



CLIMATIC CHAMBER SIMULATION FOR BUILDING ENVELOPE SYSTEMS TO BUILD NETZERO BUILDINGS

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WE SAVE ENERGY FOR NEXT GENERATION





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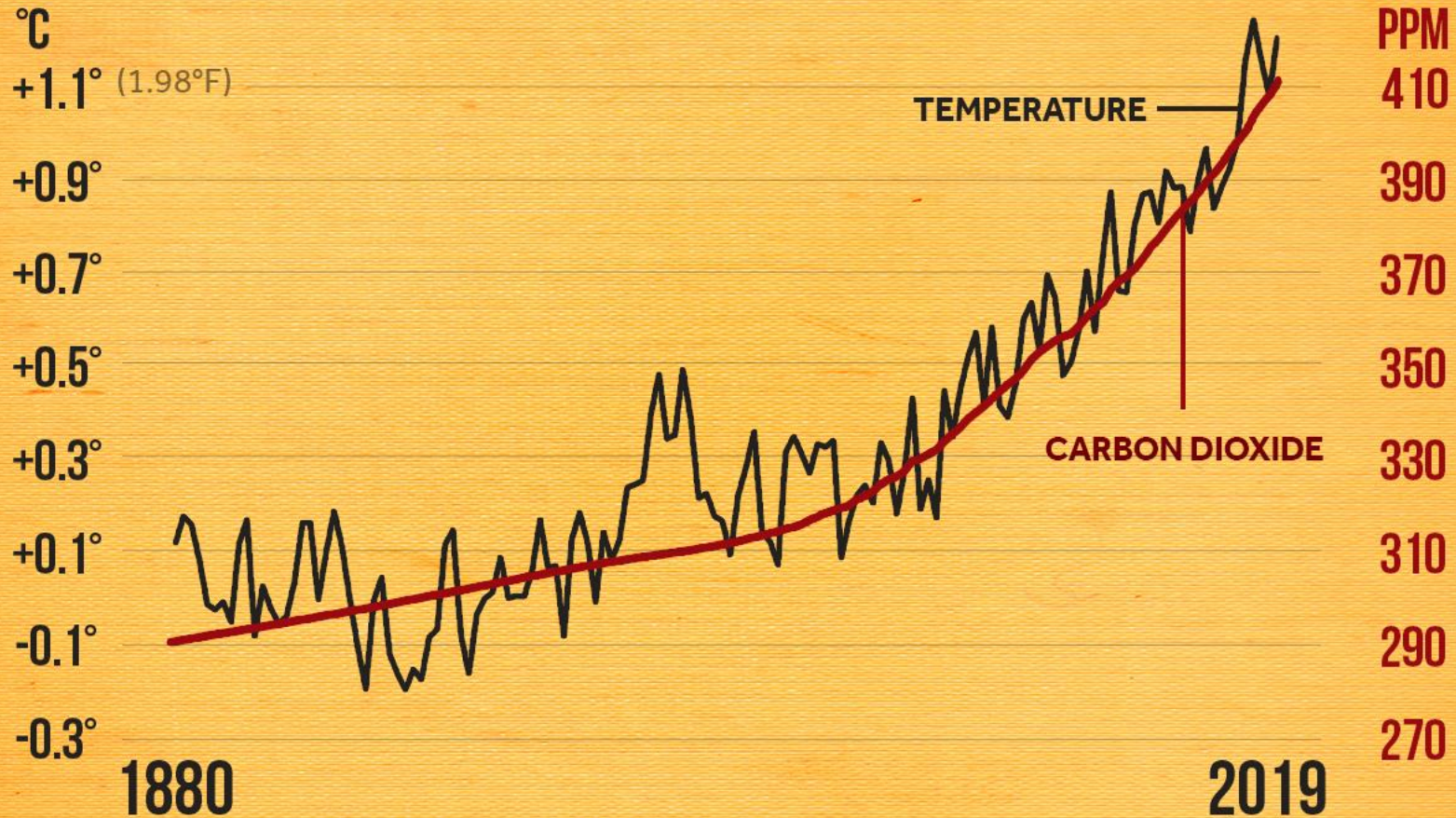
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GLOBAL TEMPERATURE & CARBON DIOXIDE



Global temperature anomalies averaged and adjusted to early industrial baseline (1881-1910)
Global annual average carbon dioxide
Source: NASA GISS, NOAA NCEI, ESRL

