



ZEB Renovation

for existing buildings

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People want ZERO Energy Buildings

but lack of awareness & misconceptions

Cartoon of a real conversation
I had when explaining my job as Energy Efficiency Consultant



Courtesy of Gregers Reimann/IEN Consultants Sdn Bhd / Illustration by Rachel Chen Ruiqi

The Star newspaper, Malaysia, 16 August 2013

Post Malaysia Stamp Series for Energy Efficient Buildings

We were the energy efficiency consultants for all three buildings
and call them our “stamps of approval”



.....but how do we make energy efficient buildings common place?

How to Accelerate Energy Efficiency?

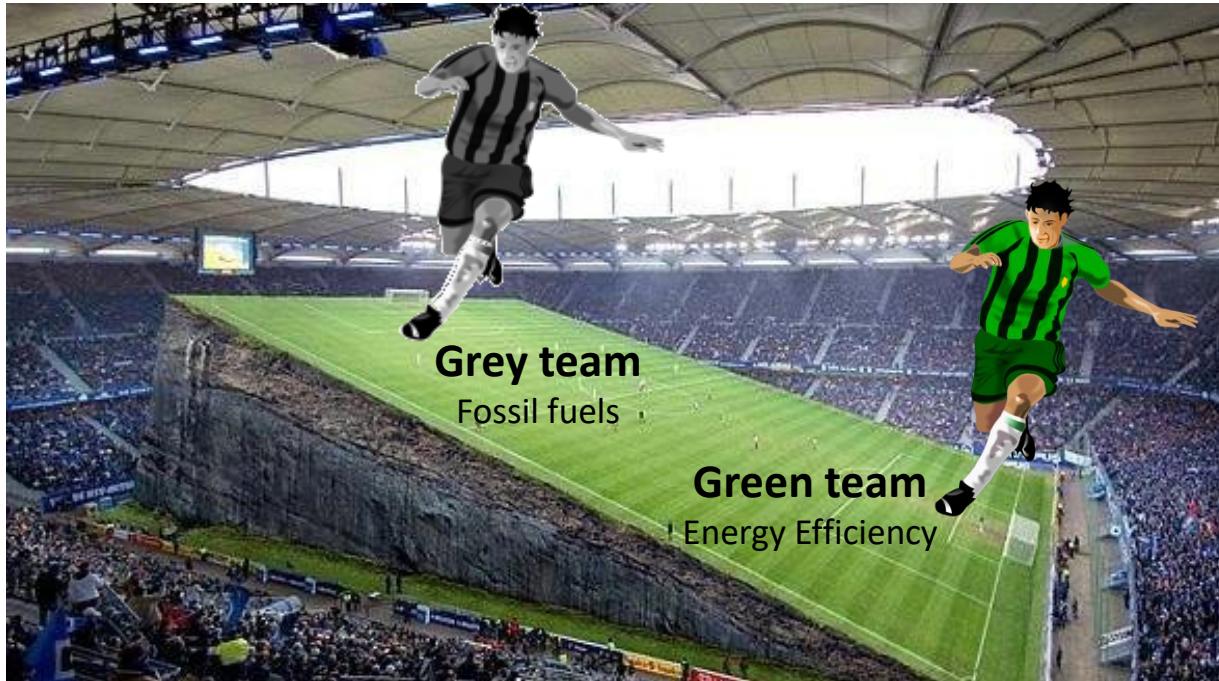


We need to talk about the Elephant in the Room: Energy Pricing

ENERGY EFFICIENCY

The playing field is NOT level

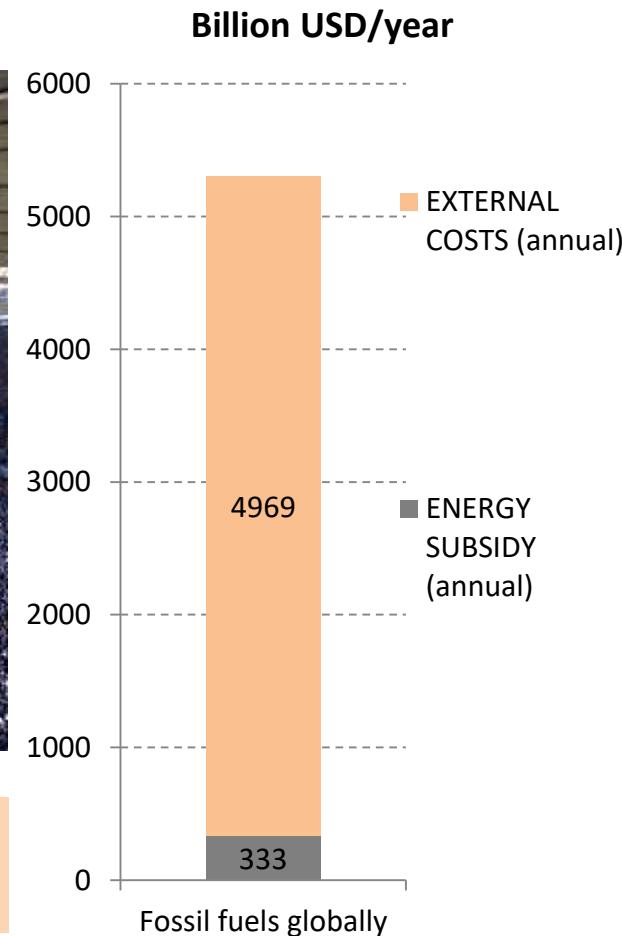
Fossil fuels are subsidized and underpriced. In fact, the annual cost of fossil is USD5.3 trillion – or 6.5% of the global GDP (Source: IMF, 2015)



EXTERNAL COST break-down:

