# Glass- A Step towards Net Zero

# Net Zero Energy Buildings

A building with zero net energy consumption, meaning the total amount of energy used by the building on an annual basis is roughly equal to the amount of renewable energy created on the site

THE POWER OF ZERO

# Glass is Indispensable

YES! And for more than one reason –

## Unmatched Aesthetics

which allow architects and builders to explore unconventional building shapes.

## No Deterioration

corrosion, stains or fading throughout its lifespan.

## Transparent

to visible light.

## A Sustainable

material.

## Can be recycled indefinitely

as the structure of glass does not deteriorate through the process.

## Zero-degeneration and easy maintenance

which helps in maintaining a clean environment.

# Glass – A Green Building Material

## Why Glass?

- It controls light – letting in the good rays & leaving out the bad ones
- It saves on energy – providing natural day lighting
- It harmonizes a structure with the environment
- It is recyclable and non-toxic
- Conforming to & also bettering ECBC codes
- Savings upto 20% over the baselines possible without compromising on VLT & aesthetics

## How is Glass Green?

- Recyclable
- Use Renewable resources
- Locally or Regionally produced
- Energy Efficient
- Low embodied energy
- Low Environmental Impact
- Durable
- Minimize Waste
- Positive Social Impact
- Affordable

# Energy Efficient / Net Zero Energy Building Technology Roadmap

- Energy Efficient Glasses
- Smart Glasses
- BIPVs
- Other Futuristic Glasses

# Role of Glass in Net Zero Energy Buildings

Solar P.V.

Kinetic facade

BIPV / GIPV

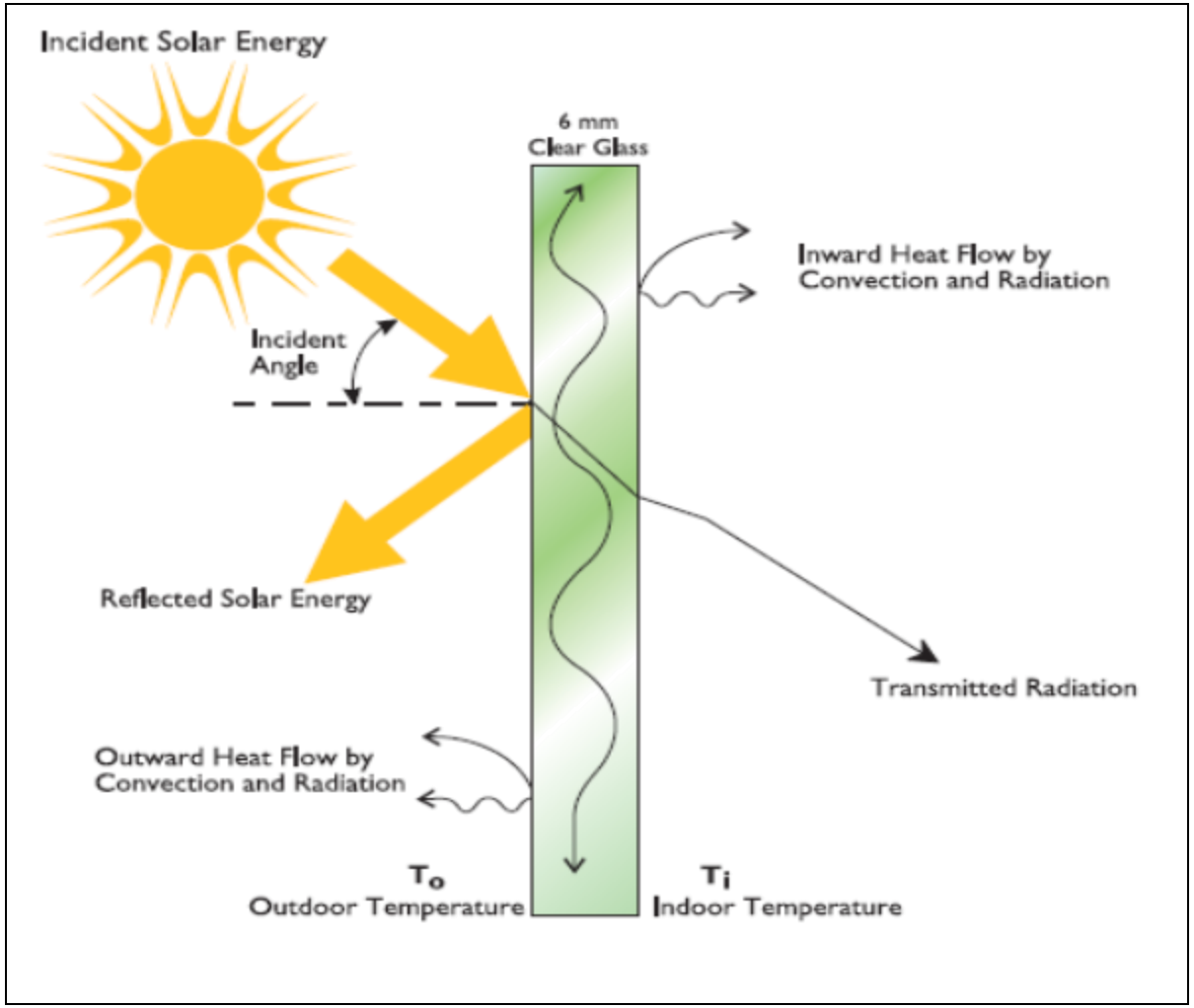
Vacuum Insulated Glass/ Energy Efficient Glass

# Basic Glass Specifications

- **Visual light Transmittance (VLT - %)** It is the percentage of visible light, incident on the glazing, that will pass through.

- **Solar Heat Gain Coefficient (SHGC - %)** is defined as the percentage of solar heat (Solar Intensity) getting transmitted through glass by direct energy transmission and energy re radiated inside from the absorbed heat.

- **U-Value (W/m2-K)** indicates the rate of heat flow due to conduction, as a result of temperature difference between inside and outside. The lower the U-value, lower the heat transferred through the glass



# Architectural Glass

## Annealed Glass

- Clear Float Glass
- Tinted Float Glass

## Coated Glass

### Glasses For Interiors

- Back painted glass (Décor)
- Mirror

### Glasses For Exterior

- Hard Coat – Opal & Opal Trendz
- Soft Coat – Ecosense, Sunshield & Neo

## Processed Glass

### Heat Treatment

- Tempering (Stronglas)
- Heat Strengthening

### Insulated Glass Unit

- With air argon and integrated blinds

### Lamination

- Security glass, acoustic glass, Valuglas, colour laminated, fabric laminated, mesh laminated