Building Energy Consumption

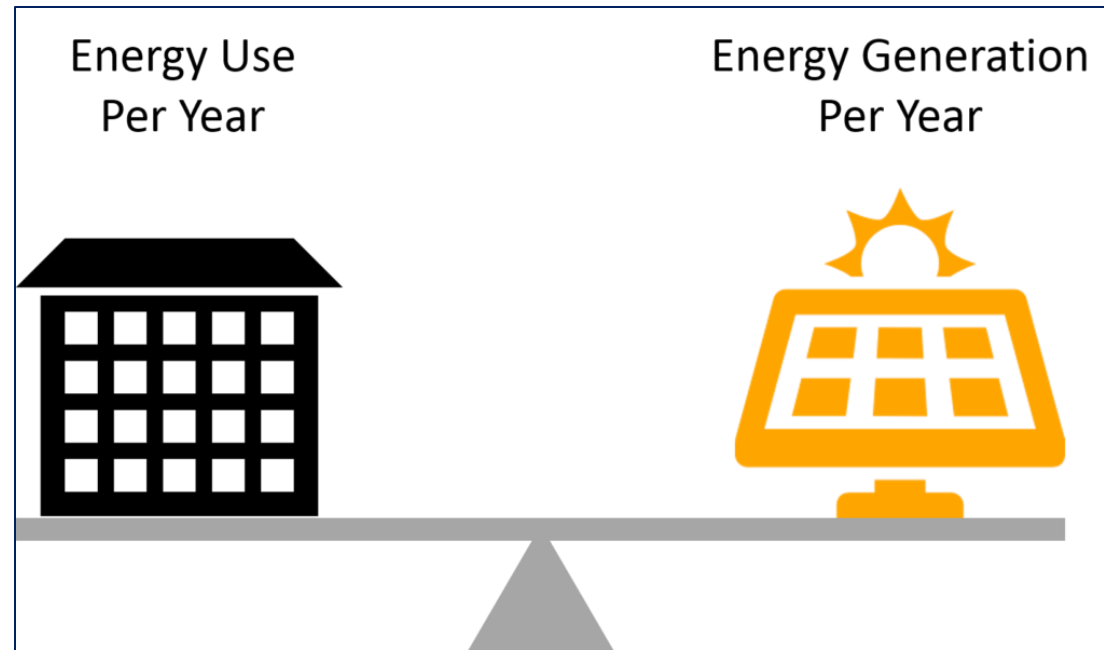
Buildings and construction account for more than **35% of global final energy use** & **almost 40% of energy related CO₂ emissions**

(UN environment global status report, 2017)

In India, **33% of total energy** is consumed by **buildings** and is expected to **increase up to 55% by 2047**

(NITI Ayog, 2019)

AIM: Net Zero Energy Buildings

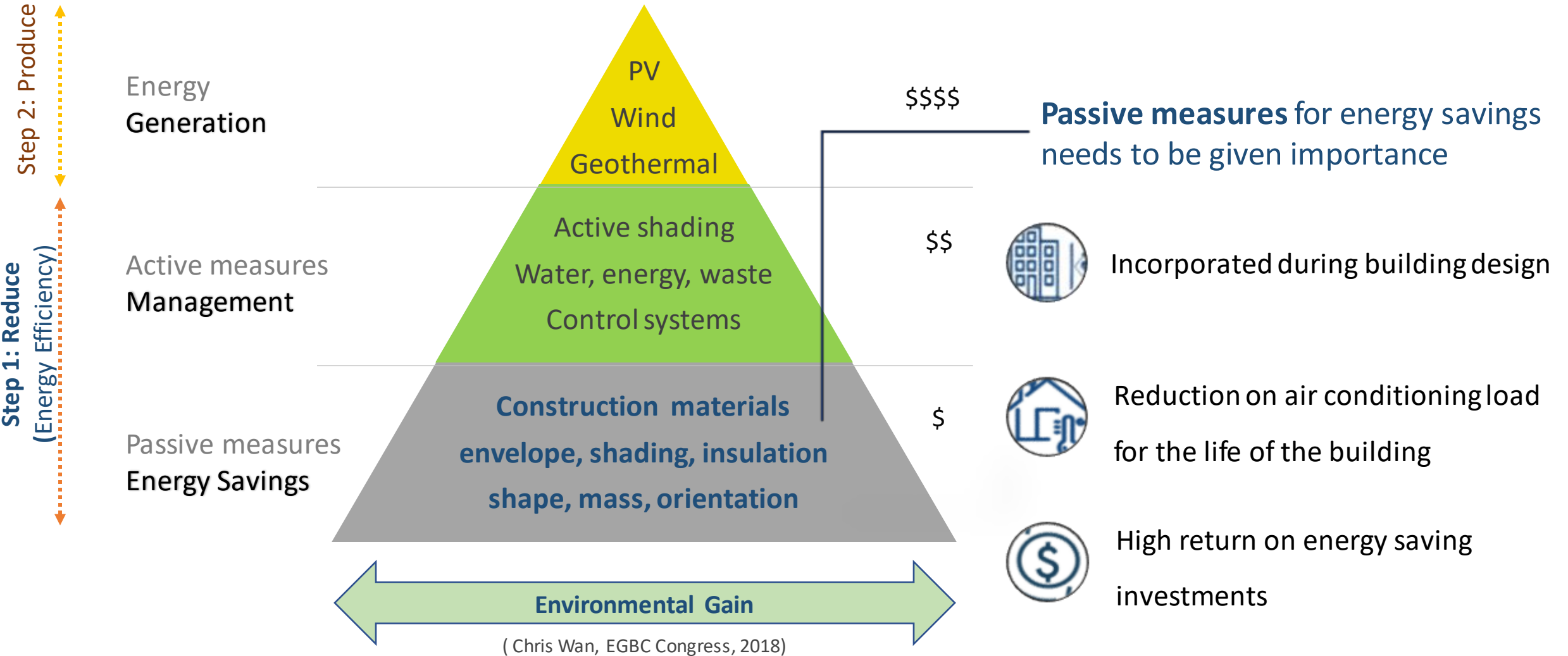


Definition: This is when the total annual energy consumed is offset with renewable energy either on site or off site.

