EnergyGlass™

Sample Preliminary Project Overview

The EnergyGlass™ system continually collects and creates electricity from sunlight, diffused light and artificial light.

The future of energy generation is clear glass with Nano Technology

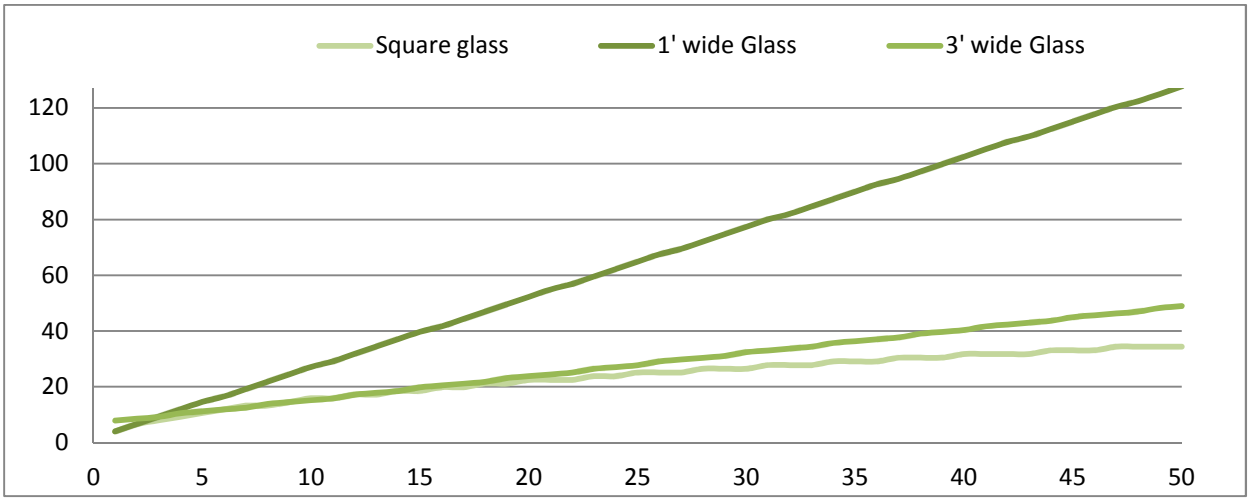
www.EnergyGlass.com

EnergyGlass™

EnergyGlass™ offers an unique and revolutionary totally transparent electrical energy producing glass with a wide variety of applications that gives the project a compelling advantage over any other photovoltaic product on the market today. There is not an optically clear glass product on the world market that produces electricity except for EnergyGlass™. EnergyGlass™ is also by standard make up bomb blast, high wind and forced entry resistant.

EnergyGlass™ is an optically clear vertically installed building integrated photovoltaic window system that produces continuous energy from sunlight, diffused, ambient light and ground reflectance and the only 100% field of vision in the world. The entire surface of the windows is clear – No grids, dots or lines! This proprietary inorganic nano technology and solar collector does not degrade from IR like typical solar cells, do.

EnergyGlass™ produces 1-3 watts per sq. ft. per hour for 10-12 hours during the day and 2-4 watts at peak dependent on location, size, orientation, thickness and formula. Energy generated can be inverted back to the grid, battery backup or direct to DC equipment! This means a FEED In Tariff opportunity could be available, thus generating revenue from windows and/or reducing a building's energy consumption.



Watts Produced from Ultra-clear 7/8" EnergyGlass™

EnergyGlass™ can incorporate many types of design applications, including tints, low E, insulated, reflective, and glass ceramic. Its use is designed for windows, doors, transoms, sidelights, sky lights, and any other design where transparency, protection, and electrical production are mandated. It is in a class by itself, which makes EnergyGlass™ a state of the art, one of a kind technology.

Beside the previously discussed characteristics of EnergyGlass™, one crucial feature is the almost seamless interchangeability of our products with the traditional building materials used today. Bottom line, EnergyGlass™ products have a similar installation process; safety and physical characteristic; structural and insulation capabilities; and price; with the added benefit of producing electrical energy.

