



Achieving Net ZEB for the UniKL Sustainable Energy Living Lab

UNIVERSITI
KUALA LUMPUR
**SUSTAINABLE
ENERGY
LIVING LAB**



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**Workshop on
ZEB Development Program**
Zenith Hotel, Putrajaya
7 March 2024 (Thursday)
08:00 – 13:00

Building Project Team:
Client: Universiti Kuala Lumpur & MARA
Contractor: Smart Road System Sdn Bhd
Architect: NR Architects Sdn Bhd
ESD consultant: IEN Consultants Sdn Bhd

M&E Consultant: Ryan Hassan and Associates Sdn Bhd
C&S: Kezo Consult Sdn Bhd
QS: Jurukur Bahan Pendita Sdn Bhd
Solar systems: AGC Group
BIPV EPCC Contractor: Greenviro Solutions Sdn Bhd

KEY BUILDING DATA

areas, cost, energy and carbon



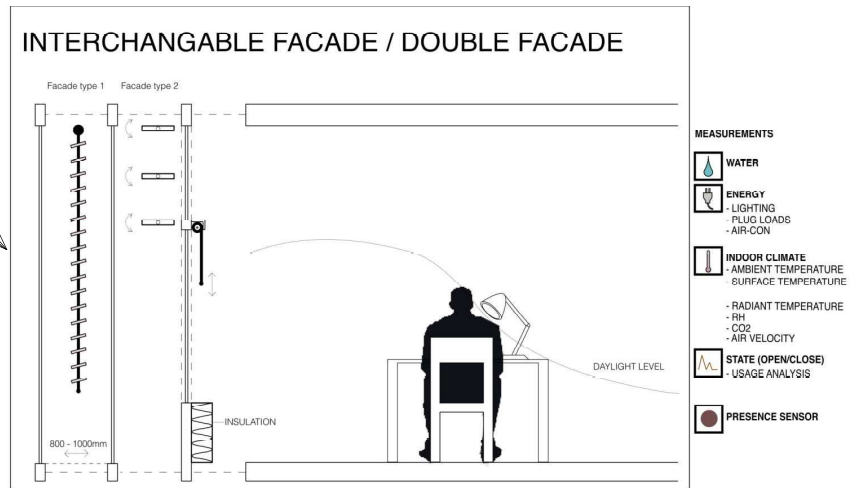
- Building name: Sustainable Energy Living Lab
- Owner: UniKL
- Location: UniKL-BMI, Batu 8, Jalan Sg. Pusu, Gombak, 53100 Selangor
- Building type: Academic Institution
- Total floor Area: 2392 m²
- Number of floors: 3 storeys
- Completion Date: 2024
- Net BEI (Building Energy Index): -49 kWh/m²/year (Incl. PV)
- ZEB (Zero Energy Building) category: A Zero Energy Plus Building
(106 MWh/year consumption vs. 220MWh/year production)
- CO₂e: Building is CO₂ negative by 80 ton CO₂/year
(corresponding to removing 40 cars from the from road)

