panel	257.09	812.67	1069.76	$172.35	**13.9%**	$0.68	**13.3**	**5.0**
4	NC Raleigh	with interior low-E panel	267.32	789.55	1056.87	$185.24	**14.9%**	$0.73	**13.8**	**4.4**
4	NC Raleigh	with exterior solar-E panel	229.74	849.66	1079.40	$162.71	**13.1%**	$0.64	**14.1**	**6.2**
4	NC Raleigh	Wood frame, double pane	280.45	868.16	1148.60	--	--	--	--	
4	NC Raleigh	with exterior clear panel	265.77	842.72	1108.49	$40.11	3.5%	$0.16	50.9	
4	NC Raleigh	with interior clear panel	269.88	834.63	1104.51	$44.09	3.8%	$0.17	52.1	
4	NC Raleigh	with exterior low-E panel	251.53	813.82	1065.36	$83.24	**7.2%**	$0.33	**27.6**	**5.9**
4	NC Raleigh	with interior low-E panel	263.10	795.33	1058.43	$90.18	**7.9%**	$0.35	**28.3**	**5.5**
4	NC Raleigh	with exterior solar-E panel	225.85	849.66	1075.51	$73.10	**6.4%**	$0.29	**31.4**	**7.7**
4	NC Raleigh	Metal frame, double pane	275.33	947.92	1223.25	--	--	--	--	
4	NC Raleigh	with exterior clear panel	271.11	871.62	1142.73	$80.52	6.6%	$0.32	25.3	
4	NC Raleigh	with interior clear panel	268.44	865.84	1134.28	$88.97	7.3%	$0.35	25.8	
4	NC Raleigh	with exterior low-E panel	256.09	828.85	1084.95	$138.31	**11.3%**	$0.54	**16.6**	**4.4**
4	NC Raleigh	with interior low-E panel	261.32	817.29	1078.61	$144.64	**11.8%**	$0.57	**17.6**	**4.6**
4	NC Raleigh	with exterior solar-E panel	229.52	867.00	1096.52	$126.73	**10.4%**	$0.50	**18.1**	**5.5**
4	NC Raleigh	with exterior clear panel, worst case mounting	267.10	910.93	1178.03	$45.22	3.7%	$0.18	45.1	
4	NC Raleigh	with exterior low-E panel, worst case mounting	253.09	887.81	1140.90	$82.35	6.7%	$0.32	27.9	
4	NC Raleigh	with exterior solar-E panel, worst case mounting	230.52	919.02	1149.54	$73.71	6.0%	$0.29	31.1	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
3	GA Atlanta	Wood frame, single pane	Furnace / AC	2827	kWh	38.9	MBtu	74.9	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2696	kWh	31.7	MBtu	65.6	MBtu	12.5%
3	GA Atlanta	with interior clear panel	Furnace / AC	2695	kWh	31.4	MBtu	65.2	MBtu	13.0%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2566	kWh	29.3	MBtu	61.5	MBtu	**18.0%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2669	kWh	27.8	MBtu	61.0	MBtu	**18.6%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	2288	kWh	31.8	MBtu	61.0	MBtu	**18.6%**
3	GA Atlanta	Wood frame, double pane	Furnace / AC	2770	kWh	33	MBtu	67.8	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2640	kWh	31.3	MBtu	64.5	MBtu	4.9%
3	GA Atlanta	with interior clear panel	Furnace / AC	2680	kWh	30.7	MBtu	64.3	MBtu	5.2%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2512	kWh	29.3	MBtu	60.8	MBtu	**10.3%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2629	kWh	28	MBtu	60.8	MBtu	**10.4%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	2251	kWh	31.6	MBtu	60.4	MBtu	**11.0%**
3	GA Atlanta	Metal frame, double pane	Furnace / AC	2709	kWh	38.3	MBtu	72.9	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2685	kWh	33.2	MBtu	67.1	MBtu	8.0%
3	GA Atlanta	with interior clear panel	Furnace / AC	2662	kWh	32.7	MBtu	66.3	MBtu	9.1%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2558	kWh	30.3	MBtu	62.5	MBtu	**14.4%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2611	kWh	29.5	MBtu	62.2	MBtu	**14.7%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	2285	kWh	32.8	MBtu	62.1	MBtu	**14.9%**
3	GA Atlanta	with exterior clear panel, worst case mounting	Furnace / AC	2644	kWh	35.8	MBtu	69.5	MBtu	4.8%
3	GA Atlanta	with exterior low-E panel, worst case mounting	Furnace / AC	2513	kWh	34.1	MBtu	66.1	MBtu	9.4%
3	GA Atlanta	with exterior solar-E panel, worst case mountin	Furnace / AC	2283	kWh	36.4	MBtu	66.0	MBtu	9.6%
3	TX Fort Worth	Wood frame, single pane	Furnace / AC	4410	kWh	29	MBtu	82.3	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	4130	kWh	22.9	MBtu	72.4	MBtu	12.0%
3	TX Fort Worth	with interior clear panel	Furnace / AC	4126	kWh	22.6	MBtu	72.1	MBtu	12.5%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3910	kWh	20.9	MBtu	67.7	MBtu	**17.7%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	4004	kWh	19.7	MBtu	67.5	MBtu	**18.0%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3544	kWh	23.2	MBtu	66.0	MBtu	**19.8%**
3	TX Fort Worth	Wood frame, double pane	Furnace / AC	4256	kWh	24	MBtu	75.1	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	4054	kWh	22.6	MBtu	71.2	MBtu	5.1%
3	TX Fort Worth	with interior clear panel	Furnace / AC	4106	kWh	22.1	MBtu	71.3	MBtu	5.1%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3839	kWh	20.9	MBtu	66.9	MBtu	**10.9%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3958	kWh	19.9	MBtu	67.2	MBtu	**10.5%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3492	kWh	23.1	MBtu	65.3	MBtu	**13.0%**
3	TX Fort Worth	Metal frame, double pane	Furnace / AC	4232	kWh	28.5	MBtu	79.7	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	4141	kWh	24.2	MBtu	74.0	MBtu	7.2%
3	TX Fort Worth	with interior clear panel	Furnace / AC	4103	kWh	23.8	MBtu	73.1	MBtu	8.3%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3910	kWh	21.8	MBtu	68.7	MBtu	**13.8%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3972	kWh	21.1	MBtu	68.6	MBtu	**13.9%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3553	kWh	24.1	MBtu	67.1	MBtu	**15.8%**
3	TX Fort Worth	with exterior clear panel, worst case mounting	Furnace / AC	4112	kWh	26.4	MBtu	76.0	MBtu	4.6%
3	TX Fort Worth	with exterior low-E panel, worst case mounting	Furnace / AC	3892	kWh	25.1	MBtu	72.1	MBtu	9.6%
3	TX Fort Worth	with exterior solar-E panel, worst case mountin	Furnace / AC	3591	kWh	27.1	MBtu	70.8	MBtu	11.2%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
3	GA Atlanta	Wood frame, single pane	327.08	558.60	885.69	--	--	--	--	
3	GA Atlanta	with exterior clear panel	311.93	455.21	767.14	$118.55	13.4%	$0.46	17.2	
3	GA Atlanta	with interior clear panel	311.81	450.90	762.72	$122.97	13.9%	$0.48	18.7	
3	GA Atlanta	with exterior low-E panel	296.89	420.75	717.63	$168.05	**19.0%**	$0.66	**13.7**	**5.2**
3	GA Atlanta	with interior low-E panel	308.80	399.21	708.01	$177.68	**20.1%**	$0.70	**14.4**	**4.7**
3	GA Atlanta	with exterior solar-E panel	264.72	456.65	721.37	$164.32	**18.6%**	$0.64	**14.0**	**5.6**
3	GA Atlanta	Wood frame, double pane	320.49	473.88	794.37	--	--	--	--	
3	GA Atlanta	with exterior clear panel	305.45	449.47	754.92	$39.45	5.0%	$0.15	51.7	
3	GA Atlanta	with interior clear panel	310.08	440.85	750.93	$43.44	5.5%	$0.17	52.8	
3	GA Atlanta	with exterior low-E panel	290.64	420.75	711.39	$82.98	**10.4%**	$0.33	**27.7**	**5.9**
3	GA Atlanta	with interior low-E panel	304.18	402.08	706.26	$88.11	**11.1%**	$0.35	**28.9**	**5.7**
3	GA Atlanta	with exterior solar-E panel	260.44	453.78	714.22	$80.15	**10.1%**	$0.31	**28.6**	**6.3**
3	GA Atlanta	Metal frame, double pane	313.43	549.99	863.42	--	--	--	--	
3	GA Atlanta	with exterior clear panel	310.65	476.75	787.41	$76.01	8.8%	$0.30	26.8	
3	GA Atlanta	with interior clear panel	307.99	469.57	777.57	$85.85	9.9%	$0.34	26.7	
3	GA Atlanta	with exterior low-E panel	295.96	435.11	731.07	$132.35	**15.3%**	$0.52	**17.3**	**4.5**
3	GA Atlanta	with interior low-E panel	302.09	423.62	725.71	$137.71	**15.9%**	$0.54	**18.5**	**4.9**
3	GA Atlanta	with exterior solar-E panel	264.37	471.01	735.38	$128.04	**14.8%**	$0.50	**17.9**	**4.9**
3	GA Atlanta	with exterior clear panel, worst case mounting	305.91	514.09	820.00	$43.42	5.0%	$0.17	47.0	
3	GA Atlanta	with exterior low-E panel, worst case mounting	290.75	489.68	780.43	$82.99	9.6%	$0.33	27.7	
3	GA Atlanta	with exterior solar-E panel, worst case mounting	264.14	522.70	786.85	$76.57	8.9%	$0.30	30.0	
3	TX Fort Worth	Wood frame, single pane – Natural Gas Heating	521.26	312.33	833.59	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	488.17	246.63	734.80	$98.79	11.9%	$0.39	20.6	
3	TX Fort Worth	with interior clear panel	487.69	243.40	731.10	$102.50	12.3%	$0.40	22.4	
3	TX Fort Worth	with exterior low-E panel	462.16	225.09	687.26	$146.34	**17.6%**	$0.57	**15.7**	**5.4**
3	TX Fort Worth	with interior low-E panel	473.27	212.17	685.44	$148.15	**17.8%**	$0.58	**17.2**	**5.6**
3	TX Fort Worth	with exterior solar-E panel	418.90	249.86	668.76	$164.83	**19.8%**	$0.65	**13.9**	**3.9**
3	TX Fort Worth	Wood frame, double pane – Natural Gas Heating	503.06	258.48	761.54	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	479.18	243.40	722.58	$38.95	5.1%	$0.15	52.4	
3	TX Fort Worth	with interior clear panel	485.33	238.02	723.35	$38.19	5.0%	$0.15	60.1	
3	TX Fort Worth	with exterior low-E panel	453.77	225.09	678.86	$82.68	**10.9%**	$0.32	**27.8**	**5.8**
3	TX Fort Worth	with interior low-E panel	467.84	214.32	682.16	$79.38	**10.4%**	$0.31	**32.1**	**6.2**
3	TX Fort Worth	with exterior solar-E panel	412.75	248.79	661.54	$100.00	**13.1%**	$0.39	**23.0**	**4.2**
3	TX Fort Worth	Metal frame, double pane – Natural Gas Heating	500.22	306.95	807.17	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	489.47	260.63	750.10	$57.07	7.1%	$0.22	35.7	
3	TX Fort Worth	with interior clear panel	484.97	256.33	741.30	$65.87	8.2%	$0.26	34.8	
3	TX Fort Worth	with exterior low-E panel	462.16	234.79	696.95	$110.22	**13.7%**	$0.43	**20.8**	**4.8**
3	TX Fort Worth	with interior low-E panel	469.49	227.25	696.74	$110.43	**13.7%**	$0.43	**23.1**	**5.7**
3	TX Fort Worth	with exterior solar-E panel	419.96	259.56	679.52	$127.65	**15.8%**	$0.50	**18.0**	**3.6**
3	TX Fort Worth	with exterior clear panel, worst case mounting	486.04	284.33	770.37	$36.80	4.6%	$0.14	55.4	
3	TX Fort Worth	with exterior low-E panel, worst case mounting	460.03	270.33	730.36	$76.81	9.5%	$0.30	29.9	
3	TX Fort Worth	with exterior solar-E panel, worst case mounting	424.46	291.87	716.32	$90.84	11.3%	$0.36	25.3	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
3	TX Fort Worth	Wood frame, single pane	Heat pump / AC	4410	kWh	2544	kWh	79.8	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	4130	kWh	2115	kWh	71.7	MBtu	10.2%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	4126	kWh	2099	kWh	71.5	MBtu	10.5%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3910	kWh	1970	kWh	67.5	MBtu	**15.4%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	4004	kWh	1864	kWh	67.4	MBtu	**15.6%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3544	kWh	2123	kWh	65.1	MBtu	**18.5%**
3	TX Fort Worth	Wood frame, double pane	Heat pump / AC	4256	kWh	2197	kWh	74.1	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	4054	kWh	2087	kWh	70.5	MBtu	4.8%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	4106	kWh	2060	kWh	70.8	MBtu	4.4%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3839	kWh	1970	kWh	66.7	MBtu	**10.0%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3958	kWh	1879	kWh	67.0	MBtu	**9.5%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3492	kWh	2117	kWh	64.4	MBtu	**13.1%**
3	TX Fort Worth	Metal frame, double pane	Heat pump / AC	4232	kWh	2488	kWh	77.2	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	4141	kWh	2202	kWh	72.8	MBtu	5.6%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	4103	kWh	2176	kWh	72.1	MBtu	6.6%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3910	kWh	2032	kWh	68.2	MBtu	**11.6%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3972	kWh	1985	kWh	68.4	MBtu	**11.4%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3553	kWh	2186	kWh	65.9	MBtu	**14.6%**
3	TX Fort Worth	with exterior clear panel, worst case mounting	Heat pump / AC	4112	kWh	2345	kWh	74.1	MBtu	3.9%
3	TX Fort Worth	with exterior low-E panel, worst case mounting	Heat pump / AC	3892	kWh	2251	kWh	70.5	MBtu	8.6%
3	TX Fort Worth	with exterior solar-E panel, worst case mountin	Heat pump / AC	3591	kWh	2382	kWh	68.6	MBtu	11.1%
2	AZ Phoenix	Wood frame, single pane	Heat pump / AC	8238	kWh	984	kWh	105.9	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	7591	kWh	791	kWh	96.2	MBtu	9.1%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	7578	kWh	783	kWh	96.0	MBtu	9.3%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	7157	kWh	724	kWh	90.5	MBtu	**14.5%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	7315	kWh	685	kWh	91.9	MBtu	**13.3%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	6634	kWh	800	kWh	85.4	MBtu	**19.4%**
2	AZ Phoenix	Wood frame, double pane	Heat pump / AC	7832	kWh	827	kWh	99.4	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	7470	kWh	782	kWh	94.7	MBtu	4.7%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	7535	kWh	766	kWh	95.3	MBtu	4.1%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	7042	kWh	725	kWh	89.2	MBtu	**10.3%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	7248	kWh	692	kWh	91.2	MBtu	**8.3%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	6549	kWh	799	kWh	84.4	MBtu	**15.1%**
2	AZ Phoenix	Metal frame, double pane	Heat pump / AC	7945	kWh	969	kWh	102.3	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	7669	kWh	834	kWh	97.6	MBtu	4.6%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	7591	kWh	821	kWh	96.6	MBtu	5.6%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	7191	kWh	752	kWh	91.2	MBtu	**10.9%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	7270	kWh	730	kWh	91.9	MBtu	**10.3%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	6679	kWh	834	kWh	86.3	MBtu	**15.7%**
2	AZ Phoenix	with exterior clear panel, worst case mounting	Heat pump / AC	7691	kWh	905	kWh	98.7	MBtu	3.6%
2	AZ Phoenix	with exterior low-E panel, worst case mounting	Heat pump / AC	7277	kWh	858	kWh	93.4	MBtu	8.7%
2	AZ Phoenix	with exterior solar-E panel, worst case mountin	Heat pump / AC	6841	kWh	929	kWh	89.2	MBtu	12.8%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
3	TX Fort Worth	Wood frame, single pane – Heat Pump Heating	521.26	300.70	821.96	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	488.17	249.99	738.16	$83.80	10.2%	$0.33	24.3	
3	TX Fort Worth	with interior clear panel	487.69	248.10	735.80	$86.17	10.5%	$0.34	26.6	
3	TX Fort Worth	with exterior low-E panel	462.16	232.85	695.02	$126.95	**15.4%**	$0.50	**18.1**	**5.9**
3	TX Fort Worth	with interior low-E panel	473.27	220.32	693.60	$128.37	**15.6%**	$0.50	**19.9**	**6.0**
3	TX Fort Worth	with exterior solar-E panel	418.90	250.94	669.84	$152.12	**18.5%**	$0.60	**15.1**	**3.7**
3	TX Fort Worth	Wood frame, double pane – Heat Pump Heating	503.06	259.69	762.74	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	479.18	246.68	725.87	$36.88	4.8%	$0.14	55.3	
3	TX Fort Worth	with interior clear panel	485.33	243.49	728.82	$33.92	4.4%	$0.13	67.7	
3	TX Fort Worth	with exterior low-E panel	453.77	232.85	686.62	$76.12	**10.0%**	$0.30	**30.1**	**6.5**
3	TX Fort Worth	with interior low-E panel	467.84	222.10	689.93	$72.81	**9.5%**	$0.29	**35.0**	**6.6**
3	TX Fort Worth	with exterior solar-E panel	412.75	250.23	662.98	$99.76	**13.1%**	$0.39	**23.0**	**4.1**
3	TX Fort Worth	Metal frame, double pane – Heat Pump Heating	500.22	294.08	794.30	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	489.47	260.28	749.74	$44.56	5.6%	$0.17	45.8	