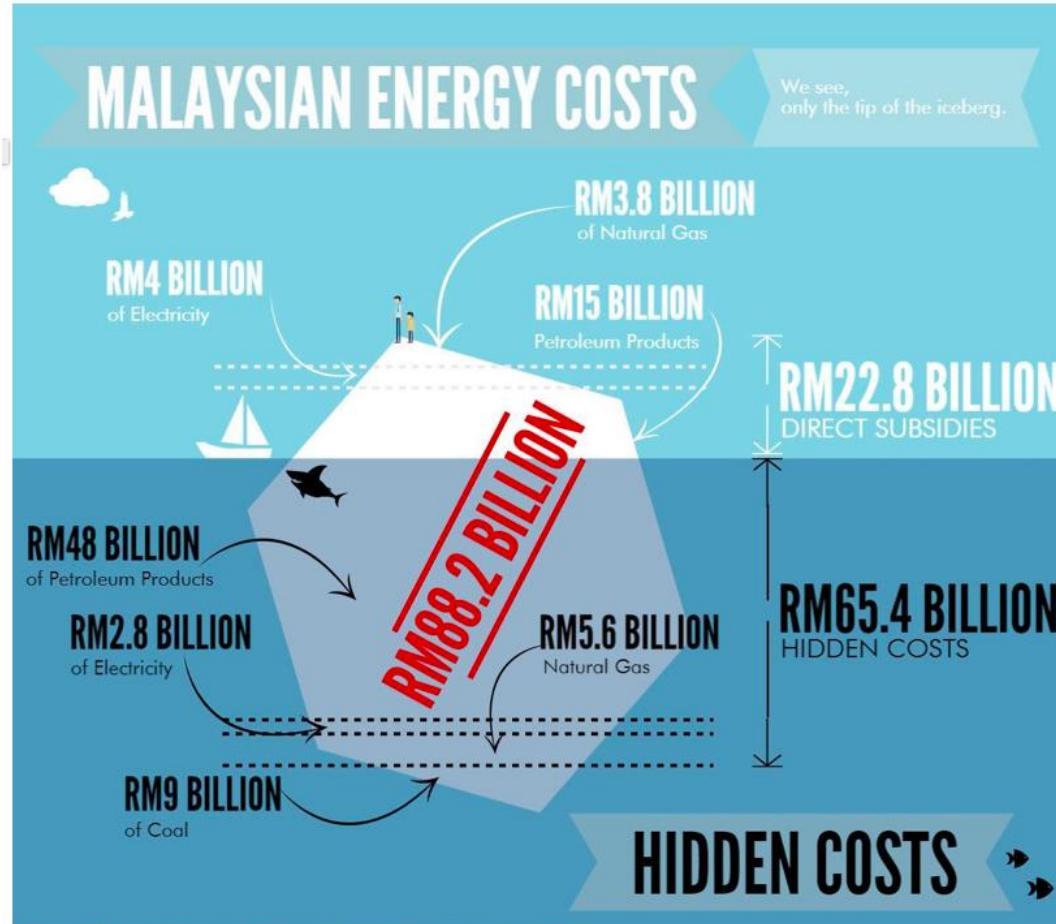
19% (Traffic congestion), 26% (Extreme weather) and 55% (Air Pollution Health Costs)

LEVEL PLAYING FIELD?



IMF Energy Figures for Malaysia

“Energy Subsidy Reform: Lessons and Implications”



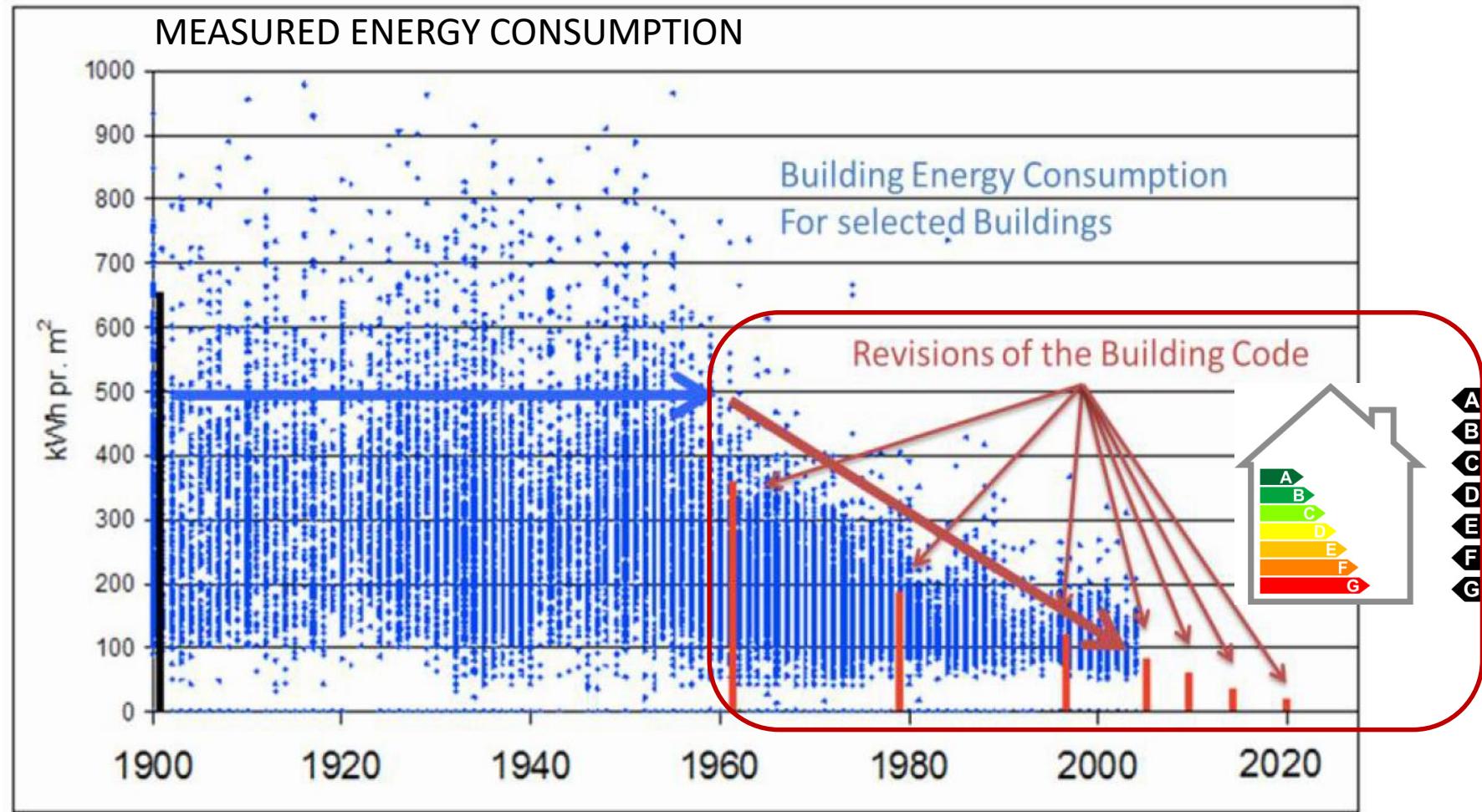
Source: IMF "Energy Subsidy Reform: Lessons and Implications", 2013