LIVING LAB CONCEPT

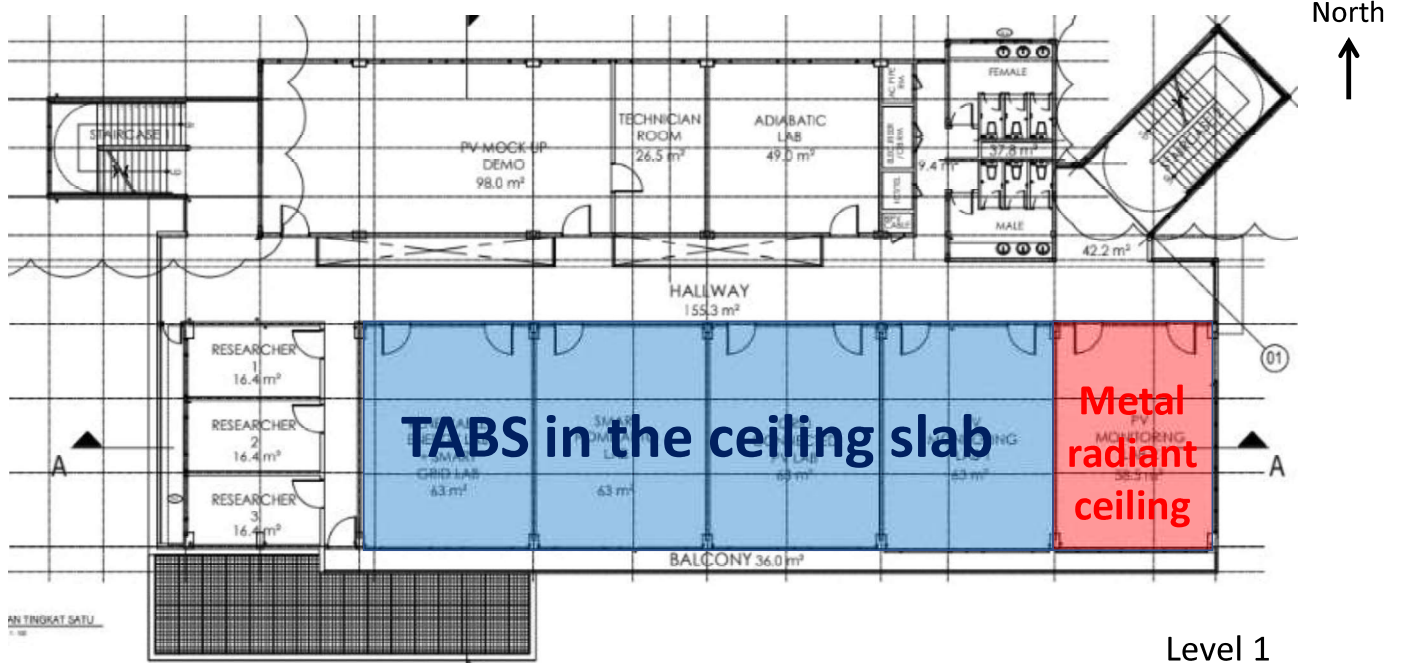
5 identical side-by-side rooms allow for comparative testing of building technologies during ordinary use



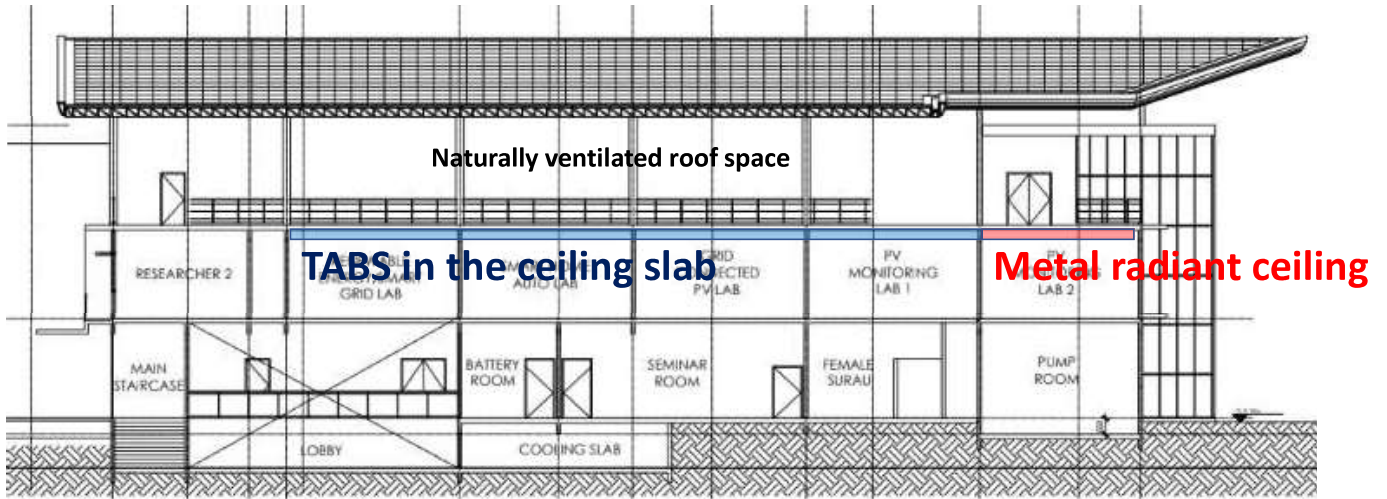
- 1) Excellent environment for University – Industry collaboration & applied research
- 2) Real-life testing of building products
→ 3rd party technical testing (by university staff / students)
→ user interaction observations and feed-back
- 3) Basis for many research projects (Ph.D. & M.Sc.) by staff and students



LIVING LABS (5 identical rooms)



Section



ENERGY EFFICIENT: 51% Energy Savings from a combination of passive and active design



Passive Designs:

- 1) Optimal orientation. Long façades facing North or South
- 2) Daylighting with lightshelves
- 3) Naturally ventilated corridors