Step 1: Reduce demand as much as possible.

Step 2: Produce Energy with renewables (on site or off site).

How can we achieve Net Zero Energy Buildings ?



Why Envelope Insulation ?

~50% of the energy in a building is consumed by HVAC (Construction Week, 2021)

a **Poor Envelope** can lead to energy losses (HVAC)



Note on ECBC Code

- The Energy Conservation Building Code (ECBC) was developed by the Govt. of India in 2007 (& revised in 2017) to address energy efficiency in commercial building sector. This is applicable not only for new buildings **but also for existing building stocks.**
- The ECBC Code prescribes certain requirements to achieve energy efficiency either by using active measures or by passive measures in areas of Building envelope, HVAC, Lighting, Electrical Power and Solar hot water & Pumps.
- Building envelope is one the core focus area in the ECBC code and there are prescribed U-Values for the roof and wall assemblies which needs to be complied to.
- The U-Value requirements are bifurcated basis the climate type (location), type and size of the project and the code classification (ECBC. ECBC Plus, Super ECBC)

U Values for ECBC Compliance

“U value” Thermal Conductance (W/m²K)

	Composite	Hot and dry	Warm and Humid	Temperate	Cold
All building types, except below	0.22 – 0.40	0.22 – 0.40	0.22 – 0.40	0.22 – 0.55	0.22 – 0.34
No Star Hotel < 10,000 Sqm AGA	0.22 – 0.63	0.22 – 0.63	0.22 – 0.63	0.22 – 0.63	0.22 – 0.40
Business < 10,000 Sqm AGA	0.22 – 0.63	0.22 – 0.63	0.22 – 0.63	0.22 – 0.63	0.22 – 0.40
School < 10,000 Sqm AGA	0.22 – 0.85	0.22 – 0.85	0.22 – 0.85	0.22 – 1.00	0.22 – 0.40

(These values are for *wall assembly* for ECBC, ECBC+ and Super ECBC Compliance)

LEC insulation System

- LEC is a green and sustainable **Integrated insulation and waterproofing system** for roofs.
- It can be designed based on the required roof U-Factor as per guidelines of ECBC | Eco-Niwas | ASHRAE



Substantial Reduction in heat gain through roof | Enhances Thermal Comfort

Reduces thermal stresses & cracks in concrete



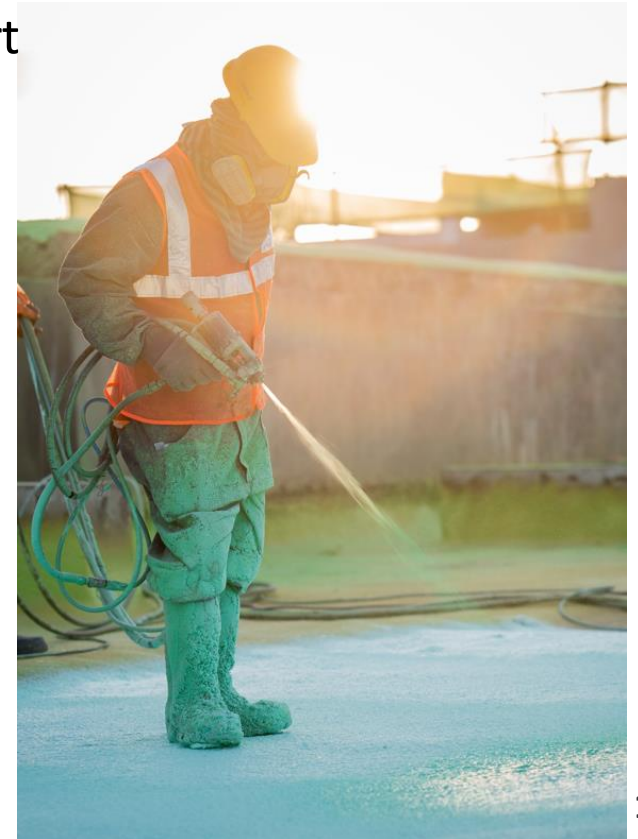
Spray applied rigid PU foam | CFC & HCFC Free | Green enlisted



Fully bonded seamless system | No Thermal Bridging



Dual waterproofing protection | Eliminates risk of lateral migration of water



External wall Insulation & Finishing Systems

- **EIFS is a multi-layered wall finish system** comprising of **rigid insulation panel**, adhesive, base coat, reinforcing mesh and finishing coat.
- It is suitable for **both new buildings and for refurbishment of existing buildings** - Enhances Thermal performance as well as aesthetics



Superior assembly that replaces conventional plaster + putty + primer + paint/ texture build-up



High Thermal Resistance | Reduces load on AC Systems | Customizable as per required wall assembly U-Factor as per ECBC & ASHRAE guidelines



Waterproofing | Crack Resistance



Architectural Flexibility | Final Finish can be customized as per Architects requirement



Smart Wall Masonry Panel System

- SWMP is a unique wall insulation system that has two parts which interlock together to form the masonry wall and over this the finishing layers are applied as per EIFS.
- The system can be designed based on the required wall assembly U-factor as per ECBC/ASHRAE requirements.



