Report on Energy Modeling of Select Architectural Glazings

The data generated by this energy modeling program is for comparative purposes only. It is general in nature and will vary for specific buildings according to numerous variables, including building design and type, site location, occupation and utilization levels, local utility costs and more.

Energy consumption simulations are based on modeling conducted with the U.S. Department of Energy (DOE) 2.2 Building Energy Analysis Simulation Tool developed at the Lawrence Berkeley National Laboratory and Los Alamos National Laboratory. It is the most accurate and well-documented energy modeling tool available in the U.S.

DOE-2 calculates hour-by-hour energy consumption by the prototype facility over an entire year (8,760 hours) using hourly climate data for the location under consideration. Input into the DOE-2 Model consists of detailed descriptions of the buildings being analyzed, including the hourly scheduling of occupants, lighting, equipment and thermostat settings.

The DOE-2 Model provides accurate simulation of building features such as shading, fenestration, interior building mass, envelope building mass, and the dynamic response of differing heating and air conditioning system types and controls.

All energy simulation scenarios are calculated with the following data:

- Total Electric Consumption (kWh)
- Total Natural Gas Consumption (therms)
- Total Electric Cost ($)
- Total Natural Gas Cost ($)
- Total Building Energy Consumption Cost ($)
- Total Cooling HVAC Capital Cost ($)
- Annual Energy Savings Using Low E Coatings ($)
- Initial Capital Savings Using Low E Coatings ($)
- Annual CO2 Reduction Using Low E Coatings (tons)
- 40 Year CO2 Reduction Using Low E Coatings (tons)

Results

Glazing	Electricity	Gas	Total Operating Electric Cost	Total Operating Gas Cost	Total Operating Cost	Total Capital Cooling HVAC Cost	Annual Operating Cost Savings of Low E Coatings vs DT	Initial Capital Cost Savings of Low E Coatings vs DT	Annual CO2 Savings of Low E vs DT	40 Year Building Life CO2 Savings of Low E Coatings vs DT
Double Pane Tinted	**4,277,723**	**49,148**	**$563,301**	**$44,967**	**$608,268**	**$1,798,119**	**$**	**$**		
Solarban 60 (2)	4,123,407	40,128	$541,647	$36,806	$578,453	$1,674,573	$29,815	$123,546	156	6,224
Solarban 70XL (2)	3,974,617	36,740	$522,134	$33,740	$555,874	$1,566,777	$52,394	$231,342	276	11,058
Solarban 80 (2)	3,971,399	36,276	$520,183	$33,320	$553,503	$1,551,946	$54,765	$246,173	281	11,248
Solarban z50 (2)	4,032,993	38,035	$529,686	$34,912	$564,598	$1,598,924	$43,670	$199,195	229	9,169
Solexia Sungate 500 (3)	4,205,726	43,818	$553,197	$40,144	$593,341	$1,740,468	$14,927	$57,651	79	3,151
VE 1-52 (2)	4,149,060	41,581	$545,175	$38,120	$583,295	$1,695,607	$24,973	$102,512	130	5,200
VE 2-2M (2)	4,032,993	38,035	$529,686	$34,912	$564,598	$1,598,924	$43,670	$199,195	229	9,169

Criteria: Double Pane Tinted, 8-Story Office with Punched Openings in Atlanta

Details on Selection Criteria

1. *Glazing Type* – This energy modeling program contains comparative data for eight (8) commonly specified glazing types. The table below lists the specific glazing types along with their manufacturer-published performance characteristics (when they are used as part of a standard one-inch insulating glass unit).

To ensure valid comparisons, this program automatically reports data on glazings that are similar in appearance to the one selected by the user. For example, when Solarban 60 glass (PPG) is chosen by the user, comparative data for Solarban 70XL glass (PPG) and VE2-2M (Viracon) are included in the report. That's because these glazings feature a clear, color-neutral aesthetic. Tinted glazings such as Solexia glass (PPG), Solarban z50 glass (PPG) and VE1-52 (Viracon) are grouped similarly.

