SCE's IDEEA PROGRAM 2009 - 2010 / RFP V311701
RESPONSE PER REQUEST FOR SUPPORT MATERIALS

In “Window-Related Energy Consumption in the US Residential and Commercial Building Stock” a Lawrence Berkley National Laboratory Report (LBNL 60146 link attached)-“According to the US Department of Energy-in 2003 space conditioning in residential and commercial buildings was responsible for 9.19 quadrillion Btu (Quads) of site energy consumption and 12.03 Quads of primary (source) consumption (US DOE Office of Energy Efficiency and Renewable Energy 2005). Further this reports states- Although windows are generally understood to be an important driver of space conditioning energy consumption, few studies have directly investigated the energy impacts of windows on a national level.” As you are aware, California is a very significant part of this energy consumption.

Since it has been estimated that up to sixty per cent of the energy consumption in America is to heat and cool homes and buildings, and windows are the energy weak link in structures “envelope”, arguably nothing can impact energy consumption and peak load demand more than insulated windows!

Energy Star and the National Fenestration Rating Council (NFRC) do not currently test, rate, or evaluate window insulators. Due to a concentrated effort, NFRC is now developing a testing methodology and we expect this category and the guidelines to be in place in 2008- attachment) Be assured the Advantage Window Systems Incorporated (AWSI) is looking forward to this development.

Since In’Flector Window and Skylight Insulators are an energy efficiency category without peers and we encountered difficulty in getting conventional testing, we have had testing done from a variety of sources. These sources include- Ortech Laboratories, Scanada, John Yellott Engineering Associates, and Texas A&M. The Ortech Laboratories report is available on our web site and we are sending you the Texas A&M report which includes the John Yellott Engineering Associates report. Due to the in depth analysis provided by the John Yellott Engineering Associates report, it will be the basis of our savings calculations. To better understand the quality of this research we are including some background, but in short John Yellott was a pioneer in solar energy research for over thirty years. He was the first executive director of the Association for Applied Solar Energy (founded in 1954), later known as the International Solar Energy Society. By the late 1950s, he established the Yellott Solar Energy Laboratory for research and development in solar applications. His career also included teaching solar architecture and energy technology at Arizona State University from the 1960s to the 1980s. His work in the field earned him international stature, especially in the area of solar technology and theory for building design and construction. The American Solar Energy Society presents an annual John and Barbara Yellott Award to a graduate student concentrating on solar energy. In this response you will find energy savings verifications based upon the John Yellott Engineering Associates report.

You should have in your possession now a sample In’Flector Window Insulator panel. This should help in answering the question regarding the material. The In’Flector

material is specially made to deal with window and skylight weaknesses. It is a three layer material consisting of an aluminum film, bonded to a vinyl film which is embossed and perforated then bonded to a transparent polyester film with UV protection. This is a totally scientific design-the aluminized surface reflects most of the direct sunlight, while the embossed surface helps redirect it diffusely. Silver also has no heat absorbing pigment. The transparent film allows a clear view but creates a dead space insulation barrier between the window and the controlled inside environment. The dark side has a solar collector benefit that when in the winter configuration will generate as much heat as a 600 watt electric heater!

OUR RESPONSE RECAP

There are four things that experts recommend for the "enveloping" of windows (previously supplied efficiency booklet-"How to Reduce Your Energy Costs"). Using only the calculations relating to heat and solar gain, we demonstrate a significant reduction in Btu usage and much of this reduction will be in peak load times! When you consider that window insulators also significantly reduce infiltration, help control humidity and will actually generate heat in its winter configuration, then you are assured of greater savings which in some buildings can be very impressive.

CALCULATIONS

From Page 8 of Yellot report

Q total = 0.37 x 248.3 + 0.60 x (89 – 75) = 91.9 + 8.4 = 100.3 Btu/hr.ft2

Solar Heat Gain Coefficient for a single pane of glass 0.80 taken from www.energy.ca.gov/title24/standards/residential_manual/1998_RES_FORM_S.PDF

In summer using the standard ASHRAE values of 89 F outdoor and 75 F inside air temperature, 7.5 mph wind velocity outdoors, the heat gain through a single pane window toward the sun would be.
Q total = 0.80 x 248.3 + 1.04 x (89-75) = 198.64 + 14.56 = 213.2 Btu's /hr/sq ft

1st Abstract

Single Pane of Glass heat Absorption

76,622 sq ft of glass x 213.2 Btu's = 16,335,810 Btu's of heat gain per square foot of window per hour, times 10 hours per day = 163,358,100 Btu's of heat gain per day, times 30 days per month = 4,900,743,000 Btu's of heat gain per month, times 8 months per year = 39,205,944,000 Btu's of heat gain over an 8 month time frame which equals 392,059.44 therms per year which is equal to 11,369,723 kWh per 8 month time frame.