Electrical Configuration for EnergyGlass

(PRELIMINARY- NOT FOR CONSTRUCTION)

Take-off analysis for the building glazing system indicates that on average, the building has vision glass in mainly three different lengths. The final lengths and sizes of the glass panels will be adjusted in order to optimize the energy output that goes into the micro inverters and the number of panels connected per unit.

Inverters

A microinverter strategy will be deployed with the EnergyGlass™ curtain wall and window system. EnergyGlass™ uses a 215- watt AC rated micro inverter with a maximum input of 260 watts DC. With the specified inverter for each group of vision glass, we will be able to combine 17 inverter AC outputs in a parallel AC string to feed a single-phase 220VAC 20-amp circuit.

Estimate Glass Schedule	# Floors	Estimate SqFt of glass
Fist 3 floors	3	18,660
South façade	31	24,340
East façade	31	29,920
West façade	38	29,560
North façade	38	35,260
South East curtain wall	7	16,340
Total		**154,080**

M215—MICROINVERTER

[e] enphase ENERGY

The Enphase Energy Microinverter System improves energy harvest, increases reliability, and dramatically simplifies design, installation and management of solar power systems.

The Enphase System includes the microinverter, the Envoy Communications Gateway, and Enlighten, Enphase's monitoring and analysis software.

PRODUCTIVE
- Maximum energy production
- Resilient to dust, debris and shading
- Performance monitoring per module

RELIABLE
- System availability greater than 99.8%
- No single point of system failure

SMART
- Quick and simple design, installation and management
- 24/7 monitoring and analysis

SAFE
- Low voltage DC
- Reduced fire risk

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enphase.com

M215 — MICROINVERTER TECHNICAL DATA

Input Data (DC)	M215-60-2LL-S22/S23 and M215-60-2LL-S22-NA/S23-NA (Ontario)
Recommended input power (STC)	190 - 260W
Maximum input DC voltage	45V
Peak power tracking voltage	22V - 36V
Operating range	16V - 36V
Min./Max. start voltage	22V/45V
Max. DC short circuit current	15A
Max. input current	10.5A

Output Data (AC)	@208 Vac	@240 Vac
Maximum output power	215W	215W
Nominal output current	1.0A (arms at nominal duration)	0.9A (arms at nominal duration)
Nominal voltage/range	208V/183-229V	240V/211-264V
Extended voltage/range	208V/179-232V	240V/206-269V
Nominal frequency/range	60.0/59.3-60.5 Hz	60.0/59.3-60.5 Hz
Extended frequency range	60.0/59.2-60.6 Hz	60.0/59.2-60.6 Hz
Power Factor	>0.95	>0.95
Maximum units per 20A branch circuit	25 (three phase)	17 (single phase)
Maximum output fault current	1.05 Arms, over 3 cycles; 25.2 Apeak, 1.74ms duration	

Efficiency	
CEC weighted efficiency	96.0%
Peak inverter efficiency	96.3%
Static MPPT efficiency (weighted, reference EN50530)	99.6%
Dynamic MPPT efficiency (fast irradiation changes, reference EN50530)	99.3%
Night time power consumption	46mW

Mechanical Data	
Ambient temperature range	-40°C to + 65°C
Operating temperature range (internal)	-40°C to + 85°C
Dimensions (WxHxD)	17.3 cm x 16.4 cm x 2.5 cm (6.8" x 6.45" x 1.0")*
Weight	1.6 kg (3.5 lbs)
Cooling	Natural convection - No fans
Enclosure environmental rating	Outdoor - NEMA 6

* without mounting bracket

Features	
Compatibility	Pairs with most 60-cell PV modules
Communication	Power line
Warranty	25-year limited warranty
Monitoring	Free lifetime monitoring via Enlighten software
Compliance	UL1741/IEEE1547, FCC Part 15 Class B CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01

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142-00010 Rev 03

Product Information

SAF-GLAS, LLC Specification for glass clad polycarbonate

9/16'' Hurricane , Physical Attack, Bomb and Terror Glass
Optional: Standard Energy Producing Glass & 1-5/16'' IG

The intent of this specification is to clearly define the correct product and protocol. A format and specific data are named in this text to aid in the specification of a chosen product.