3	TX Fort Worth	with interior clear panel	484.97	257.20	742.18	$52.13	6.6%	$0.20	44.0	
3	TX Fort Worth	with exterior low-E panel	462.16	240.18	702.34	$91.96	**11.6%**	$0.36	**25.0**	**5.4**
3	TX Fort Worth	with interior low-E panel	469.49	234.63	704.12	$90.19	**11.4%**	$0.35	**28.3**	**6.7**
3	TX Fort Worth	with exterior solar-E panel	419.96	258.39	678.35	$115.95	**14.6%**	$0.45	**19.8**	**3.6**
3	TX Fort Worth	with exterior clear panel, worst case mounting	486.04	277.18	763.22	$31.09	3.9%	$0.12	65.6	
3	TX Fort Worth	with exterior low-E panel, worst case mounting	460.03	266.07	726.10	$68.20	8.6%	$0.27	33.7	
3	TX Fort Worth	with exterior solar-E panel, worst case mounting	424.46	281.55	706.01	$88.30	11.1%	$0.35	26.0	
2	AZ Phoenix	Wood frame, single pane	986.91	117.88	1104.80	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	909.40	94.76	1004.16	$100.63	9.1%	$0.39	20.3	
2	AZ Phoenix	with interior clear panel	907.84	93.80	1001.65	$103.15	9.3%	$0.40	22.2	
2	AZ Phoenix	with exterior low-E panel	857.41	86.74	944.14	$160.65	**14.5%**	$0.63	**14.3**	**4.2**
2	AZ Phoenix	with interior low-E panel	876.34	82.06	958.40	$146.40	**13.3%**	$0.57	**17.4**	**5.9**
2	AZ Phoenix	with exterior solar-E panel	794.75	95.84	890.59	$214.20	**19.4%**	$0.84	**10.7**	**2.2**
2	AZ Phoenix	Wood frame, double pane	938.27	99.07	1037.35	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	894.91	93.68	988.59	$48.76	4.7%	$0.19	41.8	
2	AZ Phoenix	with interior clear panel	902.69	91.77	994.46	$42.89	4.1%	$0.17	53.5	
2	AZ Phoenix	with exterior low-E panel	843.63	86.86	930.49	$106.86	**10.3%**	$0.42	**21.5**	**4.4**
2	AZ Phoenix	with interior low-E panel	868.31	82.90	951.21	$86.14	**8.3%**	$0.34	**29.6**	**5.9**
2	AZ Phoenix	with exterior solar-E panel	784.57	95.72	880.29	$157.06	**15.1%**	$0.62	**14.6**	**2.4**
2	AZ Phoenix	Metal frame, double pane	951.81	116.09	1067.90	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	918.75	99.91	1018.66	$49.24	4.6%	$0.19	41.4	
2	AZ Phoenix	with interior clear panel	909.40	98.36	1007.76	$60.14	5.6%	$0.24	38.2	
2	AZ Phoenix	with exterior low-E panel	861.48	90.09	951.57	$116.33	**10.9%**	$0.46	**19.7**	**3.8**
2	AZ Phoenix	with interior low-E panel	870.95	87.45	958.40	$109.50	**10.3%**	$0.43	**23.3**	**5.2**
2	AZ Phoenix	with exterior solar-E panel	800.14	99.91	900.06	$167.84	**15.7%**	$0.66	**13.7**	**2.2**
2	AZ Phoenix	with exterior clear panel, worst case mounting	921.38	108.42	1029.80	$38.10	3.6%	$0.15	53.5	
2	AZ Phoenix	with exterior low-E panel, worst case mounting	871.78	102.79	974.57	$93.32	8.7%	$0.37	24.6	
2	AZ Phoenix	with exterior solar-E panel, worst case mounting	819.55	111.29	930.85	$137.05	12.8%	$0.54	16.7	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
2	FL Jacksonville	Wood frame, single pane	Heat pump / AC	4614	kWh	1457	kWh	69.7	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4379	kWh	1207	kWh	64.1	MBtu	8.0%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	4377	kWh	1198	kWh	64.0	MBtu	8.2%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	4171	kWh	1122	kWh	60.8	MBtu	**12.8%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	4320	kWh	1067	kWh	61.9	MBtu	**11.3%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3782	kWh	1223	kWh	57.5	MBtu	**17.6%**
2	FL Jacksonville	Wood frame, double pane	Heat pump / AC	4499	kWh	1255	kWh	66.1	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4300	kWh	1195	kWh	63.1	MBtu	4.5%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	4353	kWh	1176	kWh	63.5	MBtu	3.9%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	4101	kWh	1123	kWh	60.0	MBtu	**9.2%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	4263	kWh	1078	kWh	61.3	MBtu	**7.2%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3731	kWh	1221	kWh	56.9	MBtu	**13.9%**
2	FL Jacksonville	Metal frame, double pane	Heat pump / AC	4437	kWh	1441	kWh	67.5	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4375	kWh	1264	kWh	64.7	MBtu	4.1%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	4338	kWh	1248	kWh	64.1	MBtu	5.0%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	4168	kWh	1162	kWh	61.2	MBtu	**9.3%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	4240	kWh	1130	kWh	61.7	MBtu	**8.6%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3783	kWh	1262	kWh	57.9	MBtu	**14.2%**
2	FL Jacksonville	with exterior clear panel, worst case mounting	Heat pump / AC	4327	kWh	1353	kWh	65.2	MBtu	3.4%
2	FL Jacksonville	with exterior low-E panel, worst case mounting	Heat pump / AC	4127	kWh	1297	kWh	62.3	MBtu	7.7%
2	FL Jacksonville	with exterior solar-E panel, worst case mountin	Heat pump / AC	3805	kWh	1384	kWh	59.6	MBtu	11.7%
2	TX Houston	Wood frame, single pane	Furnace / AC	4709	kWh	18.4	MBtu	74.2	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4459	kWh	14.4	MBtu	66.9	MBtu	9.8%
2	TX Houston	with interior clear panel	Furnace / AC	4456	kWh	14.3	MBtu	66.8	MBtu	10.0%
2	TX Houston	with exterior low-E panel	Furnace / AC	4245	kWh	13	MBtu	62.9	MBtu	**15.1%**
2	TX Houston	with interior low-E panel	Furnace / AC	4388	kWh	12.3	MBtu	63.8	MBtu	**14.0%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3839	kWh	14.3	MBtu	59.7	MBtu	**19.5%**
2	TX Houston	Wood frame, double pane	Furnace / AC	4582	kWh	15.2	MBtu	69.2	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4378	kWh	14.2	MBtu	65.8	MBtu	5.0%
2	TX Houston	with interior clear panel	Furnace / AC	4432	kWh	13.9	MBtu	66.1	MBtu	4.5%
2	TX Houston	with exterior low-E panel	Furnace / AC	4164	kWh	13	MBtu	62.0	MBtu	**10.4%**
2	TX Houston	with interior low-E panel	Furnace / AC	4334	kWh	12.4	MBtu	63.3	MBtu	**8.5%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3783	kWh	14.2	MBtu	58.9	MBtu	**14.8%**
2	TX Houston	Metal frame, double pane	Furnace / AC	4526	kWh	18	MBtu	71.6	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4457	kWh	15.2	MBtu	67.8	MBtu	5.4%
2	TX Houston	with interior clear panel	Furnace / AC	4419	kWh	15	MBtu	67.1	MBtu	6.3%
2	TX Houston	with exterior low-E panel	Furnace / AC	4237	kWh	13.6	MBtu	63.5	MBtu	**11.3%**
2	TX Houston	with interior low-E panel	Furnace / AC	4309	kWh	13.1	MBtu	63.8	MBtu	**10.9%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3840	kWh	14.9	MBtu	60.4	MBtu	**15.7%**
2	TX Houston	with exterior clear panel, worst case mounting	Furnace / AC	4412	kWh	16.6	MBtu	68.8	MBtu	4.0%
2	TX Houston	with exterior low-E panel, worst case mounting	Furnace / AC	4197	kWh	15.7	MBtu	65.3	MBtu	8.8%
2	TX Houston	with exterior solar-E panel, worst case mountin	Furnace / AC	3863	kWh	16.8	MBtu	62.7	MBtu	12.5%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
2	FL Jacksonville	Wood frame, single pane	552.76	174.55	727.31	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	524.60	144.60	669.20	$58.10	8.0%	$0.23	35.1	
2	FL Jacksonville	with interior clear panel	524.36	143.52	667.89	$59.42	8.2%	$0.23	38.6	
2	FL Jacksonville	with exterior low-E panel	499.69	134.42	634.10	$93.20	**12.8%**	$0.37	**24.6**	**7.3**
2	FL Jacksonville	with interior low-E panel	517.54	127.83	645.36	$81.94	**11.3%**	$0.32	**31.1**	**11.3**
2	FL Jacksonville	with exterior solar-E panel	453.08	146.52	599.60	$127.71	**17.6%**	$0.50	**18.0**	**3.7**
2	FL Jacksonville	Wood frame, double pane	538.98	150.35	689.33	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	515.14	143.16	658.30	$31.03	4.5%	$0.12	65.7	
2	FL Jacksonville	with interior clear panel	521.49	140.88	662.37	$26.95	3.9%	$0.11	85.1	
2	FL Jacksonville	with exterior low-E panel	491.30	134.54	625.84	$63.49	**9.2%**	$0.25	**36.1**	**7.9**
2	FL Jacksonville	with interior low-E panel	510.71	129.14	639.85	$49.48	**7.2%**	$0.19	**51.5**	**11.3**
2	FL Jacksonville	with exterior solar-E panel	446.97	146.28	593.25	$96.08	**13.9%**	$0.38	**23.9**	**3.9**
2	FL Jacksonville	Metal frame, double pane	531.55	172.63	704.18	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	524.13	151.43	675.55	$28.63	4.1%	$0.11	71.2	
2	FL Jacksonville	with interior clear panel	519.69	149.51	669.20	$34.98	5.0%	$0.14	65.6	
2	FL Jacksonville	with exterior low-E panel	499.33	139.21	638.53	$65.65	**9.3%**	$0.26	**35.0**	**6.9**
2	FL Jacksonville	with interior low-E panel	507.95	135.37	643.33	$60.86	**8.6%**	$0.24	**41.9**	**9.9**
2	FL Jacksonville	with exterior solar-E panel	453.20	151.19	604.39	$99.79	**14.2%**	$0.39	**23.0**	**3.6**
2	FL Jacksonville	with exterior clear panel, worst case mounting	518.37	162.09	680.46	$23.72	3.4%	$0.09	86.0	
2	FL Jacksonville	with exterior low-E panel, worst case mounting	494.41	155.38	649.80	$54.39	7.7%	$0.21	42.2	
2	FL Jacksonville	with exterior solar-E panel, worst case mounting	455.84	165.80	621.64	$82.54	11.7%	$0.32	27.8	
2	TX Houston	Wood frame, single pane – Natural Gas Heating	556.60	198.17	754.77	--	--	--	--	
2	TX Houston	with exterior clear panel	527.05	155.09	682.14	$72.63	9.6%	$0.28	28.1	
2	TX Houston	with interior clear panel	526.70	154.01	680.71	$74.06	9.8%	$0.29	31.0	
2	TX Houston	with exterior low-E panel	501.76	140.01	641.77	$113.00	**15.0%**	$0.44	**20.3**	**6.3**
2	TX Houston	with interior low-E panel	518.66	132.47	651.13	$103.64	**13.7%**	$0.41	**24.6**	**8.6**
2	TX Houston	with exterior solar-E panel	453.77	154.01	607.78	$146.99	**19.5%**	$0.58	**15.6**	**3.4**
2	TX Houston	Wood frame, double pane – Natural Gas Heating	541.59	163.70	705.30	--	--	--	--	
2	TX Houston	with exterior clear panel	517.48	152.93	670.41	$34.88	4.9%	$0.14	58.5	
2	TX Houston	with interior clear panel	523.86	149.70	673.57	$31.73	4.5%	$0.12	72.3	
2	TX Houston	with exterior low-E panel	492.18	140.01	632.19	$73.10	**10.4%**	$0.29	**31.4**	**6.7**
2	TX Houston	with interior low-E panel	512.28	133.55	645.83	$59.47	**8.4%**	$0.23	**42.9**	**9.2**
2	TX Houston	with exterior solar-E panel	447.15	152.93	600.08	$105.21	**14.9%**	$0.41	**21.8**	**3.6**
2	TX Houston	Metal frame, double pane – Natural Gas Heating	534.97	193.86	728.83	--	--	--	--	
2	TX Houston	with exterior clear panel	526.82	163.70	690.52	$38.31	5.3%	$0.15	53.2	
2	TX Houston	with interior clear panel	522.33	161.55	683.88	$44.96	6.2%	$0.18	51.0	
2	TX Houston	with exterior low-E panel	500.81	146.47	647.29	$81.55	**11.2%**	$0.32	**28.1**	**5.9**
2	TX Houston	with interior low-E panel	509.32	141.09	650.41	$78.42	**10.8%**	$0.31	**32.5**	**7.6**
2	TX Houston	with exterior solar-E panel	453.89	160.47	614.36	$114.47	**15.7%**	$0.45	**20.0**	**3.3**
2	TX Houston	with exterior clear panel, worst case mounting	521.50	178.78	700.28	$28.55	3.9%	$0.11	71.4	
2	TX Houston	with exterior low-E panel, worst case mounting	496.09	169.09	665.17	$63.66	8.7%	$0.25	36.1	
2	TX Houston	with exterior solar-E panel, worst case mounting	456.61	180.94	637.54	$91.29	12.5%	$0.36	25.1	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
2	TX Houston	Wood frame, single pane	Heat pump / AC	4709	kWh	1710	kWh	73.7	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4459	kWh	1420	kWh	67.5	MBtu	8.4%
2	TX Houston	with interior clear panel	Heat pump / AC	4456	kWh	1411	kWh	67.4	MBtu	8.6%
2	TX Houston	with exterior low-E panel	Heat pump / AC	4245	kWh	1313	kWh	63.8	MBtu	**13.4%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4388	kWh	1260	kWh	64.8	MBtu	**12.0%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3839	kWh	1404	kWh	60.2	MBtu	**18.3%**
2	TX Houston	Wood frame, double pane	Heat pump / AC	4582	kWh	1478	kWh	69.6	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4378	kWh	1397	kWh	66.3	MBtu	4.7%
2	TX Houston	with interior clear panel	Heat pump / AC	4432	kWh	1383	kWh	66.8	MBtu	4.0%
2	TX Houston	with exterior low-E panel	Heat pump / AC	4165	kWh	1311	kWh	62.9	MBtu	**9.6%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4334	kWh	1268	kWh	64.3	MBtu	**7.6%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3783	kWh	1397	kWh	59.5	MBtu	**14.5%**
2	TX Houston	Metal frame, double pane	Heat pump / AC	4526	kWh	1668	kWh	71.1	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4457	kWh	1475	kWh	68.1	MBtu	4.2%
2	TX Houston	with interior clear panel	Heat pump / AC	4419	kWh	1458	kWh	67.5	MBtu	5.1%
2	TX Houston	with exterior low-E panel	Heat pump / AC	4237	kWh	1356	kWh	64.2	MBtu	**9.7%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4309	kWh	1325	kWh	64.7	MBtu	**9.0%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3840	kWh	1443	kWh	60.7	MBtu	**14.7%**
2	TX Houston	with exterior clear panel, worst case mounting	Heat pump / AC	4412	kWh	1568	kWh	68.7	MBtu	3.5%
2	TX Houston	with exterior low-E panel, worst case mounting	Heat pump / AC	4197	kWh	1497	kWh	65.4	MBtu	8.1%
2	TX Houston	with exterior solar-E panel, worst case mountin	Heat pump / AC	3863	kWh	1576	kWh	62.4	MBtu	12.2%
1	FL Miami	Wood frame, single pane	Heat pump / AC	7251	kWh	64	kWh	84.0	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6920	kWh	43	kWh	79.9	MBtu	4.8%
1	FL Miami	with interior clear panel	Heat pump / AC	6917	kWh	42	kWh	79.9	MBtu	4.9%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6625	kWh	36	kWh	76.5	MBtu	**8.9%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6821	kWh	33	kWh	78.7	MBtu	**6.3%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	6051	kWh	41	kWh	69.9	MBtu	**16.7%**
1	FL Miami	Wood frame, double pane	Heat pump / AC	7096	kWh	46	kWh	82.0	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6813	kWh	42	kWh	78.7	MBtu	4.0%
1	FL Miami	with interior clear panel	Heat pump / AC	6890	kWh	40	kWh	79.6	MBtu	3.0%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6517	kWh	35	kWh	75.2	MBtu	**8.3%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6752	kWh	33	kWh	77.9	MBtu	**5.0%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	5972	kWh	41	kWh	69.0	MBtu	**15.8%**
1	FL Miami	Metal frame, double pane	Heat pump / AC	7007	kWh	61	kWh	81.2	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6921	kWh	47	kWh	80.0	MBtu	1.4%
1	FL Miami	with interior clear panel	Heat pump / AC	6869	kWh	45	kWh	79.4	MBtu	2.2%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6613	kWh	38	kWh	76.4	MBtu	**5.9%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6718	kWh	36	kWh	77.5	MBtu	**4.4%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	6052	kWh	44	kWh	70.0	MBtu	**13.8%**
1	FL Miami	with exterior clear panel, worst case mounting	Heat pump / AC	6855	kWh	54	kWh	79.3	MBtu	2.2%
1	FL Miami	with exterior low-E panel, worst case mounting	Heat pump / AC	6554	kWh	48	kWh	75.8	MBtu	6.6%
1	FL Miami	with exterior solar-E panel, worst case mountin	Heat pump / AC	6068	kWh	55	kWh	70.3	MBtu	13.4%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
2	TX Houston	Wood frame, single pane – Heat Pump Heating	556.60	202.12	758.73	--	--	--	--	
2	TX Houston	with exterior clear panel	527.05	167.84	694.90	$63.83	8.4%	$0.25	32.0	
2	TX Houston	with interior clear panel	526.70	166.78	693.48	$65.25	8.6%	$0.26	35.2	
2	TX Houston	with exterior low-E panel	501.76	155.20	656.96	$101.77	**13.4%**	$0.40	**22.6**	**6.7**