## Specialized Glass

### Printed Glass

- Ceramic Fritted, Acid Etched, Printed Frosting

### Fire Rated Glass

- Pyrobel

### Bullet Resistance Glass

- BR1 – BR6

### Switchable Glass

- Swytchglas

### Building Integrated Photovoltaic

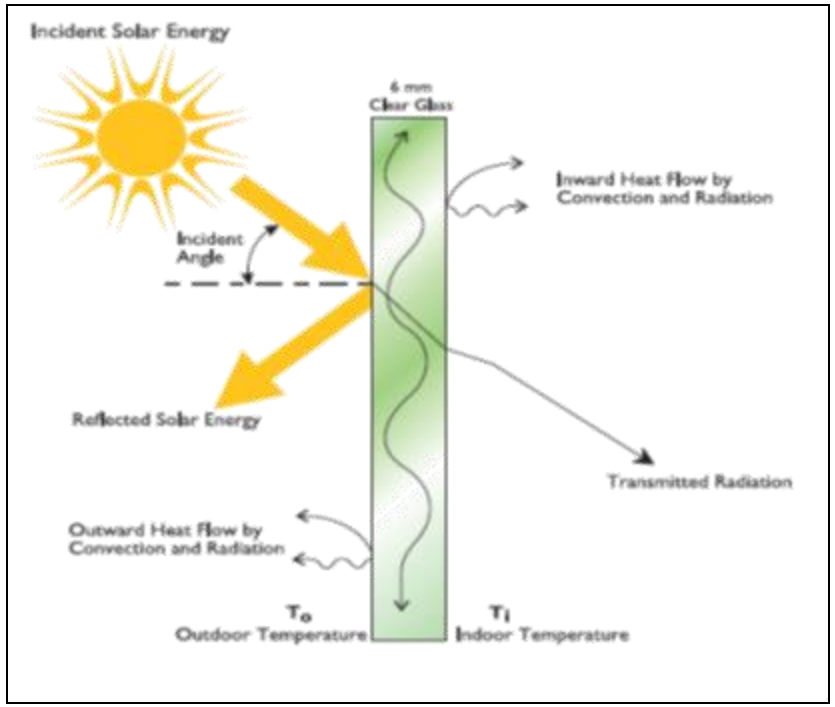
# Energy Efficient Coated Glass

- On Line Coating
- Off Line Coating

# Product Category

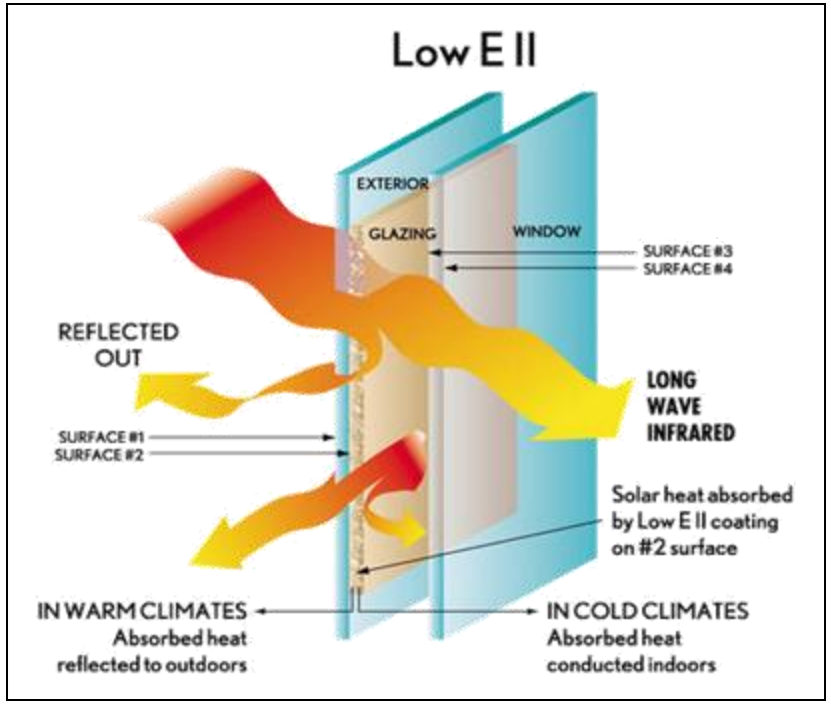
## Solar Control

A solar control glass allows sunlight to pass through a window or facade while radiating away a large degree of the sun's heat, thereby reducing significantly the need for air conditioning and sometime even eliminates the need for it.

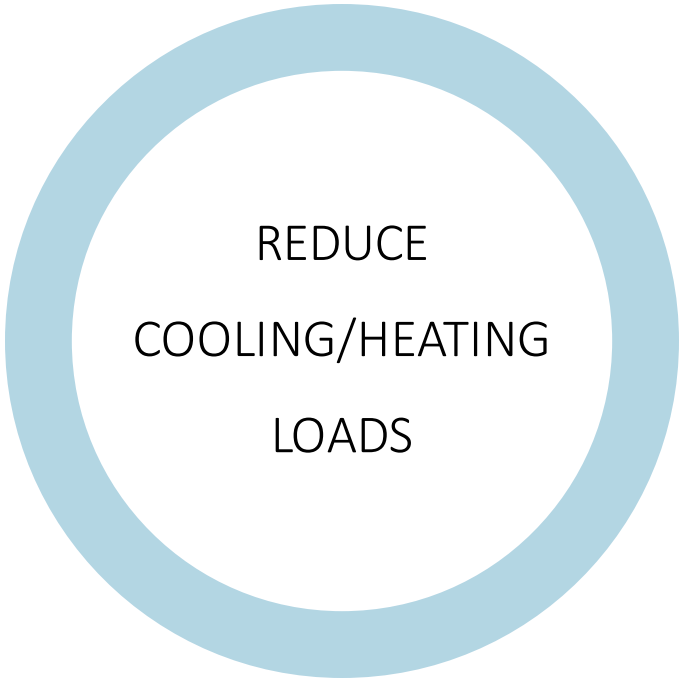


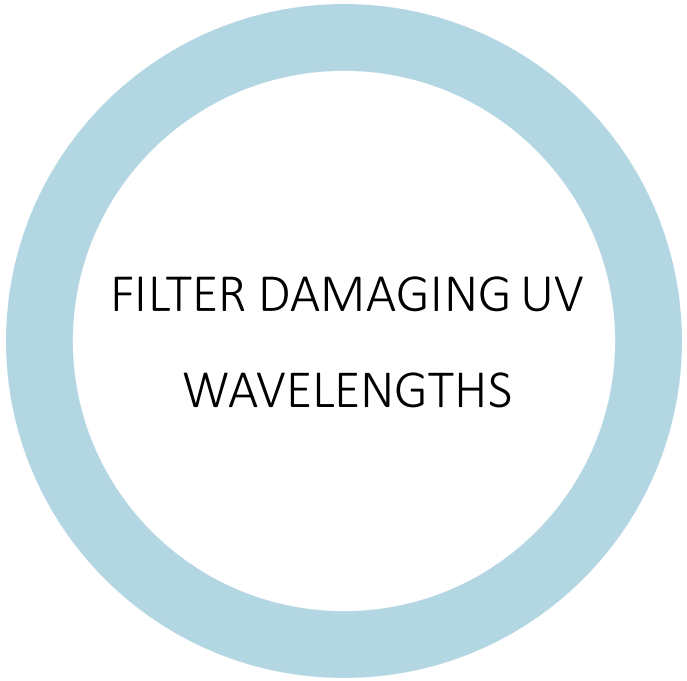

## Low – e

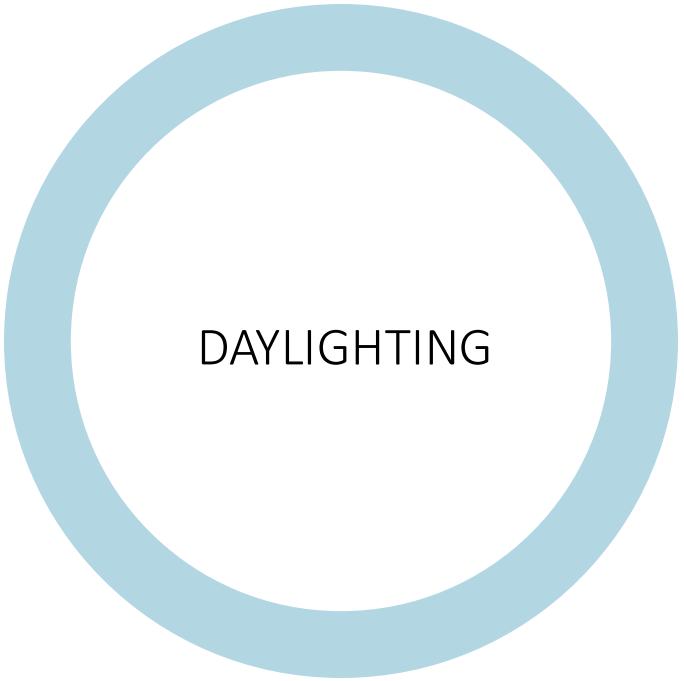
Low-e coatings reduce heat transfer through windows by limiting the amount of radiant energy they emit. So in warm climates it reflects the heat outside and in cold climate reduce the heat transfer through windows which has a silver layer.