Product description: Saf-Glas GCPC, Hurricane, Physical Attack, Bomb blast resistant.

Frame per specification supplied, glass make to be: {¼'' clear Annealed glass x .025'' bonding film x 0.070''' polycarbonate x .025'' bonding film x ¼'' Annealed Low E Glass x ½'' Air Space x ¼'' TP Glass Total Nominal Thickness: 1-5/16''}.

Saf-Glas is a glass clad polycarbonate consisting of one or more plies of polycarbonate, two or more plies of patented bonding film, glass and / or glass ceramic. Saf-Glas thickness of product ranges from ¼'' through 3-1/2''. Saf-Glas GCPC is fabricated as a defense against bullet, bomb blast, forced entry, fire, hurricane, typhoon, tornado, earthquake or any other threat of a man-made or natural origin. Saf-Glas can be also laminated for photovoltaic solar cell, hologram and for all other nano tech products utilizing glass. Saf-Glas Standard Composition:

[Glass x Bonding Film x Polycarbonate x Bonding Film x Glass]

1. Glass thickness: [2.5mm].
2. Glass type: [Annealed, Tempered]
3. Glass color: [Clear] offered by float glass manufacturers.
4. Coatings: [N/A].
5. Glass Ceramic: [N/A].
6. Bonding Film: [Saf-Glas Patented]
7. Bonding Film Thickness: [0.025''].
8. Bonding Film Color: [Clear].
9. Polycarbonate Thickness: [0.070''].
10. Polycarbonate Color: [Clear].

Interlayer Performance Data:

1. Tensile Strength: 10,400 psi [ASTM D-638]
2. Tensile Modulus: 351,000 psi [ASTM D-638]
3. Flexural Strength: 14,200 psi [ASTM D-790].
4. Flexural Modulus: 351,000 psi [ASTM D-790].

References:

[ASTM International] American Society for Testing and Materials

Applicable ASTM Standards: [C 1036], [C 1048], [C 1172], [C 1349], [C 1376], [C 1464], [E 1300]
[GANA] Glazing Association of North America; [Full manual inclusive of table IV & 01-0300].
[ANSI] American National Standards Institute; [ANSI Z97.1 – 2004].
[ASCE] American Society of Civil Engineering; [ASCE 7-98].
[CPSC] Consumer Product Safety Standard; [16 CFR 1201].
[UL] Underwriters Laboratories; [UL -9].
[HP White] Human impact
PAS Range: 9mm hand gun three shots
[ASTM F – 1642] Air blast Loading Dept. of the Army
[GSA] Air blast Loading "D" & Quantico Arena Hand grenade / Claymore mine.
[USACE-SEM] Security Engineering

Format:

1. General project submittal requirements to levels, pressures or other.
2. Specified product data and approvals.
3. Samples (2) 12'' x 12'' square.

Quality Assurance Standards:

1. Miami Dade County Quality Assurance Manual.
2. Wilfred Baker Engineering Files GSA Blast 1-4.
3. HP White Laboratories .
4. OSHA Guide lines manufacturing

Qualification:

1. Provide test reports for specified product to meet or exceed requirement.
{Hurricane, Bomb Blast, Physical Attack}.
2. Warranty specification.
3. Compatibility of materials regarding the assembly.

Storage:

1. Stored goods pursuant to fabricated guidelines and warranty supplied upon order.
2. Stored goods in a well-ventilated shaded area under roof and out of weather.
3. Store goods no longer than (30) days.