Lightweight complete wall assembly



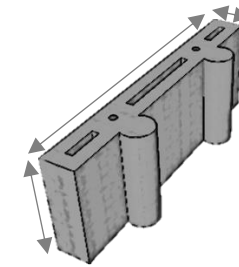
Continuous exterior insulation with extremely low U - value



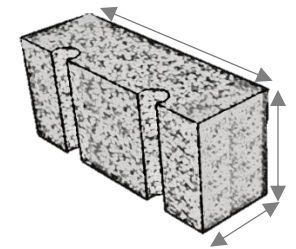
Fire Resistant Class A (ASTM E84)



Variety of exterior finishes, stone finishes and decorative renders



SWMP – Part A



SWMP – Part B

Building Envelope Retrofit Services



BEFORE



AFTER



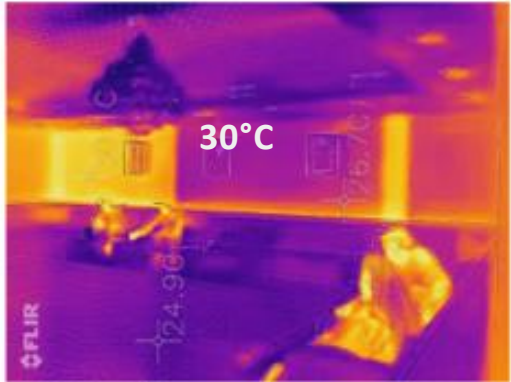
Envelope retrofit involves energy auditing using thermal cameras & real-time u value meters



Real-time U value Meters



Thermal Camera





2020 MENA Green Building

AWARDS

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GREEN BUILDING RESEARCH AWARD 2020

SIFS Building Envelope Analyzer

*A large scale **climatic-chamber** for comparative study of building envelope insulation systems and its impact on **heat transfer and energy consumption***

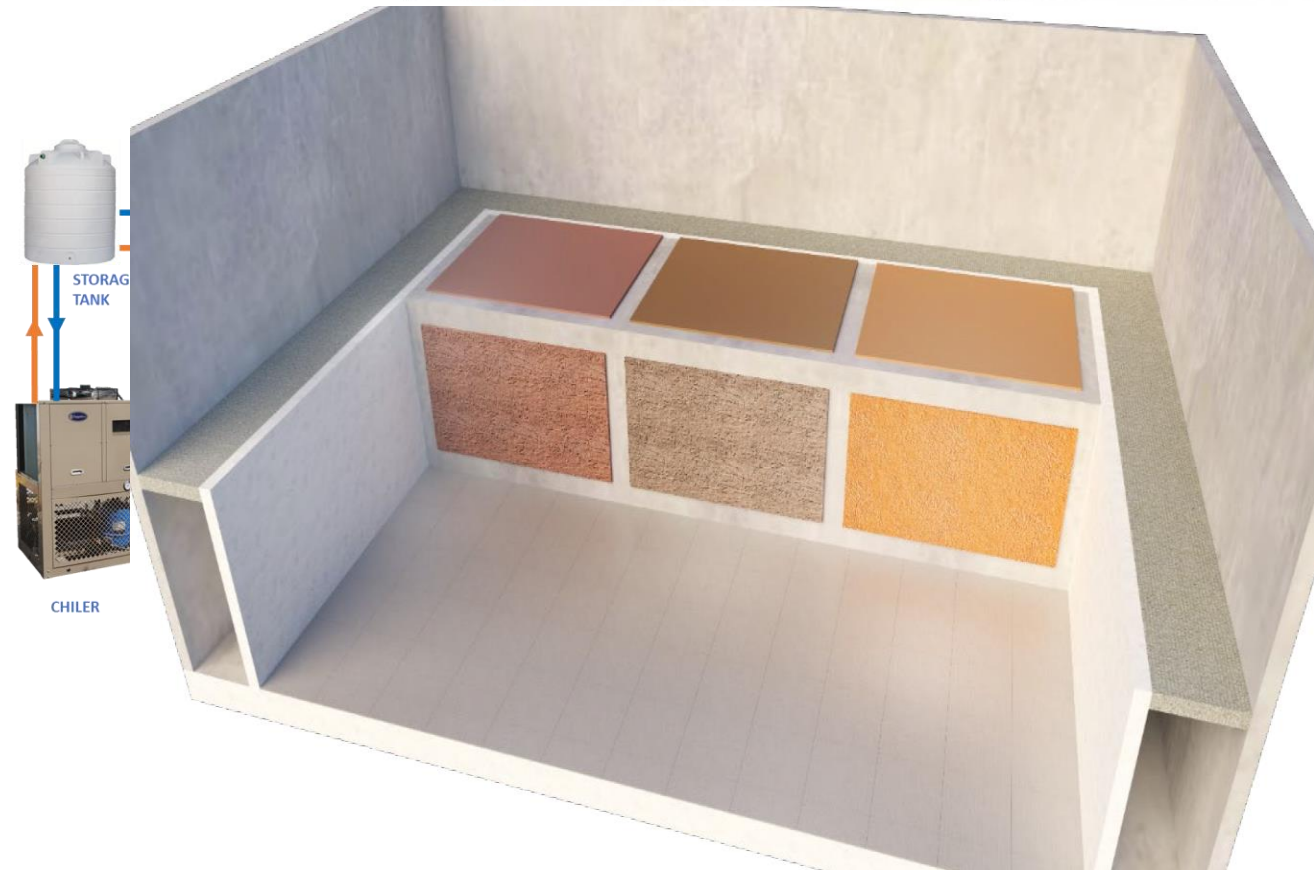
Building Envelope Analyzer - Concept

The facility comprises **3 calorimetric chambers** placed in a large hall.