2	TX Houston	with interior low-E panel	518.66	148.93	667.59	$91.13	**12.0%**	$0.36	**28.0**	**9.9**
2	TX Houston	with exterior solar-E panel	453.77	165.95	619.72	$139.00	**18.3%**	$0.55	**16.5**	**3.4**
2	TX Houston	Wood frame, double pane – Heat Pump Heating	541.59	174.70	716.29	--	--	--	--	
2	TX Houston	with exterior clear panel	517.48	165.13	682.61	$33.69	4.7%	$0.13	60.6	
2	TX Houston	with interior clear panel	523.86	163.47	687.33	$28.96	4.0%	$0.11	79.2	
2	TX Houston	with exterior low-E panel	492.30	154.96	647.26	$69.03	**9.6%**	$0.27	**33.2**	**7.2**
2	TX Houston	with interior low-E panel	512.28	149.88	662.16	$54.14	**7.6%**	$0.21	**47.1**	**10.1**
2	TX Houston	with exterior solar-E panel	447.15	165.13	612.28	$104.02	**14.5%**	$0.41	**22.1**	**3.6**
2	TX Houston	Metal frame, double pane – Heat Pump Heating	534.97	197.16	732.13	--	--	--	--	
2	TX Houston	with exterior clear panel	526.82	174.35	701.16	$30.97	4.2%	$0.12	65.9	
2	TX Houston	with interior clear panel	522.33	172.34	694.66	$37.47	5.1%	$0.15	61.2	
2	TX Houston	with exterior low-E panel	500.81	160.28	661.09	$71.04	**9.7%**	$0.28	**32.3**	**6.4**
2	TX Houston	with interior low-E panel	509.32	156.62	665.94	$66.19	**9.0%**	$0.26	**38.5**	**8.9**
2	TX Houston	with exterior solar-E panel	453.89	170.56	624.45	$107.68	**14.7%**	$0.42	**21.3**	**3.3**
2	TX Houston	with exterior clear panel, worst case mounting	521.50	185.34	706.84	$25.29	3.5%	$0.10	80.6	
2	TX Houston	with exterior low-E panel, worst case mounting	496.09	176.95	673.03	$59.10	8.1%	$0.23	38.8	
2	TX Houston	with exterior solar-E panel, worst case mounting	456.61	186.28	642.89	$89.24	12.2%	$0.35	25.7	
1	FL Miami	Wood frame, single pane	868.67	7.67	876.34	--	--	--	--	
1	FL Miami	with exterior clear panel	829.02	5.15	834.17	$42.17	4.8%	$0.17	48.4	
1	FL Miami	with interior clear panel	828.66	5.03	833.69	$42.65	4.9%	$0.17	53.8	
1	FL Miami	with exterior low-E panel	793.68	4.31	797.99	$78.35	**8.9%**	$0.31	**29.3**	**7.0**
1	FL Miami	with interior low-E panel	817.16	3.95	821.11	$55.23	**6.3%**	$0.22	**46.2**	**20.3**
1	FL Miami	with exterior solar-E panel	724.91	4.91	729.82	$146.52	**16.7%**	$0.57	**15.7**	**2.4**
1	FL Miami	Wood frame, double pane	850.10	5.51	855.61	--	--	--	--	
1	FL Miami	with exterior clear panel	816.20	5.03	821.23	$34.38	4.0%	$0.13	59.3	
1	FL Miami	with interior clear panel	825.42	4.79	830.21	$25.40	3.0%	$0.10	90.4	
1	FL Miami	with exterior low-E panel	780.74	4.19	784.93	$70.68	**8.3%**	$0.28	**32.5**	**7.0**
1	FL Miami	with interior low-E panel	808.89	3.95	812.84	$42.77	**5.0%**	$0.17	**59.6**	**14.7**
1	FL Miami	with exterior solar-E panel	715.45	4.91	720.36	$135.25	**15.8%**	$0.53	**17.0**	**2.5**
1	FL Miami	Metal frame, double pane	839.44	7.31	846.75	--	--	--	--	
1	FL Miami	with exterior clear panel	829.14	5.63	834.77	$11.98	1.4%	$0.05	170.3	
1	FL Miami	with interior clear panel	822.91	5.39	828.30	$18.45	2.2%	$0.07	124.4	
1	FL Miami	with exterior low-E panel	792.24	4.55	796.79	$49.96	**5.9%**	$0.20	**45.9**	**6.7**
1	FL Miami	with interior low-E panel	804.82	4.31	809.13	$37.62	**4.4%**	$0.15	**67.8**	**13.3**
1	FL Miami	with exterior solar-E panel	725.03	5.27	730.30	$116.45	**13.8%**	$0.46	**19.7**	**2.4**
1	FL Miami	with exterior clear panel, worst case mounting	821.23	6.47	827.70	$19.05	2.2%	$0.07	107.1	
1	FL Miami	with exterior low-E panel, worst case mounting	785.17	5.75	790.92	$55.83	6.6%	$0.22	41.1	
1	FL Miami	with exterior solar-E panel, worst case mounting	726.95	6.59	733.54	$113.21	13.4%	$0.44	20.3	

LARGER, NEWER HOME (2-story, 2800 ft^2)

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
8	AK Fairbanks	Wood frame, single pane	Furnace / AC	138	kWh	212.2	MBtu	233.3	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	117	kWh	166.7	MBtu	183.4	MBtu	21.4%
8	AK Fairbanks	with interior clear panel	Furnace / AC	119	kWh	164.8	MBtu	181.3	MBtu	22.3%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	98	kWh	149.1	MBtu	163.9	MBtu	**29.7%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	113	kWh	143.8	MBtu	158.3	MBtu	**32.1%**
8	AK Fairbanks	Wood frame, double pane	Furnace / AC	130	kWh	176.6	MBtu	194.3	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	108	kWh	160.8	MBtu	176.8	MBtu	9.0%
8	AK Fairbanks	with interior clear panel	Furnace / AC	114	kWh	158.8	MBtu	174.7	MBtu	10.1%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	90	kWh	146.8	MBtu	161.3	MBtu	**17.0%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	107	kWh	143.6	MBtu	158.0	MBtu	**18.7%**
8	AK Fairbanks	Metal frame, double pane	Furnace / AC	119	kWh	203.3	MBtu	223.4	MBtu	--
8	AK Fairbanks	with exterior clear panel	Furnace / AC	112	kWh	172.6	MBtu	189.8	MBtu	15.0%
8	AK Fairbanks	with interior clear panel	Furnace / AC	110	kWh	169.8	MBtu	186.7	MBtu	16.4%
8	AK Fairbanks	with exterior low-E panel	Furnace / AC	95	kWh	153.9	MBtu	169.1	MBtu	**24.3%**
8	AK Fairbanks	with interior low-E panel	Furnace / AC	102	kWh	151.3	MBtu	166.4	MBtu	**25.5%**
8	AK Fairbanks	with exterior clear panel, worst case mounting	Furnace / AC	108	kWh	185.7	MBtu	204.0	MBtu	8.7%
8	AK Fairbanks	with exterior low-E panel, worst case mounting	Furnace / AC	92	kWh	173.9	MBtu	191.0	MBtu	14.5%
7	AK Anchorage	Wood frame, single pane	Furnace / AC	27	kWh	141.7	MBtu	155.0	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	18	kWh	105.8	MBtu	115.7	MBtu	25.4%
7	AK Anchorage	with interior clear panel	Furnace / AC	21	kWh	104.4	MBtu	114.2	MBtu	26.3%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	14	kWh	92.2	MBtu	100.8	MBtu	**35.0%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	18	kWh	88.2	MBtu	96.5	MBtu	**37.7%**
7	AK Anchorage	Wood frame, double pane	Furnace / AC	24	kWh	113.3	MBtu	124.0	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	16	kWh	101.9	MBtu	111.5	MBtu	10.1%
7	AK Anchorage	with interior clear panel	Furnace / AC	16	kWh	100.5	MBtu	109.9	MBtu	11.3%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	14	kWh	90.7	MBtu	99.2	MBtu	**20.0%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	16	kWh	88.2	MBtu	96.5	MBtu	**22.2%**
7	AK Anchorage	Metal frame, double pane	Furnace / AC	18	kWh	134.8	MBtu	147.4	MBtu	--
7	AK Anchorage	with exterior clear panel	Furnace / AC	17	kWh	111	MBtu	121.4	MBtu	17.6%
7	AK Anchorage	with interior clear panel	Furnace / AC	16	kWh	108.7	MBtu	118.9	MBtu	19.4%
7	AK Anchorage	with exterior low-E panel	Furnace / AC	14	kWh	96	MBtu	105.0	MBtu	**28.8%**
7	AK Anchorage	with interior low-E panel	Furnace / AC	16	kWh	93.9	MBtu	102.7	MBtu	**30.3%**
7	AK Anchorage	with exterior clear panel, worst case mounting	Furnace / AC	16	kWh	121.4	MBtu	132.8	MBtu	9.9%
7	AK Anchorage	with exterior low-E panel, worst case mounting	Furnace / AC	12	kWh	111.8	MBtu	122.2	MBtu	17.1%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
8	AK Fairbanks	Wood frame, single pane	26.65	1835.53	1862.18	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	22.59	1441.96	1464.55	$397.63	21.4%	$0.95	8.5	
8	AK Fairbanks	with interior clear panel	22.98	1425.52	1448.50	$413.68	22.2%	$0.98	9.1	
8	AK Fairbanks	with exterior low-E panel	18.92	1289.72	1308.64	$553.54	**29.7%**	$1.32	**6.8**	**2.7**
8	AK Fairbanks	with interior low-E panel	21.82	1243.87	1265.69	$596.49	**32.0%**	$1.42	**7.0**	**2.3**
8	AK Fairbanks	Wood frame, double pane	25.10	1527.59	1552.69	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	20.85	1390.92	1411.77	$140.92	9.1%	$0.34	23.8	
8	AK Fairbanks	with interior clear panel	22.01	1373.62	1395.63	$157.06	10.1%	$0.37	24.1	
8	AK Fairbanks	with exterior low-E panel	17.38	1269.82	1287.20	$265.49	**17.1%**	$0.63	**14.2**	**3.4**
8	AK Fairbanks	with interior low-E panel	20.66	1242.14	1262.80	$289.89	**18.7%**	$0.69	**14.5**	**3.2**
8	AK Fairbanks	Metal frame, double pane	22.98	1758.55	1781.52	--	--	--	--	
8	AK Fairbanks	with exterior clear panel	21.63	1492.99	1514.62	$266.91	15.0%	$0.64	12.6	
8	AK Fairbanks	with interior clear panel	21.24	1468.77	1490.01	$291.51	16.4%	$0.69	13.0	
8	AK Fairbanks	with exterior low-E panel	18.34	1331.24	1349.58	$431.94	**24.2%**	$1.03	**8.8**	**2.5**
8	AK Fairbanks	with interior low-E panel	19.70	1308.75	1328.44	$453.08	**25.4%**	$1.08	**9.3**	**2.6**
8	AK Fairbanks	with exterior clear panel, worst case mounting	20.85	1606.31	1627.16	$154.36	8.7%	$0.37	21.8	
8	AK Fairbanks	with exterior low-E panel, worst case mounting	17.77	1504.24	1522.00	$259.52	14.6%	$0.62	14.6	
7	AK Anchorage	Wood frame, single pane	5.21	1225.71	1230.92	--	--	--	--	
7	AK Anchorage	with exterior clear panel	3.48	915.17	918.65	$312.27	25.4%	$0.74	10.8	
7	AK Anchorage	with interior clear panel	4.06	903.06	907.12	$323.80	26.3%	$0.77	11.7	
7	AK Anchorage	with exterior low-E panel	2.70	797.53	800.23	$430.69	**35.0%**	$1.03	**8.8**	**3.5**
7	AK Anchorage	with interior low-E panel	3.48	762.93	766.41	$464.51	**37.7%**	$1.11	**9.0**	**3.0**
7	AK Anchorage	Wood frame, double pane	4.63	980.05	984.68	--	--	--	--	
7	AK Anchorage	with exterior clear panel	3.09	881.44	884.52	$100.15	10.2%	$0.24	33.5	
7	AK Anchorage	with interior clear panel	3.09	869.33	872.41	$112.26	11.4%	$0.27	33.7	
7	AK Anchorage	with exterior low-E panel	2.70	784.56	787.26	$197.42	**20.0%**	$0.47	**19.1**	**4.3**
7	AK Anchorage	with interior low-E panel	3.09	762.93	766.02	$218.66	**22.2%**	$0.52	**19.2**	**3.9**
7	AK Anchorage	Metal frame, double pane	3.48	1166.02	1169.50	--	--	--	--	
7	AK Anchorage	with exterior clear panel	3.28	960.15	963.43	$206.06	17.6%	$0.49	16.3	
7	AK Anchorage	with interior clear panel	3.09	940.26	943.34	$226.15	19.3%	$0.54	16.7	
7	AK Anchorage	with exterior low-E panel	2.70	830.40	833.10	$336.39	**28.8%**	$0.80	**11.2**	**3.2**
7	AK Anchorage	with interior low-E panel	3.09	812.24	815.32	$354.17	**30.3%**	$0.84	**11.9**	**3.3**
7	AK Anchorage	with exterior clear panel, worst case mounting	3.09	1050.11	1053.20	$116.30	9.9%	$0.28	28.9	
7	AK Anchorage	with exterior low-E panel, worst case mounting	2.32	967.07	969.39	$200.11	17.1%	$0.48	18.9	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
7	MN Duluth	Wood frame, single pane	Furnace / AC	340	kWh	146.2	MBtu	163.6	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	319	kWh	106.6	MBtu	120.1	MBtu	26.6%
7	MN Duluth	with interior clear panel	Furnace / AC	322	kWh	105.1	MBtu	118.5	MBtu	27.6%
7	MN Duluth	with exterior low-E panel	Furnace / AC	289	kWh	93.2	MBtu	105.1	MBtu	**35.7%**
7	MN Duluth	with interior low-E panel	Furnace / AC	329	kWh	88.2	MBtu	100.1	MBtu	**38.8%**
7	MN Duluth	Wood frame, double pane	Furnace / AC	337	kWh	114.2	MBtu	128.6	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	301	kWh	102.6	MBtu	115.5	MBtu	10.2%
7	MN Duluth	with interior clear panel	Furnace / AC	317	kWh	100.8	MBtu	113.7	MBtu	11.6%
7	MN Duluth	with exterior low-E panel	Furnace / AC	280	kWh	91.9	MBtu	103.6	MBtu	**19.4%**
7	MN Duluth	with interior low-E panel	Furnace / AC	318	kWh	88.4	MBtu	100.2	MBtu	**22.1%**
7	MN Duluth	Metal frame, double pane	Furnace / AC	297	kWh	137.7	MBtu	153.8	MBtu	--
7	MN Duluth	with exterior clear panel	Furnace / AC	307	kWh	112	MBtu	125.8	MBtu	18.2%
7	MN Duluth	with interior clear panel	Furnace / AC	302	kWh	109.8	MBtu	123.4	MBtu	19.8%
7	MN Duluth	with exterior low-E panel	Furnace / AC	286	kWh	97.4	MBtu	109.6	MBtu	**28.7%**
7	MN Duluth	with interior low-E panel	Furnace / AC	304	kWh	94.8	MBtu	107.0	MBtu	**30.4%**
7	MN Duluth	with exterior clear panel, worst case mounting	Furnace / AC	284	kWh	123.4	MBtu	138.0	MBtu	10.3%
7	MN Duluth	with exterior low-E panel, worst case mounting	Furnace / AC	258	kWh	114.4	MBtu	127.9	MBtu	16.8%
6	MN Minneapolis	Wood frame, single pane	Furnace / AC	1135	kWh	114.4	MBtu	138.0	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	1064	kWh	84	MBtu	103.9	MBtu	24.7%
6	MN Minneapolis	with interior clear panel	Furnace / AC	1068	kWh	82.8	MBtu	102.7	MBtu	25.6%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	987	kWh	73.6	MBtu	91.7	MBtu	**33.5%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	1063	kWh	69.7	MBtu	88.3	MBtu	**36.0%**
6	MN Minneapolis	Wood frame, double pane	Furnace / AC	1113	kWh	89.8	MBtu	110.8	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	1025	kWh	81	MBtu	100.2	MBtu	9.6%
6	MN Minneapolis	with interior clear panel	Furnace / AC	1055	kWh	79.5	MBtu	98.9	MBtu	10.7%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	948	kWh	72.7	MBtu	90.3	MBtu	**18.6%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	1031	kWh	69.9	MBtu	88.2	MBtu	**20.5%**
6	MN Minneapolis	Metal frame, double pane	Furnace / AC	1034	kWh	108.2	MBtu	130.0	MBtu	--
6	MN Minneapolis	with exterior clear panel	Furnace / AC	1043	kWh	88.3	MBtu	108.4	MBtu	16.6%
6	MN Minneapolis	with interior clear panel	Furnace / AC	1029	kWh	86.5	MBtu	106.3	MBtu	18.3%
6	MN Minneapolis	with exterior low-E panel	Furnace / AC	971	kWh	77	MBtu	95.2	MBtu	**26.8%**
6	MN Minneapolis	with interior low-E panel	Furnace / AC	1007	kWh	74.8	MBtu	93.2	MBtu	**28.3%**
6	MN Minneapolis	with exterior clear panel, worst case mounting	Furnace / AC	994	kWh	97.2	MBtu	117.6	MBtu	9.6%
6	MN Minneapolis	with exterior low-E panel, worst case mounting	Furnace / AC	914	kWh	90.2	MBtu	109.0	MBtu	16.2%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
7	MN Duluth	Wood frame, single pane	41.28	1171.06	1212.34	--	--	--	--	
7	MN Duluth	with exterior clear panel	38.73	853.87	892.59	$319.75	26.4%	$0.76	10.5	
7	MN Duluth	with interior clear panel	39.09	841.85	880.94	$331.40	27.3%	$0.79	11.4	
7	MN Duluth	with exterior low-E panel	35.08	746.53	781.62	$430.72	**35.5%**	$1.03	**8.8**	**3.8**
7	MN Duluth	with interior low-E panel	39.94	706.48	746.42	$465.92	**38.4%**	$1.11	**9.0**	**3.1**
7	MN Duluth	Wood frame, double pane	40.91	914.74	955.65	--	--	--	--	
7	MN Duluth	with exterior clear panel	36.54	821.83	858.37	$97.29	10.2%	$0.23	34.5	
7	MN Duluth	with interior clear panel	38.48	807.41	845.89	$109.76	11.5%	$0.26	34.4	
7	MN Duluth	with exterior low-E panel	33.99	736.12	770.11	$185.54	**19.4%**	$0.44	**20.4**	**4.8**
7	MN Duluth	with interior low-E panel	38.61	708.08	746.69	$208.96	**21.9%**	$0.50	**20.1**	**4.2**
7	MN Duluth	Metal frame, double pane	36.06	1102.98	1139.03	--	--	--	--	
7	MN Duluth	with exterior clear panel	37.27	897.12	934.39	$204.64	18.0%	$0.49	16.4	
7	MN Duluth	with interior clear panel	36.66	879.50	916.16	$222.87	19.6%	$0.53	17.0	
7	MN Duluth	with exterior low-E panel	34.72	780.17	814.89	$324.14	**28.5%**	$0.77	**11.7**	**3.5**
7	MN Duluth	with interior low-E panel	36.91	759.35	796.25	$342.78	**30.1%**	$0.82	**12.3**	**3.5**
7	MN Duluth	with exterior clear panel, worst case mounting	34.48	988.43	1022.91	$116.12	10.2%	$0.28	28.9	
7	MN Duluth	with exterior low-E panel, worst case mounting	31.32	916.34	947.67	$191.37	16.8%	$0.46	19.8	
6	MN Minneapolis	Wood frame, single pane	137.79	916.34	1054.13	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	129.17	672.84	802.01	$252.12	23.9%	$0.60	13.3	