# Advantages of High Performance Glazing



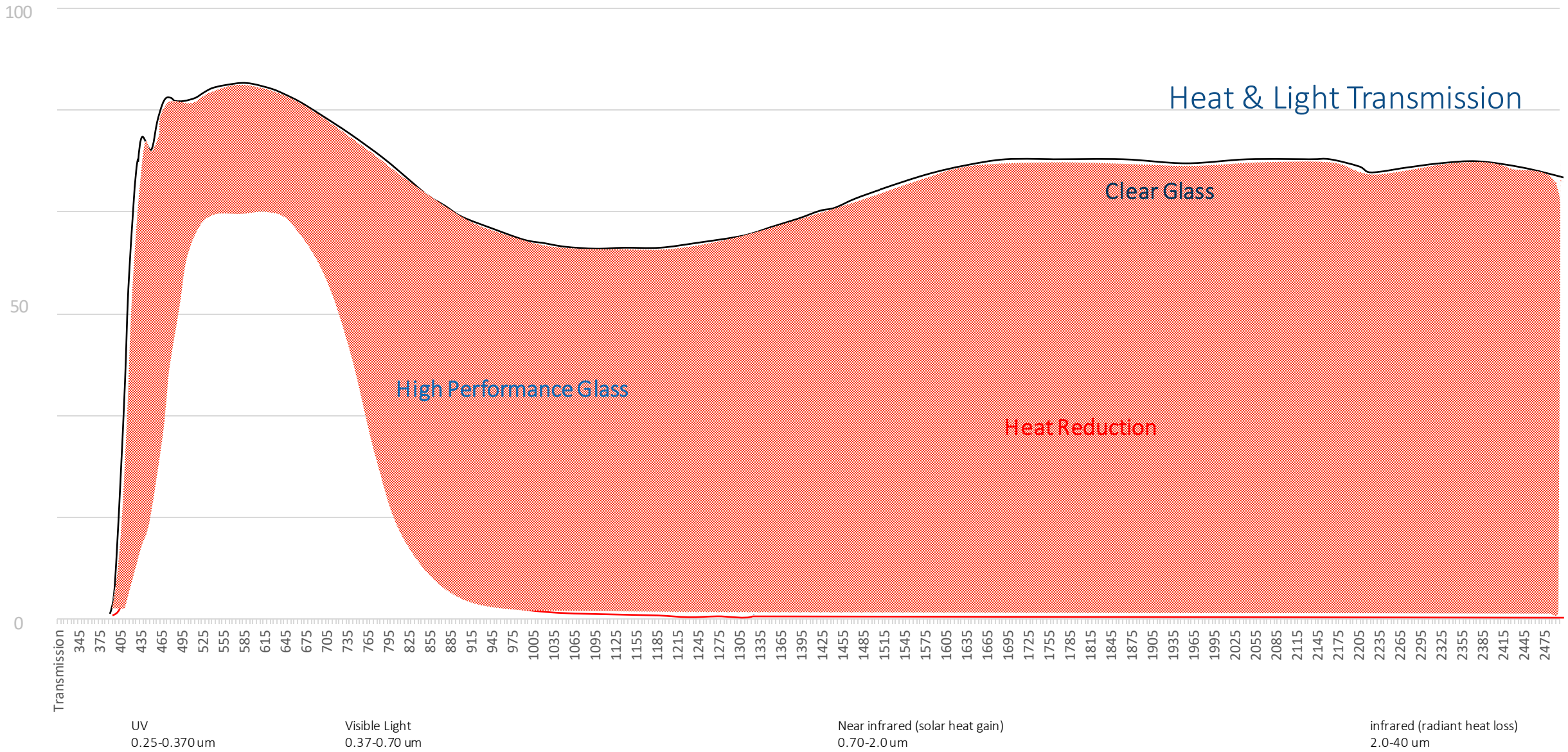




Eliminates the need for perimeter cooling in internal-load dominated buildings due to the effect of increased Mean Radiant Temperature (MRT) on **occupant comfort**

Window systems with low-e and spectrally selective coatings can filter damaging UV wavelengths and increase the life of room furnishings.

**Daylighting** in commercial/industrial buildings will reduce electrical lighting loads and save O&M costs.

# High Performance Glass Comparison



# High performance glass is ideal for buildings where sustainability is a goal

### Controls Sunlight & Heat

It controls the sunlight and heat that enter a building, providing great thermal efficiency

### Smaller HVAC systems

Buildings can use smaller, more efficient HVAC systems, dramatically reducing energy consumption

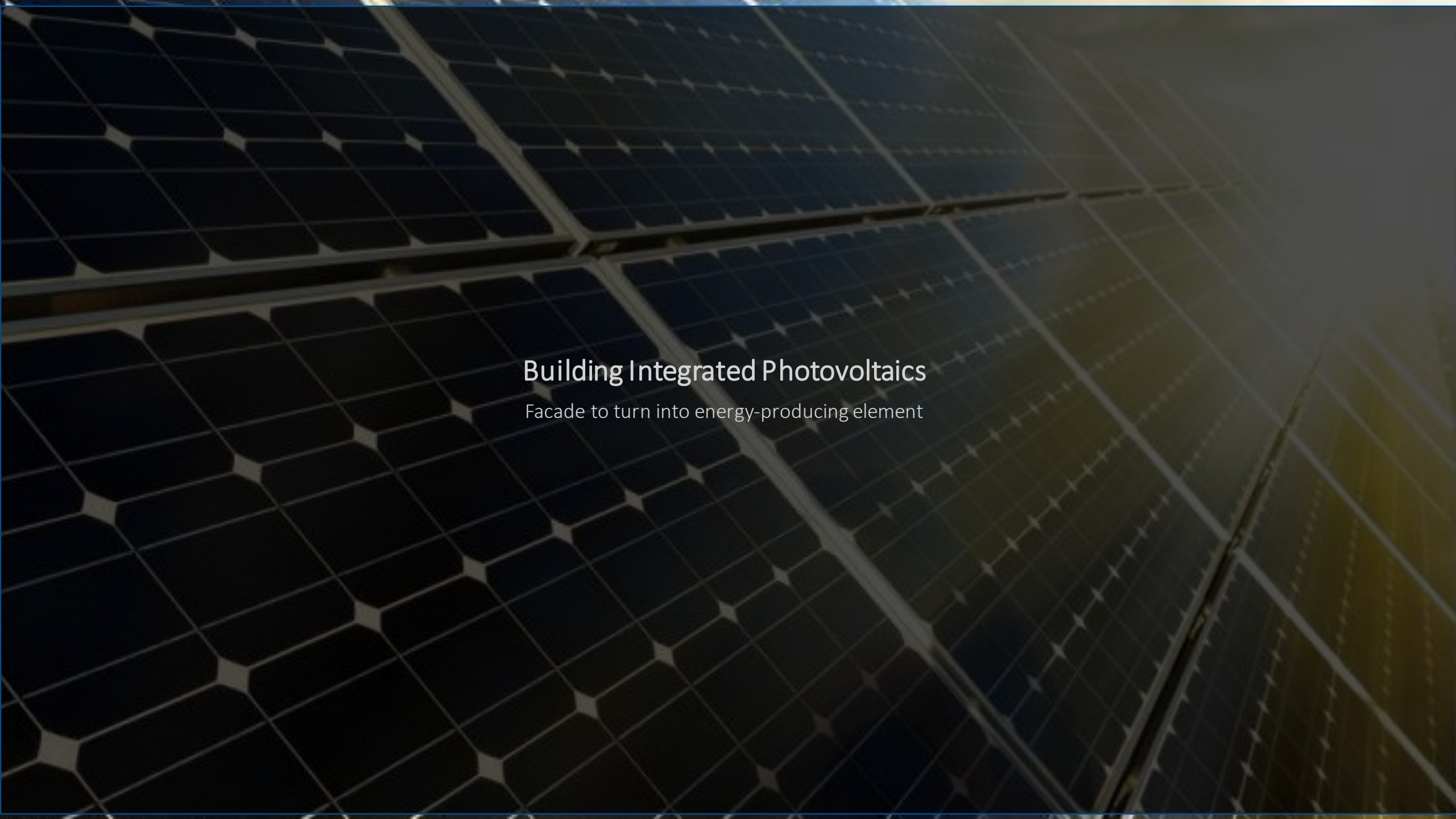
### Elegant Solutions

A smarter, more elegant solution than sun controls such as mechanized window shades, blinds and louvers

### Lesser Carbon Footprint

Other building materials result in a much higher carbon footprint in transportation and operational energy they consume

# High Performance Glass Classification

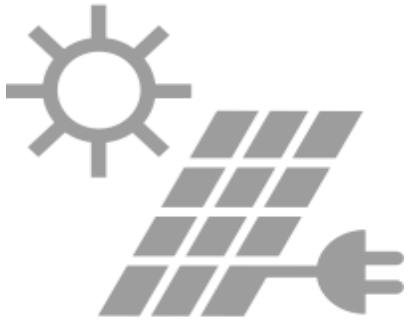


# Building Integrated Photovoltaics

Facade to turn into energy-producing element

# Understanding BIPV System

Building-integrated photovoltaic (BIPV) refers to the concept of integrating photovoltaic elements into the building envelope, establishing a symbiotic relationship between the architectural design, structure and multi-functional properties of the building materials and the generation of renewable energy.



The PV modules

Which might be thin-film or crystalline, transparent, semi-transparent, or opaque

Charge controller

To regulate the power into and out of the battery storage bank (in stand-alone systems)

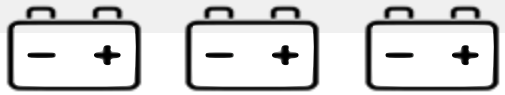
Power conversion

Including an inverter to convert the PV modules' DC output to AC compatible with the utility grid

DC Current

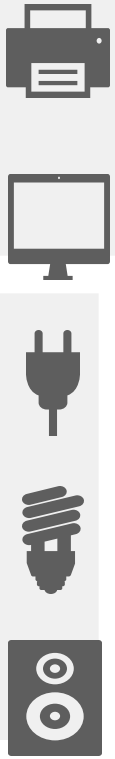
DC Current

AC Current



Power storage system

generally comprised of the utility grid in utility-interactive systems or, a number of batteries in stand-alone systems



Appliances

# Why Building Integrated Photovoltaic?

## Aesthetic & Modern

Application of (BIPV) technology in the building envelope gives an aesthetical and modern appearance. BIPV is a practical, innovative and promising technology for net zero emission buildings.