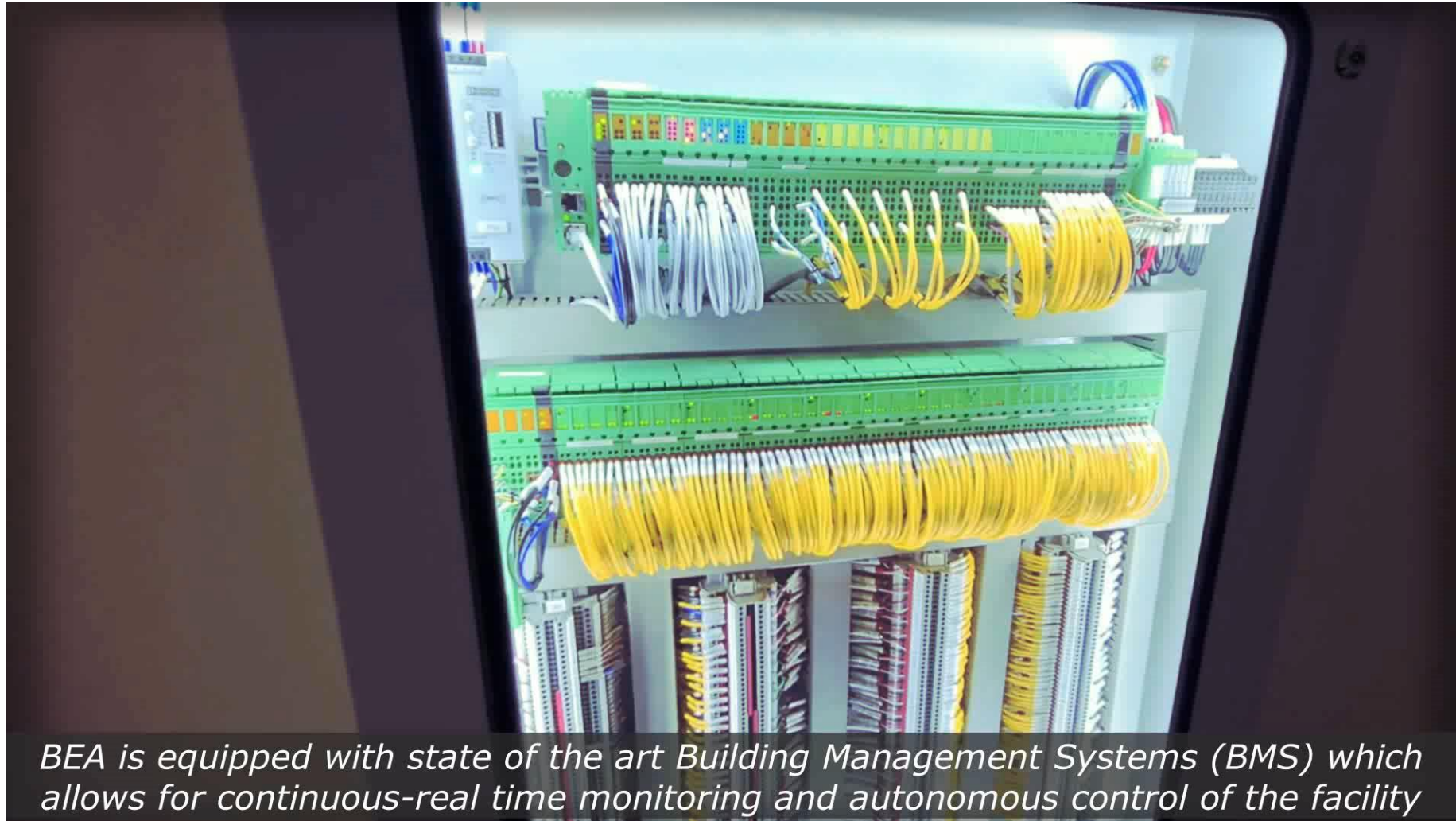
All chambers have **two surfaces (one wall and the roof)** exposed to the large hall where the **test specimens** will be installed.

The **large hall will simulate the effect of external weather**, while the 3 small chambers will be kept at comfort conditions.