6	MN Minneapolis	with interior clear panel	129.66	663.23	792.88	$261.25	24.8%	$0.62	14.5	
6	MN Minneapolis	with exterior low-E panel	119.82	589.54	709.36	$344.78	**32.7%**	$0.82	**11.0**	**4.5**
6	MN Minneapolis	with interior low-E panel	129.05	558.30	687.35	$366.79	**34.8%**	$0.87	**11.5**	**4.0**
6	MN Minneapolis	Wood frame, double pane	135.12	719.30	854.42	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	124.44	648.81	773.25	$81.17	9.5%	$0.19	41.4	
6	MN Minneapolis	with interior clear panel	128.08	636.80	764.87	$89.54	10.5%	$0.21	42.2	
6	MN Minneapolis	with exterior low-E panel	115.09	582.33	697.41	$157.00	**18.4%**	$0.37	**24.1**	**5.5**
6	MN Minneapolis	with interior low-E panel	125.16	559.90	685.06	$169.35	**19.8%**	$0.40	**24.8**	**5.3**
6	MN Minneapolis	Metal frame, double pane	125.53	866.68	992.21	--	--	--	--	
6	MN Minneapolis	with exterior clear panel	126.62	707.28	833.90	$158.31	16.0%	$0.38	21.2	
6	MN Minneapolis	with interior clear panel	124.92	692.87	817.79	$174.42	17.6%	$0.42	21.7	
6	MN Minneapolis	with exterior low-E panel	117.88	616.77	734.65	$257.56	**26.0%**	$0.61	**14.7**	**4.2**
6	MN Minneapolis	with interior low-E panel	122.25	599.15	721.40	$270.81	**27.3%**	$0.64	**15.5**	**4.4**
6	MN Minneapolis	with exterior clear panel, worst case mounting	120.67	778.57	899.24	$92.97	9.4%	$0.22	36.1	
6	MN Minneapolis	with exterior low-E panel, worst case mounting	110.96	722.50	833.46	$158.75	16.0%	$0.38	23.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
6	VT Burlington	Wood frame, single pane	Furnace / AC	710	kWh	106.9	MBtu	124.9	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	675	kWh	78.7	MBtu	93.7	MBtu	25.0%
6	VT Burlington	with interior clear panel	Furnace / AC	679	kWh	77.6	MBtu	92.5	MBtu	25.9%
6	VT Burlington	with exterior low-E panel	Furnace / AC	628	kWh	68.7	MBtu	82.2	MBtu	**34.2%**
6	VT Burlington	with interior low-E panel	Furnace / AC	681	kWh	65	MBtu	78.8	MBtu	**36.9%**
6	VT Burlington	Wood frame, double pane	Furnace / AC	707	kWh	84.2	MBtu	100.1	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	648	kWh	75.9	MBtu	90.3	MBtu	9.7%
6	VT Burlington	with interior clear panel	Furnace / AC	673	kWh	74.6	MBtu	89.2	MBtu	10.9%
6	VT Burlington	with exterior low-E panel	Furnace / AC	605	kWh	67.8	MBtu	81.0	MBtu	**19.1%**
6	VT Burlington	with interior low-E panel	Furnace / AC	659	kWh	65.2	MBtu	78.8	MBtu	**21.3%**
6	VT Burlington	Metal frame, double pane	Furnace / AC	639	kWh	101.4	MBtu	118.1	MBtu	--
6	VT Burlington	with exterior clear panel	Furnace / AC	660	kWh	82.9	MBtu	98.1	MBtu	16.9%
6	VT Burlington	with interior clear panel	Furnace / AC	652	kWh	81.2	MBtu	96.2	MBtu	18.6%
6	VT Burlington	with exterior low-E panel	Furnace / AC	616	kWh	71.8	MBtu	85.5	MBtu	**27.6%**
6	VT Burlington	with interior low-E panel	Furnace / AC	640	kWh	69.9	MBtu	83.7	MBtu	**29.1%**
6	VT Burlington	with exterior clear panel, worst case mounting	Furnace / AC	622	kWh	91.1	MBtu	106.6	MBtu	9.7%
6	VT Burlington	with exterior low-E panel, worst case mounting	Furnace / AC	568	kWh	84.3	MBtu	98.6	MBtu	16.5%
5	CO Denver	Wood frame, single pane	Furnace / AC	1083	kWh	65.7	MBtu	84.2	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	983	kWh	45.4	MBtu	60.9	MBtu	27.7%
5	CO Denver	with interior clear panel	Furnace / AC	989	kWh	44.5	MBtu	59.9	MBtu	28.8%
5	CO Denver	with exterior low-E panel	Furnace / AC	886	kWh	38.3	MBtu	52.0	MBtu	**38.2%**
5	CO Denver	with interior low-E panel	Furnace / AC	962	kWh	35	MBtu	49.3	MBtu	**41.5%**
5	CO Denver	Wood frame, double pane	Furnace / AC	1038	kWh	49.2	MBtu	65.6	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	942	kWh	43.6	MBtu	58.4	MBtu	11.0%
5	CO Denver	with interior clear panel	Furnace / AC	973	kWh	42.4	MBtu	57.5	MBtu	12.4%
5	CO Denver	with exterior low-E panel	Furnace / AC	847	kWh	37.9	MBtu	51.1	MBtu	**22.1%**
5	CO Denver	with interior low-E panel	Furnace / AC	931	kWh	35.4	MBtu	49.3	MBtu	**24.8%**
5	CO Denver	Metal frame, double pane	Furnace / AC	973	kWh	62.8	MBtu	79.7	MBtu	--
5	CO Denver	with exterior clear panel	Furnace / AC	968	kWh	48.8	MBtu	64.4	MBtu	19.2%
5	CO Denver	with interior clear panel	Furnace / AC	952	kWh	47.6	MBtu	62.9	MBtu	21.1%
5	CO Denver	with exterior low-E panel	Furnace / AC	879	kWh	40.8	MBtu	54.6	MBtu	**31.5%**
5	CO Denver	with interior low-E panel	Furnace / AC	916	kWh	39	MBtu	53.1	MBtu	**33.4%**
5	CO Denver	with exterior clear panel, worst case mounting	Furnace / AC	925	kWh	55.4	MBtu	71.1	MBtu	10.8%
5	CO Denver	with exterior low-E panel, worst case mounting	Furnace / AC	827	kWh	50.6	MBtu	64.8	MBtu	18.8%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
6	VT Burlington	Wood frame, single pane	124.25	1534.02	1658.27	--	--	--	--	
6	VT Burlington	with exterior clear panel	118.13	1129.35	1247.47	$410.80	24.8%	$0.98	8.2	
6	VT Burlington	with interior clear panel	118.83	1113.56	1232.39	$425.88	25.7%	$1.01	8.9	
6	VT Burlington	with exterior low-E panel	109.90	985.85	1095.75	$562.52	**33.9%**	$1.34	**6.7**	**2.8**
6	VT Burlington	with interior low-E panel	119.18	932.75	1051.93	$606.34	**36.6%**	$1.44	**6.9**	**2.3**
6	VT Burlington	Wood frame, double pane	123.73	1208.27	1332.00	--	--	--	--	
6	VT Burlington	with exterior clear panel	113.40	1089.17	1202.57	$129.43	9.7%	$0.31	26.0	
6	VT Burlington	with interior clear panel	117.78	1070.51	1188.29	$143.71	10.8%	$0.34	26.3	
6	VT Burlington	with exterior low-E panel	105.88	972.93	1078.81	$253.19	**19.0%**	$0.60	**14.9**	**3.4**
6	VT Burlington	with interior low-E panel	115.33	935.62	1050.95	$281.05	**21.1%**	$0.67	**14.9**	**3.1**
6	VT Burlington	Metal frame, double pane	111.83	1455.09	1566.92	--	--	--	--	
6	VT Burlington	with exterior clear panel	115.50	1189.62	1305.12	$261.80	16.7%	$0.62	12.8	
6	VT Burlington	with interior clear panel	114.10	1165.22	1279.32	$287.60	18.4%	$0.68	13.1	
6	VT Burlington	with exterior low-E panel	107.80	1030.33	1138.13	$428.79	**27.4%**	$1.02	**8.8**	**2.5**
6	VT Burlington	with interior low-E panel	112.00	1003.07	1115.07	$451.85	**28.8%**	$1.08	**9.3**	**2.6**
6	VT Burlington	with exterior clear panel, worst case mounting	108.85	1307.29	1416.14	$150.78	9.6%	$0.36	22.3	
6	VT Burlington	with exterior low-E panel, worst case mounting	99.40	1209.71	1309.11	$257.81	16.5%	$0.61	14.7	
5	CO Denver	Wood frame, single pane	131.91	501.95	633.86	--	--	--	--	
5	CO Denver	with exterior clear panel	119.73	346.86	466.59	$167.27	26.4%	$0.40	20.1	
5	CO Denver	with interior clear panel	120.46	339.98	460.44	$173.42	27.4%	$0.41	21.8	
5	CO Denver	with exterior low-E panel	107.91	292.61	400.53	$233.33	**36.8%**	$0.56	**16.2**	**6.4**
5	CO Denver	with interior low-E panel	117.17	267.40	384.57	$249.29	**39.3%**	$0.59	**16.8**	**5.5**
5	CO Denver	Wood frame, double pane	126.43	375.89	502.32	--	--	--	--	
5	CO Denver	with exterior clear panel	114.74	333.10	447.84	$54.48	10.8%	$0.13	61.7	
5	CO Denver	with interior clear panel	118.51	323.94	442.45	$59.87	11.9%	$0.14	63.1	
5	CO Denver	with exterior low-E panel	103.16	289.56	392.72	$109.60	**21.8%**	$0.26	**34.5**	**7.6**
5	CO Denver	with interior low-E panel	113.40	270.46	383.85	$118.46	**23.6%**	$0.28	**35.5**	**7.2**
5	CO Denver	Metal frame, double pane	118.51	479.79	598.30	--	--	--	--	
5	CO Denver	with exterior clear panel	117.90	372.83	490.73	$107.57	18.0%	$0.26	31.2	
5	CO Denver	with interior clear panel	115.95	363.66	479.62	$118.69	19.8%	$0.28	31.8	
5	CO Denver	with exterior low-E panel	107.06	311.71	418.77	$179.53	**30.0%**	$0.43	**21.1**	**5.8**
5	CO Denver	with interior low-E panel	111.57	297.96	409.53	$188.77	**31.6%**	$0.45	**22.2**	**6.0**
5	CO Denver	with exterior clear panel, worst case mounting	112.67	423.26	535.92	$62.38	10.4%	$0.15	53.9	
5	CO Denver	with exterior low-E panel, worst case mounting	100.73	386.58	487.31	$110.99	18.6%	$0.26	34.1	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	ID Boise	Wood frame, single pane	Furnace / AC	1337	kWh	71	MBtu	92.9	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1180	kWh	50.2	MBtu	68.4	MBtu	26.4%
5	ID Boise	with interior clear panel	Furnace / AC	1183	kWh	49.4	MBtu	67.5	MBtu	27.3%
5	ID Boise	with exterior low-E panel	Furnace / AC	1067	kWh	42.9	MBtu	59.1	MBtu	**36.4%**
5	ID Boise	with interior low-E panel	Furnace / AC	1137	kWh	39.8	MBtu	56.5	MBtu	**39.2%**
5	ID Boise	Wood frame, double pane	Furnace / AC	1248	kWh	54.3	MBtu	73.6	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1143	kWh	48.4	MBtu	66.0	MBtu	10.4%
5	ID Boise	with interior clear panel	Furnace / AC	1166	kWh	47.3	MBtu	65.0	MBtu	11.7%
5	ID Boise	with exterior low-E panel	Furnace / AC	1023	kWh	42.4	MBtu	58.0	MBtu	**21.2%**
5	ID Boise	with interior low-E panel	Furnace / AC	1106	kWh	40.1	MBtu	56.5	MBtu	**23.3%**
5	ID Boise	Metal frame, double pane	Furnace / AC	1216	kWh	67.8	MBtu	88.0	MBtu	--
5	ID Boise	with exterior clear panel	Furnace / AC	1183	kWh	53.7	MBtu	72.2	MBtu	17.9%
5	ID Boise	with interior clear panel	Furnace / AC	1164	kWh	52.4	MBtu	70.6	MBtu	19.8%
5	ID Boise	with exterior low-E panel	Furnace / AC	1059	kWh	45.3	MBtu	61.6	MBtu	**30.0%**
5	ID Boise	with interior low-E panel	Furnace / AC	1095	kWh	43.7	MBtu	60.3	MBtu	**31.5%**
5	ID Boise	with exterior clear panel, worst case mounting	Furnace / AC	1152	kWh	60.2	MBtu	79.0	MBtu	10.3%
5	ID Boise	with exterior low-E panel, worst case mounting	Furnace / AC	1041	kWh	55.1	MBtu	72.1	MBtu	18.0%
5	IL Chicago	Wood frame, single pane	Furnace / AC	1292	kWh	92.2	MBtu	115.5	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	1207	kWh	67.1	MBtu	87.1	MBtu	24.6%
5	IL Chicago	with interior clear panel	Furnace / AC	1214	kWh	66.2	MBtu	86.2	MBtu	25.4%
5	IL Chicago	with exterior low-E panel	Furnace / AC	1126	kWh	58.4	MBtu	76.7	MBtu	**33.6%**
5	IL Chicago	with interior low-E panel	Furnace / AC	1220	kWh	55.1	MBtu	74.2	MBtu	**35.8%**
5	IL Chicago	Wood frame, double pane	Furnace / AC	1259	kWh	72	MBtu	93.1	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	1162	kWh	64.9	MBtu	84.2	MBtu	9.5%
5	IL Chicago	with interior clear panel	Furnace / AC	1200	kWh	63.6	MBtu	83.2	MBtu	10.6%
5	IL Chicago	with exterior low-E panel	Furnace / AC	1078	kWh	57.7	MBtu	75.4	MBtu	**19.0%**
5	IL Chicago	with interior low-E panel	Furnace / AC	1185	kWh	55.4	MBtu	74.1	MBtu	**20.4%**
5	IL Chicago	Metal frame, double pane	Furnace / AC	1171	kWh	87.4	MBtu	108.9	MBtu	--
5	IL Chicago	with exterior clear panel	Furnace / AC	1180	kWh	71	MBtu	91.1	MBtu	16.4%
5	IL Chicago	with interior clear panel	Furnace / AC	1165	kWh	69.4	MBtu	89.2	MBtu	18.1%
5	IL Chicago	with exterior low-E panel	Furnace / AC	1102	kWh	61.2	MBtu	79.5	MBtu	**27.0%**
5	IL Chicago	with interior low-E panel	Furnace / AC	1151	kWh	59.5	MBtu	78.2	MBtu	**28.2%**
5	IL Chicago	with exterior clear panel, worst case mounting	Furnace / AC	1131	kWh	78.3	MBtu	98.5	MBtu	9.5%
5	IL Chicago	with exterior low-E panel, worst case mounting	Furnace / AC	1042	kWh	72.3	MBtu	90.9	MBtu	16.5%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
5	ID Boise	Wood frame, single pane	130.49	602.79	733.28	--	--	--	--	
5	ID Boise	with exterior clear panel	115.17	426.20	541.37	$191.92	26.2%	$0.46	17.5	
5	ID Boise	with interior clear panel	115.46	419.41	534.87	$198.41	27.1%	$0.47	19.1	
5	ID Boise	with exterior low-E panel	104.14	364.22	468.36	$264.92	**36.1%**	$0.63	**14.3**	**5.8**
5	ID Boise	with interior low-E panel	110.97	337.90	448.87	$284.41	**38.8%**	$0.68	**14.8**	**4.9**
5	ID Boise	Wood frame, double pane	121.80	461.01	582.81	--	--	--	--	
5	ID Boise	with exterior clear panel	111.56	410.92	522.47	$60.34	10.4%	$0.14	55.7	
5	ID Boise	with interior clear panel	113.80	401.58	515.38	$67.43	11.6%	$0.16	56.1	
5	ID Boise	with exterior low-E panel	99.84	359.98	459.82	$122.99	**21.1%**	$0.29	**30.7**	**6.7**
5	ID Boise	with interior low-E panel	107.95	340.45	448.39	$134.42	**23.1%**	$0.32	**31.2**	**6.3**
5	ID Boise	Metal frame, double pane	118.68	575.62	694.30	--	--	--	--	
5	ID Boise	with exterior clear panel	115.46	455.91	571.37	$122.93	17.7%	$0.29	27.3	
5	ID Boise	with interior clear panel	113.61	444.88	558.48	$135.82	19.6%	$0.32	27.8	
5	ID Boise	with exterior low-E panel	103.36	384.60	487.96	$206.35	**29.7%**	$0.49	**18.3**	**5.0**
5	ID Boise	with interior low-E panel	106.87	371.01	477.89	$216.42	**31.2%**	$0.52	**19.4**	**5.2**
5	ID Boise	with exterior clear panel, worst case mounting	112.44	511.10	623.53	$70.77	10.2%	$0.17	47.5	
5	ID Boise	with exterior low-E panel, worst case mounting	101.60	467.80	569.40	$124.90	18.0%	$0.30	30.3	
5	IL Chicago	Wood frame, single pane	147.42	739.44	886.86	--	--	--	--	
5	IL Chicago	with exterior clear panel	137.72	538.14	675.86	$211.00	23.8%	$0.50	15.9	
5	IL Chicago	with interior clear panel	138.52	530.92	669.44	$217.42	24.5%	$0.52	17.4	
5	IL Chicago	with exterior low-E panel	128.48	468.37	596.84	$290.02	**32.7%**	$0.69	**13.0**	**5.3**
5	IL Chicago	with interior low-E panel	139.20	441.90	581.10	$305.76	**34.5%**	$0.73	**13.7**	**4.8**
5	IL Chicago	Wood frame, double pane	143.65	577.44	721.09	--	--	--	--	
5	IL Chicago	with exterior clear panel	132.58	520.50	653.08	$68.01	9.4%	$0.16	49.4	
5	IL Chicago	with interior clear panel	136.92	510.07	646.99	$74.10	10.3%	$0.18	51.0	
5	IL Chicago	with exterior low-E panel	123.00	462.75	585.75	$135.34	**18.8%**	$0.32	**27.9**	**6.2**
5	IL Chicago	with interior low-E panel	135.21	444.31	579.52	$141.58	**19.6%**	$0.34	**29.7**	**6.2**
5	IL Chicago	Metal frame, double pane	133.61	700.95	834.56	--	--	--	--	
5	IL Chicago	with exterior clear panel	134.64	569.42	704.06	$130.50	15.6%	$0.31	25.7	
5	IL Chicago	with interior clear panel	132.93	556.59	689.51	$145.04	17.4%	$0.35	26.1	
5	IL Chicago	with exterior low-E panel	125.74	490.82	616.56	$218.00	**26.1%**	$0.52	**17.3**	**4.8**
5	IL Chicago	with interior low-E panel	131.33	477.19	608.52	$226.04	**27.1%**	$0.54	**18.6**	**5.2**
5	IL Chicago	with exterior clear panel, worst case mounting	129.05	627.97	757.01	$77.55	9.3%	$0.18	43.3	
5	IL Chicago	with exterior low-E panel, worst case mounting	118.89	579.85	698.74	$135.82	16.3%	$0.32	27.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	MA Boston	Wood frame, single pane	Furnace / AC	908	kWh	83.8	MBtu	101.9	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	876	kWh	60.3	MBtu	75.9	MBtu	25.5%
5	MA Boston	with interior clear panel	Furnace / AC	882	kWh	59.4	MBtu	75.0	MBtu	26.4%
5	MA Boston	with exterior low-E panel	Furnace / AC	813	kWh	52.5	MBtu	66.7	MBtu	**34.6%**
5	MA Boston	with interior low-E panel	Furnace / AC	879	kWh	49.1	MBtu	63.7	MBtu	**37.5%**
5	MA Boston	Wood frame, double pane	Furnace / AC	916	kWh	64.6	MBtu	81.1	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	844	kWh	58.4	MBtu	73.5	MBtu	9.4%
5	MA Boston	with interior clear panel	Furnace / AC	872	kWh	57.2	MBtu	72.5	MBtu	10.6%
5	MA Boston	with exterior low-E panel	Furnace / AC	777	kWh	52	MBtu	65.7	MBtu	**18.9%**
