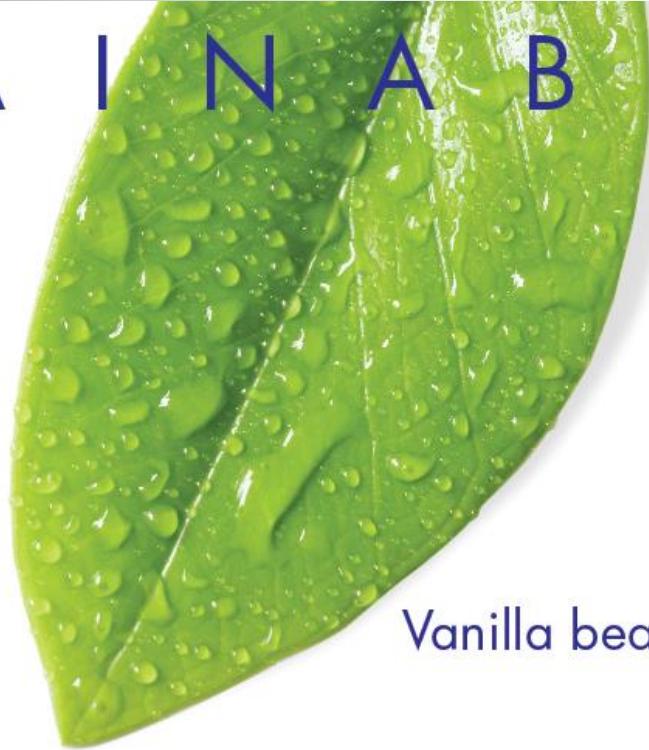


S U S T A I N A B I L I T Y



Green today

Vanilla bean tomorrow.

All-inclusive approach to sustainability

May 14th, 2019



Indochine Engineering

Leading multi-discipline consultancy (MEP/C&S) in South East Asia

Recognized provider of 'good engineering' services to 'good teams' achieving great projects.

Strong team of multi-discipline engineers with a reputation for high quality & sustainable assets.

We wish to be involved with great teams on great projects for good clients, who recognise value in high quality assets.

We wish to be involved with buildings that work well.

**Throwback
to 2011...**



Indochine
Engineering



Innovative Building Services Adding Asset Value in Vietnam

prepared by Carl Gay
Tuesday, April 19, 2011

Throwback to 2011...



Indochine
Engineering



Sustainability **Which Buildings Benefit? Who Should Lead?**

prepared by Carl Gay
Tuesday, May 31, 2011

Throwback to 2012...



Sustainable Quality

A Showcase of 2012

Wednesday, December 5th, 2012

Innovative Building Services - Energy

**At that
time...**

- Displacement air conditioning such as RMIT sports hall
- Ice storage as at DB Office Tower
- Glazing/ shading – low-e rather than double glazing
- Demand - controlled exhaust system for dryers, kitchens and bathrooms
- CO2 monitoring/ Outside air control
- Heat recovery - air
- Heat recovery - chillers
- Heat pumps
- Solar
- Efficient chillers
- Ammonia chillers
- Insulated buildings vs ventilated buildings
- Natural ventilation
- Building management systems
- Testing & commissioning
- Training

At that

time... **Innovative Building Services – Hydraulics (P&D)**

- Tradesmen – plumbers & drainers
- Soil/ waste pipework
- Rainwater harvesting
- Water management
- Grey water reuse eg irrigation or flushing
- Laundry water recycling
- Low water usage sanitaryware eg waterless urinals
- Sewage treatment plants
- Lower pressures (more zones)
- Dual pipework systems
- Replace steam boilers with electric laundry equipment

At that
time...

Innovative Building Services – Electrical

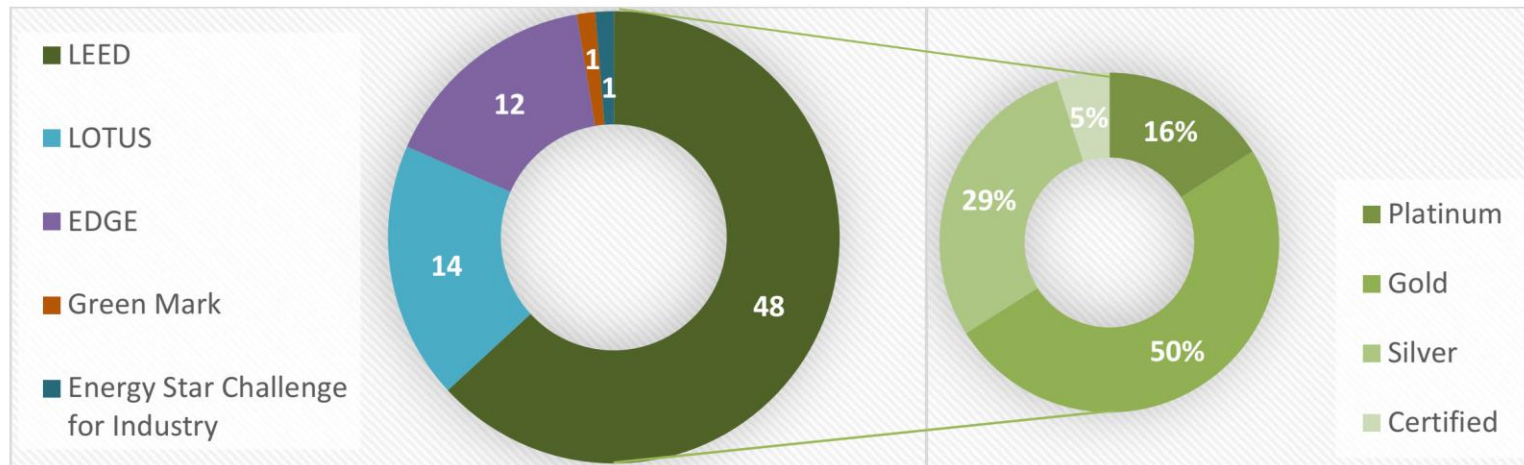
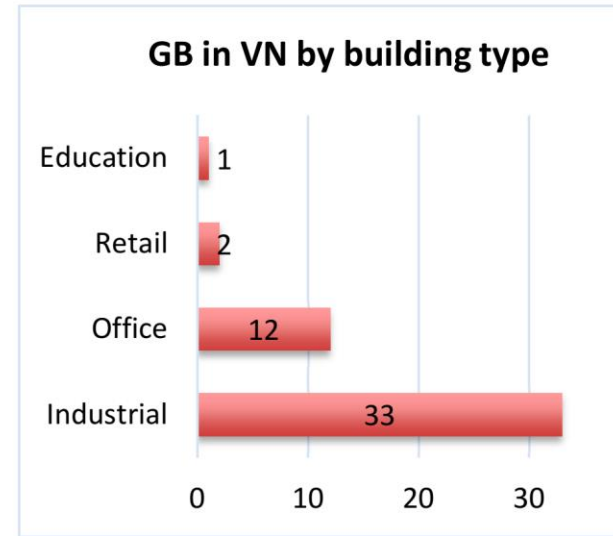
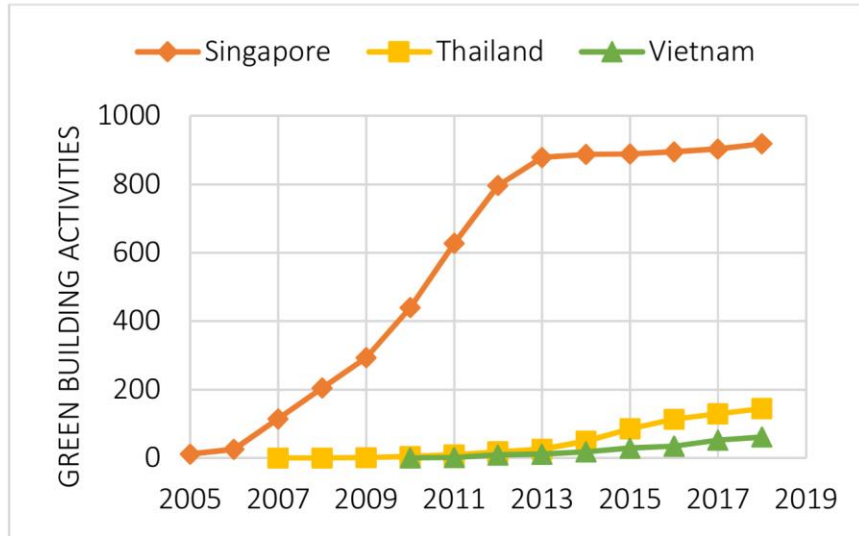
- Earthing & switches!
- Appropriate circuit protection
- Energy efficient lights
- Less lights... Jevons paradox
- Site generation
- Renewables – wind, solar, biomass
- Co & tri-generation
- Appropriate conductor sizes (less voltage drop/ less fires)
- Fiber optic communication – triple play
- Wireless/mesh communication systems

At that

time... **Innovative Building Services – Environment**

- Green walls (inside)
- Green roofs (outside)
- Renewables – solar, wind, biomass
- Green buildings
- Low energy/ carbon buildings
- Sustainability benchmarking
- Sustainability certification (LEED, Lotus etc)

What have not been mentioned?



No. of Green building projects by Rating tool

LEED Certificate by level

Innovation of yesterday

- ✓ LED lighting
- ✓ Occupancy sensing
- ✓ Low-e double glazing
- ✓ Demand fresh air/ Exhaust
- ✓ Heat recovery – air Chillers
- ✓ BMS
- ✓ STP for irrigation
- ✓ E-17 filtration
- ✓ Low water usage fixtures
- ✓ Demand control ventilation (CO2)
- ✓ Low water usage fixtures
- ✓ STP

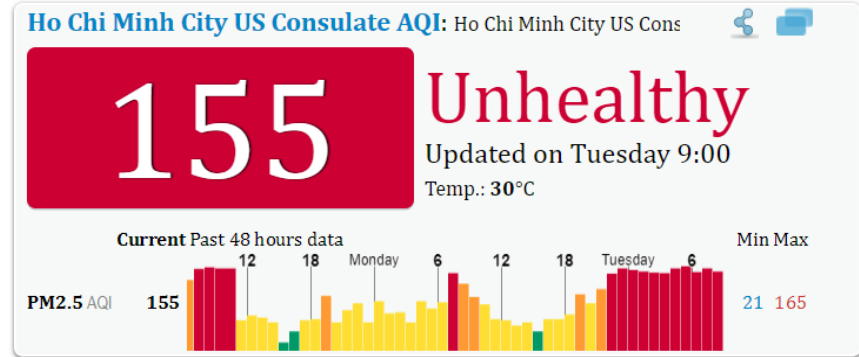
ADOPTED!