Active Designs:

- 1) Energy efficient VRF chiller
- 2) Energy efficient VSD controls of pumps and fans
- 3) Energy efficient daylight responsive electric lighting
- 4) High temperature floor slab cooling
- 5) 3 different energy storage systems

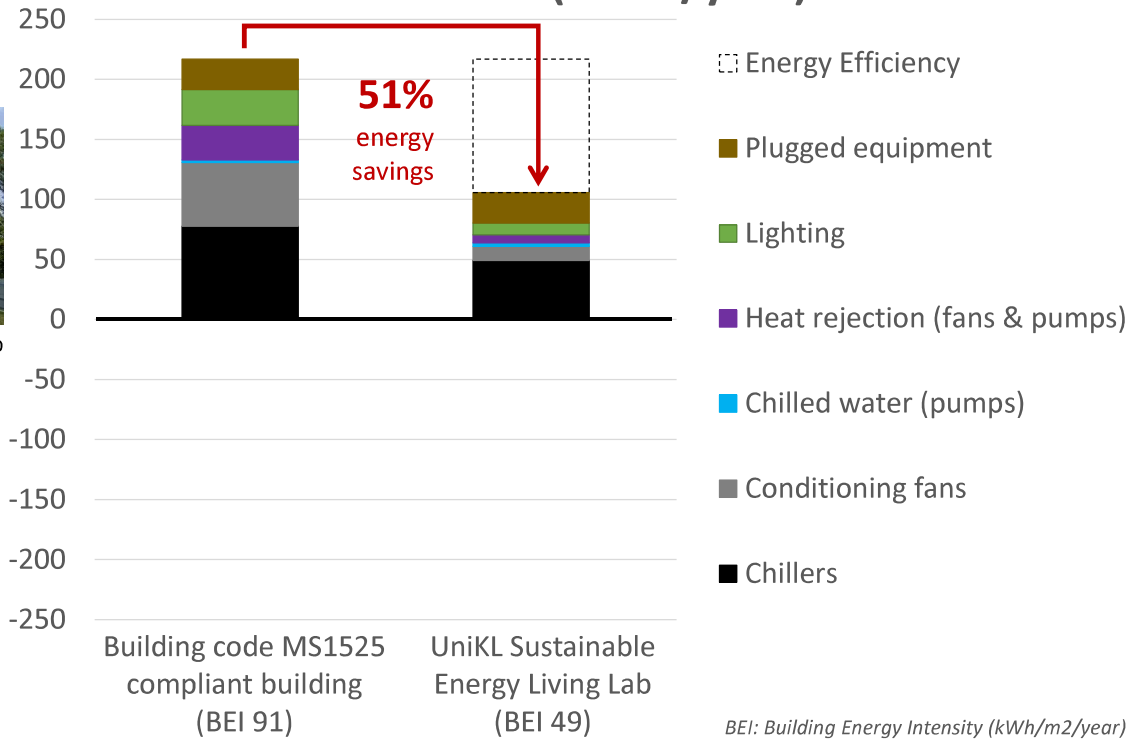
51%

Energy Savings



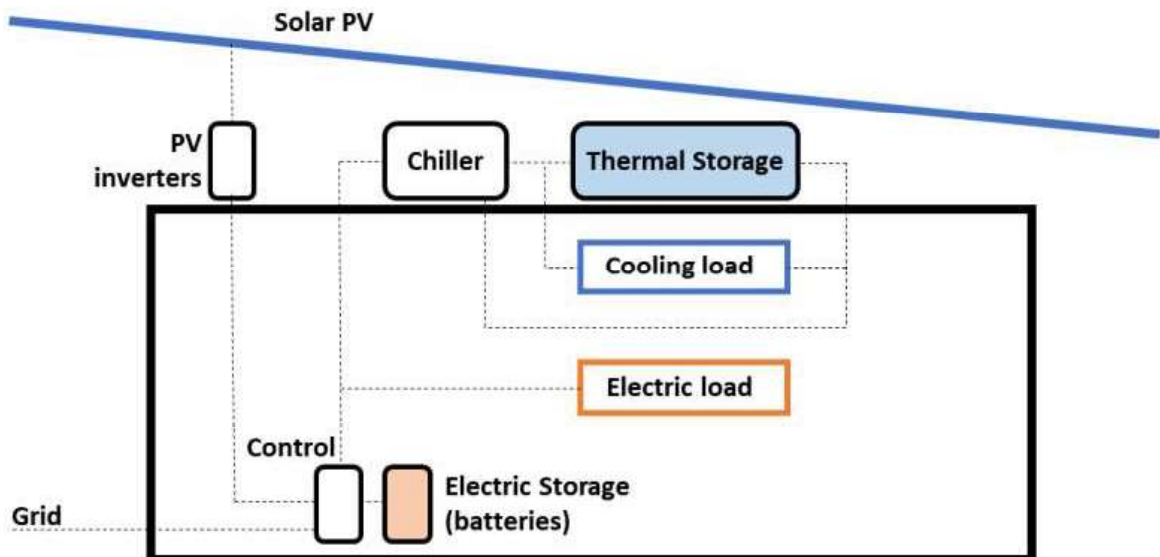
UniKL Sustainable Energy Living Lab

ENERGY BALANCE (MWh/year)



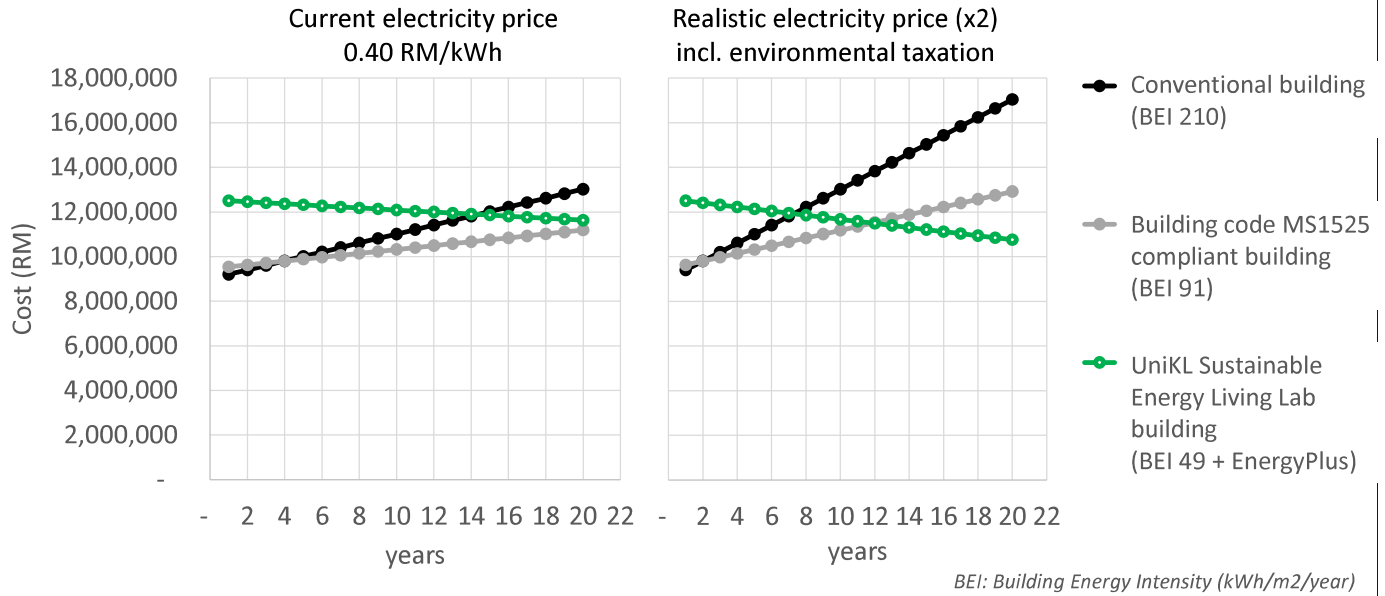
ENERGY SYSTEMS

solar energy stored in thermal storage (150 kWh) or electric storage (384 kWh)



LIFECYCLE COST

energy efficient building with/without solar PV and “real” price of energy



SOLAR PV INSTALLATIONS

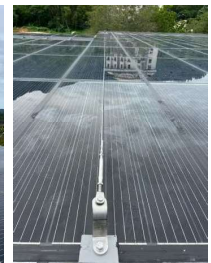
UniKL Sustainable Energy Living Lab (First ZEB in Malaysia)

Total PV Area: 1,046m²

PV System Capacity: 181 kWp (495 Modules)

Integration of PV Modules: Mullion-Transom Stick System & Rainscreen Cladding

| Skylight | Area (m ²) | System Capacity (kWp) | Notes |
|--|------------------------|-----------------------|--------------------|
| A. Vision Square – Mono-Si PERC Semi-Trans. PV | 950 | 167.6 | 14 % VLT (453 pcs) |

