

# EcoLine

## Solar Thermal Air Conditioning

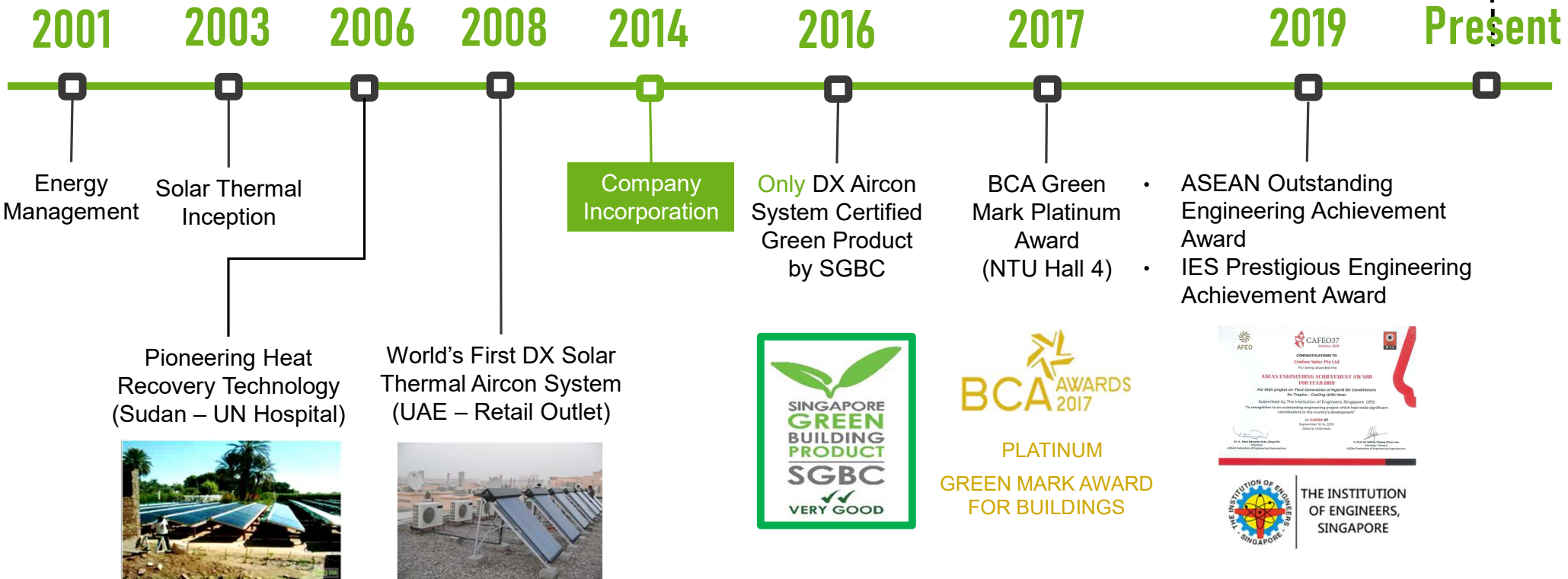
Mar 2021



*biz*SAFE<sub>4</sub>

We are NOT  
just another  
Air-Conditioner  
Manufacturer

# About Us



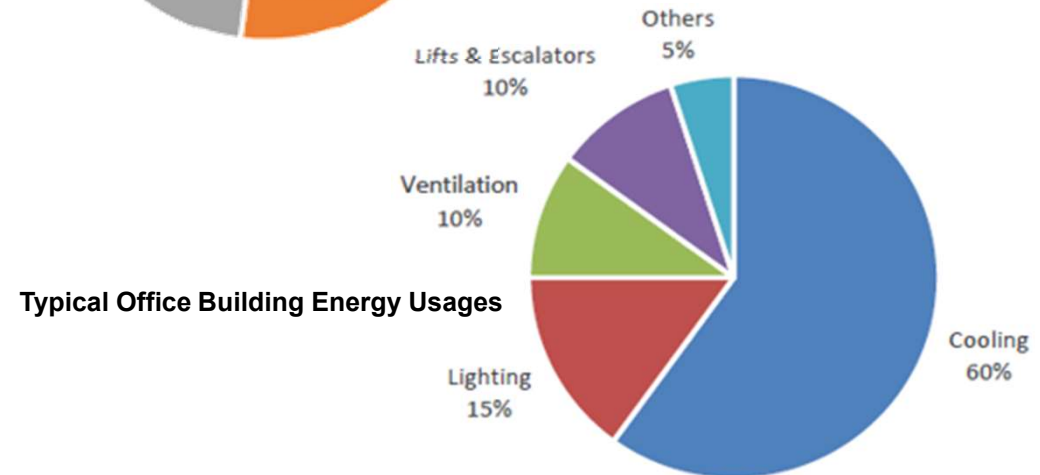
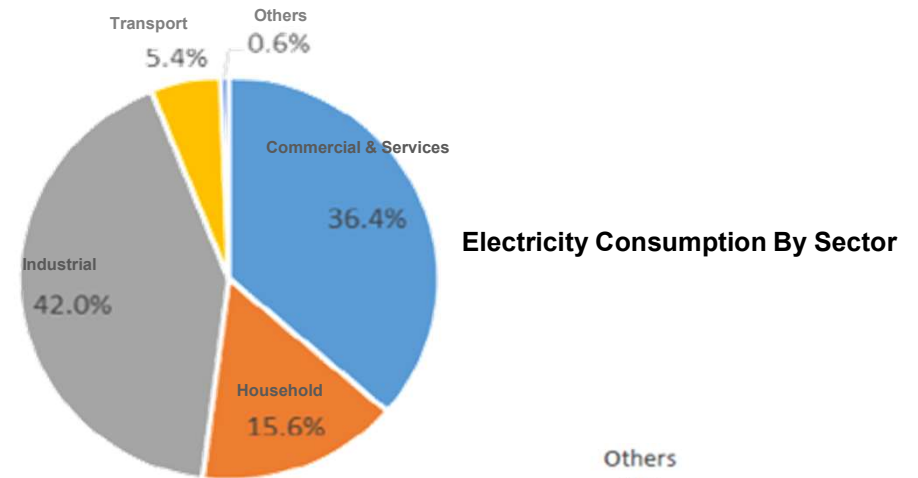
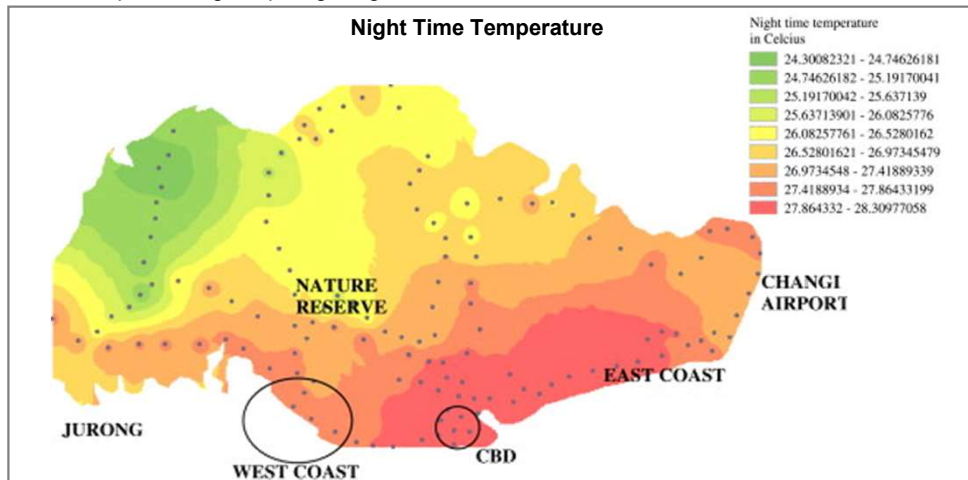
## Sustainable Cost Effective Green Cooling Solution

# Aircon: Cooler indoors, Hotter outdoors

“Global warming and rising temperature is another issue that we must grapple with. This is compounded by the Urban Heat Island (or UHI) effect. When temperature rises, we turn up air-conditioners, which in-turn generate more heat in the surrounding, resulting in a vicious cycle. Built-up areas such as the CBD can be more than 3 degree Celsius hotter than our parks.”