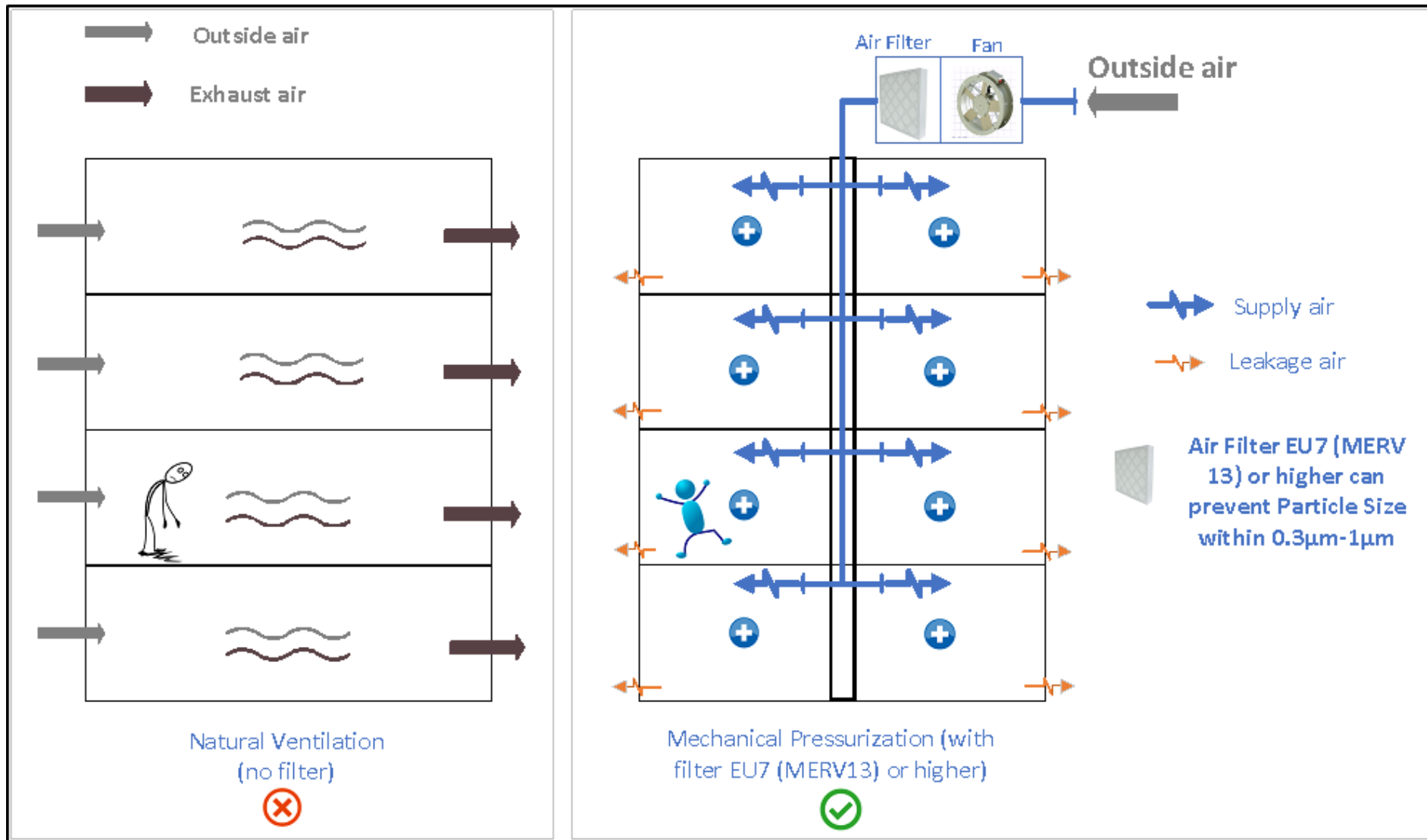
Innovation of today

- Dedicated outdoor air system (for Residential)
- CFD
- Daylighting
- Renewable energy
- Waste to energy

Will it be standard tomorrow?

Who and what drive the market?

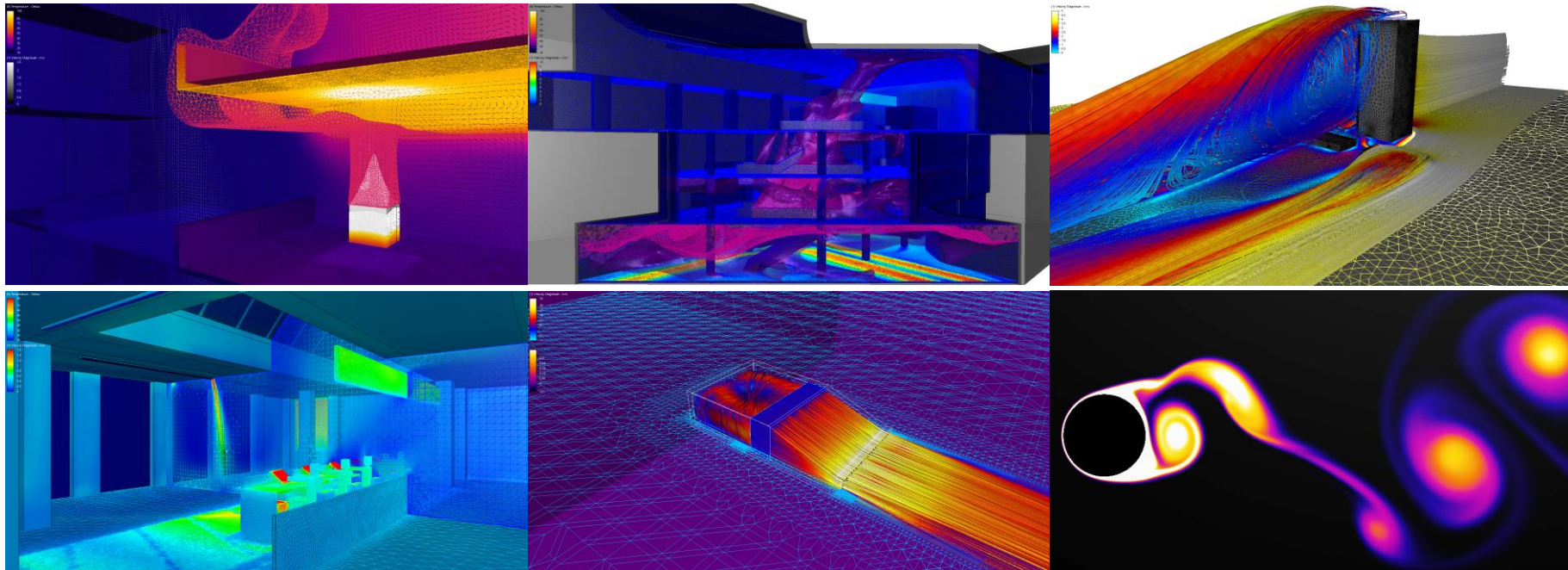




Good HVAC design can be even *better*
with a **CFD analysis**

Process:

1. Create geometry
2. Define physics
3. Solve with computers
4. Analyze results

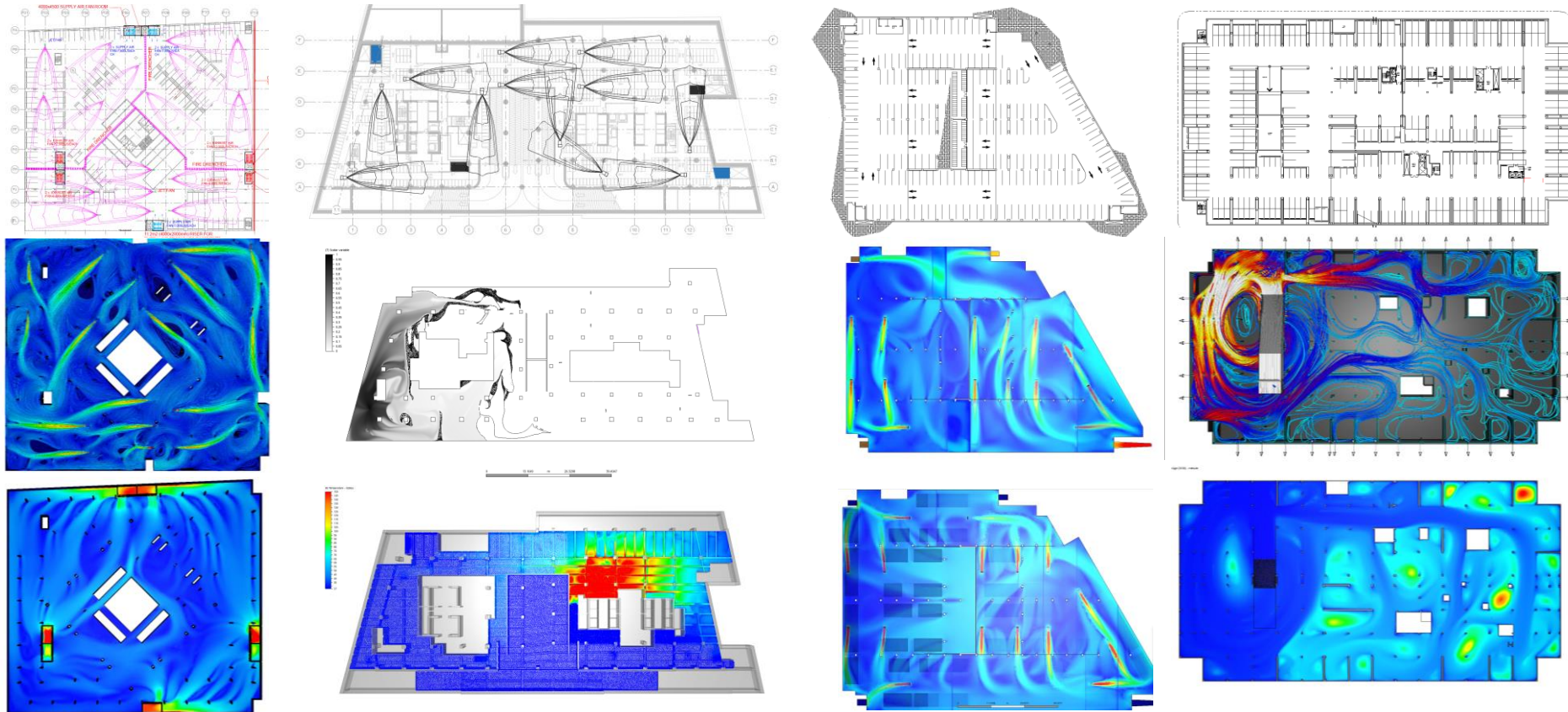


Typical application 1

Parking Garage

Type of analysis:

- Ventilation control
- Smoke control
- CO2 control

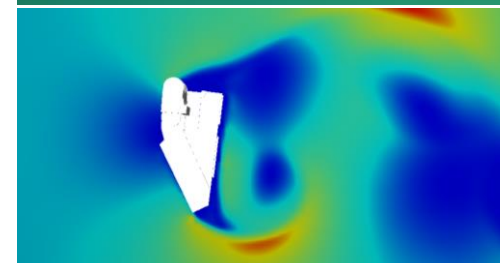
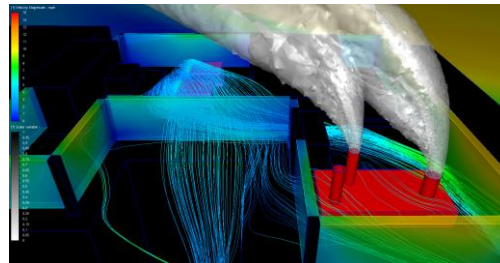
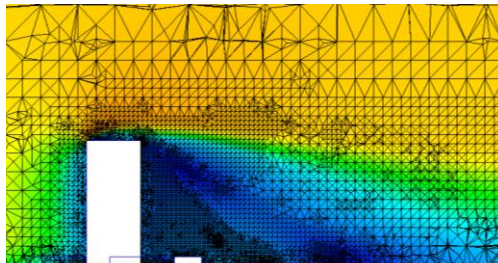
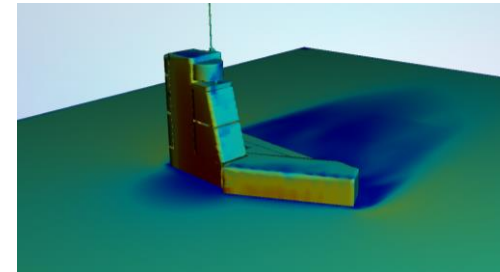
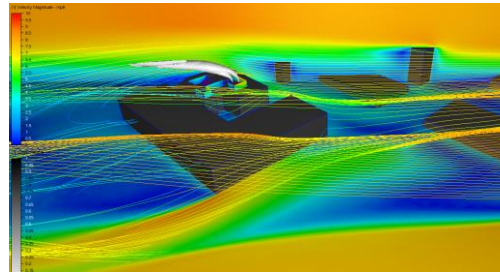
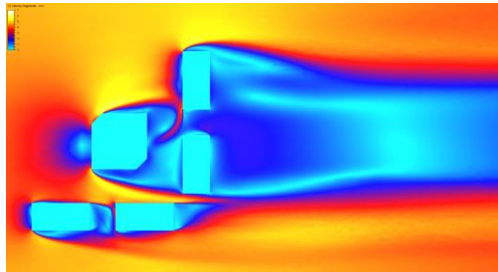
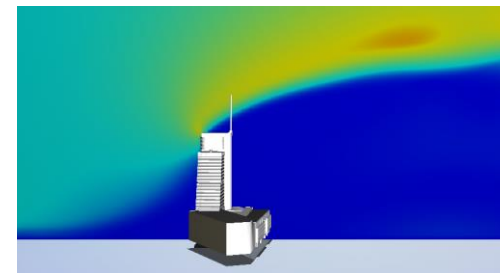
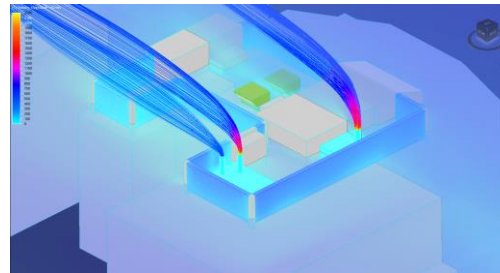
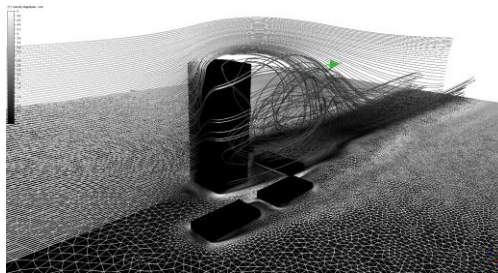


Typical application 2

External aerodynamics

Type of analysis:

- Wind comfort on rooftops
- Pollutant control
- Natural ventilation

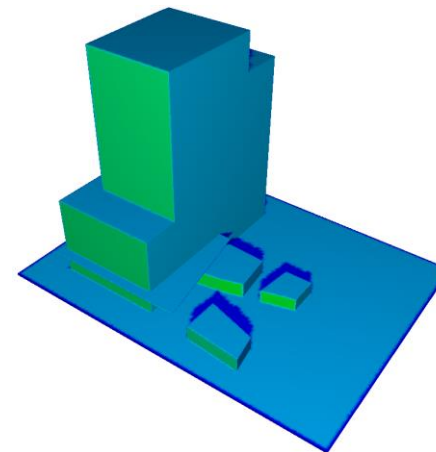
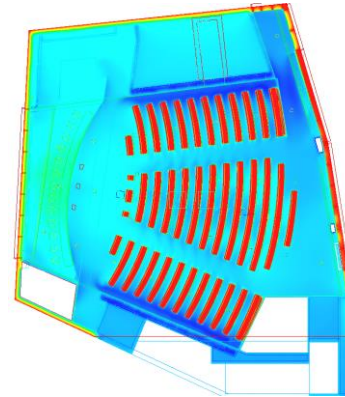
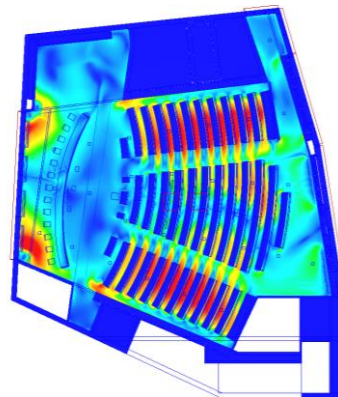
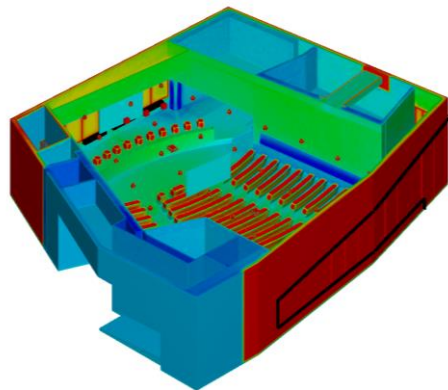
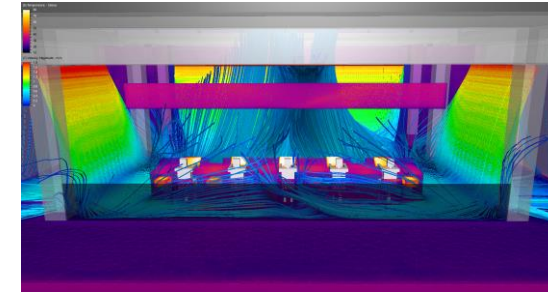
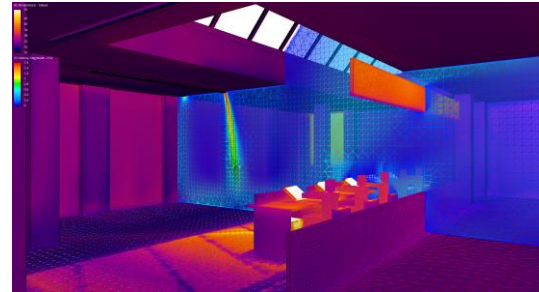
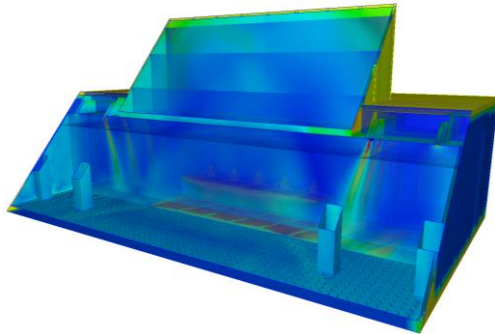


Typical application 3

Heat transfer

Type of analysis:

- Thermal comfort
- Solar shadowing

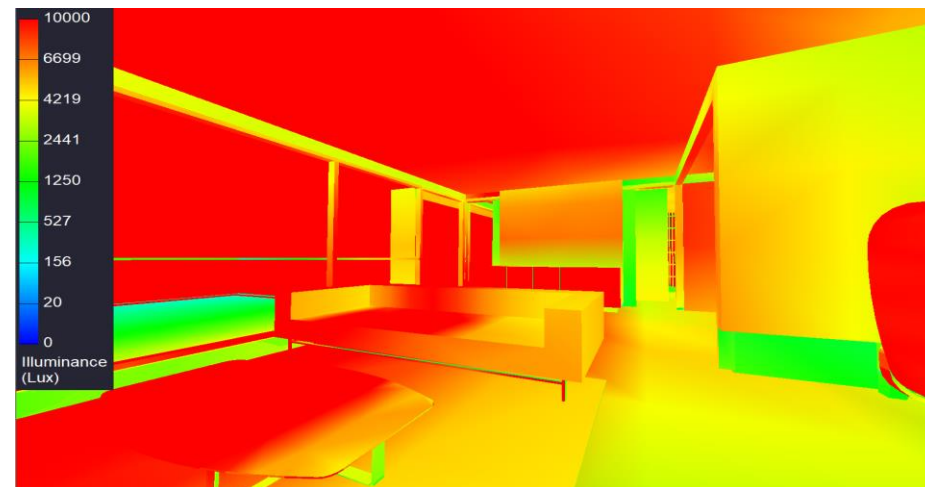
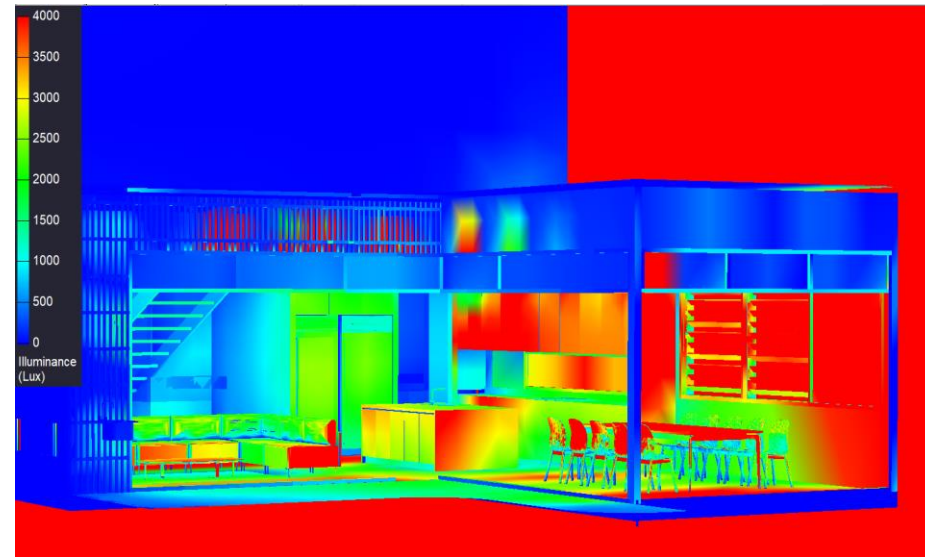




Asses the amount of
daylight within the required spaces

Parameters to be evaluated

- Different VLT (Visual Light Transmittance) options
- Different interior/ exterior surface reflectance
- Shading devices



- Verify the compliance with Green building standard like LEED, BREEAM, LOTUS, etc... and Building Code

Clause G7—NATURAL LIGHT

Provisions

OBJECTIVE

G7.1 The objective of this provision is to safeguard people from illness or loss of *amenity* due to isolation from natural light and the outside environment.

FUNCTIONAL REQUIREMENT

G7.2 *Habitable spaces* shall provide *adequate* openings for natural light and for a visual awareness of the outside environment.