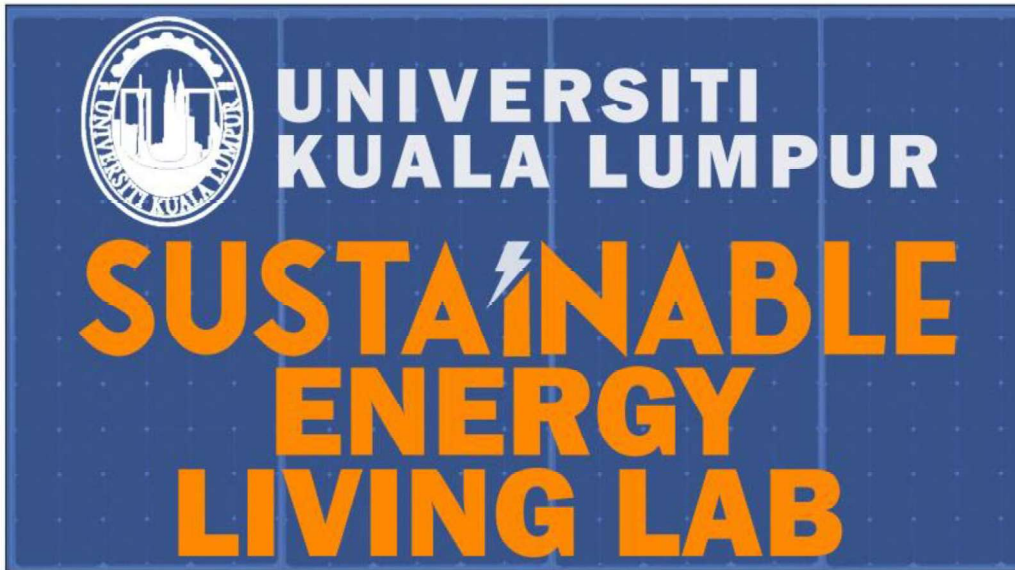


| Facade | Area (m ²) | System Capacity (kWp) | Notes |
|--|------------------------|-----------------------|---------------------------|
| B. Artlite Active – Mono-Si PERC Printed PV | 45 | 4.5 | Printed Solar PV (18 pcs) |
| C. Vision Square – Mono-Si PERC Semi-Trans. PV | 51 | 8.9 | 14 % VLT (24 pcs) |



PRINTED SOLAR PV INSTALLATIONS

1st in Malaysia



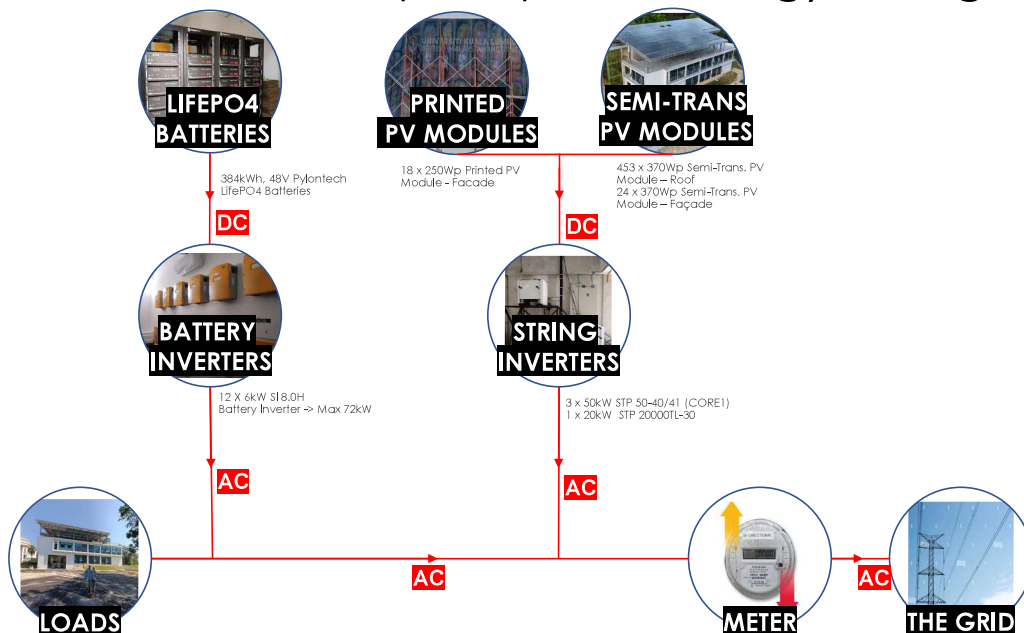
9 x 5 meter wall

Doubles up as University Logo and solar panel wall using the printed PV technology Artlite Active by AGC