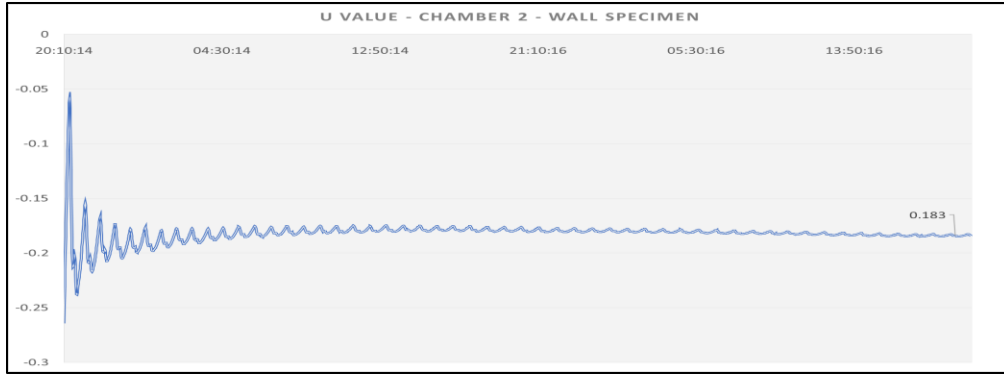
PURPOSE: *comparative assessment of building envelope insulation systems*



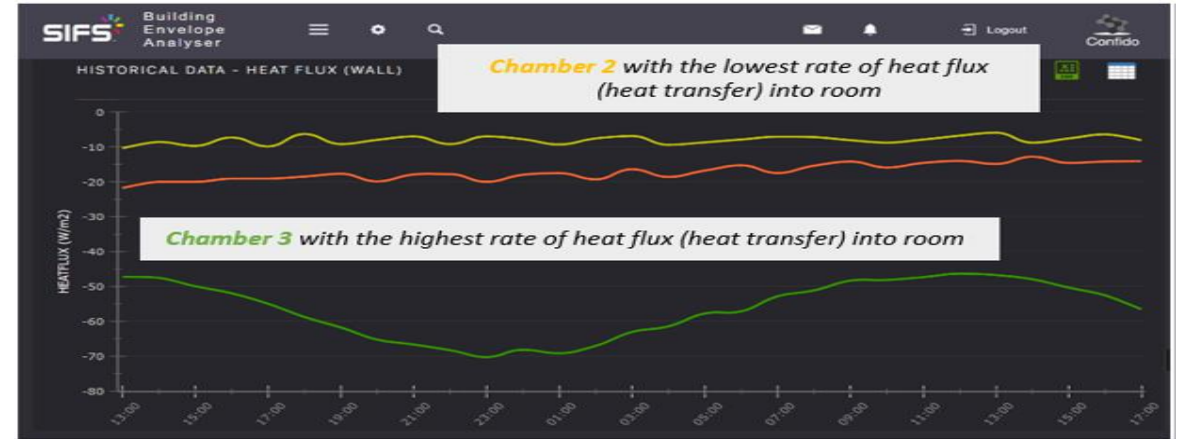
Advance BMS Systems for Data Analysis, Monitoring & Control of Facility



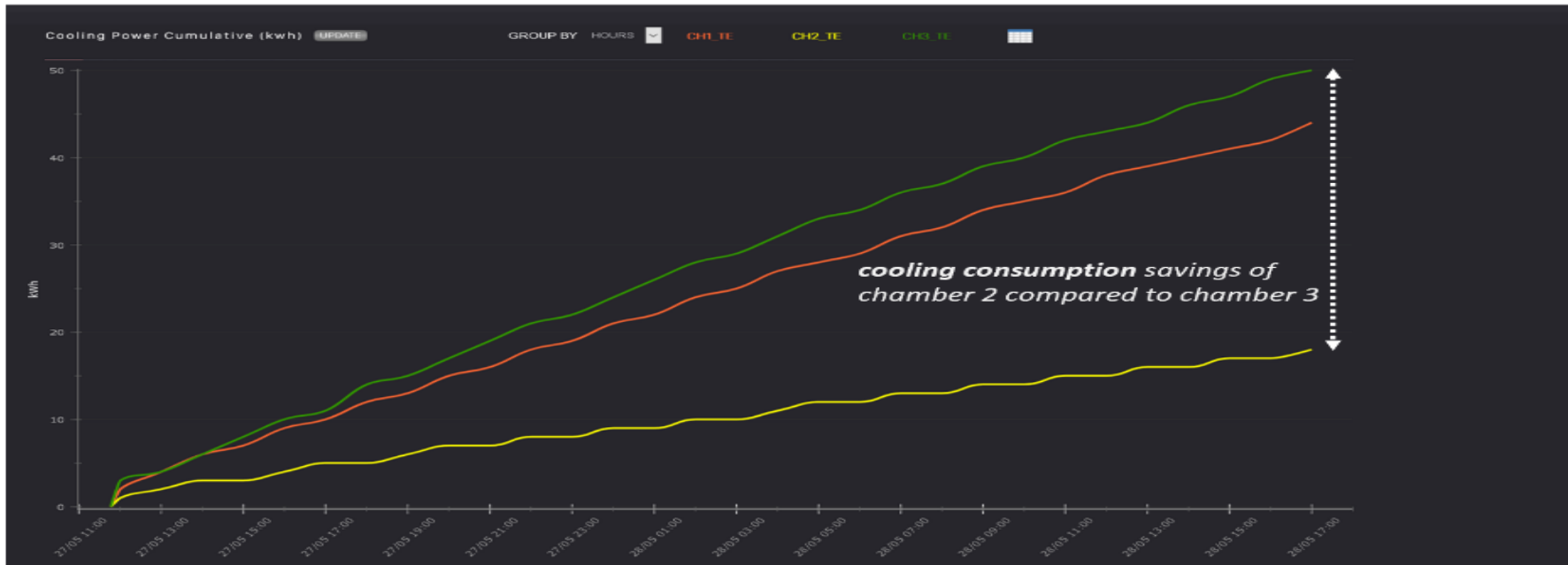
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Real time U value