**Grace Fu, Minister for Sustainability and the Environment.**  
**Joint segment on Sustainability at MSE's COS Debates 2021**

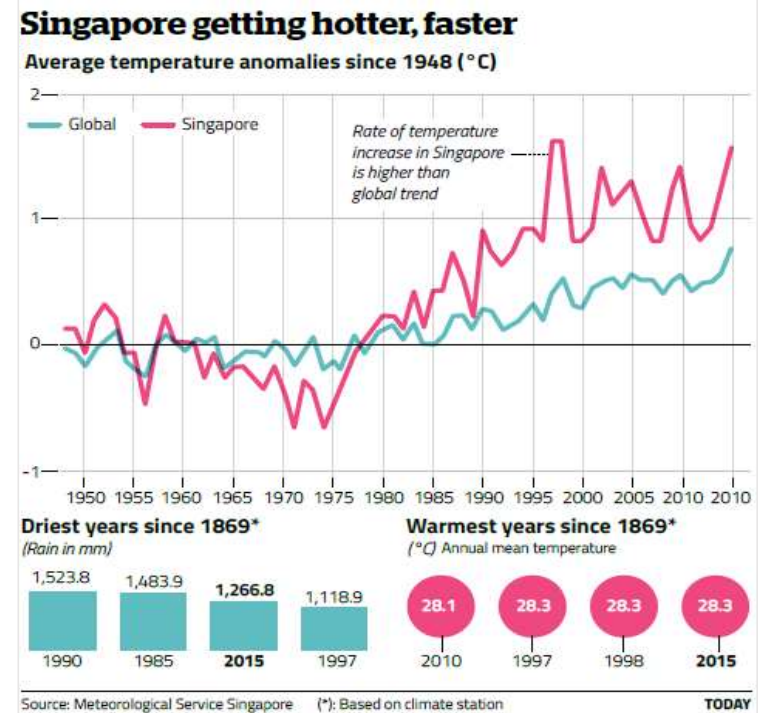
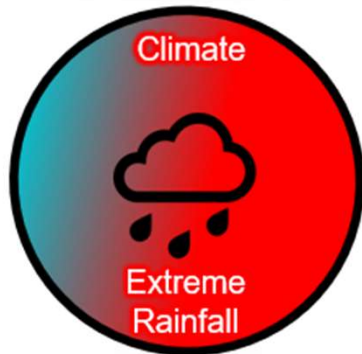
Source: <https://www.greenplan.gov.sg/resource-room/2021-03-04-mse>



Source: [https://www.bca.gov.sg/greenmark/others/SLE\\_Tech\\_Roadmap.pdf](https://www.bca.gov.sg/greenmark/others/SLE_Tech_Roadmap.pdf)

Private & Confidential

# Urban Heat Island (UHI) Effect



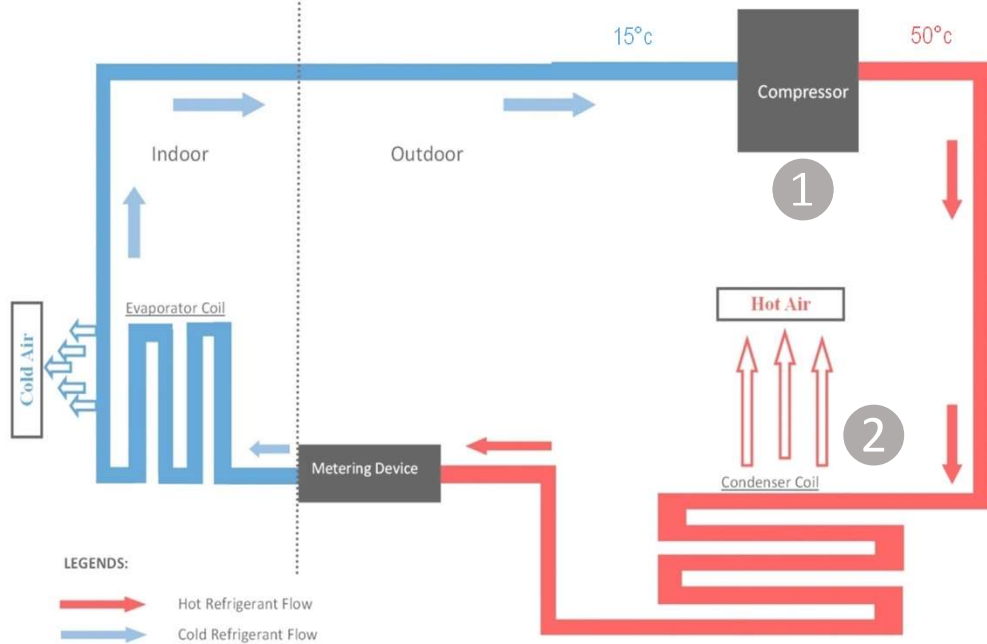
Singapore Mean surface air temperature has risen by an average of **0.25°C** per decade between 1948 and today. The upward trend is approximately **double** the trend in global temperatures, which occurred at a rate of **0.12°C** per decade from 1951-2012.