BIPV SYSTEM DESIGN

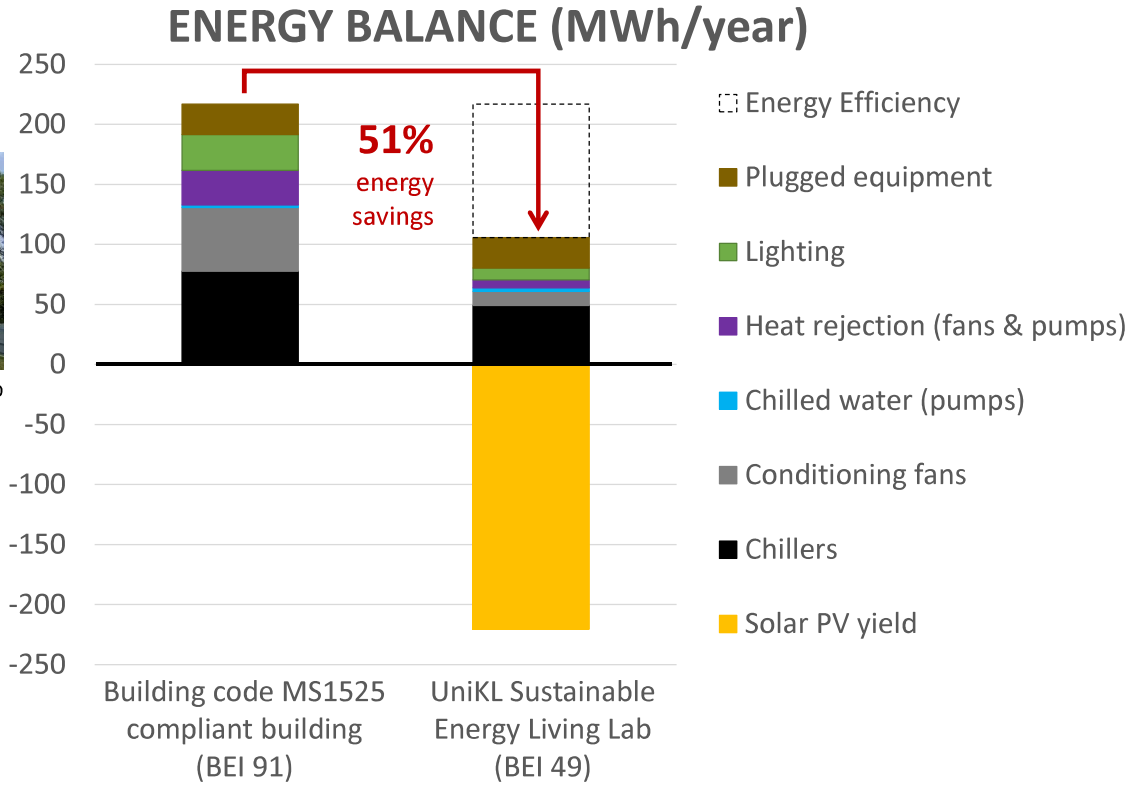
Grid Connected Solar PV (NEM) With Energy Storage System