The Star newspaper, 5 Oct 2015

Energy Efficient Retrofit of Existing Building Stock in Denmark

50% Measured Energy Savings in Danish Buildings



50% reduction in heating per square meter for entire building stock

Let's strive for a similar improvement of the energy efficiency of the Malaysian building stock

Mandatory Energy Label for Buildings

www.nybolig.dk/soegeresultat-boliger?locationFreetext=københavn&postalDistrict=&roadName=&minPrice=-2147483648&maxPrice=2147483647&m

Property Size: 0 m² - 300+ m²

Lot Size: 0 m² - 2000+ m²

Number of rooms: 1 - 6+

Year: Before 1900 - 2016

Level: 0 level - 5 plan

Floor: Basement - 8+ floor

Energy: A - G

length of stay: 0 - 1000+

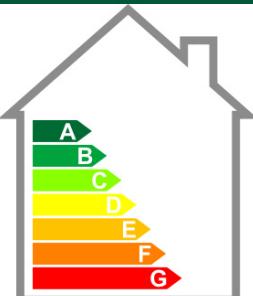
All labels

Show homes: 2,081 homes



A house icon with a green arrow pointing up and a red arrow pointing down, indicating energy efficiency.

Real estate search for Copenhagen



Mandatory Energy Label for Buildings

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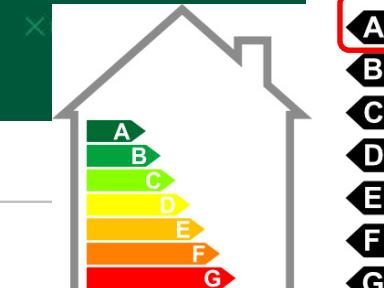
Floor: Basement - 8+ floor

Energy: A - A

length of stay: 0 - 1000+

Label A only

Show homes: 412 homes



Real estate search for Copenhagen

412 Energy Efficient Buildings (Label A)

www.nybolig.dk/soegeresultat-boliger?locationFreetext=københavn&postalDistrict=&roadName=&minPrice=-2147483648&maxPrice=2147483647&m=1

Nybolig

We have found 412 properties that might be something for you.

Customize search: +

Sort by: Select sort ↓

Kålagervej 24, 2300 Copenhagen S

177 m² 6 139 days Save

Type: Villa Cash price: 6,500,000

Nybolig

Strandlodsvej 18 C2, 2300 Copenhagen S

127 m² 6 309 days Save

Type: Townhouse Cash: 4795000

Nybolig

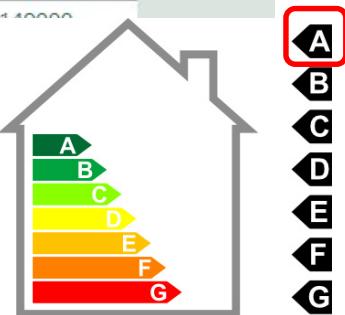
Weidekampsgade 57 5 2, 2300 Copenhagen S

79 m² 2 75 days Save

Type: Condo Cash: 3140000

Nybolig

Real estate search for Copenhagen



Energy Efficient Home (Label A)

www.nybolig.dk/ejerlejlighed/2300/weidekampsgade/260369/08tm0109

Weidekampsgade 57, 5. 2.
2300 Copenhagen S

type Apartment
Size 79
cash price 3149000
Owner Per capita spending, md. 2,213

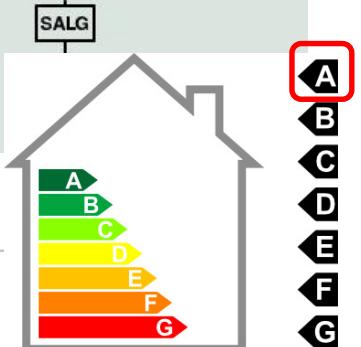
Monthly energy bill: kr 2213

Monthly energy bill: RM1307 monthly

79 m² 2 5th floor 2006 A -3% SALG

A

Real estate search for Copenhagen



Energy Efficient Building Labelling in Malaysia

Energy Labelling of Buildings in Malaysia in progress

Mandatory energy label for government buildings
(launched 2019)



TNB's Home Energy Report gives comparison of your energy bill to that of your neighbours
(launched 2015)

<https://tnb.opower.com/ei/app/dashboard>

Efficient Homes: 265 kWh

Similar Homes: 424 kWh

YOUR HOME: 922 kWh

How you're doing: 15 Aug–14 Sep
You used 118% more than similar homes

Great ☺☺
Good ☺
Need to improve

Explore my usage

What homes are compared?