PERFORMANCE

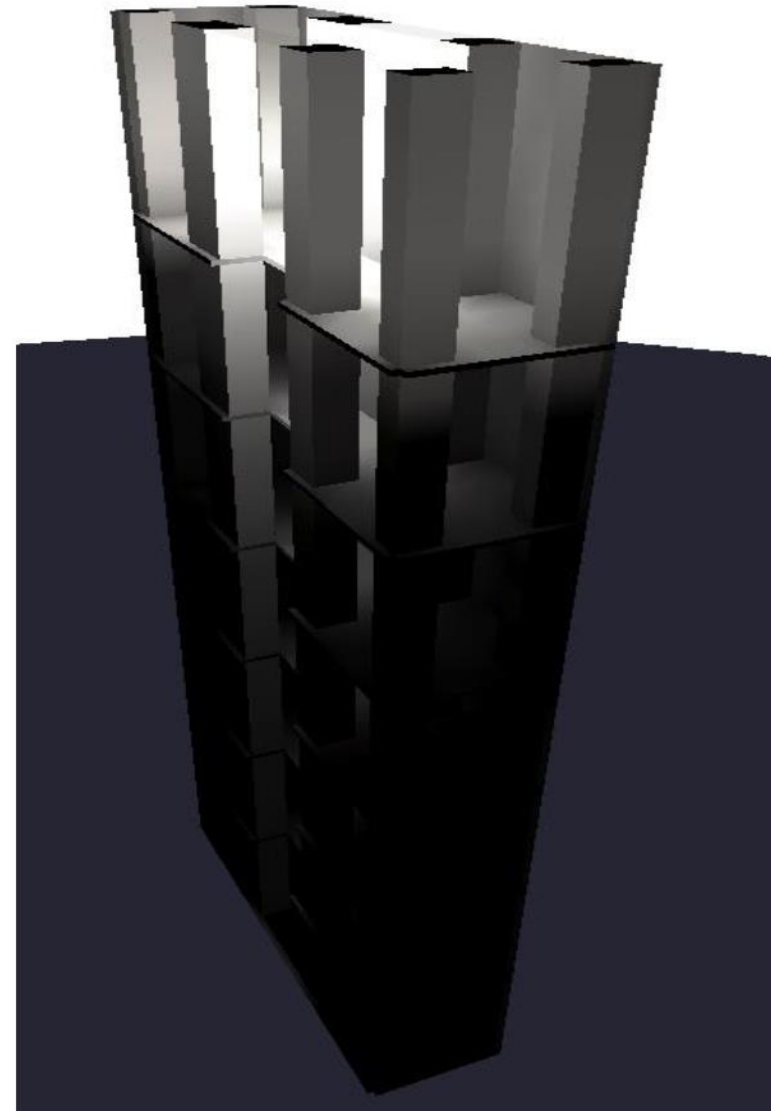
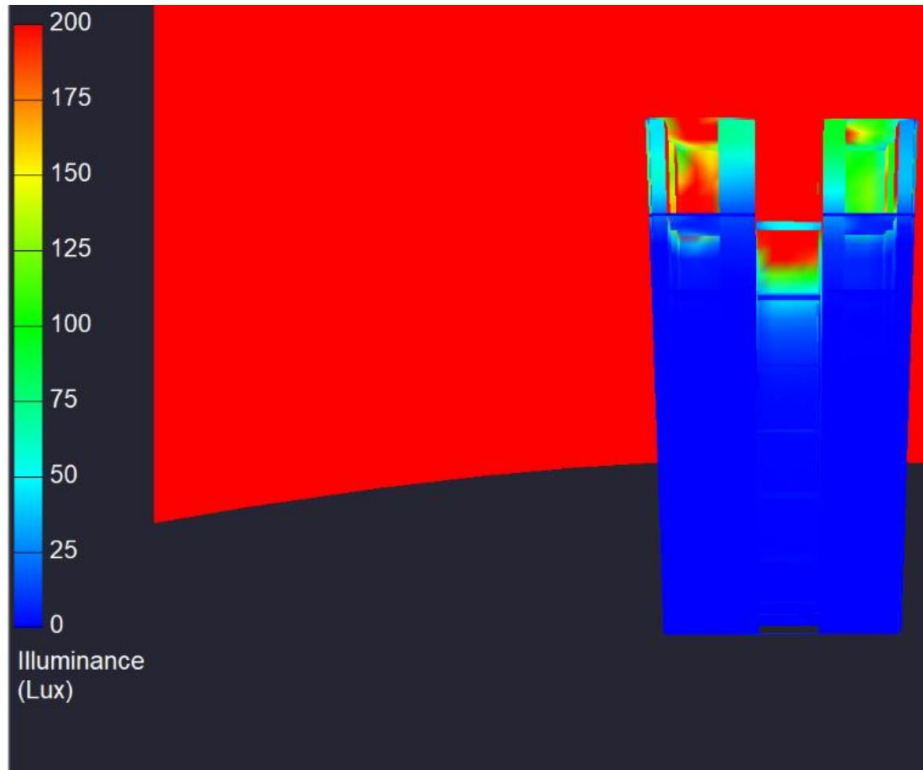
G7.3.1 Natural light shall provide an *illuminance* of no less than 30 lux at floor level for 75% of the *standard year*.

G7.3.2 Openings to give awareness of the outside shall be transparent and provided in suitable locations.



New Zealand Building Code compliance Study

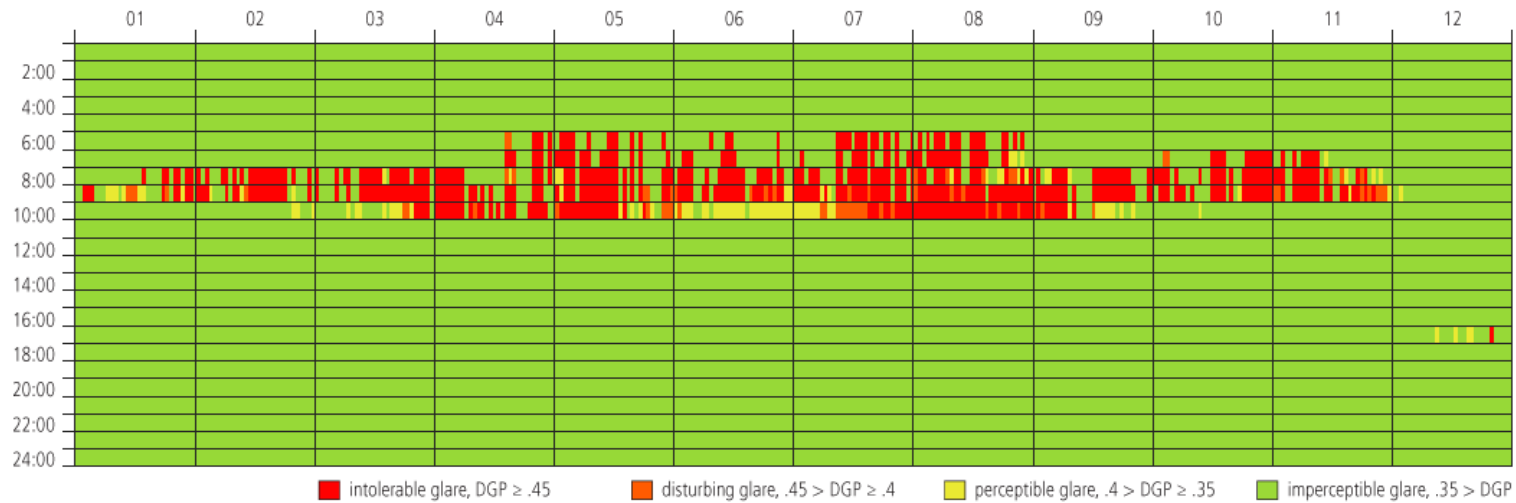
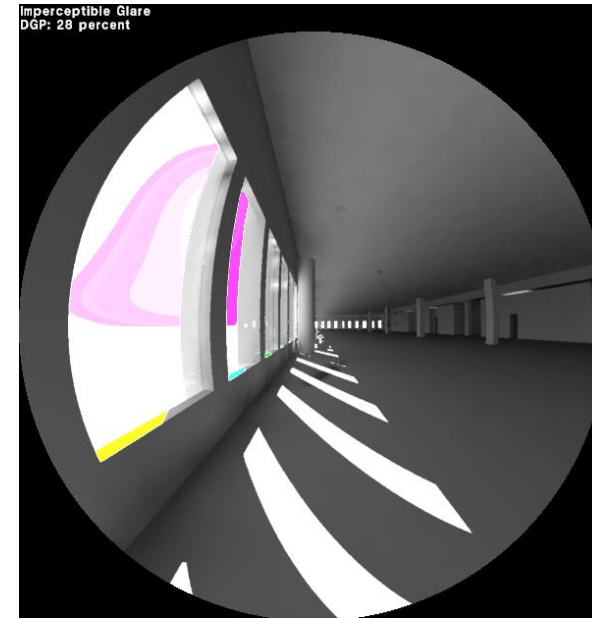
Hotel Stairwell Daylight Model

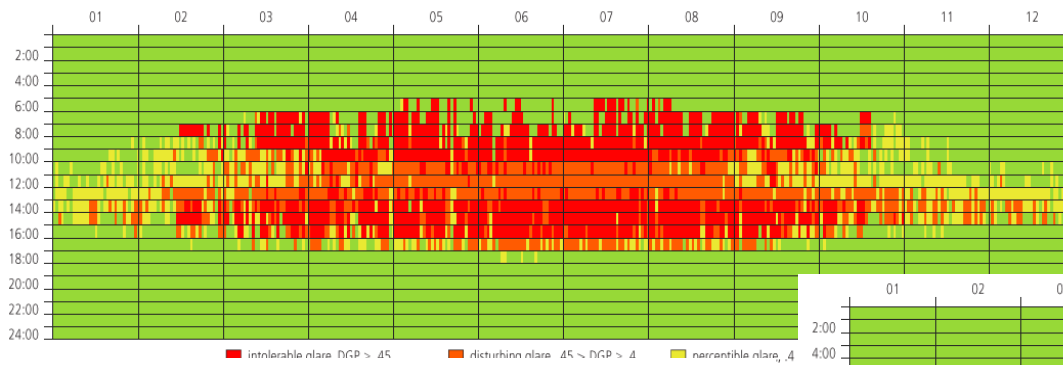
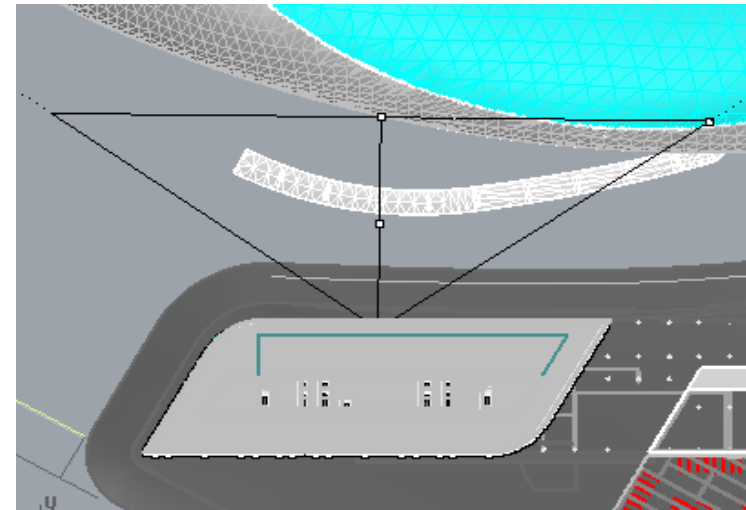
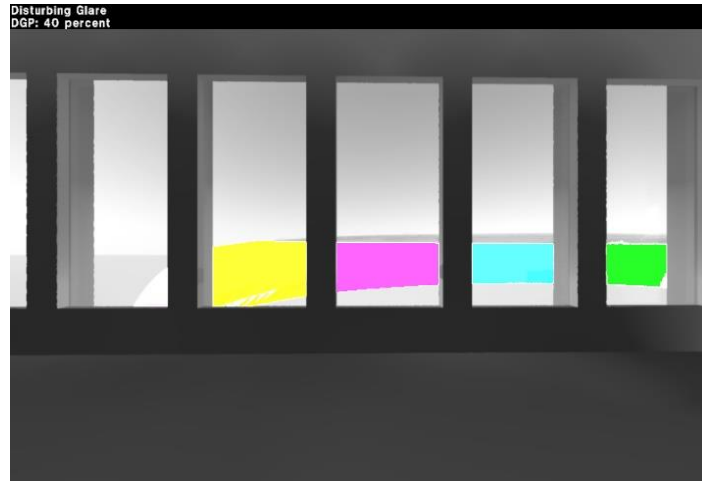