5	MA Boston	with interior low-E panel	Furnace / AC	857	kWh	49.5	MBtu	63.9	MBtu	**21.2%**
5	MA Boston	Metal frame, double pane	Furnace / AC	821	kWh	79.5	MBtu	96.2	MBtu	--
5	MA Boston	with exterior clear panel	Furnace / AC	848	kWh	64	MBtu	79.6	MBtu	17.3%
5	MA Boston	with interior clear panel	Furnace / AC	847	kWh	62.6	MBtu	78.1	MBtu	18.9%
5	MA Boston	with exterior low-E panel	Furnace / AC	803	kWh	55.2	MBtu	69.5	MBtu	**27.8%**
5	MA Boston	with interior low-E panel	Furnace / AC	827	kWh	53.3	MBtu	67.7	MBtu	**29.7%**
5	MA Boston	with exterior clear panel, worst case mounting	Furnace / AC	797	kWh	71.2	MBtu	86.9	MBtu	9.7%
5	MA Boston	with exterior low-E panel, worst case mounting	Furnace / AC	734	kWh	65.8	MBtu	80.3	MBtu	16.6%
5	NY Rochester	Wood frame, single pane	Furnace / AC	1111	kWh	97.7	MBtu	119.4	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	1047	kWh	71.8	MBtu	90.4	MBtu	24.3%
5	NY Rochester	with interior clear panel	Furnace / AC	1051	kWh	70.8	MBtu	89.4	MBtu	25.2%
5	NY Rochester	with exterior low-E panel	Furnace / AC	976	kWh	62.6	MBtu	79.6	MBtu	**33.4%**
5	NY Rochester	with interior low-E panel	Furnace / AC	1055	kWh	59.4	MBtu	77.0	MBtu	**35.6%**
5	NY Rochester	Wood frame, double pane	Furnace / AC	1092	kWh	76.9	MBtu	96.5	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	1006	kWh	69.3	MBtu	87.2	MBtu	9.6%
5	NY Rochester	with interior clear panel	Furnace / AC	1040	kWh	68.2	MBtu	86.4	MBtu	10.5%
5	NY Rochester	with exterior low-E panel	Furnace / AC	938	kWh	61.8	MBtu	78.3	MBtu	**18.9%**
5	NY Rochester	with interior low-E panel	Furnace / AC	1025	kWh	59.6	MBtu	76.9	MBtu	**20.4%**
5	NY Rochester	Metal frame, double pane	Furnace / AC	1007	kWh	92.4	MBtu	112.5	MBtu	--
5	NY Rochester	with exterior clear panel	Furnace / AC	1023	kWh	75.7	MBtu	94.4	MBtu	16.1%
5	NY Rochester	with interior clear panel	Furnace / AC	1010	kWh	74.1	MBtu	92.5	MBtu	17.7%
5	NY Rochester	with exterior low-E panel	Furnace / AC	956	kWh	65.5	MBtu	82.5	MBtu	**26.6%**
5	NY Rochester	with interior low-E panel	Furnace / AC	1000	kWh	63.7	MBtu	81.0	MBtu	**27.9%**
5	NY Rochester	with exterior clear panel, worst case mounting	Furnace / AC	976	kWh	83.1	MBtu	102.0	MBtu	9.3%
5	NY Rochester	with exterior low-E panel, worst case mounting	Furnace / AC	897	kWh	76.7	MBtu	94.1	MBtu	16.4%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
5	MA Boston	Wood frame, single pane	157.99	1184.93	1342.92	--	--	--	--	
5	MA Boston	with exterior clear panel	152.42	852.64	1005.07	$337.86	25.2%	$0.80	9.9	
5	MA Boston	with interior clear panel	153.47	839.92	993.38	$349.54	26.0%	$0.83	10.8	
5	MA Boston	with exterior low-E panel	141.46	742.35	883.81	$459.11	**34.2%**	$1.09	**8.2**	**3.5**
5	MA Boston	with interior low-E panel	152.95	694.27	847.22	$495.70	**36.9%**	$1.18	**8.5**	**2.9**
5	MA Boston	Wood frame, double pane	159.38	913.44	1072.83	--	--	--	--	
5	MA Boston	with exterior clear panel	146.86	825.78	972.63	$100.20	9.3%	$0.24	33.5	
5	MA Boston	with interior clear panel	151.73	808.81	960.54	$112.29	10.5%	$0.27	33.7	
5	MA Boston	with exterior low-E panel	135.20	735.28	870.48	$202.35	**18.9%**	$0.48	**18.7**	**4.1**
5	MA Boston	with interior low-E panel	149.12	699.93	849.05	$223.78	**20.9%**	$0.53	**18.8**	**3.8**
5	MA Boston	Metal frame, double pane	142.85	1124.13	1266.98	--	--	--	--	
5	MA Boston	with exterior clear panel	147.55	904.96	1052.51	$214.47	16.9%	$0.51	15.7	
5	MA Boston	with interior clear panel	147.38	885.16	1032.54	$234.44	18.5%	$0.56	16.1	
5	MA Boston	with exterior low-E panel	139.72	780.53	920.25	$346.73	**27.4%**	$0.83	**10.9**	**3.2**
5	MA Boston	with interior low-E panel	143.90	753.66	897.56	$369.42	**29.2%**	$0.88	**11.4**	**3.1**
5	MA Boston	with exterior clear panel, worst case mounting	138.68	1006.77	1145.45	$121.54	9.6%	$0.29	27.6	
5	MA Boston	with exterior low-E panel, worst case mounting	127.72	930.41	1058.13	$208.86	16.5%	$0.50	18.1	
5	NY Rochester	Wood frame, single pane	222.76	1197.80	1420.56	--	--	--	--	
5	NY Rochester	with exterior clear panel	209.92	880.27	1090.19	$330.37	23.3%	$0.79	10.2	
5	NY Rochester	with interior clear panel	210.73	868.01	1078.73	$341.82	24.1%	$0.81	11.1	
5	NY Rochester	with exterior low-E panel	195.69	767.48	963.16	$457.39	**32.2%**	$1.09	**8.3**	**3.3**
5	NY Rochester	with interior low-E panel	211.53	728.24	939.77	$480.79	**33.8%**	$1.14	**8.7**	**3.0**
5	NY Rochester	Wood frame, double pane	218.95	942.79	1161.74	--	--	--	--	
5	NY Rochester	with exterior clear panel	201.70	849.62	1051.32	$110.42	9.5%	$0.26	30.4	
5	NY Rochester	with interior clear panel	208.52	836.13	1044.65	$117.09	10.1%	$0.28	32.3	
5	NY Rochester	with exterior low-E panel	188.07	757.67	945.74	$216.00	**18.6%**	$0.51	**17.5**	**4.0**
5	NY Rochester	with interior low-E panel	205.51	730.70	936.21	$225.53	**19.4%**	$0.54	**18.6**	**3.9**
5	NY Rochester	Metal frame, double pane	201.90	1132.82	1334.73	--	--	--	--	
5	NY Rochester	with exterior clear panel	205.11	928.08	1133.19	$201.53	15.1%	$0.48	16.7	
5	NY Rochester	with interior clear panel	202.51	908.47	1110.97	$223.76	16.8%	$0.53	16.9	
5	NY Rochester	with exterior low-E panel	191.68	803.03	994.71	$340.02	**25.5%**	$0.81	**11.1**	**3.0**
5	NY Rochester	with interior low-E panel	200.50	780.96	981.46	$353.27	**26.5%**	$0.84	**11.9**	**3.2**
5	NY Rochester	with exterior clear panel, worst case mounting	195.69	1018.81	1214.49	$120.23	9.0%	$0.29	27.9	
5	NY Rochester	with exterior low-E panel, worst case mounting	179.85	940.34	1120.19	$214.54	16.1%	$0.51	17.6	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
5	PA Pittsburgh	Wood frame, single pane	Furnace / AC	1152	kWh	80.3	MBtu	100.9	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	1092	kWh	58.4	MBtu	76.3	MBtu	24.4%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	1096	kWh	57.5	MBtu	75.4	MBtu	25.3%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	1020	kWh	50.5	MBtu	66.9	MBtu	**33.7%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	1104	kWh	47.6	MBtu	64.7	MBtu	**35.9%**
5	PA Pittsburgh	Wood frame, double pane	Furnace / AC	1136	kWh	62.7	MBtu	81.5	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	1052	kWh	56.3	MBtu	73.6	MBtu	9.8%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	1084	kWh	55.3	MBtu	72.8	MBtu	10.6%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	985	kWh	49.8	MBtu	65.7	MBtu	**19.4%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	1073	kWh	47.8	MBtu	64.5	MBtu	**20.8%**
5	PA Pittsburgh	Metal frame, double pane	Furnace / AC	1051	kWh	76.3	MBtu	95.4	MBtu	--
5	PA Pittsburgh	with exterior clear panel	Furnace / AC	1075	kWh	61.8	MBtu	79.8	MBtu	16.3%
5	PA Pittsburgh	with interior clear panel	Furnace / AC	1063	kWh	60.4	MBtu	78.2	MBtu	18.1%
5	PA Pittsburgh	with exterior low-E panel	Furnace / AC	1005	kWh	53	MBtu	69.4	MBtu	**27.2%**
5	PA Pittsburgh	with interior low-E panel	Furnace / AC	1043	kWh	51.4	MBtu	68.1	MBtu	**28.6%**
5	PA Pittsburgh	with exterior clear panel, worst case mounting	Furnace / AC	1021	kWh	68.3	MBtu	86.3	MBtu	9.5%
5	PA Pittsburgh	with exterior low-E panel, worst case mounting	Furnace / AC	948	kWh	62.8	MBtu	79.5	MBtu	16.7%
4	NY New York City	Wood frame, single pane	Furnace / AC	1424	kWh	75.6	MBtu	98.9	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1330	kWh	55.2	MBtu	75.5	MBtu	23.6%
4	NY New York City	with interior clear panel	Furnace / AC	1332	kWh	54.4	MBtu	74.7	MBtu	24.5%
4	NY New York City	with exterior low-E panel	Furnace / AC	1242	kWh	48.3	MBtu	67.0	MBtu	**32.3%**
4	NY New York City	with interior low-E panel	Furnace / AC	1323	kWh	45.4	MBtu	64.8	MBtu	**34.5%**
4	NY New York City	Wood frame, double pane	Furnace / AC	1384	kWh	59	MBtu	80.3	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1290	kWh	53.6	MBtu	73.3	MBtu	8.7%
4	NY New York City	with interior clear panel	Furnace / AC	1320	kWh	52.5	MBtu	72.5	MBtu	9.8%
4	NY New York City	with exterior low-E panel	Furnace / AC	1201	kWh	47.9	MBtu	66.1	MBtu	**17.7%**
4	NY New York City	with interior low-E panel	Furnace / AC	1289	kWh	45.7	MBtu	64.7	MBtu	**19.4%**
4	NY New York City	Metal frame, double pane	Furnace / AC	1320	kWh	72.1	MBtu	93.9	MBtu	--
4	NY New York City	with exterior clear panel	Furnace / AC	1316	kWh	58.6	MBtu	79.1	MBtu	15.8%
4	NY New York City	with interior clear panel	Furnace / AC	1304	kWh	57.3	MBtu	77.5	MBtu	17.4%
4	NY New York City	with exterior low-E panel	Furnace / AC	1230	kWh	50.7	MBtu	69.5	MBtu	**26.0%**
4	NY New York City	with interior low-E panel	Furnace / AC	1268	kWh	49.1	MBtu	68.2	MBtu	**27.4%**
4	NY New York City	with exterior clear panel, worst case mounting	Furnace / AC	1278	kWh	64.8	MBtu	85.4	MBtu	9.0%
4	NY New York City	with exterior low-E panel, worst case mounting	Furnace / AC	1187	kWh	60.1	MBtu	79.3	MBtu	15.6%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
5	PA Pittsburgh	Wood frame, single pane	153.68	917.03	1070.70	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	145.67	666.93	812.60	$258.10	24.1%	$0.61	13.0	
5	PA Pittsburgh	with interior clear panel	146.21	656.65	802.86	$267.85	25.0%	$0.64	14.1	
5	PA Pittsburgh	with exterior low-E panel	136.07	576.71	712.78	$357.92	**33.4%**	$0.85	**10.6**	**4.2**
5	PA Pittsburgh	with interior low-E panel	147.27	543.59	690.87	$379.84	**35.5%**	$0.90	**11.1**	**3.8**
5	PA Pittsburgh	Wood frame, double pane	151.54	716.03	867.58	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	140.34	642.95	783.28	$84.29	9.7%	$0.20	39.9	
5	PA Pittsburgh	with interior clear panel	144.61	631.53	776.13	$91.44	10.5%	$0.22	41.3	
5	PA Pittsburgh	with exterior low-E panel	131.40	568.72	700.12	$167.46	**19.3%**	$0.40	**22.6**	**5.1**
5	PA Pittsburgh	with interior low-E panel	143.14	545.88	689.01	$178.56	**20.6%**	$0.43	**23.5**	**4.8**
5	PA Pittsburgh	Metal frame, double pane	140.20	871.35	1011.55	--	--	--	--	
5	PA Pittsburgh	with exterior clear panel	143.41	705.76	849.16	$162.39	16.1%	$0.39	20.7	
5	PA Pittsburgh	with interior clear panel	141.80	689.77	831.57	$179.98	17.8%	$0.43	21.0	
5	PA Pittsburgh	with exterior low-E panel	134.07	605.26	739.33	$272.22	**26.9%**	$0.65	**13.9**	**3.8**
5	PA Pittsburgh	with interior low-E panel	139.14	586.99	726.12	$285.43	**28.2%**	$0.68	**14.7**	**4.0**
5	PA Pittsburgh	with exterior clear panel, worst case mounting	136.20	779.99	916.19	$95.36	9.4%	$0.23	35.2	
5	PA Pittsburgh	with exterior low-E panel, worst case mounting	126.46	717.18	843.64	$167.91	16.6%	$0.40	22.5	
4	NY NewYork City	Wood frame, single pane	285.51	926.86	1212.37	--	--	--	--	
4	NY NewYork City	with exterior clear panel	266.67	676.75	943.42	$268.95	22.2%	$0.64	12.5	
4	NY NewYork City	with interior clear panel	267.07	666.94	934.01	$278.36	23.0%	$0.66	13.6	
4	NY NewYork City	with exterior low-E panel	249.02	592.16	841.18	$371.19	**30.6%**	$0.88	**10.2**	**4.1**
4	NY NewYork City	with interior low-E panel	265.26	556.60	821.87	$390.50	**32.2%**	$0.93	**10.8**	**3.7**
4	NY NewYork City	Wood frame, double pane	277.49	723.34	1000.83	--	--	--	--	
4	NY NewYork City	with exterior clear panel	258.65	657.14	915.78	$85.05	8.5%	$0.20	39.5	
4	NY NewYork City	with interior clear panel	264.66	643.65	908.31	$92.52	9.2%	$0.22	40.9	
4	NY NewYork City	with exterior low-E panel	240.80	587.25	828.05	$172.78	**17.3%**	$0.41	**21.9**	**4.8**
4	NY NewYork City	with interior low-E panel	258.44	560.28	818.73	$182.11	**18.2%**	$0.43	**23.1**	**4.7**
4	NY NewYork City	Metal frame, double pane	264.66	883.95	1148.61	--	--	--	--	
4	NY NewYork City	with exterior clear panel	263.86	718.44	982.29	$166.31	14.5%	$0.40	20.2	
4	NY NewYork City	with interior clear panel	261.45	702.50	963.95	$184.66	16.1%	$0.44	20.5	
4	NY NewYork City	with exterior low-E panel	246.62	621.58	868.20	$280.41	**24.4%**	$0.67	**13.5**	**3.7**
4	NY NewYork City	with interior low-E panel	254.23	601.97	856.20	$292.41	**25.5%**	$0.70	**14.4**	**3.9**
4	NY NewYork City	with exterior clear panel, worst case mounting	256.24	794.45	1050.69	$97.92	8.5%	$0.23	34.3	
4	NY NewYork City	with exterior low-E panel, worst case mounting	237.99	736.83	974.82	$173.79	15.1%	$0.41	21.8	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
4	WA Seattle	Wood frame, single pane	Furnace / AC	266	kWh	60.3	MBtu	68.9	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	239	kWh	42.5	MBtu	49.2	MBtu	28.7%
4	WA Seattle	with interior clear panel	Furnace / AC	239	kWh	41.8	MBtu	48.4	MBtu	29.8%
4	WA Seattle	with exterior low-E panel	Furnace / AC	213	kWh	35.8	MBtu	41.5	MBtu	**39.7%**
4	WA Seattle	with interior low-E panel	Furnace / AC	229	kWh	33.5	MBtu	39.2	MBtu	**43.1%**
4	WA Seattle	Wood frame, double pane	Furnace / AC	254	kWh	46.1	MBtu	53.3	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	225	kWh	40.9	MBtu	47.2	MBtu	11.3%
4	WA Seattle	with interior clear panel	Furnace / AC	232	kWh	40.1	MBtu	46.5	MBtu	12.8%
4	WA Seattle	with exterior low-E panel	Furnace / AC	201	kWh	35.3	MBtu	40.9	MBtu	**23.3%**
4	WA Seattle	with interior low-E panel	Furnace / AC	216	kWh	33.7	MBtu	39.3	MBtu	**26.2%**
4	WA Seattle	Metal frame, double pane	Furnace / AC	228	kWh	57.4	MBtu	65.3	MBtu	--
4	WA Seattle	with exterior clear panel	Furnace / AC	232	kWh	45.5	MBtu	52.3	MBtu	19.8%
4	WA Seattle	with interior clear panel	Furnace / AC	228	kWh	44.4	MBtu	51.1	MBtu	21.7%
4	WA Seattle	with exterior low-E panel	Furnace / AC	208	kWh	37.9	MBtu	43.8	MBtu	**33.0%**
4	WA Seattle	with interior low-E panel	Furnace / AC	216	kWh	36.6	MBtu	42.4	MBtu	**35.0%**
4	WA Seattle	with exterior clear panel, worst case mounting	Furnace / AC	217	kWh	50.9	MBtu	58.1	MBtu	11.1%
4	WA Seattle	with exterior low-E panel, worst case mounting	Furnace / AC	189	kWh	46	MBtu	52.4	MBtu	19.8%
4	DC Washington	Wood frame, single pane	Furnace / AC	1798	kWh	67	MBtu	93.8	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1676	kWh	49.1	MBtu	72.9	MBtu	22.3%
4	DC Washington	with interior clear panel	Furnace / AC	1681	kWh	48.4	MBtu	72.2	MBtu	23.1%
4	DC Washington	with exterior low-E panel	Furnace / AC	1574	kWh	42.8	MBtu	64.8	MBtu	**30.9%**
4	DC Washington	with interior low-E panel	Furnace / AC	1674	kWh	40	MBtu	62.9	MBtu	**32.9%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1313	kWh	46.8	MBtu	66.2	MBtu	**29.5%**
4	DC Washington	Wood frame, double pane	Furnace / AC	1742	kWh	52.6	MBtu	77.4	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1626	kWh	47.6	MBtu	70.6	MBtu	8.8%
4	DC Washington	with interior clear panel	Furnace / AC	1663	kWh	46.6	MBtu	70.0	MBtu	9.6%
4	DC Washington	with exterior low-E panel	Furnace / AC	1526	kWh	42.4	MBtu	63.8	MBtu	**17.6%**
4	DC Washington	with interior low-E panel	Furnace / AC	1633	kWh	40.3	MBtu	62.8	MBtu	**19.0%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1281	kWh	46.2	MBtu	65.2	MBtu	**15.9%**
4	DC Washington	Metal frame, double pane	Furnace / AC	1666	kWh	64.5	MBtu	89.6	MBtu	--
4	DC Washington	with exterior clear panel	Furnace / AC	1657	kWh	52.2	MBtu	76.0	MBtu	15.1%