Steps you can take right now

Clean your AC's filters
155 people do this
Added to your completed tips Undo

Hang laundry to dry
142 people do this
Added to your completed tips Undo

Energy Efficient Retrofit of Residential Building

Night Ventilation: 2°C lower temperature

real measurements done on houses in Malaysia



Kampung house

No air-con

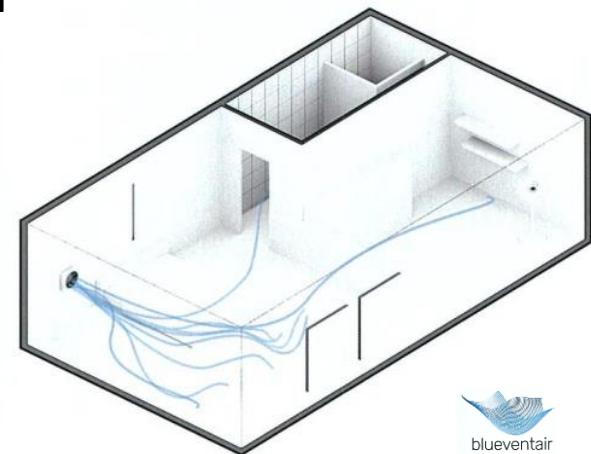
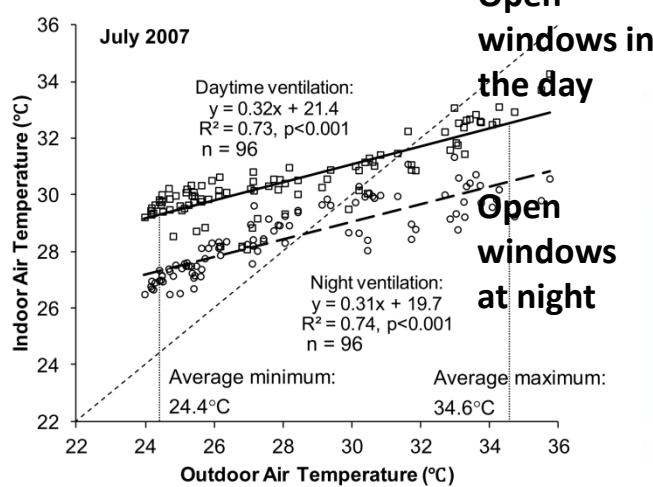
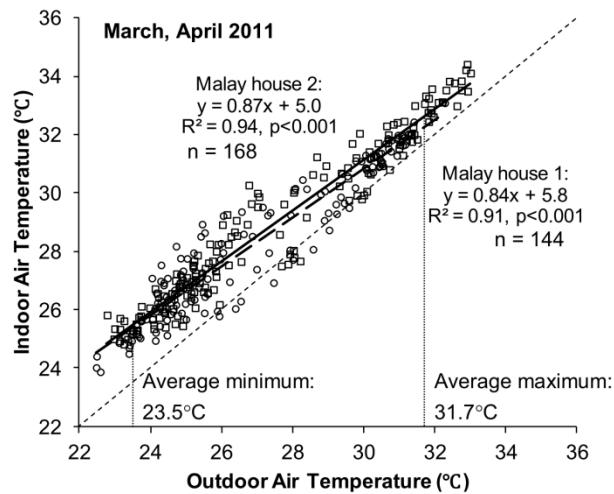


Terraced house

No air-con



Mechanical night time
ventilator with mosquito net
and/or air filter for haze



Energy Efficient Retrofit of Air-conditioned building by different approach to Thermal Comfort

New approach to Thermal Comfort: Hybrid Ventilation

Predicted Mean Vote (PMV)

6 Factors

- Garment Insulation
- Activity Metabolic Rate
- Air Speed
- Air Temperature
- Radiant Temperature
- Humidity

*Air and Radiant Temperature can be represented by a single value called Operative Temperature.

Thermal Comfort Input Parameters For Hybrid Spaces

CLO Level

- Briefs + Socks + Long-sleeve Shirt + Trousers = 0.56 (Conservative)
- Briefs + Socks + Short-sleeve Shirt + Trousers = 0.50 (Realistic)