Source: shutterstock.com

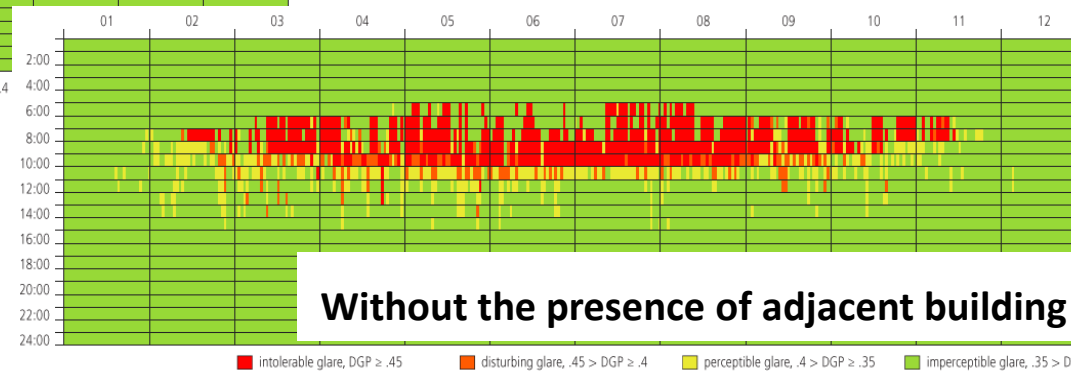
Assist design process to introduce
sufficient daylight without
compromising by **glare discomfort**





With the presence of adjacent building

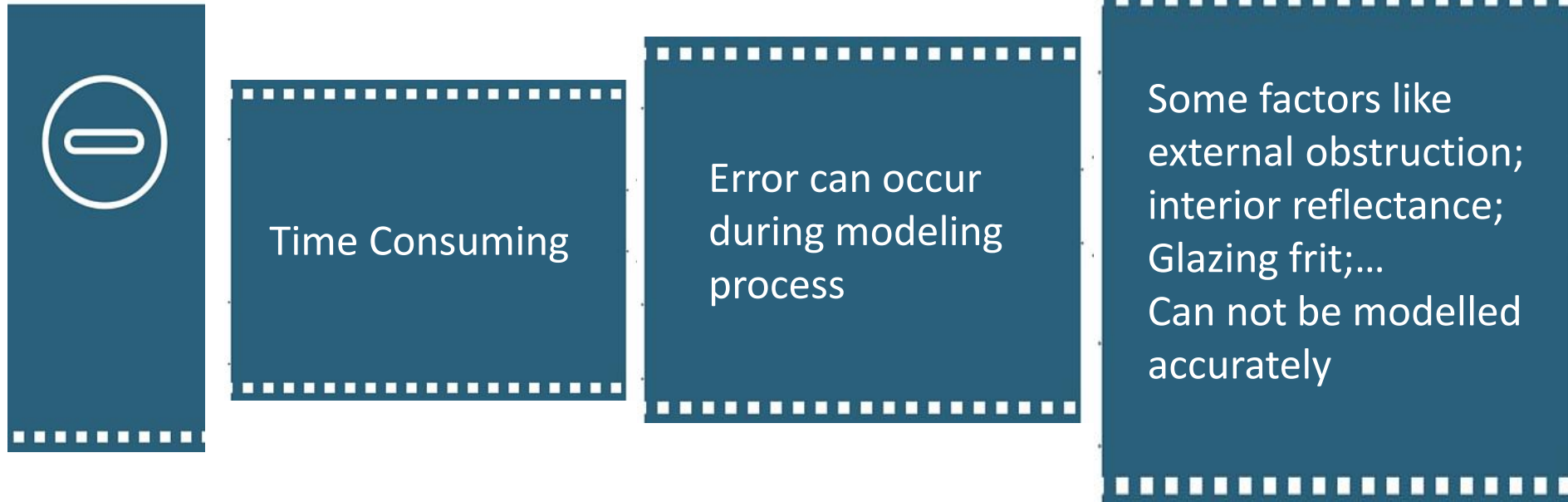
External glare analysis Study



Without the presence of adjacent building

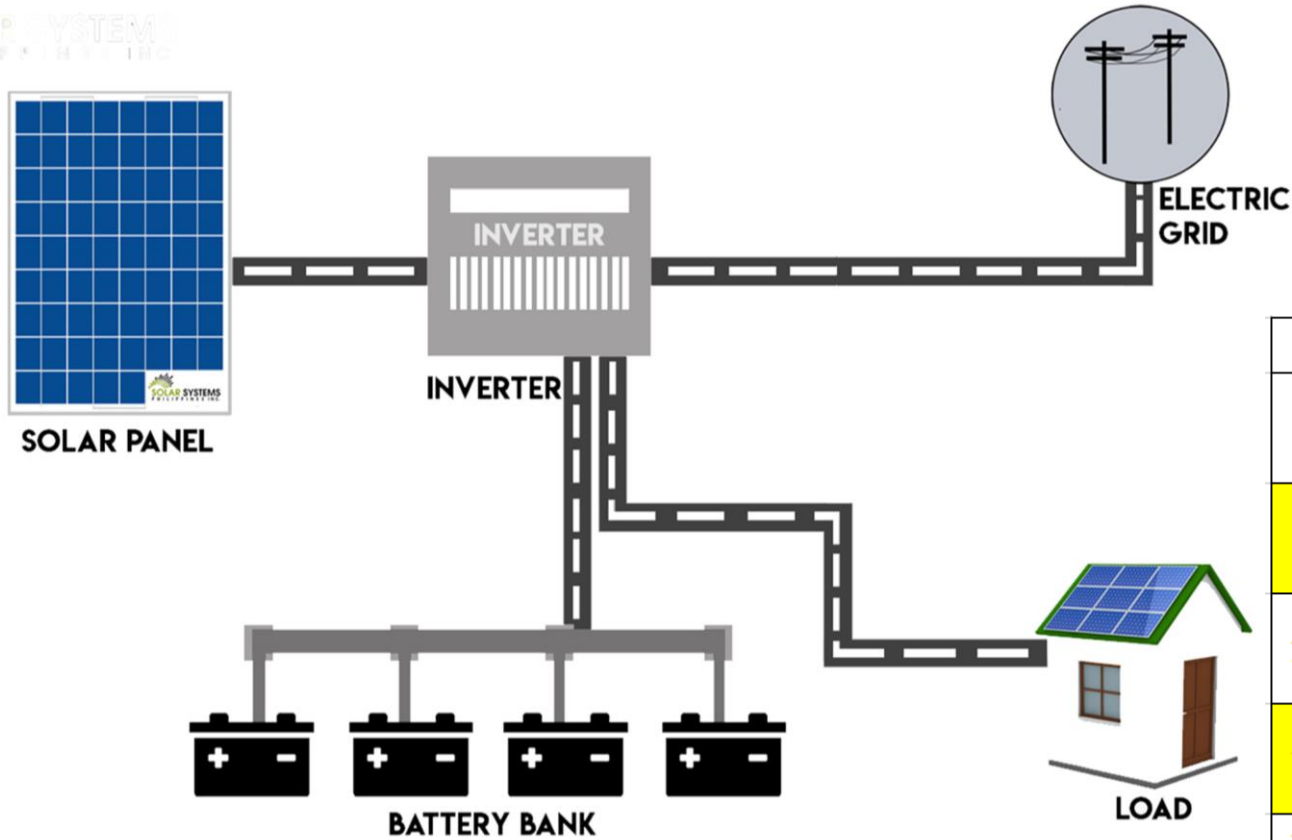
Daylight & Glare Analysis

Negative point of view

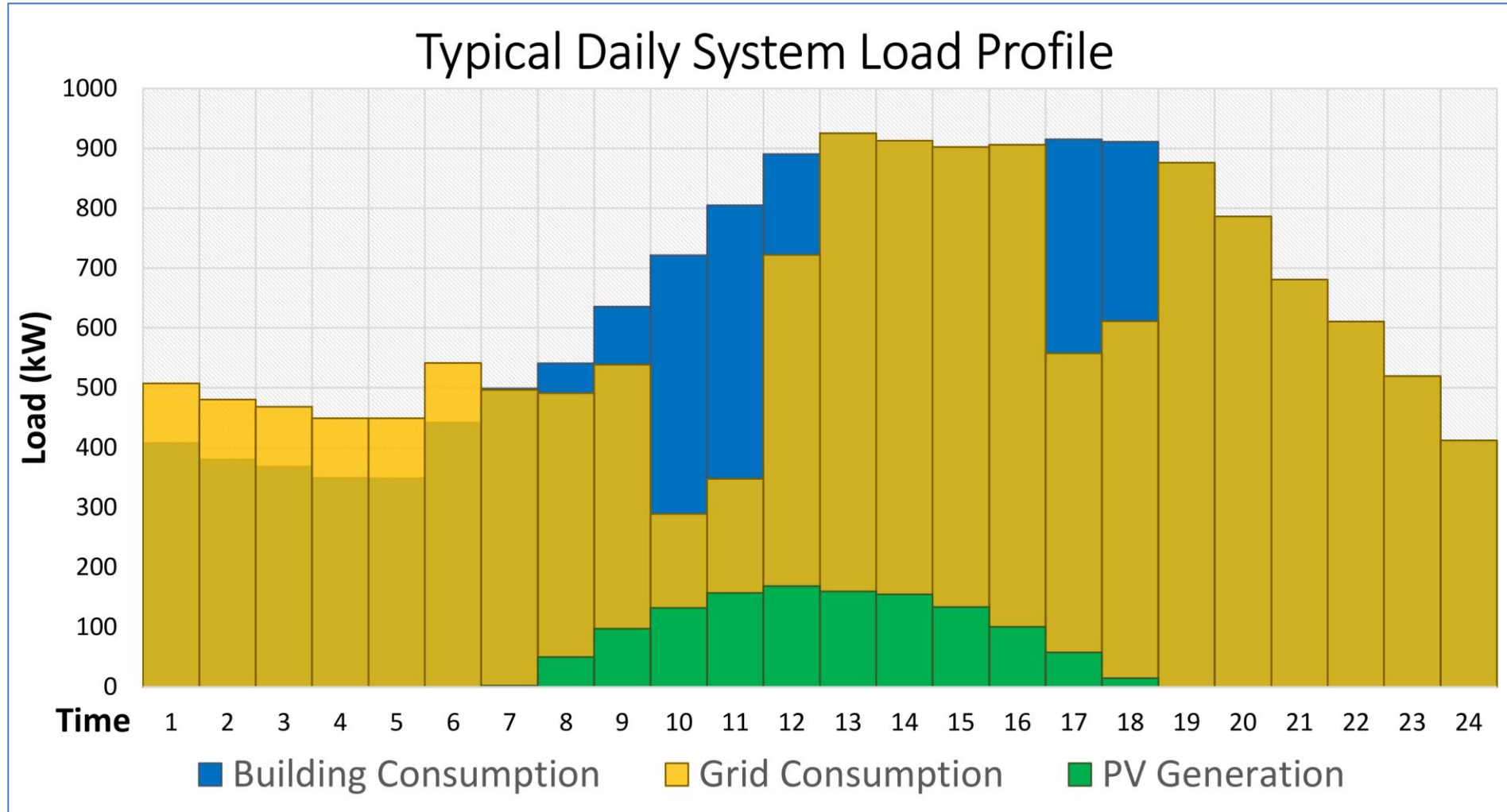


Hybrid PV system with Battery

SOLAR SYSTEMS
TRADING CO., LTD



Time	Schedule
7-9.30	PV -> Building Grid -> Building
9.30-11.30	PV -> Building Battery -> Building
11.30-17.00	PV -> Battery Grid -> Building
17.00-19.00	Battery -> Building Grid -> Building
19.00-22.00	Grid -> Building
22.00-4.00	Grid -> Battery Grid -> Building