Technical Information and Guideline Standards

Glass Storage and Handling:

Care shall be taken during handling and storage of laminated glass to ensure that glass damage will not occur. All laminated glass must be stored in a covered, cool, dry and vented area. In addition all impact glass delivered shall be installed within a 30-day period to protect from damage to said units. Failure to follow these guidelines may result in warranty being voided.

Improper storage of laminated glass may result in damage to glass. Glass crates shall be blocked properly to prevent tipping. The Company recommends a 7 – 11 degree angle against a suitable support, which is capable of handling the weight of the crated glass.

Do not allow exposed edges of laminated glass to come in contact with standing water. This may cause fissures to occur within the Polycarbonate interlayer as well as delamination of the unit.

Do not allow edges of the laminated glass unit to contact hard surfaces during installation. Rolling blocks shall be utilized if units need to be cart wheeled on their corners. You may want to refer to the Flat Glass Marketing Association glazing manual to see an example of a rolling block.

Glazing Guidelines:

Care shall be taken during installation of laminated glass to ensure unit does not come in contact with frame. Improper handling may result in glass breakage. Laminated glass unit must be supported by a minimum of two silicone setting blocks or approved equal. It is recommended that setting blocks be installed at quarter points. Setting blocks shall be 1.6 mm (1/16") less than the channel width to allow for adjustments. All setting blocks should have a hardness of 85±5 as registered on a durometer. Length of setting blocks shall be dependent upon glass area.

Adequate edge clearance should be maintained between glass and frame. The Company recommends a minimum of 6mm (1/4") edge clearance and 5mm (3/16") face clearance. Failure to maintain clearance may cause glass breakage due to glass to frame contact.

The Company requires that all impact glass be sealed in glazing pocket and free from water intrusion. This can be achieved by use of a lock strip gasket or an approved silicone cap bead. If a weep system is used it shall be the manufacturers responsibility to ensure a weather tight system to ensure no water comes in contact with the edge surface of the glass.

Structural Silicone Glazing:

The Company recommends the following silicones for glazing systems that utilize structural silicone. Dow 795, Dow 983, GE Ultraglaze 4000.

If any other glazing compounds are to be utilized installer shall check with manufacture and The Company for compatibility with glass clad polycarbonate laminated glass. Failure to do so may result in damage to polycarbonate interlayer and delaminating of components.

Framing Systems:

All framing systems shall be approved for use with (Saf-Glas) where governing bodies require such approval. It shall be the manufacturer's responsibility to provide said approval. Manufacturer shall be responsible to comply with industry stands for framing deflection.

Clean Guidelines and Maintenance Procedures:

There are no special requirements for cleaning (Saf-Glas) non coated glass clad polycarbonate. The inboard and outboard lites of non-coated products are comprised of standard float glass. Typical cleaning guidelines shall apply.

After initial installation all glass shall be rinsed immediately to remove excess dust and dirt. All excess water shall be removed with a squeegee. Care should be taken to ensure that metal parts of the squeegee do not come in contact with the glass. Failure to do so may result in scratches on the glass surface. Once the installer has completed installation and initial cleaning the Owner and General Contractor shall take adequate measures to protect the glass and maintain glass with a regular cleaning schedule. For routine cleaning, use a soft, clean, grit free cloth and a mild soap, detergent or window cleaning solution. Do not use abrasive cleaners as they may cause damage.

Special care should be taken when cleaning reflective coated surfaces. Follow the same guidelines as above. Be sure you do not use razor blades, putty knives or any other hard surface tool to clean glass. Failure to follow these instructions may-cause scratches to the reflective coating.

Special, care should be taken when cleaning Low-E glass. Apply cleaning solution by spray or with a clean smooth cloth. Wipe initially with a clean, dry, lint free towel or cloth. Finish drying with a second clean, dry, lint free towel or cloth. Be sure you do not use razor blades, putty knives or any other hard surface tool to clean glass. Failure to follow these instructions may cause scratches and removal of the low-e coating.