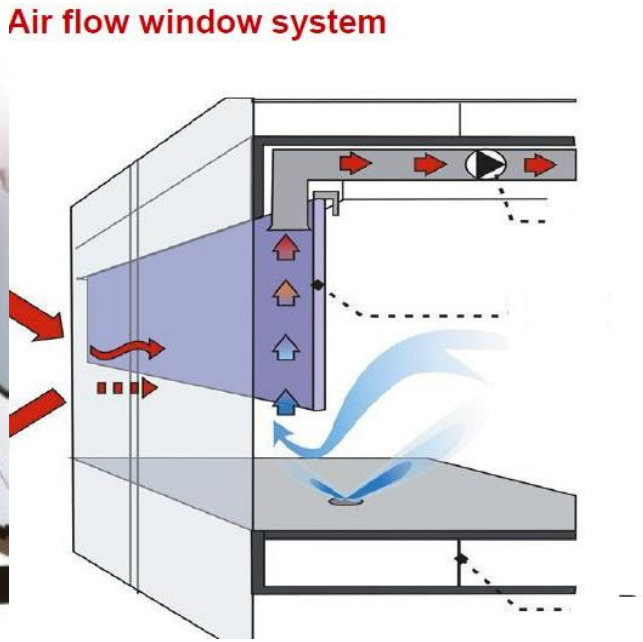
## Growing Application

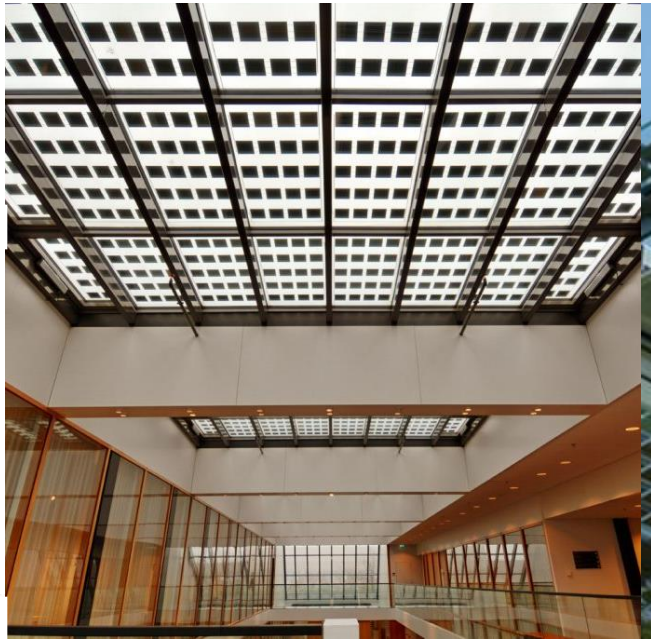
Following the advantages of building integration, more and more countries have set targets for using solar PV in building sector since PV integration in building facades represents a significant progress in urban solar PV applications

## Major Factors

In future scope for solar photovoltaic application, there are four major factors that must be considered viz. increase of efficiency, BIPV applications, cost reduction and storage system

# User Comfort in BIPV



### Absorbs UV

BIPV absorb light in the Ultra Violet (UV) wavelengths that cause bleaching and degradation of physical objects

### Heat Harness

The heat that the modules generate is then radiated into the environment which can be harnessed to provide heating or can be utilized to enhance passive ventilation systems.

### Thermal & Sound Insulation

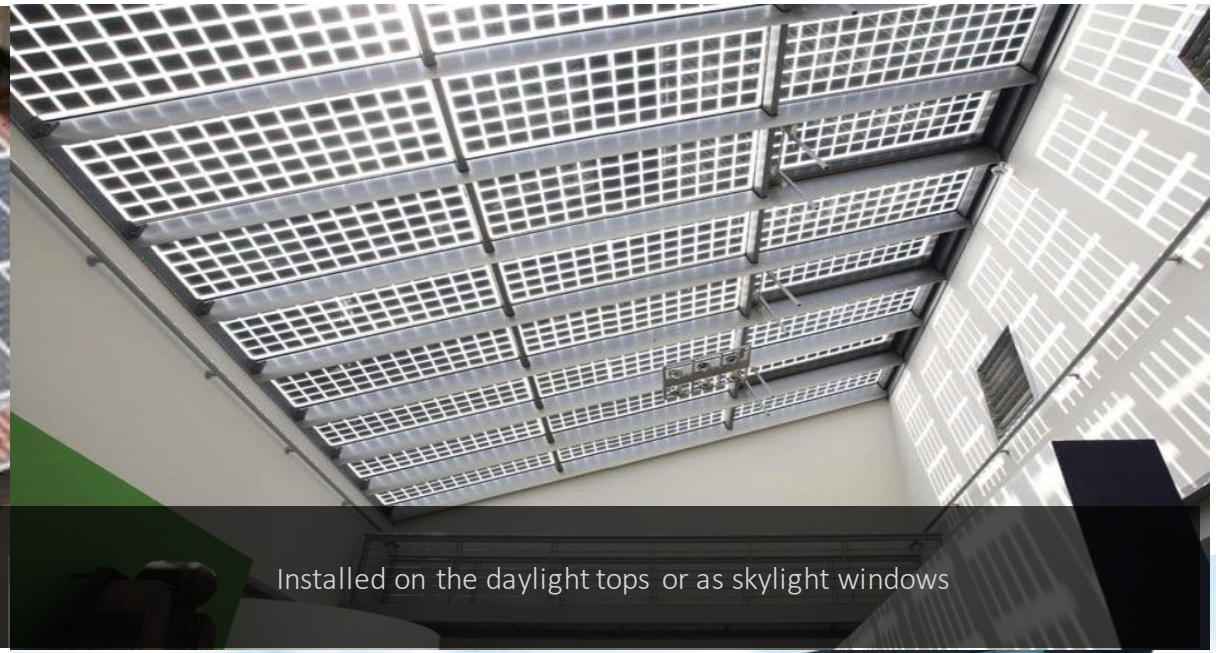
Multilayer glass structures of PV modules can be used to provide thermal & sound insulation.

### Providing Safety

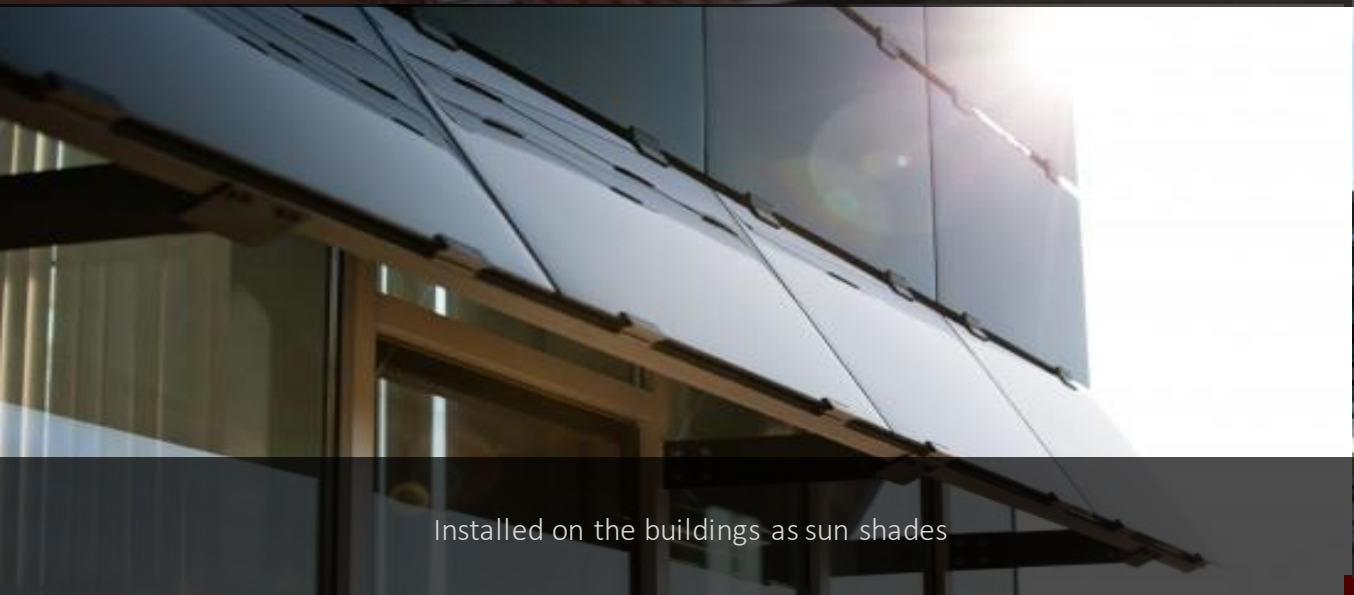
PV modules can provide rain-proofing, wind-proofing, wind load resistance and ageing resistance as well as offering residual structural integrity to the building.