CAPEX \$390k

25yrs-OPEX \$952.5k

25yrs-LCC = Saving – CAPEX - OPEX = \$575.4k

Hybrid PV system with Battery



Optimize the use of Solar Energy.
Capture the best income

Shaving energy consumption at peak hour energy cost

Charging the off-peak hours energy, discharge during high cost hours

PROS

VERSUS

CONS

OF HYBRID PV SYSTEM



Complicated control process

High Investment cost for Battery Storage system

Short life cycle of Battery - 5-10 years



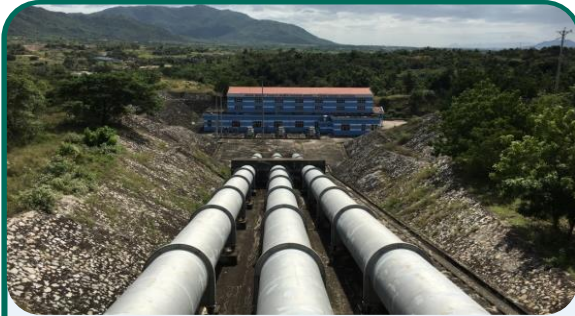
Thank you!



NEW - ACCESS TO CLEAN ENERGY



Booming CLEAN INFRA in Vietnam – Why?



Small hydro, Central Vietnam

Sector: Small hydro
Size: 8.1MW run of river hydro plant
Status: Renovated and upgraded
 Operating profitably since 2015
Invest: Majority + local partner



Solar farm, Thailand

Sector: Solar PV Greenfield
Size: 29MW solar farms
Status: COD on Dec 30th 2015
Invest: Successfully exited Aug 2017



Rooftop solar PV

Sector: SPUC Rooftop Solar PV
Size: Aggregated portfolio
Status: Greenfield
Invest: Majority + intrntnl partner



Small hydro, Central Vietnam

Sector: Small hydro
Size: 29MW run of river hydro plant
Status: Greenfield - COD Oct 2015
Invest: Largest Shareholder + partner



Water treatment facility, Cambodia

Sector: Water treatment
Size: 590,000m³/day
Status: Operating asset with expansion
Invest: Active Minority



Solid Waste Management, Cambodia

Sector: Solid Waste Management
Size: 282 tons/day
Status: Operating asset with expansion
Invest: Active Minority



**40MW SOLAR PROJECT IN MUI NE (PACIFICO ENERGY AND DRAGON CAPITAL)
FINISHED CONSTRUCTION 15TH MAY**

UTILITY Rooftop solar systems

- *No Cost, Onsite Electricity Generation*



- **No Capital Investment** - SPUC Finances and Operates
- OPEX Cost Savings v EVN Grid Power Cost = 10%+
- **Defined Price Power for 20 years**
- CSR/Sustainability Goals are easily achieved
- Building Owner can sell excess power to the grid for VND
- Battery/PV Solar Combos available (no more diesel?)





Installed and designed to provide 100% self-consumption at one of the largest sports and activity centres in the UK. The system also required integration with existing CHP unit.

Equipment: Canadian Solar Panels, Fronius Inverters
Total System Size: 350kW
Annual Electricity Production: 360,000 kWh's



Helping Nuffield Health to a 20% reduction in energy by 2020. South facing roofs at high level It required 4 storey access scaffold in places. We worked closely with Nuffield in-house team to ensure no interruption of critical services and integration with the backup generator.

Equipment: Bisol Solar Panels, SMA Inverters
Total System Size: 165kW
Annual Electricity Production: 161,000 kWh's

WHAT NEXT?

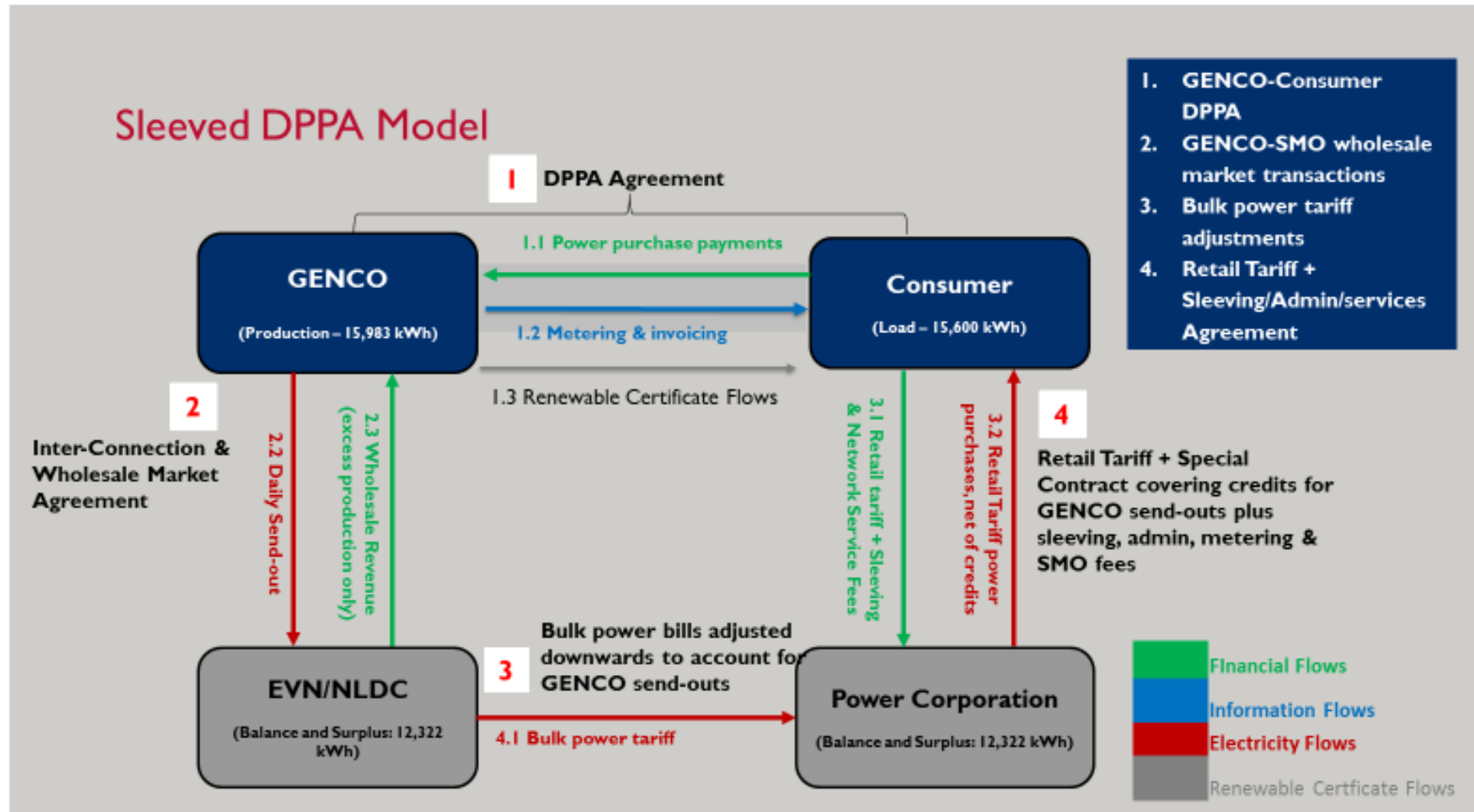
“BEHIND THE METER POWER” PLANTS ON-SITE



WHAT NEXT?

DIRECT POWER PURCHASE (PRODUCER SELLS TO USER DIRECT)

OFFSITE LOCATION



CAN YOU BUY 100% CLEAN ENERGY IN VIETNAM?

- Solar Rooftop and Behind the Meter available now
- Renewable energy certificates (RECS) available from Vietnam sources – Q2 2019
- 100% Access to Clean requires addition of the Direct PPA (Free Market Mechanism)



Waste to resources – the INSEE Ecocycle approach

Hoa Le Ngoc, Ecocycle Commercial Manager, Ho Chi Minh City, May 14th 2019



Content

1. Overall of the waste
2. A short introduction to Ecocycle – who we are, what we do, and WHY
3. What is co-processing, its advantages and position in the waste management hierarchy, link to waste to resources
4. Experience of Ecocycle in Vietnam
5. Concluding remarks to further promote “waste to resources”
6. Green label and green office at INSEE

1. Overall of The waste – 3 kinds of waste

Municipal Solid Waste



Industrial Waste



Hazardous Waste



2. Ecocycle Vietnam Introduction

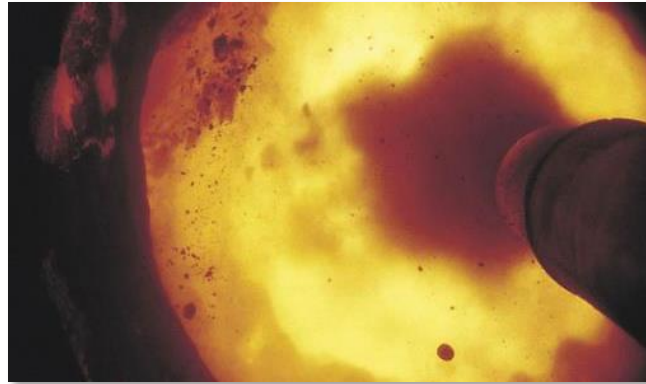
INSEE Ecocycle Vietnam, a brand of Siam City Cement Company Public Limited (formerly LafargeHolcim), is a prominent name in the waste management industry in Vietnam with over 10 years of comprehensive experience

- Processing more than **100,000 tons haz and industrial** waste material per year
- Being a trustworthy partner of leading corporations with more than **300 customers** in a wide range of manufacturing industries