Glass Breakage:

Glass breakage may occur due to improper storage and handling, glazing system pressures, excessive wind loads, thermal stress, installation damage, hard objects striking the glass or on site damage by unknown construction personnel. It shall be the architects/engineers responsibility to determine the appropriate loads for each glazed opening and the purchaser shall purchase the appropriate laminated glass based on these loads. Saf-Glas, LLC can provide architects/engineers with the appropriate testing data on specific products.

Spandrel Glass:

The Company does not warrant applications where insulation is applied directly to the opacifier. The panels must be cross-vented to prevent excessive heat gain and condensation from occurring on the interior surface. The unit must be installed with a specified air space between the spandrel impact glass and also be fully cross vented. It is the responsibility of the glazing contractor to ensure the spandrel application and building design will not cause excessive heat gain and delamination. Please contact Saf-Glas, LLC for product warranty information.

Warranty Information:

Saf-Glas, LLC products carry specific limited warranties. Failure to abide by the above guidelines may result in warranty being voided.

Project totals

Cost comparison for EnergyGlass™ vs. standard product

Project Name : Chicago	Project Total sq ft	EnergyGlass™ IG Cost Per sq ft	EnergyGlass™ IG Cost Total	Standard Laminate IG Glass per sq ft	Standard Laminate IG Glass Total
BASIC COSTS					
Standard Vision glass	154,000	$40.00	$6,160,000	$22.60	$3,480,400
EnergyGlass™ ADDITIONAL COSTS					
Inverters, wiring & electric installation estimate		$1.55	$238,700		
Total Cost of the glass project without calculating incentives			**$6,398,700**		**$3,480,400**
Plus Sale tax	9.250%		**$6,398,700**		**$3,802,337**
	(kWh)	per kWh	Total		
Energy savings first 15 years	8,669,936	$0.15	**$1,291,821**		
Total Cost of the glass project with energy savings			**$5,106,879**		**$3,802,337**
Renewable Energy Incentives					
State Incentives		Cap to 250K	$250,000		
Federal tax deduction		30%	$4,561,410		
Estimates to calculate Federal tax incentive					
Frame Cost estimate	$5,621,000				
Estimate for Design, Engineering, Permits, Staging and other project costs from on set to completion	$631,000				
Installation Cost estimate	$2,554,000				
Net cost after general incentives			**$295,469**		**$3,802,337**
Other Incentives					
Bonus Depreciation		50% year 1	$2,103,448		
MACRS Depreciation		10% annual	$420,690		
Total Depreciation year one			**$2,103,448**		
Cost less 1st year dep. and energy savings			**($1,807,978)**		**$3,802,337**
Tax, Local & Capital Incentives					
179D - Energy Efficient Commercial Buildings			**$453,600**		
IL Special Assessment for Solar Energy Systems					

Illinois Renewable Energy Credit Program		
IL Renewable Energy Project Financing		
Local Credits Incentives		
City of Chicago - Green Permit Program		
Value of Building upgrade as solar farm		
Value of Branding of Building		

Cost less local incentives	**($2,261,578)**	**$3,802,337**

Estimated saving by choosing EnergyGlass™ with incentives **$6,063,915**

Assumptions:

Above does not include City, County or other incentives
Above does not include feed in tariffs incentives
Above does not include PACE program benefits
Above does not include property tax exemptions
Above does not include insurance and other incentives
Above does not include subsidies for renewable energy projects
Above does not include performance based incentives
Above does not include loan and grant programs
Above does not include jobs incentive funds
Above does not include worth of SREC's, Carbon Credits etc.

Disclaimer: This correspondence is meant as a guide only. Note that rates included in this entry are somewhat simplified versions of those contained in tax code, which often contain additional caveats, restrictions, and modifications. Those interested in this incentive should review the relevant sections of the code in detail prior to making business decisions.

EnergyGlass™

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