181 kWp photovoltaics



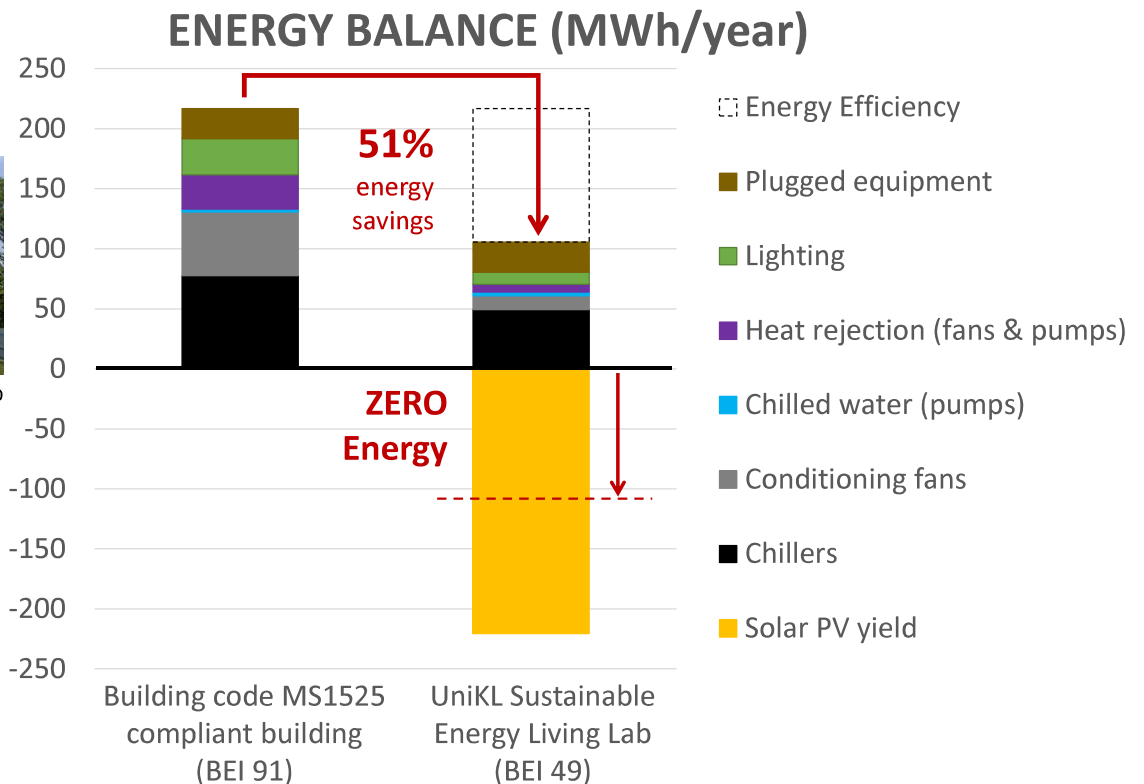
UniKL Sustainable Energy Living Lab



ZERO ENERGY



UniKL Sustainable Energy Living Lab

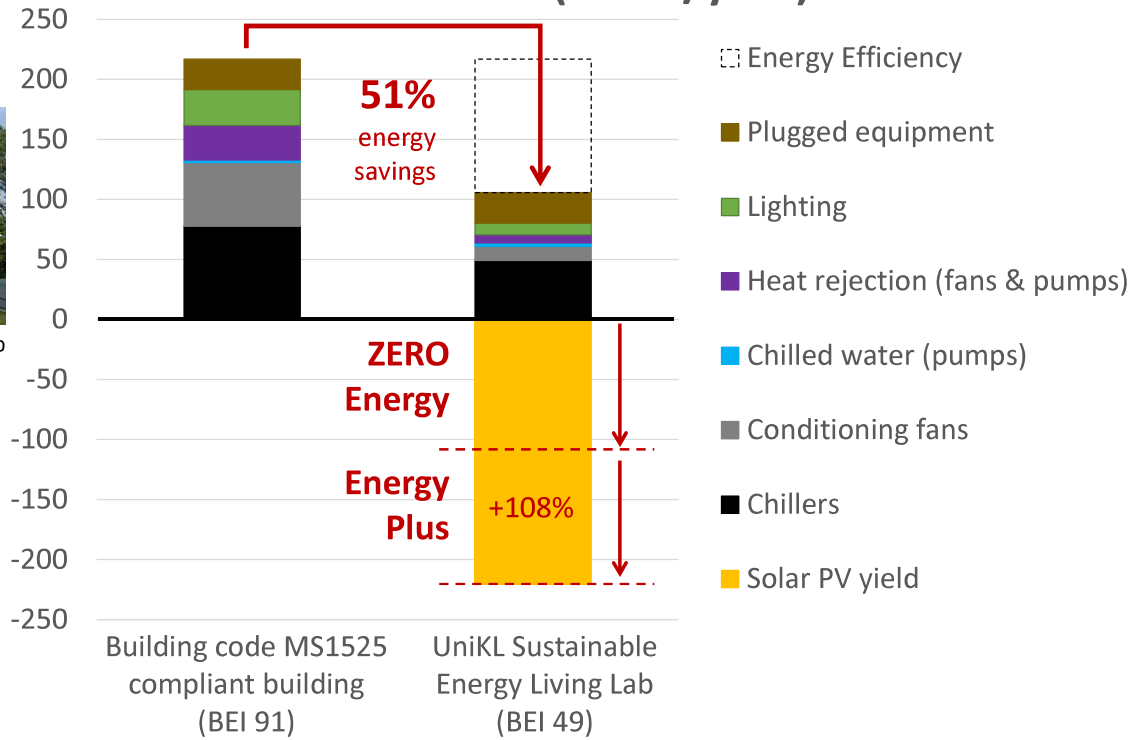


ENERGY PLUS



UniKL Sustainable Energy Living Lab

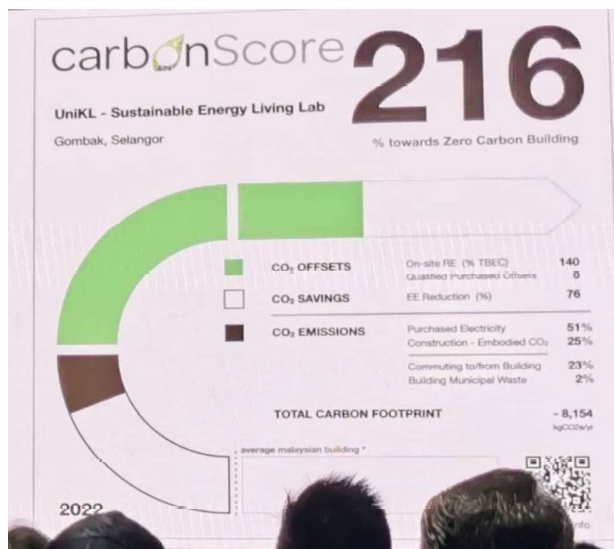
ENERGY BALANCE (MWh/year)



ZERO Carbon Certification for the UniKL Sustainable Living Lab building



GreenPass
Issued by SEDA, Malaysia



CarbonScore
Issued by malaysiaGBC, Malaysia

ARCHITECTURAL PARADIGM SHIFT for Solar Photovoltaics

Solar Panels integrated in Building Facades



CASE STUDY: UniKL Sustainable Energy Living Lab, Gombak, Selangor, Malaysia

Solar Panels integrated in Building Facades