# BIPV Application and Design Solutions

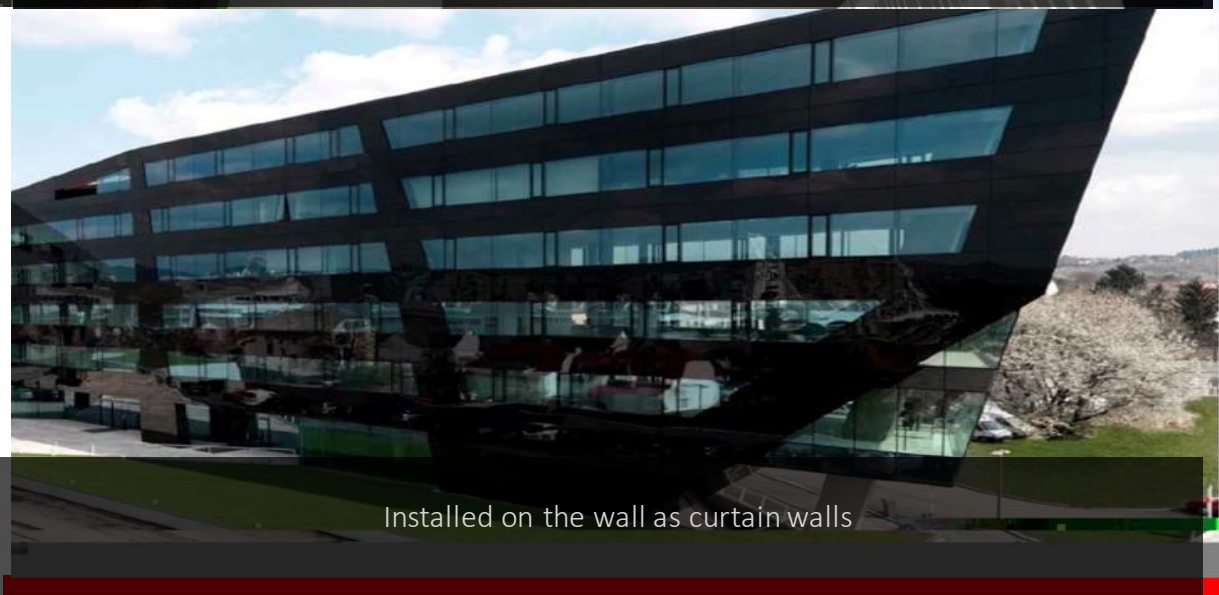
Installed on the rooftop like building materials



Installed on the daylight tops or as skylight windows



Installed on the buildings as sun shades



Installed on the wall as curtain walls

# Vacuum Insulated Glass

Vacuum Insulated Glass consists of an outer pane of high performance glass and an inner pane of clear float, with a vacuum rather than air or another gas in between.

> *“The result is excellent thermal performance from a unit as modern double glazing, but in a unit that is typically only a quarter of the thickness*

# Understanding Vacuum Glass

## Glass Panes

Vacuum glazing consists of an outer pane of low-emissivity glass and an inner pane of clear float glass

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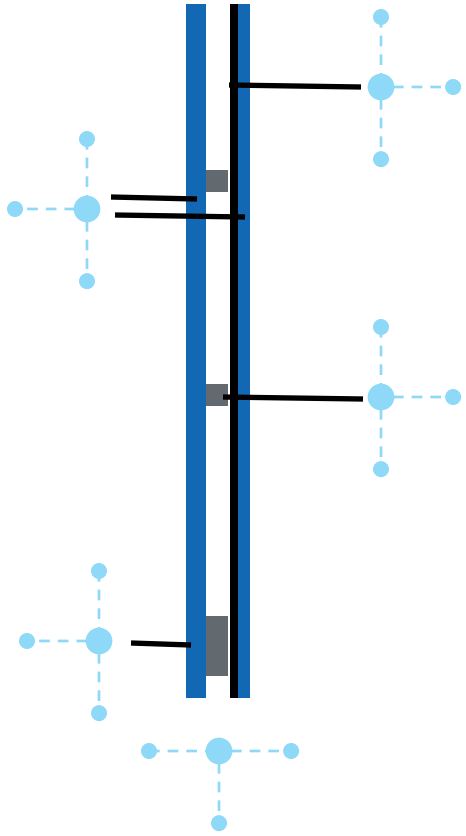
## Airtight Edge Seal

The edges are welded to achieve a hermetic seal. Air is extracted to create a vacuum



Minimum distance between glass

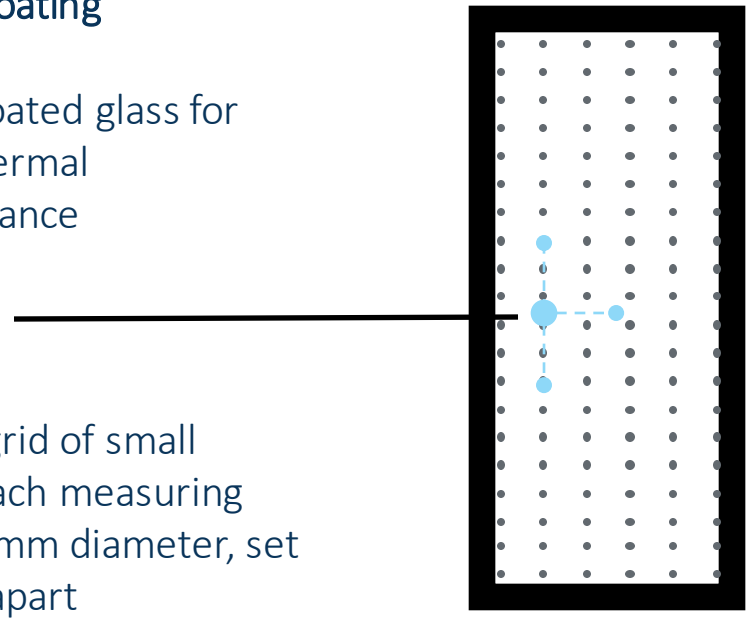
0.25mm

## Low E Coating

Low E coated glass for good thermal performance

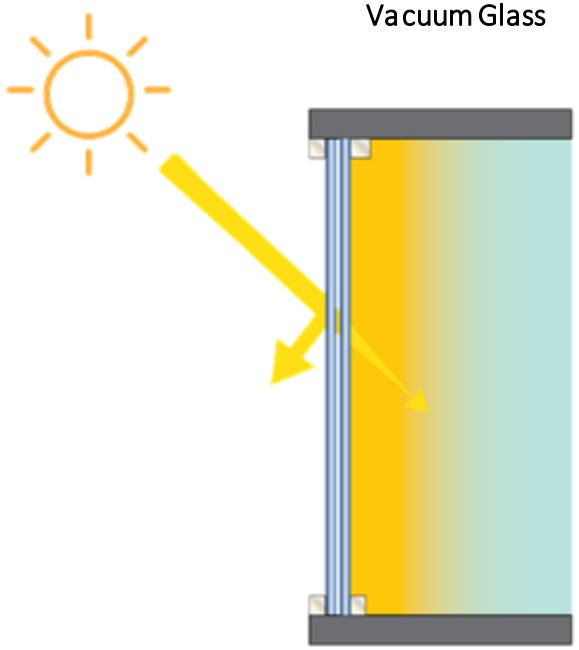
## Spacer

Spacer grid of small pillars each measuring just 0.5 mm diameter, set 20 mm apart



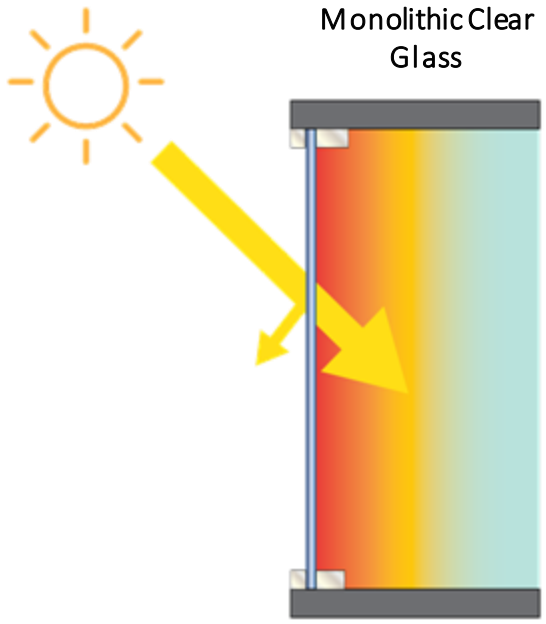
# Performance- Vacuum Glass Vs Monolithic Clear Glass

Vacuum Glass



SHGC = 0.48
U-Factor= 0.18

Monolithic Clear Glass



SHGC = 0.82
U-Factor= 1.03

## Low U Value

Considerably suppresses radiation heat transfer and reduces the U-value to 1.02 W/(m2•K).