Activity Level

- Office: Typing = 1.1
- Studio: Standing = 1.4

HYBRID VENTILATION: Air-con with fans

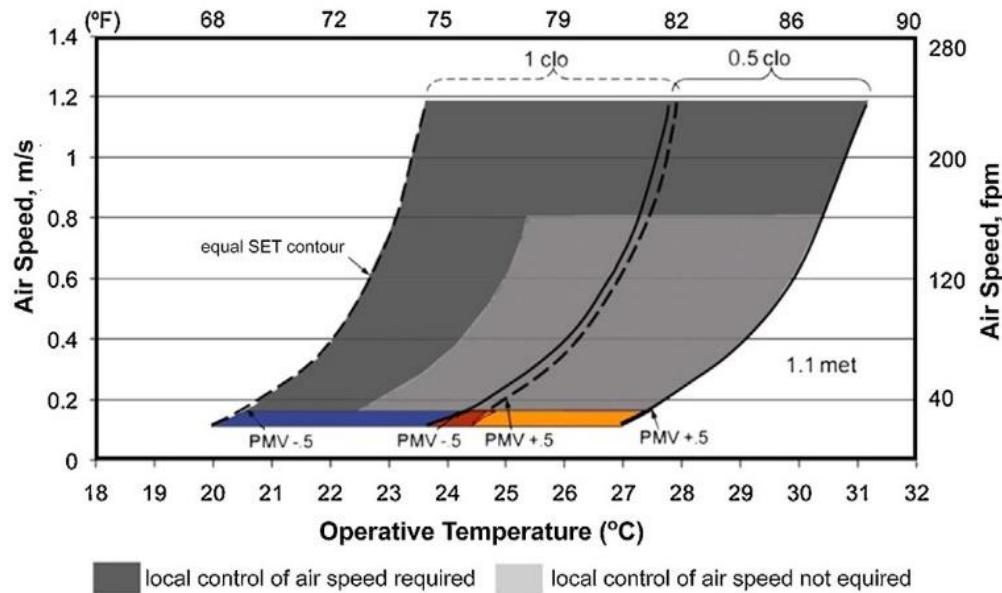
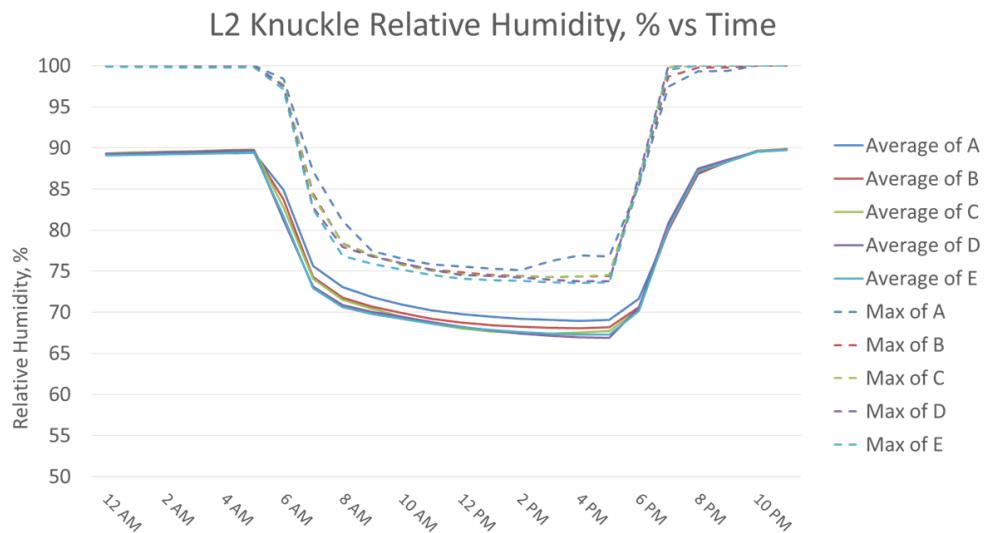
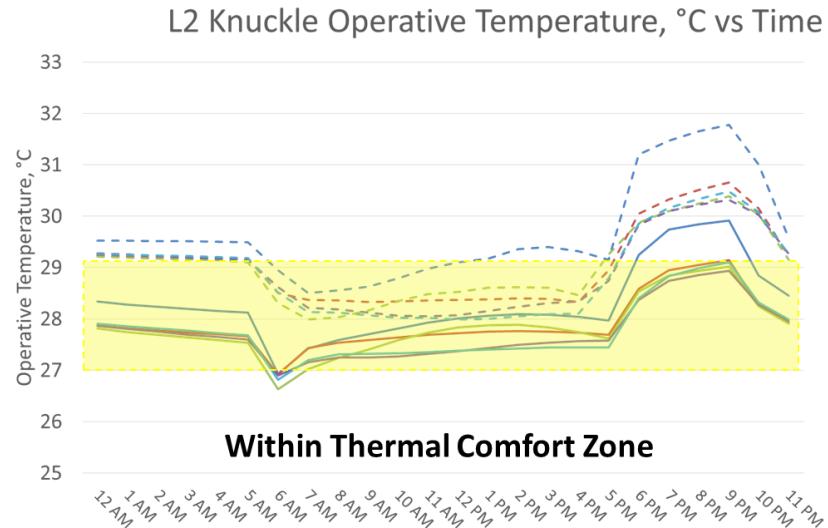


Fig. 5. Acceptable ranges of operative temperature and air speeds, reproduced from [24].

Thermal Comfort

(annual simulation for hybrid ventilation space)