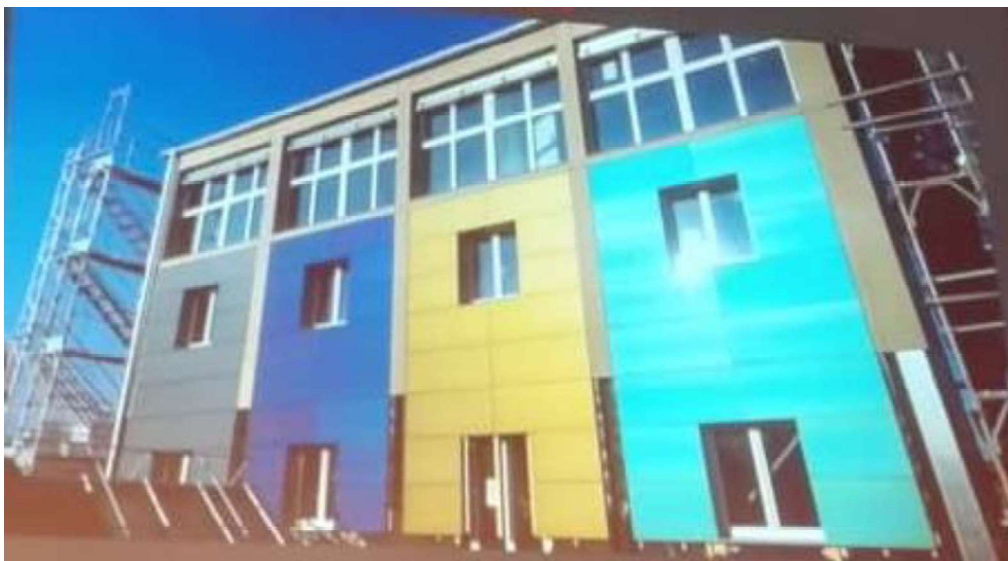
Solar facade panels as glass spandrel (left), as façade panels (middle), as printed artwork (right). The technologies are AGC (left and right) and Kromatix (centre).



Solar panel window façade (left) with the view from inside (right). Technology by AGC.

Source: <https://www.ien.com.my/post/dbkl-s-requirement-of-30-renewable-energy-for-residential-commercial-projects>

Solar Photovoltaics as colourful façade panels





Solar Façade Panels Create New Architectural Marvels

CASE STUDY: Copenhagen International School

Foto - Niels Hoffmeyer



Solar Façade Panels Create New Architectural Marvels

CASE STUDY: Copenhagen International School