## Better Insulation

The thermal insulation performance of vacuum glass is 2 to 4 times better than insulated glass and 6 to 10 times than single pane glass.

Vacuum glass has much lesser thickness and weight

It manages a much better U-value

Lesser Low-E glass layers also allow higher transmittance

# Energy Analysis of Glass

- Energy Simulation & Its Analysis

A simulation to understand the right glass for maximum energy saving- a step towards Net Zero Buildings

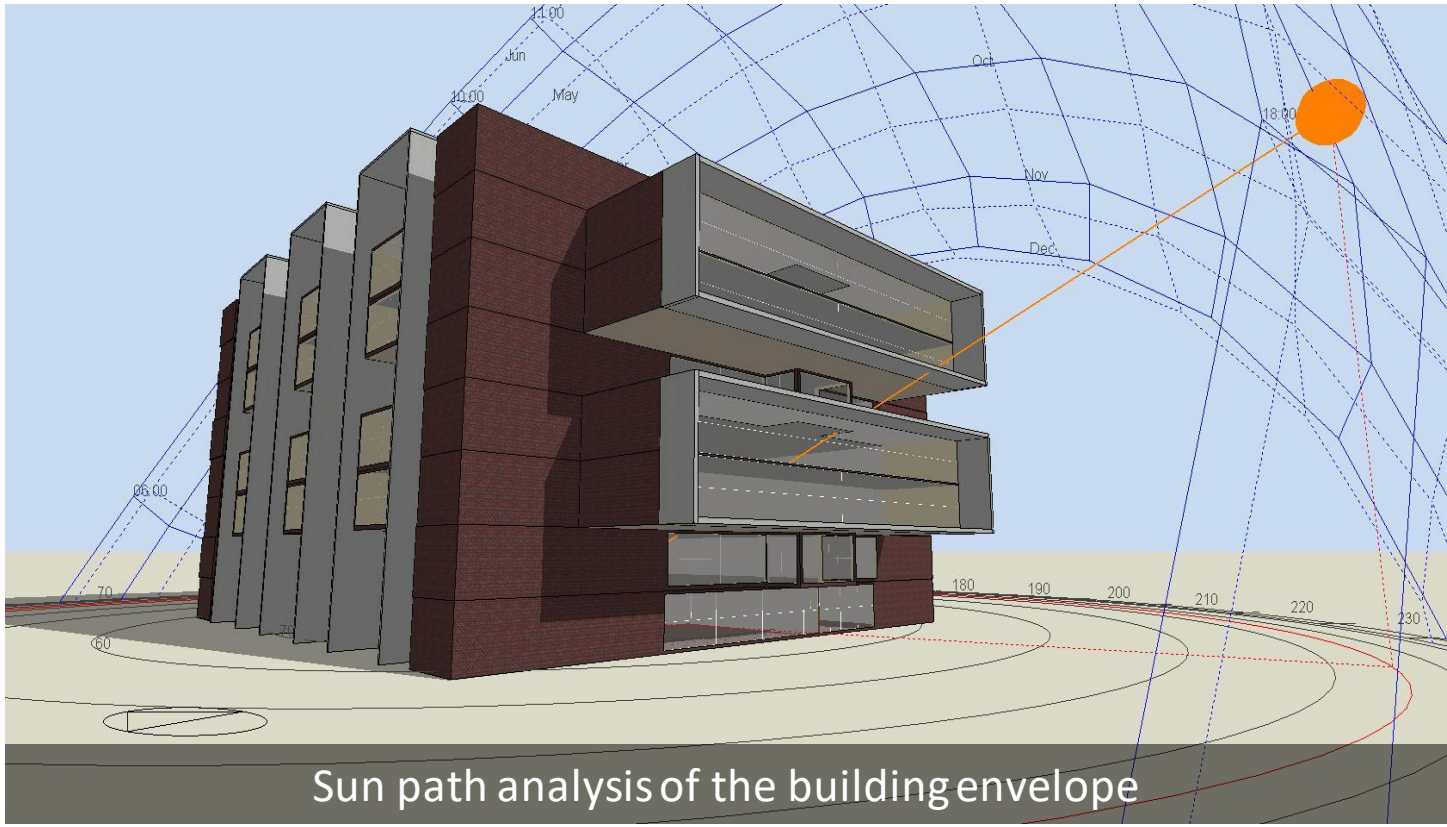
# Energy Analysis - Scenario

**Site:**
A 9AM to 5 PM
Commercial
Office Building

**Window-Wall-Ratio:**
40%

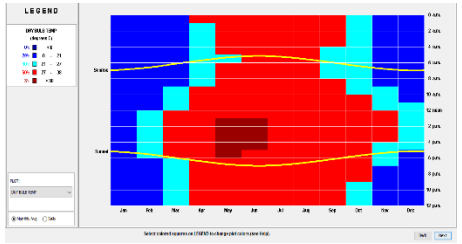
**Location:**
New Delhi

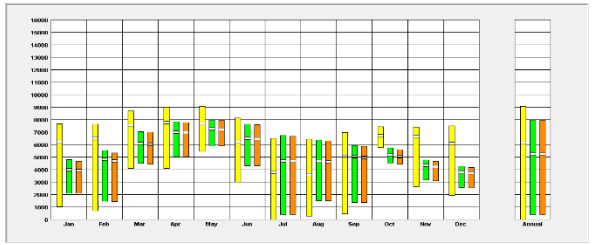
**HVAC**
Auto Sized VRF



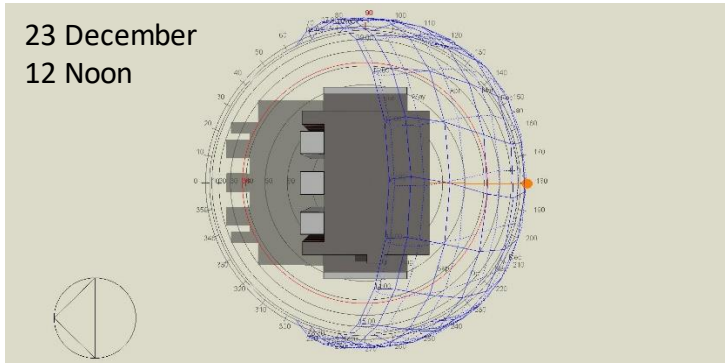
Sun path analysis of the building envelope

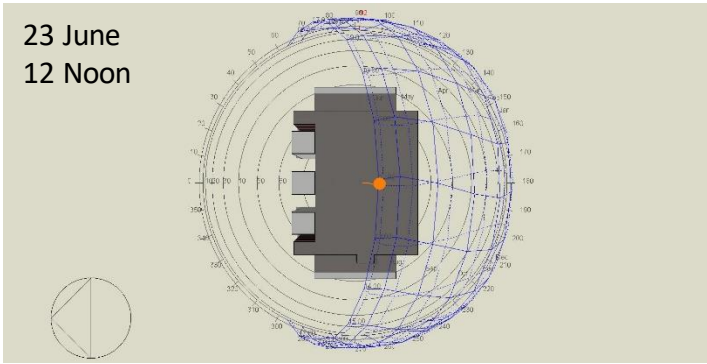
## Area Climate



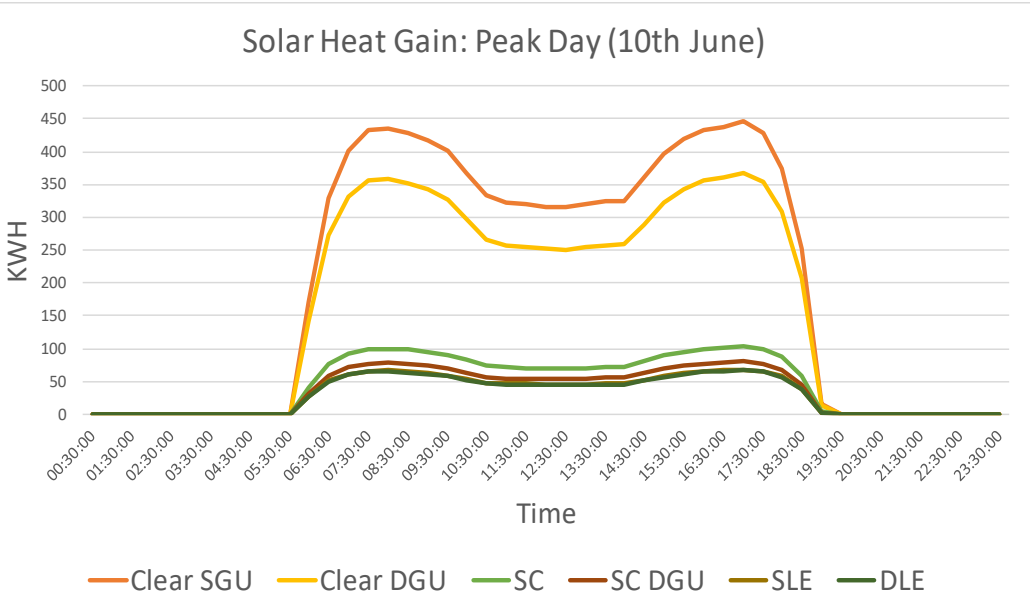
The site receives high solar radiation annually with mean radiation of **6000W/sqm/day** and reaching the maximum of **9000W/sqm/day**