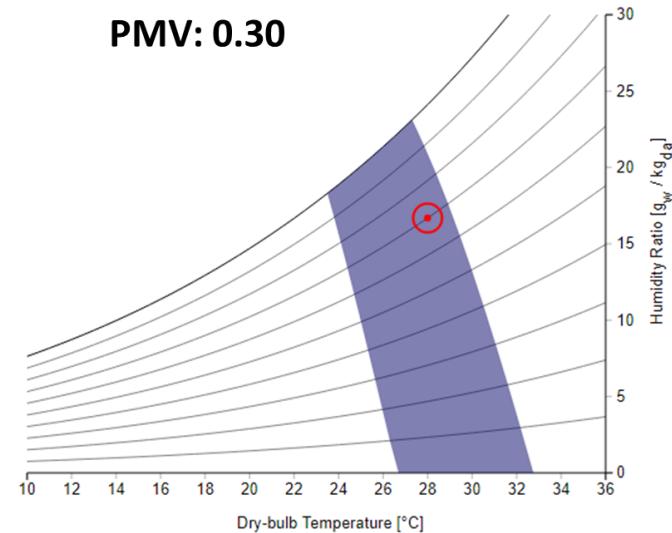


Design Air Temperature Range

Thermal Comfort Zone Based on
MET: 1.2
CLO: 0.56

Operative Temperature: 28°C
Relative Humidity 70%
Air Speed: 0.7 m/s

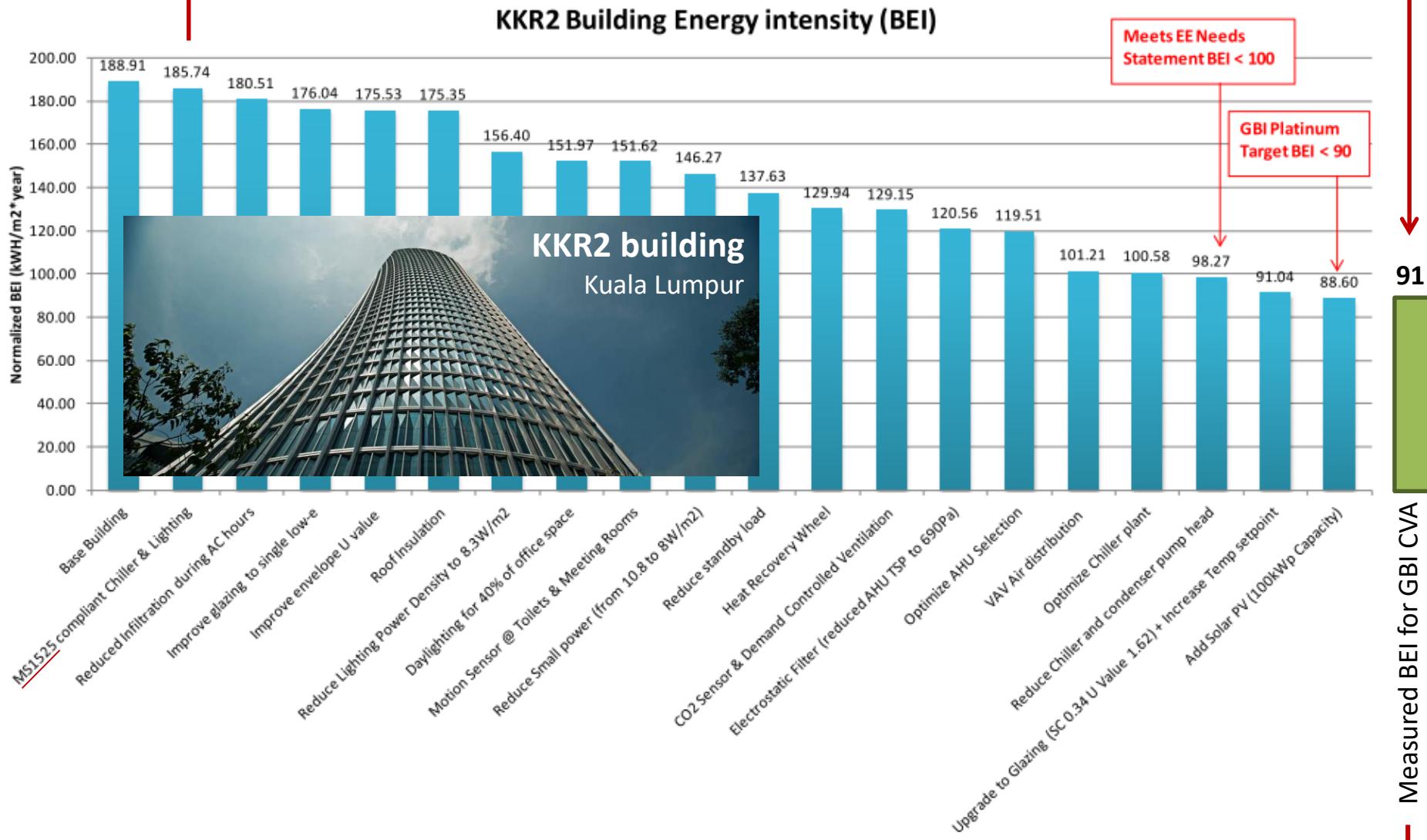
PMV: 0.30



Energy Efficient Office Building

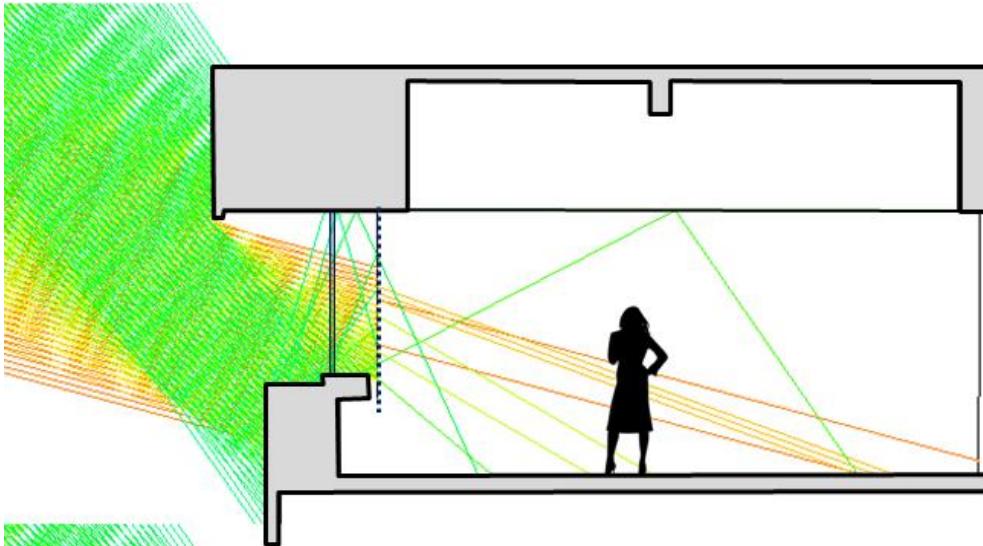
51% more energy efficient
than the MS1525 standard