Glazing	Tvis	Rfvis	Tsol	Rfsol	U-Value	Shading Coefficient (SC)	Solar Heat Gain Coefficient (SHGC)
Double Pane Tinted	0.620	0.100	0.540	0.090	0.570	0.720	0.620
Solarban 60 (2)	0.704	0.112	0.328	0.293	0.291	0.438	0.380
Solarban 70XL (2)	0.617	0.108	0.227	0.347	0.286	0.311	0.270
Solarban 80 (2)	0.470	0.330	0.200	0.380	0.290	0.280	0.240
Solarban z50 (2)	0.510	0.080	0.250	0.230	0.290	0.360	0.310
Solexia Sungate 500 (3)	0.640	0.140	0.330	0.090	0.350	0.510	0.450
VE 1-52 (2)	0.500	0.160	0.320	0.200	0.320	0.460	0.400
VE 2-2M (2)	0.600	0.090	0.240	0.100	0.290	0.360	0.310

Figures may vary due to manufacturing tolerances. All tabulated data is based on NFRC methodology using the LBL 5.2 software. Variations from previously published data are due to minor changes in the LBL Window 5.2 software versus Version 4.1.

2. *City* - Energy simulations with DOE 2.2 software are based on the utility rates and weather data of the city selected.

Atlanta

Electric Rates: Georgia Power
Monthly Charge: $41.00
Energy Charge: Time of Use Rate
- *Summer* (June-September)
  - Off Peak 0.0678 $/kWh
  - On Peak 0.1504 $/kWh
  - *(Weekday 2:00 p.m. - 7:00 p.m.)*
- *Winter* (January-May, October-December)
  - Off Peak 0.0259 $/kWh
  - On Peak 0.0678 $/kWh
  - *(Weekday 2:00 p.m. - 7:00 p.m.)*

Demand Charge:
- First 10 kW 4.30 $/kW
- Next 40 kW 8.50 $/kW
- Over 50 kW 26.40 $/kW

Gas Rates: Atlanta Gas Light
Monthly Charge: $41.50
Energy Charge: 0.9048 $/Therm

	Atlanta
Average Drybulb Temperature (F)	60.6
Average Wetbulb Temperature (F)	54.1
Average Daily Max Temperature (F)	70.3
Average Daily Min Temperature (F)	51.6
Heating Degree Days (Base 65)	3,090
Cooling Degree Days (Base 65)	1,611
Maximum Temp (F)	97
Minimum Temp (F)	12
No of Days Max Temp 90 and Above	17
No of Days Max Temp 32 and Below	4
No of Days Min Temp 32 and Below	52
No of Days Max Temp 0 and Below	0
Average Wind Speed (MPH)	8.8
Average Day Temp (F)	66.4
Average Night Temp (F)	55.9
Average RH at 4 AM	80.3
Average RH at 10 AM	67.9
Average RH at 4 PM	52.1
Average RH at 10 PM	71.1

3. *Glazing Design* – This DOE-2 simulation is based on a Punched Openings scenario.

The following chart shows the estimated total glass area for the façade of the glazing design/building selection.

Glazing Design / Building	Total Wall Area (sqft)	Window to Wall Ratio	Total Glass Area (sqft)
Punched Openings / 8 - Story Office	56,640	59%	33,418

4. *Building Prototype Description and Characteristics* – The characteristics for the selected building type is displayed below. These characteristics were developed in a study conducted by the Lawrence Berkley Laboratory's Applied Science Division, based on regional and national criteria. Each building type was adjusted to be compliant with ASHRAE 90.1-1999.

	Office
Geometry and U-values	
Floor Area (sq ft)	270,000
Number of Stories	8
Punch Window to Wall Ratio[1]	59%
Wall Window to Wall Ratio[2]	90%
Wall U-Value (Btu/ ft2-hr-F)[3]	0.124
Roof U-Value (Btu/ ft2-hr-F)[4]	0.065
Glazing Type	Dual Pane Tint Solarban-60 Solarban-70 Solarban-80 VE 2-2M Solexia x S500 Solarban z50 VE 1-52
Operating Conditions	
Cooling Temp Setpoint (F)	75
Heating Temp Setpoint (F)	70
Standard Day Schedule	7 AM - 6 PM Wkdays 8 AM - 12 PM Wkends All Year
HVAC Equipment	
Air Handling System	VAV
Cooling Plant Type	Centrifugal Chiller
Economizer	Yes
Heating Plant Type	Hot Water Boilers
Service Hot Water	Hot Water Boilers
Internal Loads (Peak)	
Occupants (ft2/ person)	448
Lighting (W/ ft2)	1.3
Equipment (W/ ft2)	0.75

1 Punch Window to Wall Ratio is based on most of the walls being window

2 Wall Window to Wall Ratio is based on the national building prototype

3 Wall U-Values are based on ASHRAE 90.1-1999 for each selected city

4 Roof U-Values are based on ASHRAE 90.1-1999 for each selected city