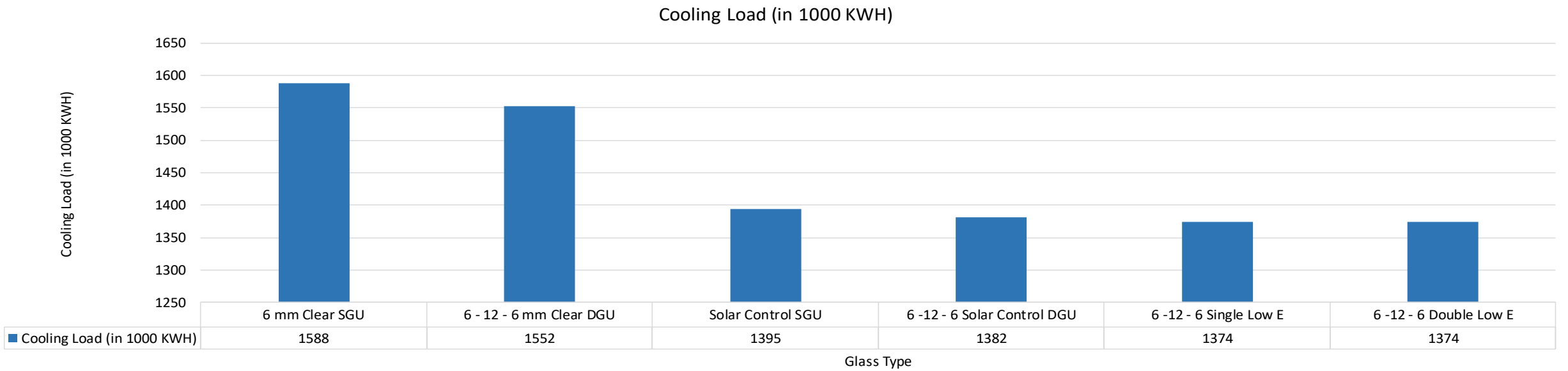


# Energy Analysis – Glass Performance

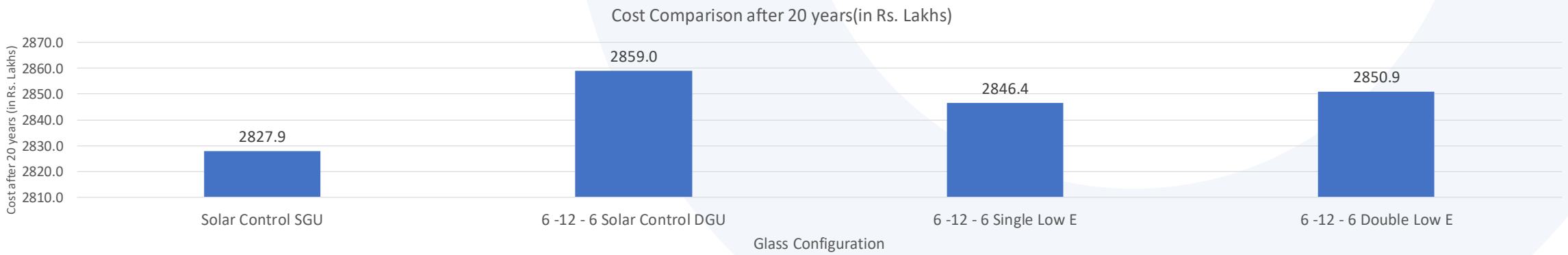
| Glass Configuration | Glass Parameters | | | | | |
|---|---|---|---|---|---|---|
| | VLT % | External Reflection % | Internal Reflection % | SF % | SC | U value |
| 6 mm Clear SGU | 88 | 8 | 8 | 84 | 0.96 | 5.7 |
| 6 - 12 - 6 mm Clear DGU | 79 | 15 | 15 | 74 | 0.85 | 3.0 |
| Solar Control SGU | 28 | 27 | 10 | 30 | 0.34 | 3.7 |
| 6 -12 - 6 Solar Control DGU | 25 | 28 | 16 | 24 | 0.28 | 2.0 |
| 6 -12 - 6 Single Low E | 33 | 39 | 21 | 22 | 0.25 | 1.6 |
| 6 -12 - 6 Double Low E | 40 | 19 | 13 | 22 | 0.25 | 1.5 |



# Payback Period

| Glass Configuration | Total Cooling Energy use | Cost | Total cost | Additional Investment | Energy savings | OPex Energy savings | Payback Period | Cost After 20 years (in Rs Lakhs) |
|---|---|---|---|---|---|---|---|---|
| | KWH | ₹ / sq.m. | ₹ | ₹ | KWH | ₹ | Yrs | |
| 6 mm Clear SGU | 1588084 | 960 | 3587520 | | | | | |
| 6 - 12 - 6 mm Clear DGU | 1552137 | 2470 | 9230390 | | | | | |
| Solar Control SGU | 1394531 | 1040 | 3886480 | 298960 | 157606 | 1576060 | 0.2 | 2827.9 |
| 6 -12 - 6 Solar Control DGU | 1381845 | 2550 | 9529350 | 298960 | 170292 | 1702920 | 0.2 | 2859.0 |
| 6 -12 - 6 Single Low E | 1374434 | 2610 | 9753570 | 523180 | 177703 | 1777030 | 0.3 | 2846.4 |
| 6 -12 - 6 Double Low E | 1374421 | 2730 | 10202010 | 971620 | 177716 | 1777160 | 0.5 | 2850.9 |
| *Electricity Rate Rs 10/KWH* | | | | | | | | |
| *Glazing Area 3737 SQM* | | | | | | | | |



# Glass a net zero building product

## To sum up

### Provides more area
Can use whole façade to generate electricity

### Use of high performance glass
Reduce energy requirement

### Innovative products
BIPV to generate electricity and Vacuum IGU to reduce heat gain

### Think Sustainable

### Scientific calculation
A proper analysis should be the criteria for selecting the product for sustainability, not the heresay

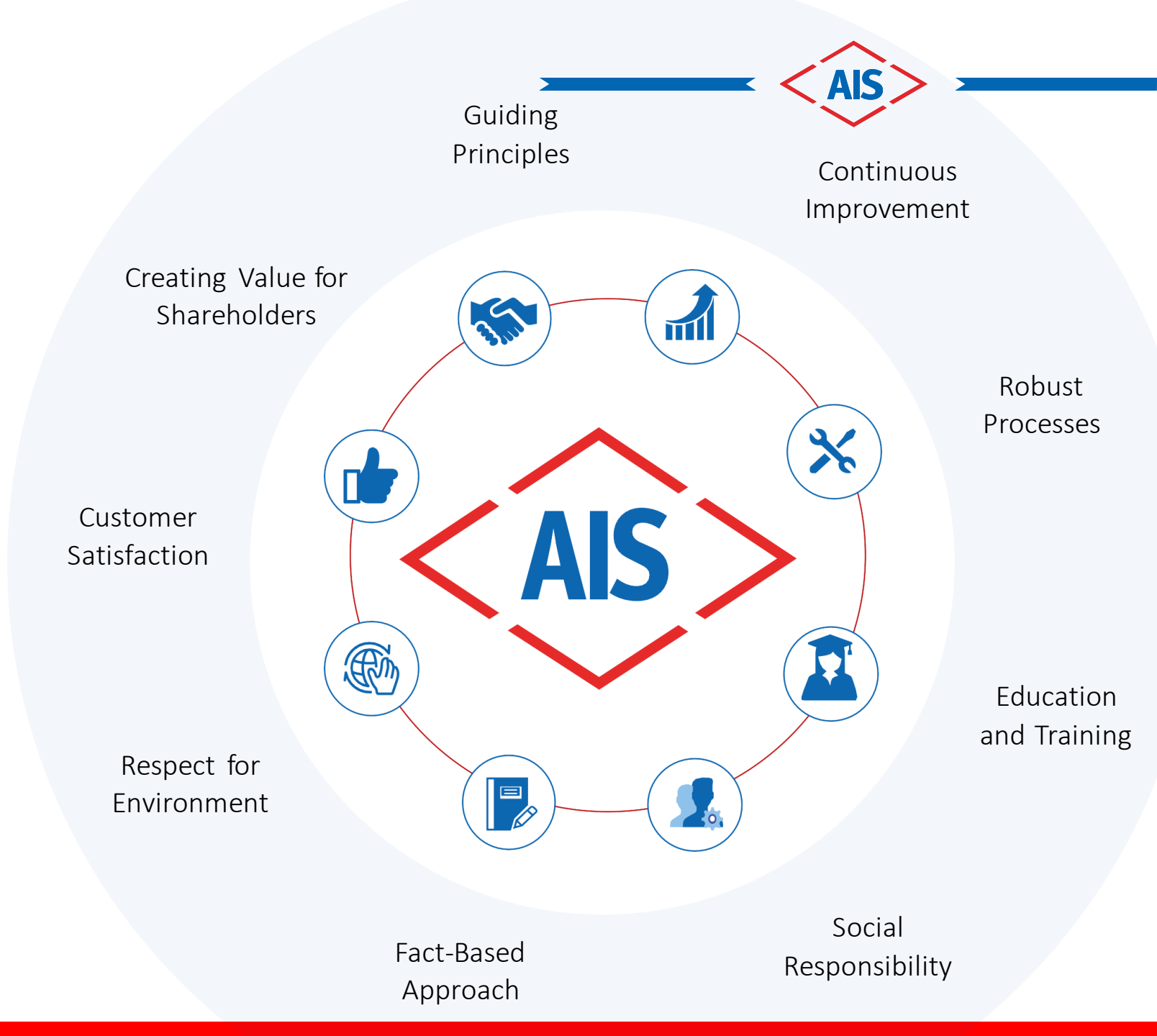
### Thought towards net zero
Commitment is the key