51% lower energy consumption than MS1525



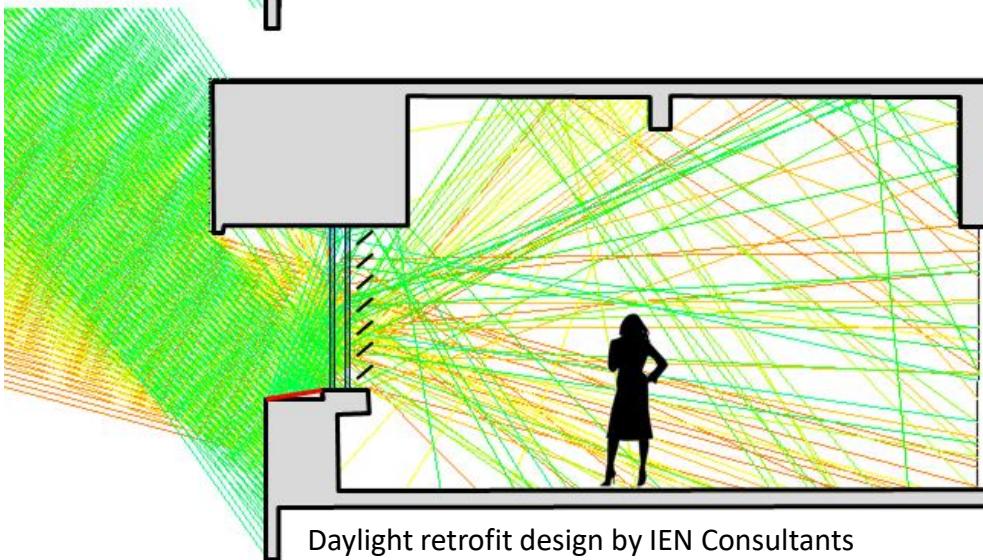
Energy Efficient Retrofit of office building (53% measured energy savings)

Retrofit & Improved Thermal Comfort



BEFORE RETROFIT

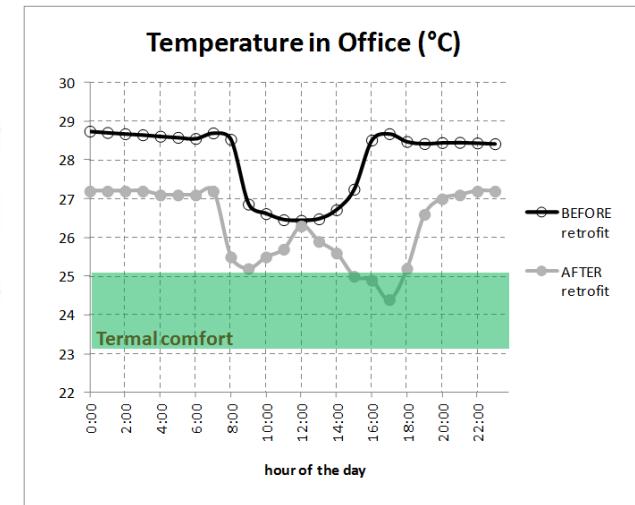
- Vertical blinds blocking most of the daylight
- Suspended ceiling



Daylight retrofit design by IEN Consultants

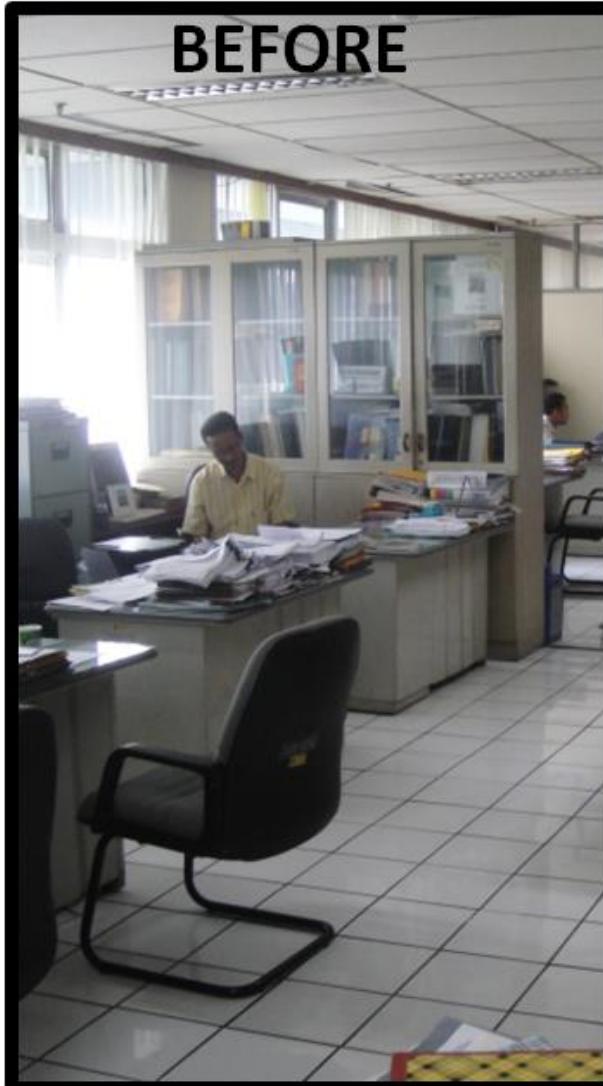
AFTER RETROFIT

- Mirror lightshelf on external ledge reflecting diffuse daylight onto the high ceiling (suspended ceiling removed)
- Perforate venetian blinds
- Extra window pane