4	DC Washington	with interior clear panel	Furnace / AC	1640	kWh	51.1	MBtu	74.6	MBtu	16.7%
4	DC Washington	with exterior low-E panel	Furnace / AC	1558	kWh	45	MBtu	67.0	MBtu	**25.2%**
4	DC Washington	with interior low-E panel	Furnace / AC	1608	kWh	43.5	MBtu	66.0	MBtu	**26.3%**
4	DC Washington	with exterior solar-E panel	Furnace / AC	1305	kWh	49.1	MBtu	68.6	MBtu	**23.4%**
4	DC Washington	with exterior clear panel, worst case mounting	Furnace / AC	1612	kWh	58	MBtu	81.8	MBtu	8.6%
4	DC Washington	with exterior low-E panel, worst case mounting	Furnace / AC	1499	kWh	53.6	MBtu	75.7	MBtu	15.4%
4	DC Washington	with exterior solar-E panel, worst case mount	Furnace / AC	1290	kWh	57.2	MBtu	77.3	MBtu	13.7%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
4	WA Seattle	Wood frame, single pane	23.17	628.93	652.10	--	--	--	--	
4	WA Seattle	with exterior clear panel	20.82	443.28	464.09	$188.01	28.8%	$0.45	17.9	
4	WA Seattle	with interior clear panel	20.82	435.97	456.79	$195.31	30.0%	$0.47	19.4	
4	WA Seattle	with exterior low-E panel	18.55	373.39	391.95	$260.15	**39.9%**	$0.62	**14.5**	**5.8**
4	WA Seattle	with interior low-E panel	19.95	349.41	369.35	$282.75	**43.4%**	$0.67	**14.9**	**4.8**
4	WA Seattle	Wood frame, double pane	22.12	480.82	502.95	--	--	--	--	
4	WA Seattle	with exterior clear panel	19.60	426.59	446.18	$56.76	11.3%	$0.14	59.2	
4	WA Seattle	with interior clear panel	20.21	418.24	438.45	$64.50	12.8%	$0.15	58.6	
4	WA Seattle	with exterior low-E panel	17.51	368.18	385.69	$117.26	**23.3%**	$0.28	**32.2**	**6.9**
4	WA Seattle	with interior low-E panel	18.81	351.49	370.30	$132.64	**26.4%**	$0.32	**31.7**	**6.2**
4	WA Seattle	Metal frame, double pane	19.86	598.68	618.54	--	--	--	--	
4	WA Seattle	with exterior clear panel	20.21	474.57	494.77	$123.77	20.0%	$0.29	27.1	
4	WA Seattle	with interior clear panel	19.86	463.09	482.95	$135.59	21.9%	$0.32	27.9	
4	WA Seattle	with exterior low-E panel	18.12	395.30	413.41	$205.13	**33.2%**	$0.49	**18.4**	**5.2**
4	WA Seattle	with interior low-E panel	18.81	381.74	400.55	$217.99	**35.2%**	$0.52	**19.3**	**5.1**
4	WA Seattle	with exterior clear panel, worst case mounting	18.90	530.89	549.79	$68.75	11.1%	$0.16	48.9	
4	WA Seattle	with exterior low-E panel, worst case mounting	16.46	479.78	496.24	$122.30	19.8%	$0.29	30.9	
4	DC Washington	Wood frame, single pane	229.78	815.39	1045.17	--	--	--	--	
4	DC Washington	with exterior clear panel	214.19	597.55	811.74	$233.43	22.3%	$0.56	14.4	
4	DC Washington	with interior clear panel	214.83	589.03	803.86	$241.31	23.1%	$0.57	15.7	
4	DC Washington	with exterior low-E panel	201.16	520.88	722.03	$323.14	**30.9%**	$0.77	**11.7**	**4.7**
4	DC Washington	with interior low-E panel	213.94	486.80	700.74	$344.44	**33.0%**	$0.82	**12.2**	**4.1**
4	DC Washington	with exterior solar-E panel	167.80	569.56	737.36	$307.82	**29.5%**	$0.73	**12.3**	**5.6**
4	DC Washington	Wood frame, double pane	222.63	640.14	862.77	--	--	--	--	
4	DC Washington	with exterior clear panel	207.80	579.29	787.09	$75.67	8.8%	$0.18	44.4	
4	DC Washington	with interior clear panel	212.53	567.12	779.65	$83.12	9.6%	$0.20	45.5	
4	DC Washington	with exterior low-E panel	195.02	516.01	711.03	$151.74	**17.6%**	$0.36	**24.9**	**5.5**
4	DC Washington	with interior low-E panel	208.70	490.45	699.15	$163.62	**19.0%**	$0.39	**25.7**	**5.2**
4	DC Washington	with exterior solar-E panel	163.71	562.25	725.97	$136.80	**15.9%**	$0.33	**27.6**	**6.9**
4	DC Washington	Metal frame, double pane	212.91	784.97	997.88	--	--	--	--	
4	DC Washington	with exterior clear panel	211.76	635.27	847.04	$150.84	15.1%	$0.36	22.3	
4	DC Washington	with interior clear panel	209.59	621.89	831.48	$166.40	16.7%	$0.40	22.7	
4	DC Washington	with exterior low-E panel	199.11	547.65	746.76	$251.12	**25.2%**	$0.60	**15.1**	**4.2**
4	DC Washington	with interior low-E panel	205.50	529.40	734.90	$262.98	**26.4%**	$0.63	**16.0**	**4.3**
4	DC Washington	with exterior solar-E panel	166.78	597.55	764.33	$233.55	**23.4%**	$0.56	**16.2**	**5.1**
4	DC Washington	with exterior clear panel, worst case mounting	206.01	705.86	911.87	$86.01	8.6%	$0.20	39.1	
4	DC Washington	with exterior low-E panel, worst case mounting	191.57	652.31	843.88	$154.00	15.4%	$0.37	24.5	
4	DC Washington	with exterior solar-E panel, worst case mounting	164.86	696.12	860.99	$136.89	13.7%	$0.33	27.6	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
4	MO Kansas City	Wood frame, single pane	Furnace / AC	2563	kWh	72.2	MBtu	108.3	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	2357	kWh	52.8	MBtu	84.7	MBtu	21.8%
4	MO Kansas City	with interior clear panel	Furnace / AC	2364	kWh	52	MBtu	83.9	MBtu	22.5%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	2200	kWh	46.1	MBtu	75.6	MBtu	**30.2%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	2322	kWh	43.2	MBtu	73.8	MBtu	**31.8%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1890	kWh	50.1	MBtu	76.4	MBtu	**29.4%**
4	MO Kansas City	Wood frame, double pane	Furnace / AC	2452	kWh	56.5	MBtu	89.9	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	2291	kWh	51.1	MBtu	82.1	MBtu	8.6%
4	MO Kansas City	with interior clear panel	Furnace / AC	2342	kWh	50.1	MBtu	81.6	MBtu	9.2%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	2137	kWh	45.6	MBtu	74.3	MBtu	**17.3%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	2274	kWh	43.5	MBtu	73.6	MBtu	**18.1%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1844	kWh	49.5	MBtu	75.2	MBtu	**16.3%**
4	MO Kansas City	Metal frame, double pane	Furnace / AC	2385	kWh	68.9	MBtu	102.6	MBtu	--
4	MO Kansas City	with exterior clear panel	Furnace / AC	2342	kWh	56	MBtu	88.0	MBtu	14.2%
4	MO Kansas City	with interior clear panel	Furnace / AC	2316	kWh	54.8	MBtu	86.4	MBtu	15.8%
4	MO Kansas City	with exterior low-E panel	Furnace / AC	2185	kWh	48.4	MBtu	77.9	MBtu	**24.1%**
4	MO Kansas City	with interior low-E panel	Furnace / AC	2244	kWh	46.8	MBtu	76.9	MBtu	**25.1%**
4	MO Kansas City	with exterior solar-E panel	Furnace / AC	1883	kWh	52.4	MBtu	78.8	MBtu	**23.2%**
4	MO Kansas City	with exterior clear panel, worst case mounting	Furnace / AC	2299	kWh	62	MBtu	94.1	MBtu	8.3%
4	MO Kansas City	with exterior low-E panel, worst case mounting	Furnace / AC	2141	kWh	57.3	MBtu	87.2	MBtu	15.1%
4	MO Kansas City	with exterior solar-E panel, worst case mountin	Furnace / AC	1873	kWh	60.9	MBtu	88.0	MBtu	14.2%
4	NC Raleigh	Wood frame, single pane	Furnace / AC	2555	kWh	47.3	MBtu	81.0	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2422	kWh	34.1	MBtu	65.0	MBtu	19.7%
4	NC Raleigh	with interior clear panel	Furnace / AC	2426	kWh	33.5	MBtu	64.4	MBtu	20.4%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2283	kWh	29.4	MBtu	58.3	MBtu	**28.0%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2397	kWh	27.2	MBtu	57.2	MBtu	**29.3%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	1940	kWh	33.1	MBtu	58.4	MBtu	**27.9%**
4	NC Raleigh	Wood frame, double pane	Furnace / AC	2501	kWh	36.6	MBtu	68.7	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2353	kWh	33.1	MBtu	63.2	MBtu	8.0%
4	NC Raleigh	with interior clear panel	Furnace / AC	2405	kWh	32.2	MBtu	62.8	MBtu	8.6%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2222	kWh	29.2	MBtu	57.4	MBtu	**16.4%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2347	kWh	27.5	MBtu	57.0	MBtu	**17.0%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	1898	kWh	32.7	MBtu	57.5	MBtu	**16.3%**
4	NC Raleigh	Metal frame, double pane	Furnace / AC	2391	kWh	45.7	MBtu	77.4	MBtu	--
4	NC Raleigh	with exterior clear panel	Furnace / AC	2397	kWh	36.5	MBtu	67.4	MBtu	12.9%
4	NC Raleigh	with interior clear panel	Furnace / AC	2368	kWh	35.7	MBtu	66.2	MBtu	14.5%
4	NC Raleigh	with exterior low-E panel	Furnace / AC	2262	kWh	31.2	MBtu	60.0	MBtu	**22.4%**
4	NC Raleigh	with interior low-E panel	Furnace / AC	2325	kWh	29.9	MBtu	59.3	MBtu	**23.3%**
4	NC Raleigh	with exterior solar-E panel	Furnace / AC	1926	kWh	34.8	MBtu	60.1	MBtu	**22.3%**
4	NC Raleigh	with exterior clear panel, worst case mounting	Furnace / AC	2325	kWh	40.9	MBtu	71.4	MBtu	7.8%
4	NC Raleigh	with exterior low-E panel, worst case mounting	Furnace / AC	2186	kWh	37.8	MBtu	66.4	MBtu	14.2%
4	NC Raleigh	with exterior solar-E panel, worst case mountin	Furnace / AC	1903	kWh	41.2	MBtu	66.8	MBtu	13.6%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
4	MO Kansas City	Wood frame, single pane	271.42	745.10	1016.53	--	--	--	--	
4	MO Kansas City	with exterior clear panel	249.61	544.90	794.50	$222.02	21.8%	$0.53	15.1	
4	MO Kansas City	with interior clear panel	250.35	536.64	786.99	$229.54	22.6%	$0.55	16.5	
4	MO Kansas City	with exterior low-E panel	232.98	475.75	708.73	$307.79	**30.3%**	$0.73	**12.3**	**4.9**
4	MO Kansas City	with interior low-E panel	245.90	445.82	691.72	$324.80	**32.0%**	$0.77	**12.9**	**4.4**
4	MO Kansas City	with exterior solar-E panel	200.15	517.03	717.18	$299.34	**29.4%**	$0.71	**12.6**	**5.4**
4	MO Kansas City	Wood frame, double pane	259.67	583.08	842.75	--	--	--	--	
4	MO Kansas City	with exterior clear panel	242.62	527.35	769.97	$72.78	8.6%	$0.17	46.2	
4	MO Kansas City	with interior clear panel	248.02	517.03	765.05	$77.70	9.2%	$0.18	48.7	
4	MO Kansas City	with exterior low-E panel	226.31	470.59	696.90	$145.85	**17.3%**	$0.35	**25.9**	**5.7**
4	MO Kansas City	with interior low-E panel	240.82	448.92	689.74	$153.01	**18.2%**	$0.36	**27.4**	**5.6**
4	MO Kansas City	with exterior solar-E panel	195.28	510.84	706.12	$136.63	**16.2%**	$0.33	**27.7**	**6.6**
4	MO Kansas City	Metal frame, double pane	252.57	711.05	963.62	--	--	--	--	
4	MO Kansas City	with exterior clear panel	248.02	577.92	825.94	$137.68	14.3%	$0.33	24.4	
4	MO Kansas City	with interior clear panel	245.26	565.54	810.80	$152.82	15.9%	$0.36	24.7	
4	MO Kansas City	with exterior low-E panel	231.39	499.49	730.88	$232.74	**24.2%**	$0.55	**16.2**	**4.4**
4	MO Kansas City	with interior low-E panel	237.64	482.98	720.62	$243.00	**25.2%**	$0.58	**17.3**	**4.7**
4	MO Kansas City	with exterior solar-E panel	199.41	540.77	740.18	$223.44	**23.2%**	$0.53	**16.9**	**4.9**
4	MO Kansas City	with exterior clear panel, worst case mounting	243.46	639.84	883.30	$80.32	8.3%	$0.19	41.8	
4	MO Kansas City	with exterior low-E panel, worst case mounting	226.73	591.34	818.07	$145.55	15.1%	$0.35	26.0	
4	MO Kansas City	with exterior solar-E panel, worst case mounting	198.35	628.49	826.84	$136.78	14.2%	$0.33	27.6	
4	NC Raleigh	Wood frame, single pane	284.12	546.79	830.90	--	--	--	--	
4	NC Raleigh	with exterior clear panel	269.33	394.20	663.52	$167.38	20.1%	$0.40	20.1	
4	NC Raleigh	with interior clear panel	269.77	387.26	657.03	$173.87	20.9%	$0.41	21.7	
4	NC Raleigh	with exterior low-E panel	253.87	339.86	593.73	$237.17	**28.5%**	$0.56	**15.9**	**6.0**
4	NC Raleigh	with interior low-E panel	266.55	314.43	580.98	$249.93	**30.1%**	$0.60	**16.8**	**5.5**
4	NC Raleigh	with exterior solar-E panel	215.73	382.64	598.36	$232.54	**28.0%**	$0.55	**16.3**	**6.4**
4	NC Raleigh	Wood frame, double pane	278.11	423.10	701.21	--	--	--	--	
4	NC Raleigh	with exterior clear panel	261.65	382.64	644.29	$56.92	8.1%	$0.14	59.0	
4	NC Raleigh	with interior clear panel	267.44	372.23	639.67	$61.54	8.8%	$0.15	61.4	
4	NC Raleigh	with exterior low-E panel	247.09	337.55	584.64	$116.57	**16.6%**	$0.28	**32.4**	**7.0**
4	NC Raleigh	with interior low-E panel	260.99	317.90	578.89	$122.32	**17.4%**	$0.29	**34.3**	**6.9**
4	NC Raleigh	with exterior solar-E panel	211.06	378.01	589.07	$112.14	**16.0%**	$0.27	**33.7**	**7.6**
4	NC Raleigh	Metal frame, double pane	265.88	528.29	794.17	--	--	--	--	
4	NC Raleigh	with exterior clear panel	266.55	421.94	688.49	$105.68	13.3%	$0.25	31.8	
4	NC Raleigh	with interior clear panel	263.32	412.69	676.01	$118.16	14.9%	$0.28	32.0	
4	NC Raleigh	with exterior low-E panel	251.53	360.67	612.21	$181.96	**22.9%**	$0.43	**20.8**	**5.5**
4	NC Raleigh	with interior low-E panel	258.54	345.64	604.18	$189.99	**23.9%**	$0.45	**22.1**	**5.8**
4	NC Raleigh	with exterior solar-E panel	214.17	402.29	616.46	$177.71	**22.4%**	$0.42	**21.3**	**5.8**
4	NC Raleigh	with exterior clear panel, worst case mounting	258.54	472.80	731.34	$62.83	7.9%	$0.15	53.5	
4	NC Raleigh	with exterior low-E panel, worst case mounting	243.08	436.97	680.05	$114.12	14.4%	$0.27	33.1	
4	NC Raleigh	with exterior solar-E panel, worst case mounting	211.61	476.27	687.89	$106.29	13.4%	$0.25	35.6	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
3	GA Atlanta	Wood frame, single pane	Furnace / AC	2581	kWh	40.9	MBtu	74.3	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2417	kWh	29.2	MBtu	59.6	MBtu	19.7%
3	GA Atlanta	with interior clear panel	Furnace / AC	2422	kWh	28.7	MBtu	59.1	MBtu	20.4%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2268	kWh	25.2	MBtu	53.6	MBtu	**27.9%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2402	kWh	23	MBtu	52.7	MBtu	**29.1%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	1897	kWh	28.8	MBtu	53.2	MBtu	**28.4%**
3	GA Atlanta	Wood frame, double pane	Furnace / AC	2511	kWh	31.3	MBtu	63.0	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2344	kWh	28.4	MBtu	57.9	MBtu	8.1%
3	GA Atlanta	with interior clear panel	Furnace / AC	2398	kWh	27.6	MBtu	57.7	MBtu	8.5%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2196	kWh	25.1	MBtu	52.6	MBtu	**16.5%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2344	kWh	23.4	MBtu	52.5	MBtu	**16.7%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	1851	kWh	28.6	MBtu	52.5	MBtu	**16.7%**
3	GA Atlanta	Metal frame, double pane	Furnace / AC	2411	kWh	39.7	MBtu	71.0	MBtu	--
3	GA Atlanta	with exterior clear panel	Furnace / AC	2395	kWh	31.4	MBtu	61.8	MBtu	13.0%
3	GA Atlanta	with interior clear panel	Furnace / AC	2368	kWh	30.7	MBtu	60.7	MBtu	14.5%
3	GA Atlanta	with exterior low-E panel	Furnace / AC	2248	kWh	26.7	MBtu	55.0	MBtu	**22.6%**
3	GA Atlanta	with interior low-E panel	Furnace / AC	2317	kWh	25.5	MBtu	54.4	MBtu	**23.3%**
3	GA Atlanta	with exterior solar-E panel	Furnace / AC	1891	kWh	30.5	MBtu	55.0	MBtu	**22.5%**
3	GA Atlanta	with exterior clear panel, worst case mounting	Furnace / AC	2332	kWh	35.5	MBtu	65.5	MBtu	7.7%
3	GA Atlanta	with exterior low-E panel, worst case mounting	Furnace / AC	2173	kWh	32.8	MBtu	60.8	MBtu	14.5%
3	GA Atlanta	with exterior solar-E panel, worst case mountin	Furnace / AC	1882	kWh	36.2	MBtu	61.1	MBtu	13.9%
3	TX Fort Worth	Wood frame, single pane	Furnace / AC	4263	kWh	32.9	MBtu	84.9	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	3911	kWh	22.9	MBtu	69.9	MBtu	17.6%
3	TX Fort Worth	with interior clear panel	Furnace / AC	3913	kWh	22.5	MBtu	69.5	MBtu	18.1%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3639	kWh	19.6	MBtu	63.2	MBtu	**25.6%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3806	kWh	17.8	MBtu	63.1	MBtu	**25.6%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3173	kWh	22.8	MBtu	61.3	MBtu	**27.7%**