# About AIS

Asahi India Glass Limited (AIS) is one of India's leading integrated glass companies, offering end-to-end solutions across the **Automotive and Architectural** glass value chains

**Established in 1984**, AIS is an outcome of a joint venture between the Labroo family, Asahi Glass Co., Japan and Maruti Suzuki India Limited.

AIS is **an ISO 9001 and ISO 14001** company listed on the National Stock Exchange Limited and Bombay Stock Exchange Limited



# AIS Value Proposition: Sand To Solutions

A sand-to-solutions company, the AIS offering spans the entire spectrum of the automotive and architectural glass value chains. Presenting the evolution of each segment from their inception to this day.

FLOAT GLASS

## Sand to Car Glass

| | | | |
|---|---|---|---|
| Automotive Glass | Automotive Glass Distribution (AIM) | Allied Products Distribution (Adhesives) | Auto Glass Fitment Services (WE) |
| Value Added Products, Reflective & Mirrors | Processing Laminated, Tempered, Insulated Glass, Products | Fabrication uPVC windows | Installation |

## Sand to Window

### Architectural Glass

- 2 Float Lines, 1200 TPD
- Soft Coat
- Hard Coat
- Mirror Line
- Architectural Processing Lines – 1.4 mn.sqm.

### Automotive Glass

- Laminated windshield 5.4 mn. pcs
- Tempered glass 7.7 mn. sqm.
- 4 Laminated Plants
- 3 Tempered Plants

### Automotive Glass

- Laminated windshield 5.4 mn. pcs
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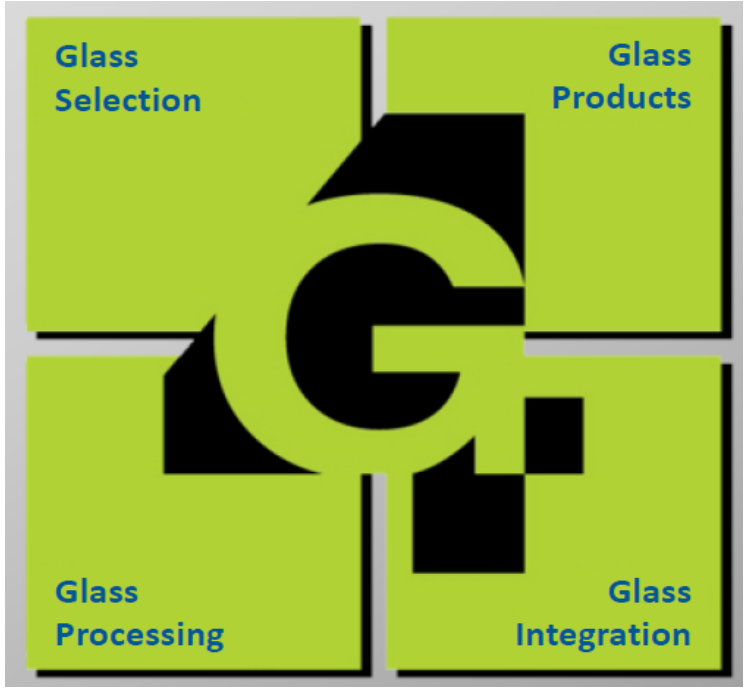
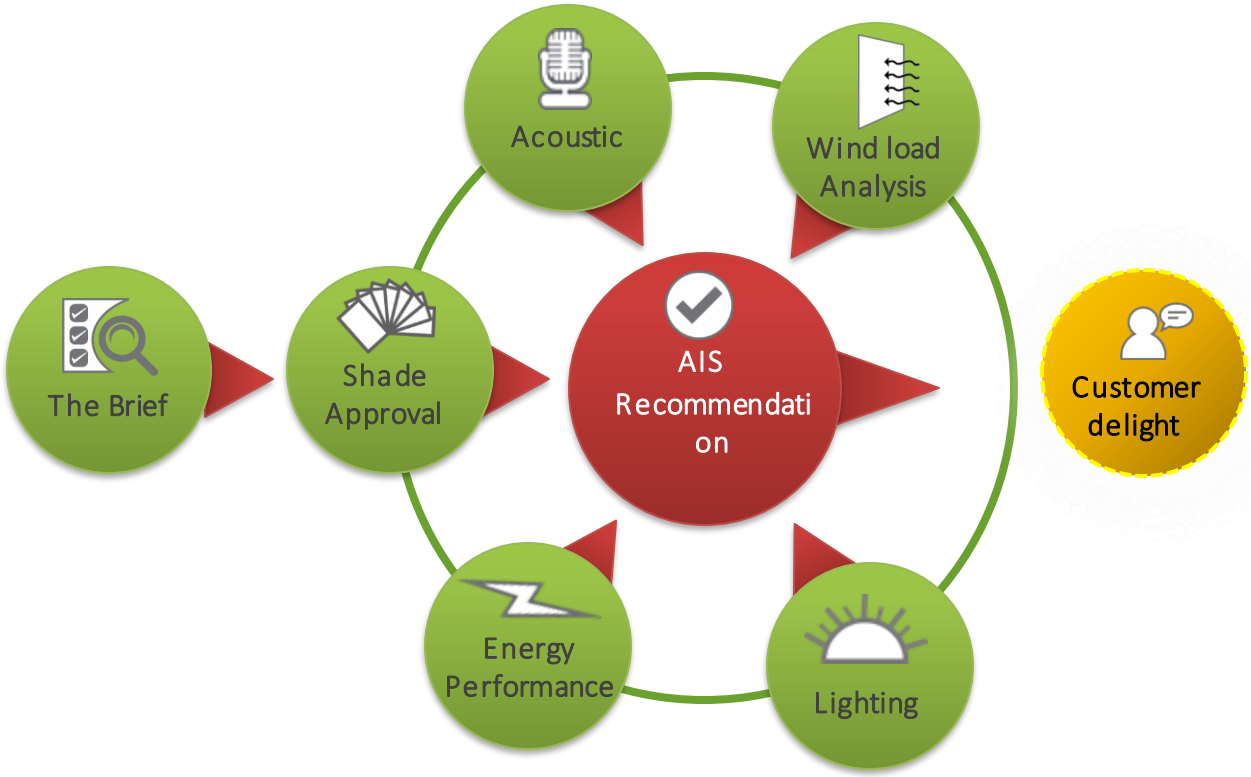
# AIS – 4G Solutions




**Glass Processing** – AIS provides all kinds of processing of glass as per your requirements

**Glass Integration** – AIS fulfills all your needs related to glass as it is present in every part of the value chain, be it glass manufacturing, processing, consultation, interior installation, window solutions and much more.

**Glass Selection** – AIS helps in the selection of the right product depending on your requirements

**Glass Products** – AIS, with it's wide range of products, offers solutions to fulfill all requirements , exteriors as well as interiors, performing well on parameters such as energy performance, lighting, acoustic and wind load.

# End of Presentation

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