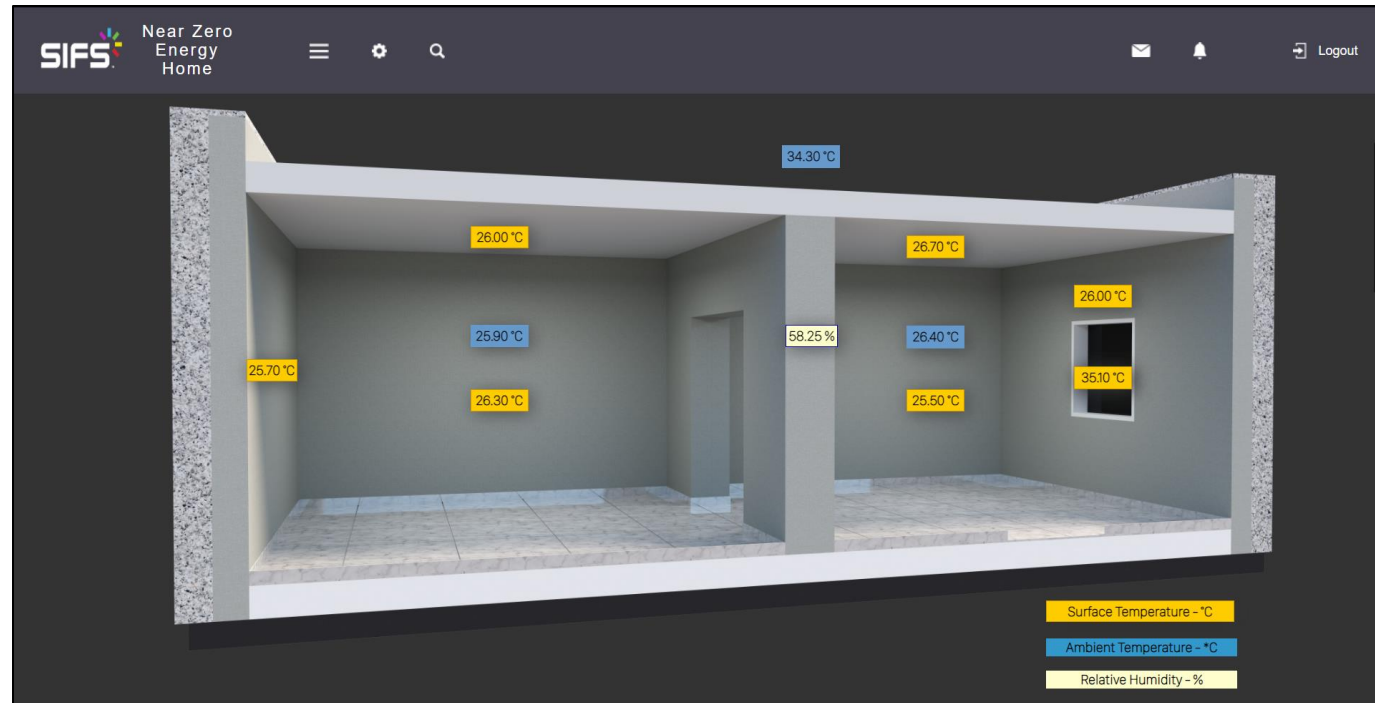


Heat Flux



Cooling Consumption

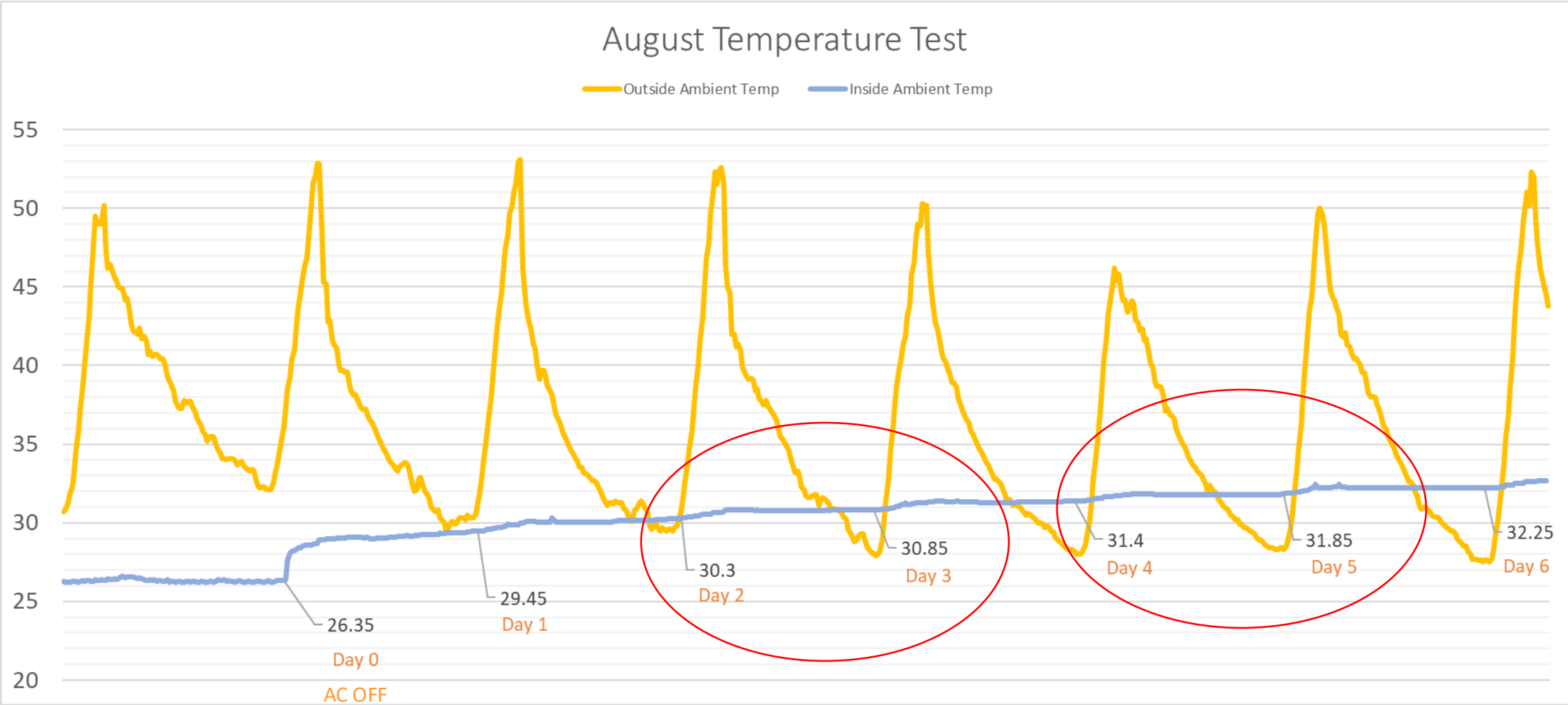
Net-Zero Energy Home – Test Facility



Wall U value: **0.25 W/m²K** Roof U value: **0.3 W/m²K** Window U value: **1.5 W/m²K**