3	TX Fort Worth	Wood frame, double pane	Furnace / AC	4070	kWh	24.7	MBtu	73.7	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	3811	kWh	22.3	MBtu	68.1	MBtu	7.6%
3	TX Fort Worth	with interior clear panel	Furnace / AC	3880	kWh	21.6	MBtu	68.1	MBtu	7.6%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3545	kWh	19.5	MBtu	62.0	MBtu	**15.9%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3739	kWh	18.1	MBtu	62.7	MBtu	**14.9%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3099	kWh	22.7	MBtu	60.4	MBtu	**18.1%**
3	TX Fort Worth	Metal frame, double pane	Furnace / AC	4010	kWh	31.8	MBtu	80.8	MBtu	--
3	TX Fort Worth	with exterior clear panel	Furnace / AC	3916	kWh	24.8	MBtu	72.0	MBtu	10.8%
3	TX Fort Worth	with interior clear panel	Furnace / AC	3868	kWh	24.2	MBtu	70.8	MBtu	12.3%
3	TX Fort Worth	with exterior low-E panel	Furnace / AC	3633	kWh	20.9	MBtu	64.5	MBtu	**20.1%**
3	TX Fort Worth	with interior low-E panel	Furnace / AC	3711	kWh	19.9	MBtu	64.3	MBtu	**20.3%**
3	TX Fort Worth	with exterior solar-E panel	Furnace / AC	3174	kWh	24.2	MBtu	62.9	MBtu	**22.2%**
3	TX Fort Worth	with exterior clear panel, worst case mounting	Furnace / AC	3864	kWh	28.3	MBtu	75.3	MBtu	6.8%
3	TX Fort Worth	with exterior low-E panel, worst case mounting	Furnace / AC	3599	kWh	26.1	MBtu	69.8	MBtu	13.5%
3	TX Fort Worth	with exterior solar-E panel, worst case mountin	Furnace / AC	3213	kWh	29.1	MBtu	68.7	MBtu	15.0%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
3	GA Atlanta	Wood frame, single pane	298.62	587.32	885.95	--	--	--	--	
3	GA Atlanta	with exterior clear panel	279.65	419.31	698.96	$186.99	21.1%	$0.45	18.0	
3	GA Atlanta	with interior clear panel	280.23	412.13	692.36	$193.59	21.9%	$0.46	19.5	
3	GA Atlanta	with exterior low-E panel	262.41	361.87	624.28	$261.67	**29.5%**	$0.62	**14.4**	**5.6**
3	GA Atlanta	with interior low-E panel	277.91	330.28	608.19	$277.75	**31.4%**	$0.66	**15.1**	**5.0**
3	GA Atlanta	with exterior solar-E panel	219.48	413.57	633.05	$252.89	**28.5%**	$0.60	**14.9**	**6.4**
3	GA Atlanta	Wood frame, double pane	290.52	449.47	739.99	--	--	--	--	
3	GA Atlanta	with exterior clear panel	271.20	407.82	679.02	$60.97	8.2%	$0.15	55.1	
3	GA Atlanta	with interior clear panel	277.45	396.34	673.78	$66.21	8.9%	$0.16	57.1	
3	GA Atlanta	with exterior low-E panel	254.08	360.44	614.51	$125.48	**17.0%**	$0.30	**30.1**	**6.5**
3	GA Atlanta	with interior low-E panel	271.20	336.02	607.22	$132.77	**17.9%**	$0.32	**31.6**	**6.3**
3	GA Atlanta	with exterior solar-E panel	214.16	410.70	624.86	$115.13	**15.6%**	$0.27	**32.8**	**7.8**
3	GA Atlanta	Metal frame, double pane	278.95	570.09	849.04	--	--	--	--	
3	GA Atlanta	with exterior clear panel	277.10	450.90	728.01	$121.04	14.3%	$0.29	27.8	
3	GA Atlanta	with interior clear panel	273.98	440.85	714.83	$134.22	15.8%	$0.32	28.2	
3	GA Atlanta	with exterior low-E panel	260.09	383.41	643.51	$205.54	**24.2%**	$0.49	**18.4**	**5.0**
3	GA Atlanta	with interior low-E panel	268.08	366.18	634.26	$214.79	**25.3%**	$0.51	**19.6**	**5.2**
3	GA Atlanta	with exterior solar-E panel	218.79	437.98	656.77	$192.28	**22.6%**	$0.46	**19.7**	**5.9**
3	GA Atlanta	with exterior clear panel, worst case mounting	269.81	509.78	779.59	$69.45	8.2%	$0.17	48.4	
3	GA Atlanta	with exterior low-E panel, worst case mounting	251.42	471.01	722.42	$126.62	14.9%	$0.30	29.9	
3	GA Atlanta	with exterior solar-E panel, worst case mounting	217.75	519.83	737.58	$111.47	13.1%	$0.27	33.9	
3	TX Fort Worth	Wood frame, single pane – Natural Gas Heating	503.89	354.33	858.22	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	462.28	246.63	708.91	$149.31	17.4%	$0.36	22.5	
3	TX Fort Worth	with interior clear panel	462.52	242.33	704.84	$153.38	17.9%	$0.37	24.6	
3	TX Fort Worth	with exterior low-E panel	430.13	211.09	641.22	$217.00	**25.3%**	$0.52	**17.4**	**6.2**
3	TX Fort Worth	with interior low-E panel	449.87	191.71	641.58	$216.64	**25.2%**	$0.52	**19.4**	**6.6**
3	TX Fort Worth	with exterior solar-E panel	375.05	245.56	620.60	$237.62	**27.7%**	$0.57	**15.9**	**4.8**
3	TX Fort Worth	Wood frame, double pane – Natural Gas Heating	481.07	266.02	747.09	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	450.46	240.17	690.63	$56.46	7.6%	$0.13	59.5	
3	TX Fort Worth	with interior clear panel	458.62	232.63	691.25	$55.85	7.5%	$0.13	67.7	
3	TX Fort Worth	with exterior low-E panel	419.02	210.02	629.03	$118.06	**15.8%**	$0.28	**32.0**	**6.8**
3	TX Fort Worth	with interior low-E panel	441.95	194.94	636.89	$110.21	**14.8%**	$0.26	**38.1**	**7.7**
3	TX Fort Worth	with exterior solar-E panel	366.30	244.48	610.78	$136.31	**18.2%**	$0.32	**27.7**	**5.3**
3	TX Fort Worth	Metal frame, double pane – Natural Gas Heating	473.98	342.49	816.47	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	462.87	267.10	729.97	$86.50	10.6%	$0.21	38.8	
3	TX Fort Worth	with interior clear panel	457.20	260.63	717.83	$98.64	12.1%	$0.23	38.3	
3	TX Fort Worth	with exterior low-E panel	429.42	225.09	654.51	$161.95	**19.8%**	$0.39	**23.3**	**5.6**
3	TX Fort Worth	with interior low-E panel	438.64	214.32	652.96	$163.50	**20.0%**	$0.39	**25.7**	**6.5**
3	TX Fort Worth	with exterior solar-E panel	375.17	260.63	635.80	$180.67	**22.1%**	$0.43	**20.9**	**4.5**
3	TX Fort Worth	with exterior clear panel, worst case mounting	456.72	304.79	761.52	$54.95	6.7%	$0.13	61.1	
3	TX Fort Worth	with exterior low-E panel, worst case mounting	425.40	281.10	706.50	$109.97	13.5%	$0.26	34.4	
3	TX Fort Worth	with exterior solar-E panel, worst case mounting	379.78	313.41	693.18	$123.28	15.1%	$0.29	30.7	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
3	TX Fort Worth	Wood frame, single pane	Heat pump / AC	4263	kWh	2564	kWh	78.4	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	3911	kWh	1856	kWh	66.2	MBtu	15.5%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	3913	kWh	1825	kWh	65.9	MBtu	16.0%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3639	kWh	1603	kWh	60.2	MBtu	**23.2%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3806	kWh	1491	kWh	60.8	MBtu	**22.4%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3173	kWh	1777	kWh	56.8	MBtu	**27.5%**
3	TX Fort Worth	Wood frame, double pane	Heat pump / AC	4070	kWh	1993	kWh	69.6	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	3811	kWh	1802	kWh	64.4	MBtu	7.4%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	3880	kWh	1760	kWh	64.8	MBtu	7.0%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3545	kWh	1591	kWh	59.0	MBtu	**15.3%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3739	kWh	1504	kWh	60.2	MBtu	**13.5%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3099	kWh	1757	kWh	55.8	MBtu	**19.9%**
3	TX Fort Worth	Metal frame, double pane	Heat pump / AC	4010	kWh	2466	kWh	74.4	MBtu	--
3	TX Fort Worth	with exterior clear panel	Heat pump / AC	3916	kWh	1991	kWh	67.8	MBtu	8.8%
3	TX Fort Worth	with interior clear panel	Heat pump / AC	3868	kWh	1944	kWh	66.7	MBtu	10.3%
3	TX Fort Worth	with exterior low-E panel	Heat pump / AC	3633	kWh	1693	kWh	61.2	MBtu	**17.8%**
3	TX Fort Worth	with interior low-E panel	Heat pump / AC	3711	kWh	1632	kWh	61.3	MBtu	**17.5%**
3	TX Fort Worth	with exterior solar-E panel	Heat pump / AC	3174	kWh	1868	kWh	57.9	MBtu	**22.1%**
3	TX Fort Worth	with exterior clear panel, worst case mounting	Heat pump / AC	3864	kWh	2219	kWh	69.8	MBtu	6.1%
3	TX Fort Worth	with exterior low-E panel, worst case mounting	Heat pump / AC	3599	kWh	2044	kWh	64.8	MBtu	12.9%
3	TX Fort Worth	with exterior solar-E panel, worst case mountin	Heat pump / AC	3213	kWh	2199	kWh	62.1	MBtu	16.4%
2	AZ Phoenix	Wood frame, single pane	Heat pump / AC	7639	kWh	791	kWh	96.8	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	6707	kWh	477	kWh	82.5	MBtu	14.8%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	6696	kWh	464	kWh	82.2	MBtu	15.1%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	6197	kWh	375	kWh	75.5	MBtu	**22.0%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	6384	kWh	330	kWh	77.1	MBtu	**20.4%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	5552	kWh	450	kWh	68.9	MBtu	**28.8%**
2	AZ Phoenix	Wood frame, double pane	Heat pump / AC	7106	kWh	549	kWh	87.9	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	6550	kWh	457	kWh	80.5	MBtu	8.5%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	6630	kWh	438	kWh	81.2	MBtu	7.7%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	6042	kWh	370	kWh	73.6	MBtu	**16.2%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	6291	kWh	335	kWh	76.1	MBtu	**13.4%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	5442	kWh	444	kWh	67.6	MBtu	**23.1%**
2	AZ Phoenix	Metal frame, double pane	Heat pump / AC	7221	kWh	757	kWh	91.6	MBtu	--
2	AZ Phoenix	with exterior clear panel	Heat pump / AC	6888	kWh	550	kWh	85.4	MBtu	6.8%
2	AZ Phoenix	with interior clear panel	Heat pump / AC	6694	kWh	512	kWh	82.7	MBtu	9.7%
2	AZ Phoenix	with exterior low-E panel	Heat pump / AC	6223	kWh	408	kWh	76.1	MBtu	**16.9%**
2	AZ Phoenix	with interior low-E panel	Heat pump / AC	6321	kWh	383	kWh	77.0	MBtu	**16.0%**
2	AZ Phoenix	with exterior solar-E panel	Heat pump / AC	5596	kWh	487	kWh	69.8	MBtu	**23.8%**
2	AZ Phoenix	with exterior clear panel, worst case mounting	Heat pump / AC	6903	kWh	646	kWh	86.7	MBtu	5.4%
2	AZ Phoenix	with exterior low-E panel, worst case mounting	Heat pump / AC	6299	kWh	549	kWh	78.6	MBtu	14.2%
2	AZ Phoenix	with exterior solar-E panel, worst case mountin	Heat pump / AC	5779	kWh	624	kWh	73.5	MBtu	19.7%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
3	TX Fort Worth	Wood frame, single pane – Heat Pump Heating	503.89	303.06	806.95	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	462.28	219.38	681.66	$125.29	15.5%	$0.30	26.8	
3	TX Fort Worth	with interior clear panel	462.52	215.72	678.23	$128.72	16.0%	$0.31	29.4	
3	TX Fort Worth	with exterior low-E panel	430.13	189.47	619.60	$187.35	**23.2%**	$0.45	**20.2**	**6.8**
3	TX Fort Worth	with interior low-E panel	449.87	176.24	626.11	$180.85	**22.4%**	$0.43	**23.2**	**8.1**
3	TX Fort Worth	with exterior solar-E panel	375.05	210.04	585.09	$221.86	**27.5%**	$0.53	**17.0**	**4.3**
3	TX Fort Worth	Wood frame, double pane – Heat Pump Heating	481.07	235.57	716.65	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	450.46	213.00	663.46	$53.19	7.4%	$0.13	63.2	
3	TX Fort Worth	with interior clear panel	458.62	208.03	666.65	$50.00	7.0%	$0.12	75.6	
3	TX Fort Worth	with exterior low-E panel	419.02	188.06	607.08	$109.57	**15.3%**	$0.26	**34.5**	**7.4**
3	TX Fort Worth	with interior low-E panel	441.95	177.77	619.72	$96.92	**13.5%**	$0.23	**43.3**	**9.0**
3	TX Fort Worth	with exterior solar-E panel	366.30	207.68	573.98	$142.67	**19.9%**	$0.34	**26.5**	**4.7**
3	TX Fort Worth	Metal frame, double pane – Heat Pump Heating	473.98	291.48	765.46	--	--	--	--	
3	TX Fort Worth	with exterior clear panel	462.87	235.34	698.21	$67.26	8.8%	$0.16	50.0	
3	TX Fort Worth	with interior clear panel	457.20	229.78	686.98	$78.48	10.3%	$0.19	48.2	
3	TX Fort Worth	with exterior low-E panel	429.42	200.11	629.53	$135.93	**17.8%**	$0.32	**27.8**	**6.1**
3	TX Fort Worth	with interior low-E panel	438.64	192.90	631.54	$133.92	**17.5%**	$0.32	**31.4**	**7.6**
3	TX Fort Worth	with exterior solar-E panel	375.17	220.80	595.96	$169.50	**22.1%**	$0.40	**22.3**	**4.1**
3	TX Fort Worth	with exterior clear panel, worst case mounting	456.72	262.29	719.01	$46.45	6.1%	$0.11	72.3	
3	TX Fort Worth	with exterior low-E panel, worst case mounting	425.40	241.60	667.00	$98.46	12.9%	$0.23	38.4	
3	TX Fort Worth	with exterior solar-E panel, worst case mounting	379.78	259.92	639.70	$125.76	16.4%	$0.30	30.1	
2	AZ Phoenix	Wood frame, single pane	915.15	94.76	1009.91	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	803.50	57.14	860.64	$149.27	14.8%	$0.36	22.5	
2	AZ Phoenix	with interior clear panel	802.18	55.59	857.77	$152.15	15.1%	$0.36	24.8	
2	AZ Phoenix	with exterior low-E panel	742.40	44.93	787.33	$222.59	**22.0%**	$0.53	**17.0**	**5.7**
2	AZ Phoenix	with interior low-E panel	764.80	39.53	804.34	$205.58	**20.4%**	$0.49	**20.4**	**7.9**
2	AZ Phoenix	with exterior solar-E panel	665.13	53.91	719.04	$290.87	**28.8%**	$0.69	**13.0**	**3.0**
2	AZ Phoenix	Wood frame, double pane	851.30	65.77	917.07	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	784.69	54.75	839.44	$77.63	8.5%	$0.18	43.3	
2	AZ Phoenix	with interior clear panel	794.27	52.47	846.75	$70.32	7.7%	$0.17	53.8	
2	AZ Phoenix	with exterior low-E panel	723.83	44.33	768.16	$148.91	**16.2%**	$0.35	**25.4**	**5.9**
2	AZ Phoenix	with interior low-E panel	753.66	40.13	793.79	$123.27	**13.4%**	$0.29	**34.1**	**7.9**
2	AZ Phoenix	with exterior solar-E panel	651.95	53.19	705.14	$211.93	**23.1%**	$0.50	**17.8**	**3.1**
2	AZ Phoenix	Metal frame, double pane	865.08	90.69	955.76	--	--	--	--	
2	AZ Phoenix	with exterior clear panel	825.18	65.89	891.07	$64.69	6.8%	$0.15	51.9	
2	AZ Phoenix	with interior clear panel	801.94	61.34	863.28	$92.49	9.7%	$0.22	40.9	
2	AZ Phoenix	with exterior low-E panel	745.52	48.88	794.39	$161.37	**16.9%**	$0.38	**23.4**	**4.3**
2	AZ Phoenix	with interior low-E panel	757.26	45.88	803.14	$152.63	**16.0%**	$0.36	**27.5**	**7.0**
2	AZ Phoenix	with exterior solar-E panel	670.40	58.34	728.74	$227.02	**23.8%**	$0.54	**16.7**	**2.6**
2	AZ Phoenix	with exterior clear panel, worst case mounting	826.98	77.39	904.37	$51.39	5.4%	$0.12	65.4	
2	AZ Phoenix	with exterior low-E panel, worst case mounting	754.62	65.77	820.39	$135.37	14.2%	$0.32	27.9	
2	AZ Phoenix	with exterior solar-E panel, worst case mounting	692.32	74.76	767.08	$188.69	19.7%	$0.45	20.0	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
2	FL Jacksonville	Wood frame, single pane	Heat pump / AC	4308	kWh	1211	kWh	63.4	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4022	kWh	823	kWh	55.6	MBtu	12.2%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	4024	kWh	808	kWh	55.5	MBtu	12.4%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	3774	kWh	680	kWh	51.1	MBtu	**19.3%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	3962	kWh	614	kWh	52.5	MBtu	**17.1%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3274	kWh	804	kWh	46.8	MBtu	**26.1%**
2	FL Jacksonville	Wood frame, double pane	Heat pump / AC	4164	kWh	897	kWh	58.1	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	3918	kWh	798	kWh	54.1	MBtu	6.8%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	3990	kWh	768	kWh	54.6	MBtu	6.0%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	3673	kWh	674	kWh	49.9	MBtu	**14.1%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	3883	kWh	621	kWh	51.7	MBtu	**11.0%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3202	kWh	794	kWh	45.9	MBtu	**21.0%**
2	FL Jacksonville	Metal frame, double pane	Heat pump / AC	4058	kWh	1176	kWh	60.1	MBtu	--
2	FL Jacksonville	with exterior clear panel	Heat pump / AC	4005	kWh	900	kWh	56.3	MBtu	6.3%
2	FL Jacksonville	with interior clear panel	Heat pump / AC	3955	kWh	876	kWh	55.5	MBtu	7.7%