Single Pane of Glass heat Absorption with In'Flector

76,622 sq ft of glass x 100.3 Btu's = 7,685,186.6 Btu's of heat gain per square foot of window per hour, times 10 hours per day = 76,851,866 Btu's of heat gain per day, times 30 days per month = 2,305,555,900 Btu's of heat gain per month, times 8 months per year = 18,444,447,000 Btu's of heat gain over an 8 month time frame which equals 184,444.47 therms per year which is equal to 5,348,889.6 kWh per 8 month time frame.

Single Pane Glass	Single Pane with In'Flector
392,059.44 therms per 8 months	184,444.47 therms per 8 months
11,369,723 kWh per 8 months	5,348,889.6 kWh per 8 months

Reduction in therms and kWh from utilizing In'Flector

392,059.44 minus 184,444.47 = 207,614.97 therms

207,614.97 therms x 29 = 6,020,834.1 kWh per 8 month period times 15 cents per kWh equals a savings of $903,125.11

A peak load and energy reduction of 6,020,834.1 kWh per 8 month time frame

Heat gain of a 1500sq ft home with single pane windows

A 1500 square foot home has an average of 17.7% of square footage of the home in window surface area, calculating out to 265.5 sq ft of windows.
Average sq ft of windows in a 1500sq ft home (265.5) multiplied by the heat gain in Btu's per hr per sq ft (213.2)

265.5 x 213.2 = 56,604.6 Btu's of heat gain per hr times 10 hrs per day = 566,046 Btu's of heat gain per day, times 30 days a month = 16,981,380 Btu's of heat gain per month, times 8 months a year = 135,851,040 Btu's of heat gain per 8 month time period through the windows, which equals 1,358.51 therms which is equal to 39,396.8 kWh

1 Therm = 100,000 Btu's
135,851,040 Btu's = 1,358.51 Therms per 8 months
1 therm = 29 kWh
1,358.51 x 29 = 39,396.8 kWh per 8 months

Heat loss or gain on a 1500 sq ft home with In'Flector

265.5 x 100.3 = 26,629.65 Btu's of heat gain per hr times 10 hrs per day = 266,296.5 Btu's of heat gain per day, times 30 days a month = 7,988,895 Btu's of heat gain per month, times 8 months a year = 63,911,160 Btu's of heat gain per 8 month time frame through the windows, which equals 639.11 therms which is equal to 18534.19 kWh

1 Therm = 100,000 Btu's
63,911,160 = 639.11 Therms per 8 months
1 therm = 29 kWh
639.11 x 29 = 18,534.19 kWh per year

Without In'Flector

1 Therm = 100,000 Btu's
135,851,040 Btu,s = 1,358.51 Therms
1 therm = 29 kWh
1,358.51 x 29 = 39,396.8 kWh

With In'Flector

1 Therm = 100,000 Btu's
63,911,160 Btu's = 639.11 Therms yr
1 therm= 29 kWh
639.11 x 29 = 18,534.19 kWh

A reduction of 53% of heat gain when In'Flector is utilized.

The reduction in therms and kWh utilizing In'Flector

1,358.51 minus 639.11 = 719.4 Therms

719.4 Therms x 29 = 20862.6 kWh per 8 month time period times 15 cents per kWh equals a savings of $3,129.39
Cost of In'Flector $23.50 per sq ft x 265.5 sq ft = $6,239.25

Double Pane Window Heat Gain

In summer using the standard ASHRAE values of 89 F outdoor and 75 F inside air temperature, 7.5 mph wind velocity outdoors, the heat gain through a double pane window toward the sun would be.
Q total = 0.70 x 248.3 + .59 x (89-75) = 173.81 + 8.26 = 182.07 Btu's /hr/sq ft

Double Pane of Glass heat Absorption

76,622 sq ft of glass x 182.07 Btu's = 13,950,567 Btu's of heat gain per square foot of window per hour, times 10 hours per day = 139,505,670 Btu's of heat gain per day, times 30 days per month = 4,185,170,100 Btu's of heat gain per month, times 8 months per year = 33,481,360,000 Btu's of heat gain over an 8 month time frame which equals 334,813.6 therms per year which is equal to 9,709,594.4 kWh per 8 month time frame.

Single Pane of Glass heat Absorption with In'Flector

76,622 sq ft of glass x 100.3 Btu's = 7,685,186.6 Btu's of heat gain per square foot of window per hour, times 10 hours per day = 76,851,866 Btu's of heat gain per day, times 30 days per month = 2,305,555,900 Btu's of heat gain per month, times 8 months per year = 18,444,447,000 Btu's of heat gain over an 8 month time frame which equals 184,444.47 therms per year which is equal to 5,348,889.6 kWh per 8 month time frame.

Double Pane Glass

Single Pane with In'Flector

334,813.6 therms per 8 months	184,444.47 therms per 8 months
9,709,594.4 kWh per 8 months	5,348,889.6 kWh per 8 months

Even with the utilization of test results from single pane glass, a reduction of 45 % of heat gain is still realized when In'Flector is utilized.