Floor Area: 45 sqm Exposed wall area: 86 sqm

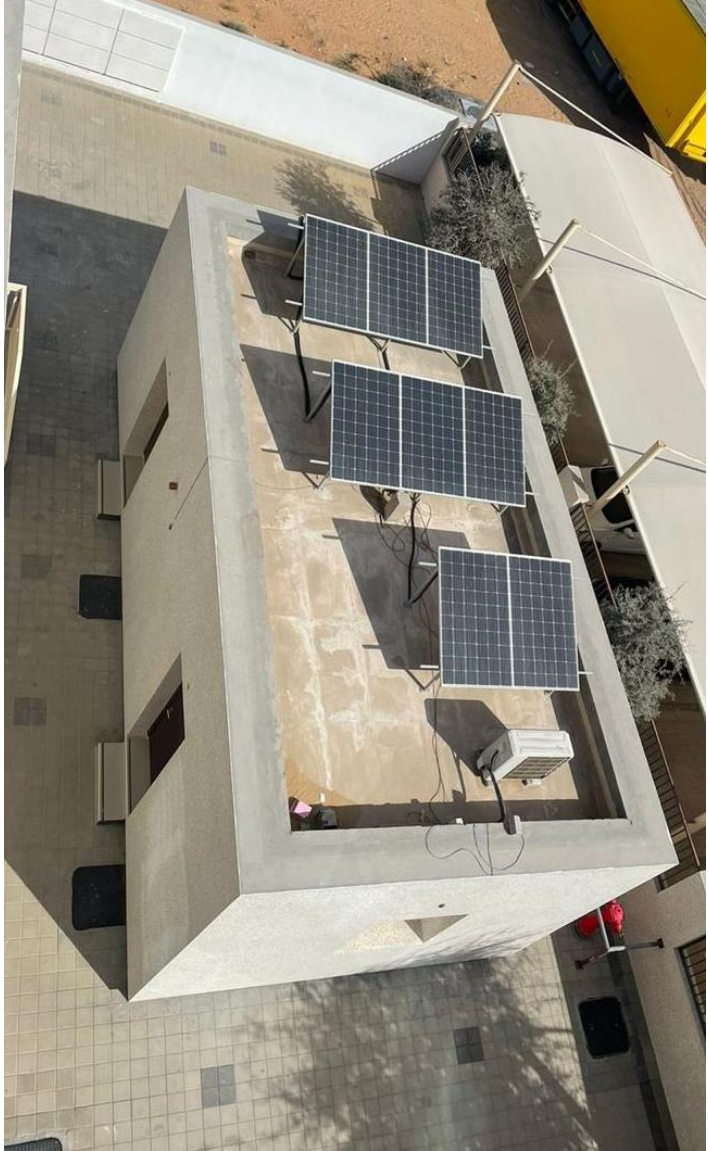
Net-Zero Energy Home – Test Facility



Net-Zero Energy Home – Test Facility



Most days, an average of 20% more energy is generated than the cooling requirement.



Thank You!