- MEP retrofit: Energy Efficient chiller (VRF) and demand side ventilation with CO₂ sensors

53% Measured Energy Savings



| Energy | |
|-----------------------|-----------------------|
| 170 | 80 |
| kWh/m ² yr | kWh/m ² yr |
| Comfort | |
| 26-31 | 24-26 |
| temp (°C) | temp (°C) |
| 75 | 55 |
| RH (%) | RH (%) |
| Noise | |
| 57 | 45 |
| dB | dB |
| Daylight | |
| No | Yes |
| View out | |
| No | Yes |

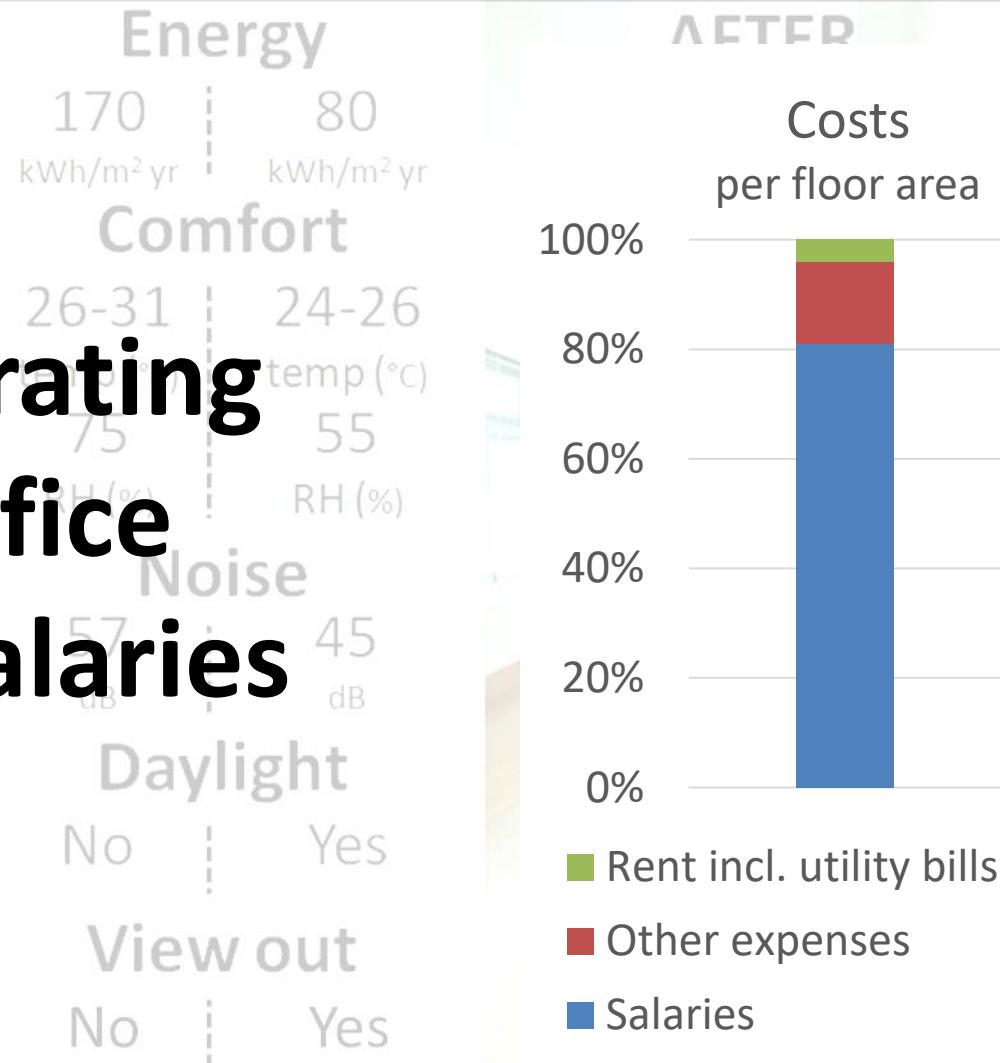


Much nicer working environment

53% Measured Energy Savings



Highest operating cost of an office building is salaries



Source: Expenses at IEN Consultants office in Kuala Lumpur

Malaysian Office Workers: Unproductive 66 days per year!

Amount of time that average Malaysian worker is either absent or suffering from presenteeism

NB. The UK figure is only 30 days per year

**MOST EMPLOYERS DO NOT REALISE THAT
HEALTH IS WEALTH...**



**EMPLOYEES UNDER-PERFORMING IN POOR WORKING ENVIRONMENT DESPITE
81% OF COST ARE GOING TO SALARIES**

In Conclusion:

Buildings are like a leaky bucket with lots of unnecessary wastages

ENERGY SUPPLY
(renewable) energy



ENERGY STORAGE
electric cars/batteries/thermal

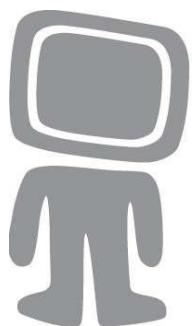
ENERGY DEMAND

Let's plug the holes!

And make buildings more healthy!



Thank you



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IEN Consultants Expert Staff



IEN Consultants

Hover the cursor over a person's head to see a short presentation and click to see a detailed personal description or click on a name in the list below.

We are a diverse group of individuals

**5 different degrees
6 different nationalities
4 LEED AP
8 GBI Facilitators**

IEN Consultants

3.2 million square meters
of green building space



Gregers (MD) Poul (Founder)

Malaysia | Singapore | China