Reduction in therms and kWh from utilizing In'Flector

334,813.6 minus 184,444.47 = 150,369.13 therms

150,369.13 therms x 29 = 4,360,704.7 kWh per 8 month period times 15 cents per kWh equals a savings of $654,105.70

A peak load and energy reduction of 4,360,704.7 kWh per 8 month time frame

Projected 53 % reduction (as realized with the single pane glass) would produce the following savings with double pane glass.

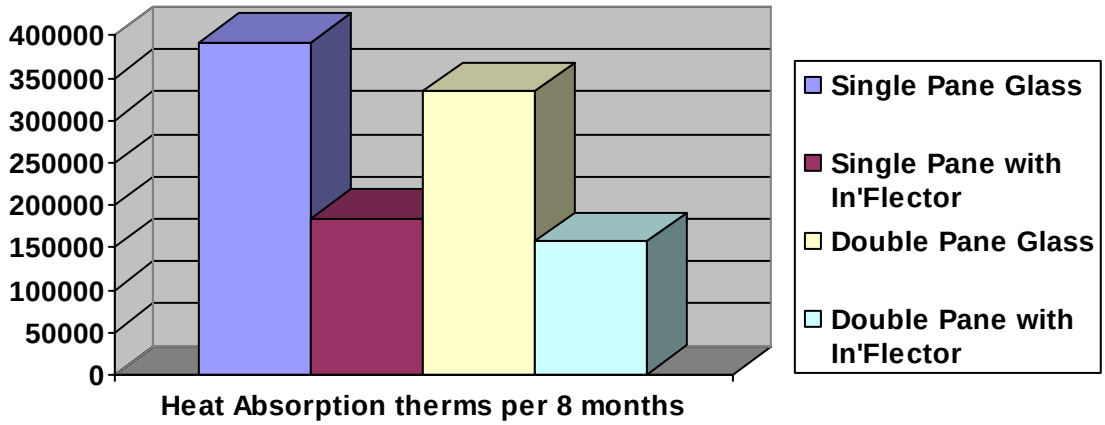
Double Pane Glass	Projected Heat gain with In'Flector
334,813.6 therms per 8 months	157,362.39 therms per 8 months
9,709,594.4 kWh per 8 months	4,563,509.3 kWh per 8 months

Reduction in therms and kWh from utilizing In'Flector

334,813.6 minus 157,362.39 = 177,451.21 therms

177,451.21 therms x 29 = 5,146,085 kWh per 8 month period times 15 cents per kWh equals a savings of $771,912.75

A peak load and energy reduction of 5,146,085 kWh per 8 month time frame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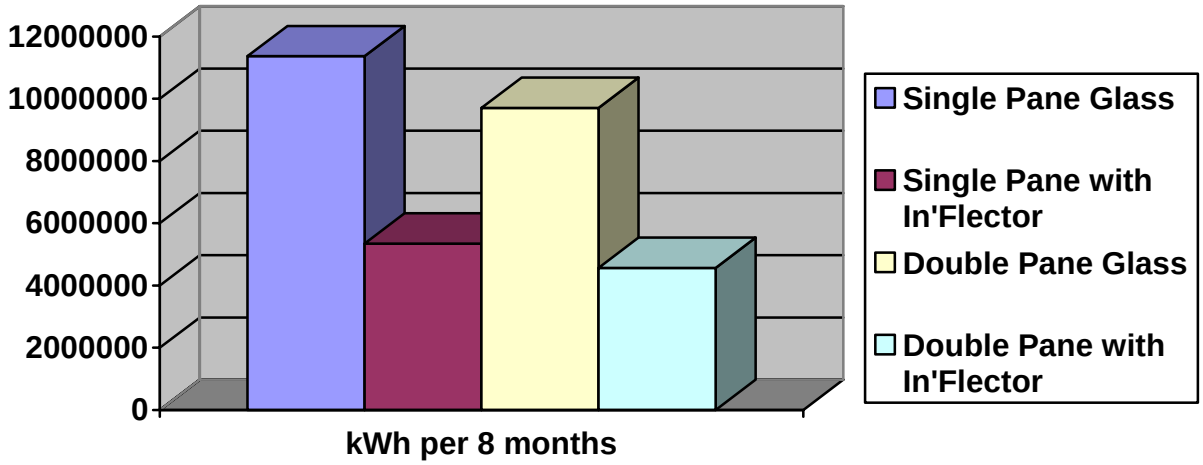
Heat Absorption therms per 8 months
Single Pane Glass
Single Pane with In'Flector
Double Pane Glass
Double Pane with In'Flector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kWh per 8 months
Single Pane Glass
Single Pane with In'Flector
Double Pane Glass
Double Pane with In'Flector