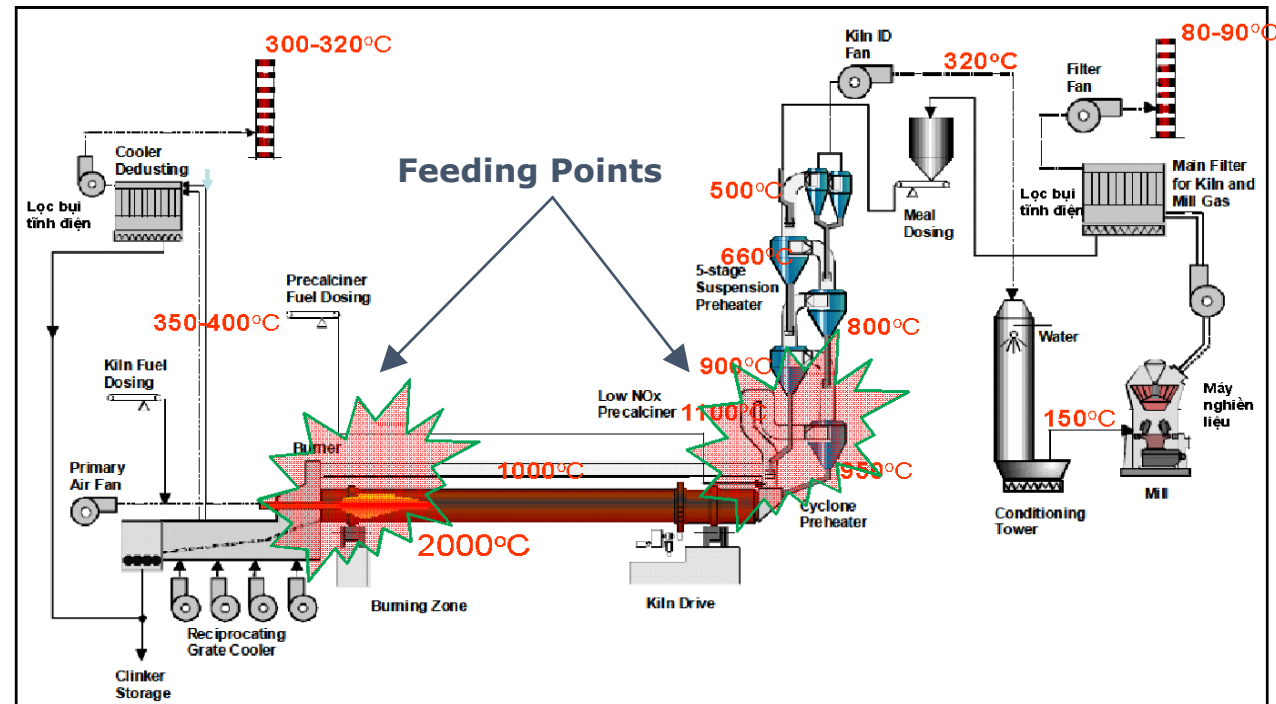


3.1 What is co-processing in cement kilns?

Co-processing is the use of waste as raw material, or as a source of energy, or both to replace natural mineral resources (**material recycling**) and fossil fuels such as coal, petroleum and gas (**energy recovery**) in industrial processes, mainly in energy intensive industries such as cement, lime, steel, glass, and power generation. Waste materials used for Co-processing are referred to as alternative fuels and raw materials (AFR)

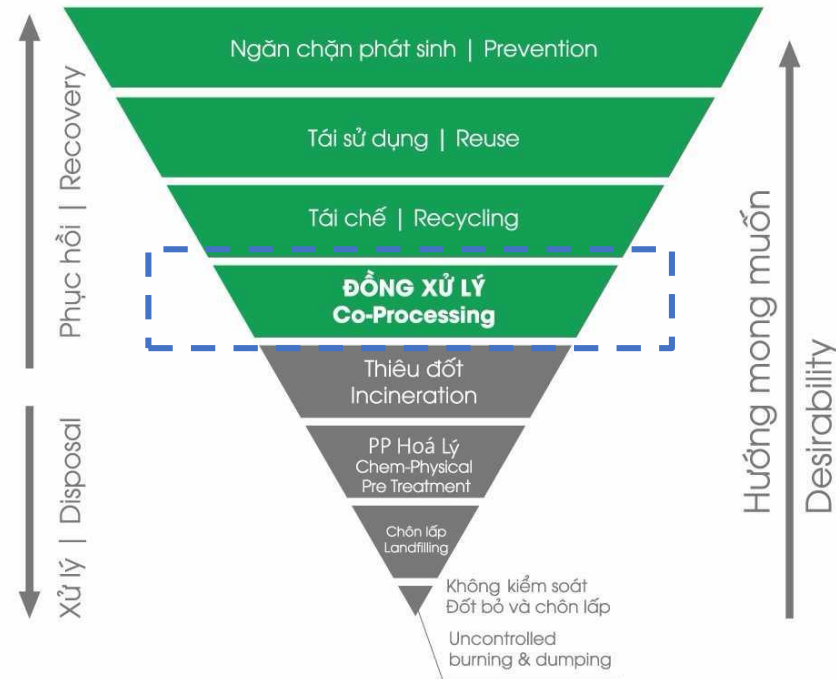


3.2 Advantages of co-processing in cement kilns



- **High & stable temperature** (up to ~ 2000 °C gas)
- Long residence time (gas ~ 8 sec, solids 30min)
- Alkaline environment and self cleaning process (CaO)
- Large capacity
- Continuous emission **real-time monitoring 24/7**
- **Overall CO2 emission reduction**
- **No ash-residues**, all materials fully incorporated in clinker
- Sustainable development technology

3.3 Waste management hierarchy & result of co-processing

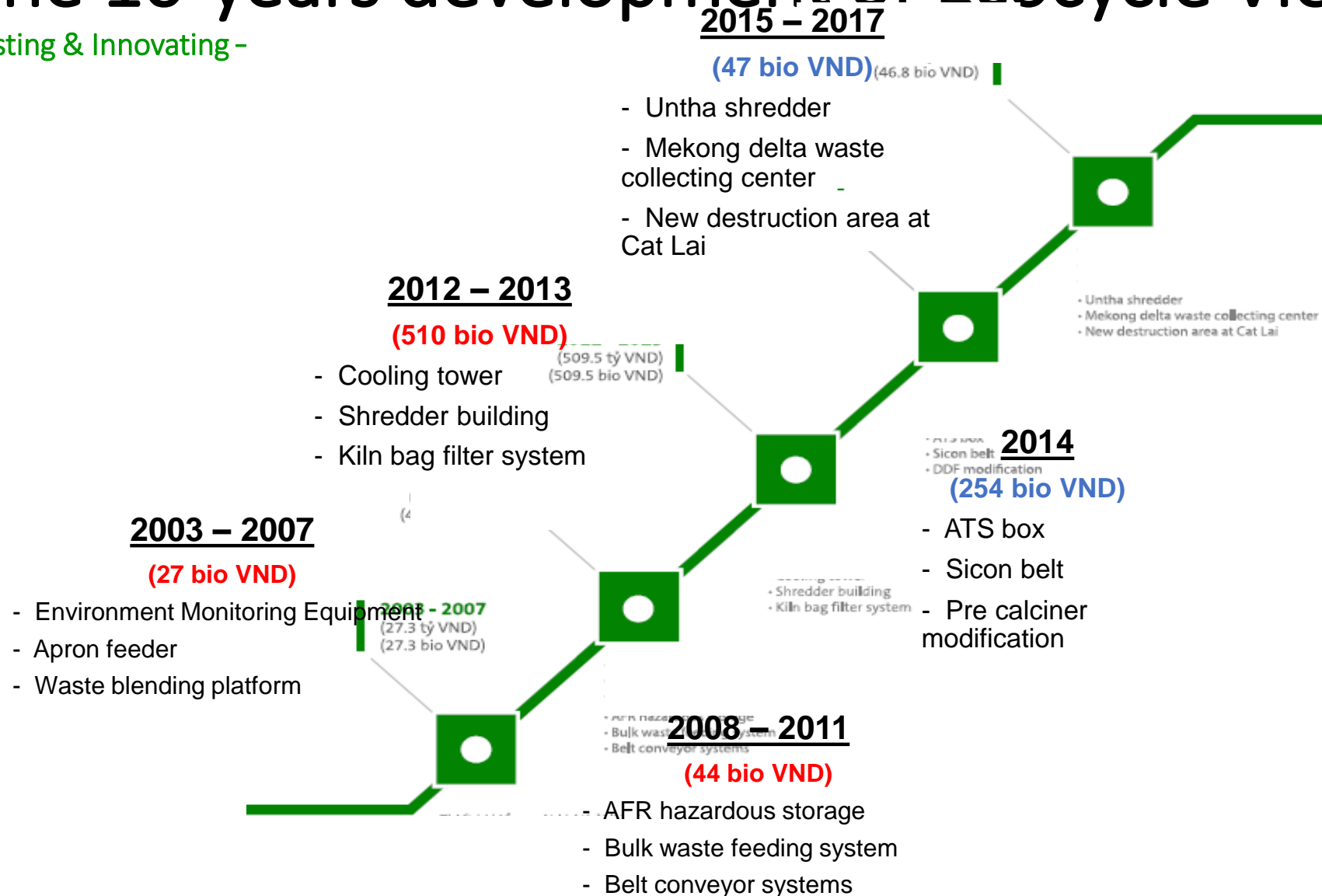


Results of co-processing

- ✓ After co-processing, the organic compounds are disposed totally in high temperature of cement kiln
- ✓ The inorganic compounds are transferred to metal oxide and become ingredients of clinker
- ✓ Green house gas emissions are reduced
- ✓ NO_x, SO_x emissions & dust are always controlled to comply with Vietnamese legal regulation
- ✓ Zero landfill, no residues
- ✓ Environment-friendly

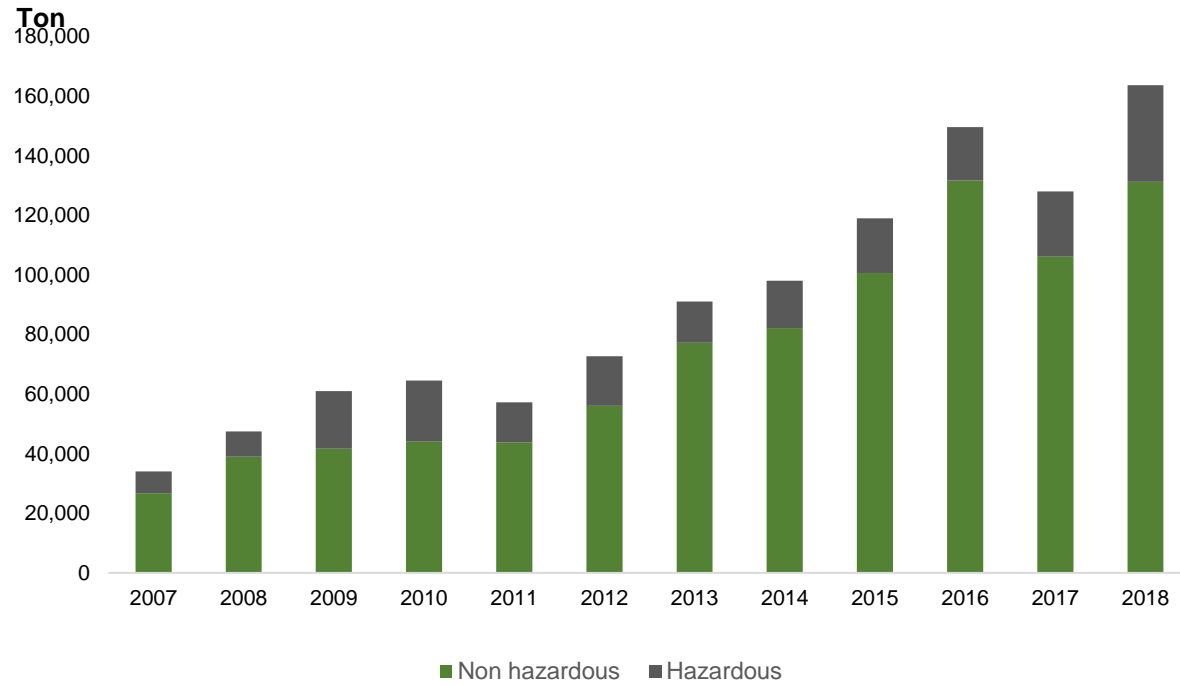
4. The 10-years development of Ecocycle Vietnam