2	FL Jacksonville	with exterior low-E panel	Heat pump / AC	3753	kWh	735	kWh	51.5	MBtu	**14.3%**
2	FL Jacksonville	with interior low-E panel	Heat pump / AC	3849	kWh	693	kWh	52.2	MBtu	**13.2%**
2	FL Jacksonville	with exterior solar-E panel	Heat pump / AC	3269	kWh	857	kWh	47.4	MBtu	**21.2%**
2	FL Jacksonville	with exterior clear panel, worst case mounting	Heat pump / AC	3928	kWh	1039	kWh	57.0	MBtu	5.1%
2	FL Jacksonville	with exterior low-E panel, worst case mounting	Heat pump / AC	3679	kWh	940	kWh	53.0	MBtu	11.8%
2	FL Jacksonville	with exterior solar-E panel, worst case mountin	Heat pump / AC	3281	kWh	1052	kWh	49.8	MBtu	17.2%
2	TX Houston	Wood frame, single pane	Furnace / AC	4555	kWh	20.5	MBtu	74.7	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4236	kWh	14.1	MBtu	64.0	MBtu	14.3%
2	TX Houston	with interior clear panel	Furnace / AC	4239	kWh	13.8	MBtu	63.7	MBtu	14.7%
2	TX Houston	with exterior low-E panel	Furnace / AC	3976	kWh	11.8	MBtu	58.5	MBtu	**21.6%**
2	TX Houston	with interior low-E panel	Furnace / AC	4168	kWh	10.7	MBtu	59.5	MBtu	**20.3%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3461	kWh	13.6	MBtu	54.6	MBtu	**26.9%**
2	TX Houston	Wood frame, double pane	Furnace / AC	4394	kWh	15.3	MBtu	67.2	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4132	kWh	13.6	MBtu	62.3	MBtu	7.2%
2	TX Houston	with interior clear panel	Furnace / AC	4205	kWh	13.2	MBtu	62.7	MBtu	6.6%
2	TX Houston	with exterior low-E panel	Furnace / AC	3874	kWh	11.7	MBtu	57.3	MBtu	**14.7%**
2	TX Houston	with interior low-E panel	Furnace / AC	4092	kWh	10.9	MBtu	58.9	MBtu	**12.3%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3391	kWh	13.4	MBtu	53.6	MBtu	**20.2%**
2	TX Houston	Metal frame, double pane	Furnace / AC	4295	kWh	19.8	MBtu	70.9	MBtu	--
2	TX Houston	with exterior clear panel	Furnace / AC	4230	kWh	15.3	MBtu	65.3	MBtu	8.0%
2	TX Houston	with interior clear panel	Furnace / AC	4183	kWh	14.8	MBtu	64.2	MBtu	9.5%
2	TX Houston	with exterior low-E panel	Furnace / AC	3959	kWh	12.6	MBtu	59.2	MBtu	**16.5%**
2	TX Houston	with interior low-E panel	Furnace / AC	4053	kWh	12	MBtu	59.6	MBtu	**15.9%**
2	TX Houston	with exterior solar-E panel	Furnace / AC	3460	kWh	14.4	MBtu	55.5	MBtu	**21.8%**
2	TX Houston	with exterior clear panel, worst case mounting	Furnace / AC	4156	kWh	17.4	MBtu	66.7	MBtu	5.9%
2	TX Houston	with exterior low-E panel, worst case mounting	Furnace / AC	3892	kWh	15.9	MBtu	62.1	MBtu	12.5%
2	TX Houston	with exterior solar-E panel, worst case mountin	Furnace / AC	3480	kWh	17.5	MBtu	59.1	MBtu	16.7%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
2	FL Jacksonville	Wood frame, single pane	516.10	145.08	661.18	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	481.84	98.60	580.43	$80.75	12.2%	$0.19	41.6	
2	FL Jacksonville	with interior clear panel	482.08	96.80	578.87	$82.30	12.4%	$0.20	45.9	
2	FL Jacksonville	with exterior low-E panel	452.13	81.46	533.59	$127.59	**19.3%**	$0.30	**29.6**	**9.0**
2	FL Jacksonville	with interior low-E panel	474.65	73.56	548.20	$112.97	**17.1%**	$0.27	**37.2**	**13.7**
2	FL Jacksonville	with exterior solar-E panel	392.23	96.32	488.54	$172.63	**26.1%**	$0.41	**21.9**	**4.6**
2	FL Jacksonville	Wood frame, double pane	498.85	107.46	606.31	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	469.38	95.60	564.98	$41.33	6.8%	$0.10	81.3	
2	FL Jacksonville	with interior clear panel	478.00	92.01	570.01	$36.30	6.0%	$0.09	104.1	
2	FL Jacksonville	with exterior low-E panel	440.03	80.75	520.77	$85.54	**14.1%**	$0.20	**44.2**	**9.5**
2	FL Jacksonville	with interior low-E panel	465.18	74.40	539.58	$66.73	**11.0%**	$0.16	**62.9**	**13.8**
2	FL Jacksonville	with exterior solar-E panel	383.60	95.12	478.72	$127.59	**21.0%**	$0.30	**29.6**	**4.9**
2	FL Jacksonville	Metal frame, double pane	486.15	140.88	627.03	--	--	--	--	
2	FL Jacksonville	with exterior clear panel	479.80	107.82	587.62	$39.41	6.3%	$0.09	85.2	
2	FL Jacksonville	with interior clear panel	473.81	104.94	578.75	$48.28	7.7%	$0.11	78.3	
2	FL Jacksonville	with exterior low-E panel	449.61	88.05	537.66	$89.37	**14.3%**	$0.21	**42.3**	**8.4**
2	FL Jacksonville	with interior low-E panel	461.11	83.02	544.13	$82.90	**13.2%**	$0.20	**50.7**	**12.1**
2	FL Jacksonville	with exterior solar-E panel	391.63	102.67	494.29	$132.74	**21.2%**	$0.32	**28.5**	**4.5**
2	FL Jacksonville	with exterior clear panel, worst case mounting	470.57	124.47	595.05	$31.99	5.1%	$0.08	105.0	
2	FL Jacksonville	with exterior low-E panel, worst case mounting	440.74	112.61	553.36	$73.68	11.8%	$0.18	51.3	
2	FL Jacksonville	with exterior solar-E panel, worst case mounting	393.06	126.03	519.09	$107.94	17.2%	$0.26	35.0	
2	TX Houston	Wood frame, single pane – Natural Gas Heating	538.40	220.79	759.19	--	--	--	--	
2	TX Houston	with exterior clear panel	500.70	151.86	652.55	$106.63	14.0%	$0.25	31.5	
2	TX Houston	with interior clear panel	501.05	148.63	649.68	$109.51	14.4%	$0.26	34.5	
2	TX Houston	with exterior low-E panel	469.96	127.09	597.05	$162.14	**21.4%**	$0.39	**23.3**	**7.6**
2	TX Houston	with interior low-E panel	492.66	115.24	607.90	$151.29	**19.9%**	$0.36	**27.8**	**10.1**
2	TX Houston	with exterior solar-E panel	409.09	146.47	555.56	$203.62	**26.8%**	$0.48	**18.6**	**4.3**
2	TX Houston	Wood frame, double pane – Natural Gas Heating	519.37	164.78	684.15	--	--	--	--	
2	TX Houston	with exterior clear panel	488.40	146.47	634.87	$49.28	7.2%	$0.12	68.2	
2	TX Houston	with interior clear panel	497.03	142.16	639.20	$44.96	6.6%	$0.11	84.1	
2	TX Houston	with exterior low-E panel	457.91	126.01	583.92	$100.24	**14.7%**	$0.24	**37.7**	**8.2**
2	TX Houston	with interior low-E panel	483.67	117.39	601.07	$83.08	**12.1%**	$0.20	**50.6**	**11.0**
2	TX Houston	with exterior solar-E panel	400.82	144.32	545.13	$139.02	**20.3%**	$0.33	**27.2**	**4.7**
2	TX Houston	Metal frame, double pane – Natural Gas Heating	507.67	213.25	720.92	--	--	--	--	
2	TX Houston	with exterior clear panel	499.99	164.78	664.77	$56.15	7.8%	$0.13	59.8	
2	TX Houston	with interior clear panel	494.43	159.40	653.83	$67.09	9.3%	$0.16	56.3	
2	TX Houston	with exterior low-E panel	467.95	135.70	603.66	$117.26	**16.3%**	$0.28	**32.2**	**6.9**
2	TX Houston	with interior low-E panel	479.06	129.24	608.30	$112.61	**15.6%**	$0.27	**37.3**	**9.2**
2	TX Houston	with exterior solar-E panel	408.97	155.09	564.06	$156.86	**21.8%**	$0.37	**24.1**	**4.2**
2	TX Houston	with exterior clear panel, worst case mounting	491.24	187.40	678.64	$42.28	5.9%	$0.10	79.5	
2	TX Houston	with exterior low-E panel, worst case mounting	460.03	171.24	631.28	$89.64	12.4%	$0.21	42.2	
2	TX Houston	with exterior solar-E panel, worst case mounting	411.34	188.48	599.81	$121.10	16.8%	$0.29	31.2	

Climate Zone	Location	Window	HVAC	Whole House Cooling		Whole House Heating		Source Energy		% source energy savings
2	TX Houston	Wood frame, single pane	Heat pump / AC	4555	kWh	1695	kWh	71.8	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4236	kWh	1214	kWh	62.6	MBtu	12.8%
2	TX Houston	with interior clear panel	Heat pump / AC	4239	kWh	1192	kWh	62.4	MBtu	13.1%
2	TX Houston	with exterior low-E panel	Heat pump / AC	3976	kWh	1034	kWh	57.5	MBtu	**19.8%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4168	kWh	965	kWh	58.9	MBtu	**17.9%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3461	kWh	1131	kWh	52.7	MBtu	**26.5%**
2	TX Houston	Wood frame, double pane	Heat pump / AC	4394	kWh	1311	kWh	65.5	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4132	kWh	1174	kWh	60.9	MBtu	7.0%
2	TX Houston	with interior clear panel	Heat pump / AC	4205	kWh	1149	kWh	61.5	MBtu	6.2%
2	TX Houston	with exterior low-E panel	Heat pump / AC	3874	kWh	1020	kWh	56.2	MBtu	**14.2%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4092	kWh	972	kWh	58.1	MBtu	**11.2%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3391	kWh	1117	kWh	51.8	MBtu	**21.0%**
2	TX Houston	Metal frame, double pane	Heat pump / AC	4295	kWh	1623	kWh	67.9	MBtu	--
2	TX Houston	with exterior clear panel	Heat pump / AC	4230	kWh	1301	kWh	63.5	MBtu	6.5%
2	TX Houston	with interior clear panel	Heat pump / AC	4183	kWh	1267	kWh	62.6	MBtu	7.9%
2	TX Houston	with exterior low-E panel	Heat pump / AC	3959	kWh	1091	kWh	58.0	MBtu	**14.7%**
2	TX Houston	with interior low-E panel	Heat pump / AC	4053	kWh	1052	kWh	58.6	MBtu	**13.7%**
2	TX Houston	with exterior solar-E panel	Heat pump / AC	3460	kWh	1191	kWh	53.4	MBtu	**21.4%**
2	TX Houston	with exterior clear panel, worst case mounting	Heat pump / AC	4156	kWh	1453	kWh	64.4	MBtu	5.2%
2	TX Houston	with exterior low-E panel, worst case mounting	Heat pump / AC	3892	kWh	1322	kWh	59.9	MBtu	11.9%
2	TX Houston	with exterior solar-E panel, worst case mountin	Heat pump / AC	3480	kWh	1413	kWh	56.2	MBtu	17.3%
1	FL Miami	Wood frame, single pane	Heat pump / AC	7031	kWh	41	kWh	81.2	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6627	kWh	18	kWh	76.3	MBtu	6.0%
1	FL Miami	with interior clear panel	Heat pump / AC	6627	kWh	17	kWh	76.3	MBtu	6.1%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6265	kWh	11	kWh	72.1	MBtu	**11.3%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6526	kWh	9	kWh	75.0	MBtu	**7.6%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	5527	kWh	14	kWh	63.6	MBtu	**21.6%**
1	FL Miami	Wood frame, double pane	Heat pump / AC	6839	kWh	21	kWh	78.8	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6485	kWh	16	kWh	74.6	MBtu	5.2%
1	FL Miami	with interior clear panel	Heat pump / AC	6588	kWh	15	kWh	75.8	MBtu	3.7%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6120	kWh	11	kWh	70.4	MBtu	**10.6%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6422	kWh	9	kWh	73.8	MBtu	**6.3%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	5423	kWh	14	kWh	62.4	MBtu	**20.7%**
1	FL Miami	Metal frame, double pane	Heat pump / AC	6698	kWh	36	kWh	77.3	MBtu	--
1	FL Miami	with exterior clear panel	Heat pump / AC	6612	kWh	21	kWh	76.2	MBtu	1.5%
1	FL Miami	with interior clear panel	Heat pump / AC	6547	kWh	20	kWh	75.4	MBtu	2.5%
1	FL Miami	with exterior low-E panel	Heat pump / AC	6240	kWh	13	kWh	71.8	MBtu	**7.1%**
1	FL Miami	with interior low-E panel	Heat pump / AC	6372	kWh	12	kWh	73.3	MBtu	**5.2%**
1	FL Miami	with exterior solar-E panel	Heat pump / AC	5525	kWh	16	kWh	63.6	MBtu	**17.7%**
1	FL Miami	with exterior clear panel, worst case mounting	Heat pump / AC	6507	kWh	27	kWh	75.0	MBtu	3.0%
1	FL Miami	with exterior low-E panel, worst case mounting	Heat pump / AC	6141	kWh	21	kWh	70.8	MBtu	8.5%
1	FL Miami	with exterior solar-E panel, worst case mountin	Heat pump / AC	5538	kWh	26	kWh	63.9	MBtu	17.4%

Climate Zone	Location	Window	Cooling Cost ($)	Heating Cost ($)	Total Cost ($)	Energy cost savings	% energy cost savings	Savings ($/yr/ft^2)	Simple payback	Payback for low-E
2	TX Houston	Wood frame, single pane – Heat Pump Heating	538.40	200.35	738.75	--	--	--	--	
2	TX Houston	with exterior clear panel	500.70	143.49	644.19	$94.56	12.8%	$0.23	35.5	
2	TX Houston	with interior clear panel	501.05	140.89	641.94	$96.81	13.1%	$0.23	39.0	
2	TX Houston	with exterior low-E panel	469.96	122.22	592.18	$146.57	**19.8%**	$0.35	**25.8**	**8.1**
2	TX Houston	with interior low-E panel	492.66	114.06	606.72	$132.03	**17.9%**	$0.31	**31.8**	**11.9**
2	TX Houston	with exterior solar-E panel	409.09	133.68	542.77	$195.98	**26.5%**	$0.47	**19.3**	**4.1**
2	TX Houston	Wood frame, double pane – Heat Pump Heating	519.37	154.96	674.33	--	--	--	--	
2	TX Houston	with exterior clear panel	488.40	138.77	627.17	$47.16	7.0%	$0.11	71.2	
2	TX Houston	with interior clear panel	497.03	135.81	632.84	$41.49	6.2%	$0.10	91.1	
2	TX Houston	with exterior low-E panel	457.91	120.56	578.47	$95.86	**14.2%**	$0.23	**39.4**	**8.6**
2	TX Houston	with interior low-E panel	483.67	114.89	598.56	$75.77	**11.2%**	$0.18	**55.4**	**12.3**
2	TX Houston	with exterior solar-E panel	400.82	132.03	532.85	$141.49	**21.0%**	$0.34	**26.7**	**4.5**
2	TX Houston	Metal frame, double pane – Heat Pump Heating	507.67	191.84	699.51	--	--	--	--	
2	TX Houston	with exterior clear panel	499.99	153.78	653.76	$45.74	6.5%	$0.11	73.5	
2	TX Houston	with interior clear panel	494.43	149.76	644.19	$55.32	7.9%	$0.13	68.3	
2	TX Houston	with exterior low-E panel	467.95	128.96	596.91	$102.60	**14.7%**	$0.24	**36.8**	**7.4**
2	TX Houston	with interior low-E panel	479.06	124.35	603.41	$96.10	**13.7%**	$0.23	**43.7**	**10.3**
2	TX Houston	with exterior solar-E panel	408.97	140.78	549.75	$149.76	**21.4%**	$0.36	**25.2**	**4.0**
2	TX Houston	with exterior clear panel, worst case mounting	491.24	171.74	662.98	$36.52	5.2%	$0.09	92.0	
2	TX Houston	with exterior low-E panel, worst case mounting	460.03	156.26	616.29	$83.21	11.9%	$0.20	45.4	
2	TX Houston	with exterior solar-E panel, worst case mounting	411.34	167.02	578.35	$121.16	17.3%	$0.29	31.2	
1	FL Miami	Wood frame, single pane	842.31	4.91	847.23	--	--	--	--	
1	FL Miami	with exterior clear panel	793.91	2.16	796.07	$51.15	6.0%	$0.12	65.7	
1	FL Miami	with interior clear panel	793.91	2.04	795.95	$51.27	6.1%	$0.12	73.7	
1	FL Miami	with exterior low-E panel	750.55	1.32	751.86	$95.36	**11.3%**	$0.23	**39.6**	**9.5**
1	FL Miami	with interior low-E panel	781.81	1.08	782.89	$64.33	**7.6%**	$0.15	**65.3**	**32.2**
1	FL Miami	with exterior solar-E panel	662.13	1.68	663.81	$183.41	**21.6%**	$0.44	**20.6**	**3.2**
1	FL Miami	Wood frame, double pane	819.31	2.52	821.83	--	--	--	--	
1	FL Miami	with exterior clear panel	776.90	1.92	778.82	$43.01	5.2%	$0.10	78.1	
1	FL Miami	with interior clear panel	789.24	1.80	791.04	$30.79	3.7%	$0.07	122.8	
1	FL Miami	with exterior low-E panel	733.18	1.32	734.49	$87.33	**10.6%**	$0.21	**43.3**	**9.5**
1	FL Miami	with interior low-E panel	769.36	1.08	770.43	$51.39	**6.3%**	$0.12	**81.7**	**20.4**
1	FL Miami	with exterior solar-E panel	649.68	1.68	651.35	$170.48	**20.7%**	$0.41	**22.2**	**3.3**
1	FL Miami	Metal frame, double pane	802.42	4.31	806.73	--	--	--	--	
1	FL Miami	with exterior clear panel	792.12	2.52	794.63	$12.10	1.5%	$0.03	277.7	
1	FL Miami	with interior clear panel	784.33	2.40	786.73	$20.01	2.5%	$0.05	188.9	
1	FL Miami	with exterior low-E panel	747.55	1.56	749.11	$57.62	**7.1%**	$0.14	**65.6**	**9.2**
1	FL Miami	with interior low-E panel	763.37	1.44	764.80	$41.93	**5.2%**	$0.10	**100.2**	**19.2**
1	FL Miami	with exterior solar-E panel	661.90	1.92	663.81	$142.92	**17.7%**	$0.34	**26.4**	**3.2**
1	FL Miami	with exterior clear panel, worst case mounting	779.54	3.23	782.77	$23.96	3.0%	$0.06	140.2	
1	FL Miami	with exterior low-E panel, worst case mounting	735.69	2.52	738.21	$68.53	8.5%	$0.16	55.2	
1	FL Miami	with exterior solar-E panel, worst case mounting	663.45	3.11	666.57	$140.17	17.4%	$0.33	27.0	

Pacific Northwest
NATIONAL LABORATORY

Proudly Operated by **Battelle** *Since 1965*

U.S. DEPARTMENT OF
ENERGY

902 Battelle Boulevard
P.O. Box 999
Richland, WA 99352
1-888-375-PNNL (7665)

www.pnnl.gov