4.1. Investing & Innovating -



4. The 10-years development of Ecocycle Vietnam

4.2. Managing a wide range of industrial waste



- ✓ Pirate goods for a secure destruction
- ✓ Plastic & rubber waste
- ✓ Pesticides
- ✓ Hydrocarbons
- ✓ Ash & Contaminated soils
- ✓ PCB
- ✓ Packaging
- ✓ Expired or off-specification products
- ✓ Waste water
- ✓ Waste water sludge
- ✓ Paint waste
- ✓ Solvent & other chemical waste
- ✓ Textile & Synthetic materials
- ✓ Pharmaceutical products
- ✓ Biomass material
- ✓ Used oils
- ✓ Other waste

4. The 10-years development of Ecocycle Vietnam

4.3. Offering different solutions related to sustainable waste management



4. The 10-years development of Ecocycle Vietnam

4.4. Delivering substantial project success for high risk material

DDT Project: 2014 - 2015

870 tones of pesticide contaminated soils in Nghe An & Ha Tinh are completely treated by Ecocycle Vietnam

A part of the “Building Capacity to Eliminate Chemical Plant Protection; POP stockpiles in Vietnam” was what the Project Management Board POP-Pesticide (Ministry of Natural Resources and Environment) and Chapter The UN Development in Vietnam deployed and controlled.

PCB Project: started 2011

Ecocycle Vietnam is the one and only company in Vietnam that can sustainably treat Polychlorinated Biphenyls (PCB) contaminated oil.

From 2011 – Aug 2018: total 170 tons were treated

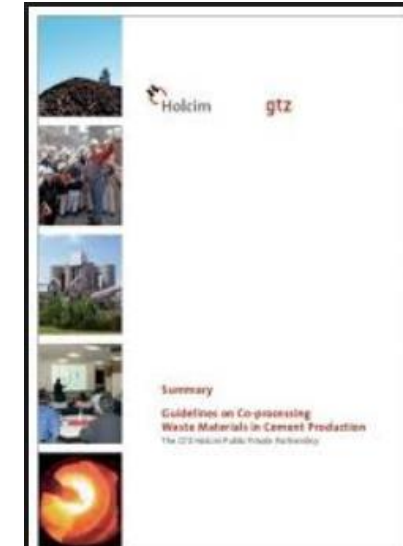
HCFC Project: 2016

Nov 2016 - Ecocycle Vietnam successfully treated HCFCs – the ozone depleting gas at Hon Chong factory in Kien Giang, marking a major turning point in the fight against climate change in Vietnam.

5. Policies that would support circular economy in Vietnam – an Ecocycle perspective

Policies and legal framework

- Enforcement of existing waste management laws and regulations is key
- Policies towards zero landfill
- Official recognition of waste management hierarchy with a clear positioning of co-processing
- Co-processing guidelines as basis of legal framework, ensuring highest standards

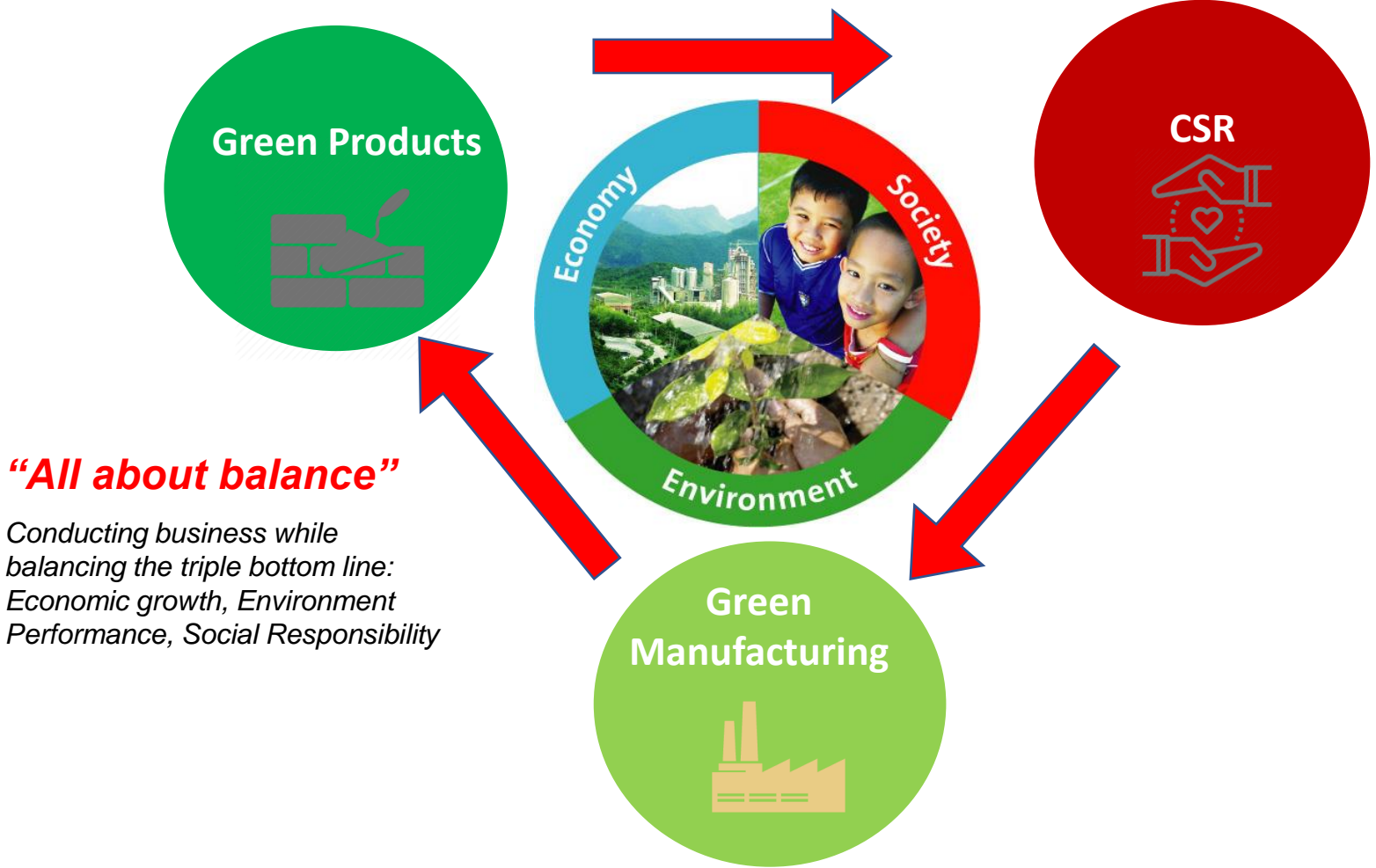


5. Potential in Vietnam is vast – exploiting it needs clear guidelines though

- Recent World Bank report confirms Ecocycle to be the pioneer and leader in AFR in Vietnam
- The reports suggest the potential to:
 - Substitute 7.5 mio tons of coal by waste derived fuels
 - Reduce greenhouse gas emissions by 14.5 mio tons of CO2 equivalents
 - Treat 15 mio tons of waste through co-processing
 - And all of it at relatively low investment costs as part of the equipment is already invested
- International guidelines should be applied in Vietnam to guarantee highest standards



6. Green Label



6. INSEE is the first & only construction material brand achieves Green certificates in Vietnam

Green Bag Cement & Mortar



Green Beton



Fiber Cement CONWOOD



Green Industrial Cement



6. What is Green Label & its benefits

- Certified by Singapore Green Building Council for environmentally-friendly products.
- Green Label Cement benefits
 1. Environmental friendly products with less carbon footprint & efficient usage of natural resources
 2. Green cement/concrete lower shrinkage rate and also becomes stronger far more quickly than traditional cement/concrete



6. Estimated CO2 emission reduced by using Green-label cement

Distributors sold ~
3 millions ton/year

Reduce
470,000 tons CO2/year



6. INSEE New Office



Welcome to
**INSEE New
Office!**

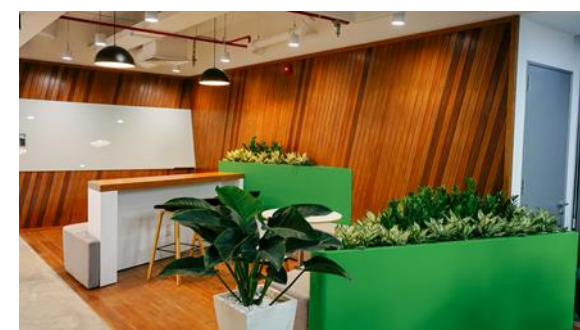


INSEE New Office: 100% from INSEE Total Solution

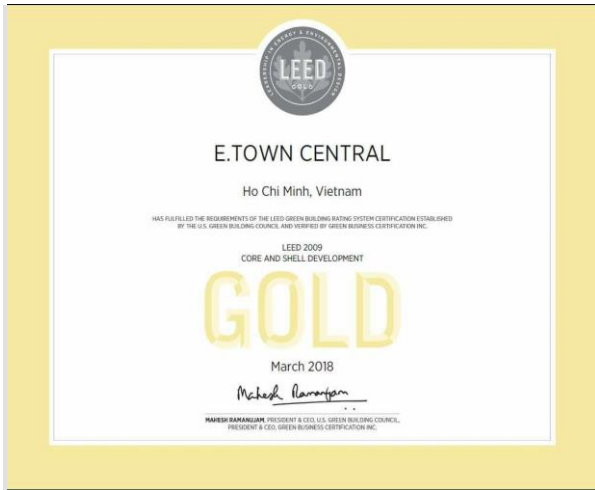


INSEE Office - made from "INSEE Total solution" with Green Label:

- Floor: INSEE Power S
- Wall: INSEE Wall Pro
- Decoration:
 - Conwood
 - INSEE Decopave polish (beton)
 - INSEE Decopave exposed



INSEE New Office: From Green Building to Green Office



- **Location:** Etown Central, Dist 4, HCM
- Certified **Green Building LEED Gold** (Leadership in Energy and Environmental Design) by U.S. Green Building Council
- On process to achieve **Green Office certification, LOTUS for Interiors**





“

INSEE believe that the world would be a better place if everything we build could always make life worth living.

Additional information – and THANK YOU!

- Check out our website: www.ecocycle.vn

- Reach out to me:

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Because tomorrow matters