Meteorological Services Singapore



# Solar Thermal Working Principle

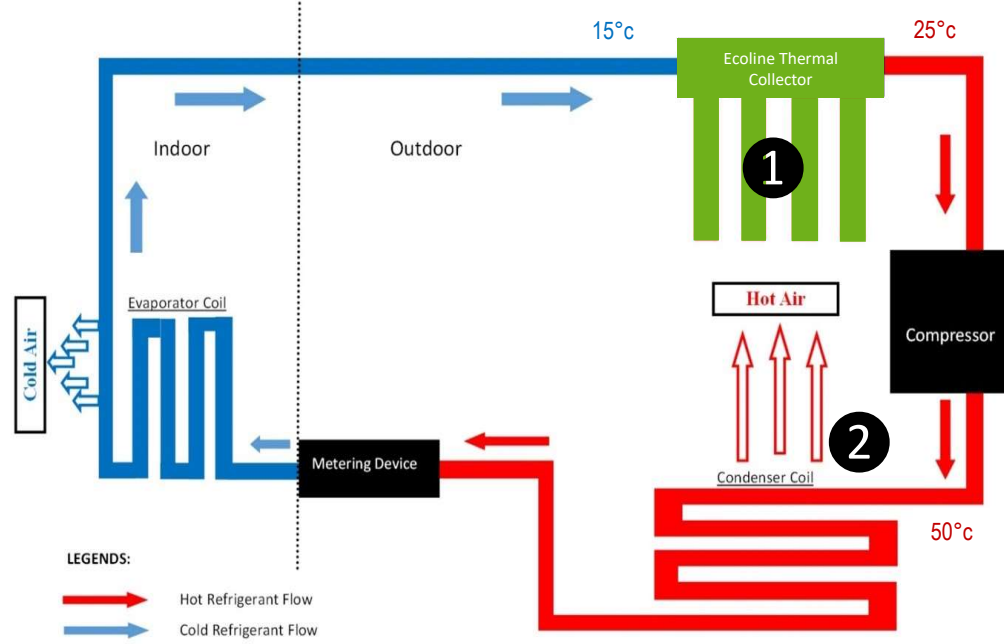
## Conventional Air Conditioning System



① Compressor is used to superheat and raise the refrigerant pressure - using more than 90% of aircon electricity

② Waste Condenser heat is constantly rejected to the environment – contributing to the Urban Heat Island (UHI) effect.

## Ecoline Solar Thermal Air Conditioning System



① The resultant pre-heat process leads to a lighter compressor workload, delivering energy savings by as much as 30-55%.

② The removal of heat waste as a by-product lowers ambient temperature by 3-4°C, thus reducing Urban Heat Island Effect

# Research & Innovation

- Proprietary Thermal-Solar



- Coating Technology



- Outdoor Cooling Technology



# Products

Wall Mounted



Ceiling Cassette



Ceiling Floor



Ducted



Multi Split



Floor Standing



VRF





# Technology Comparison



**EcoLine**  
Solar Thermal Air Conditioning



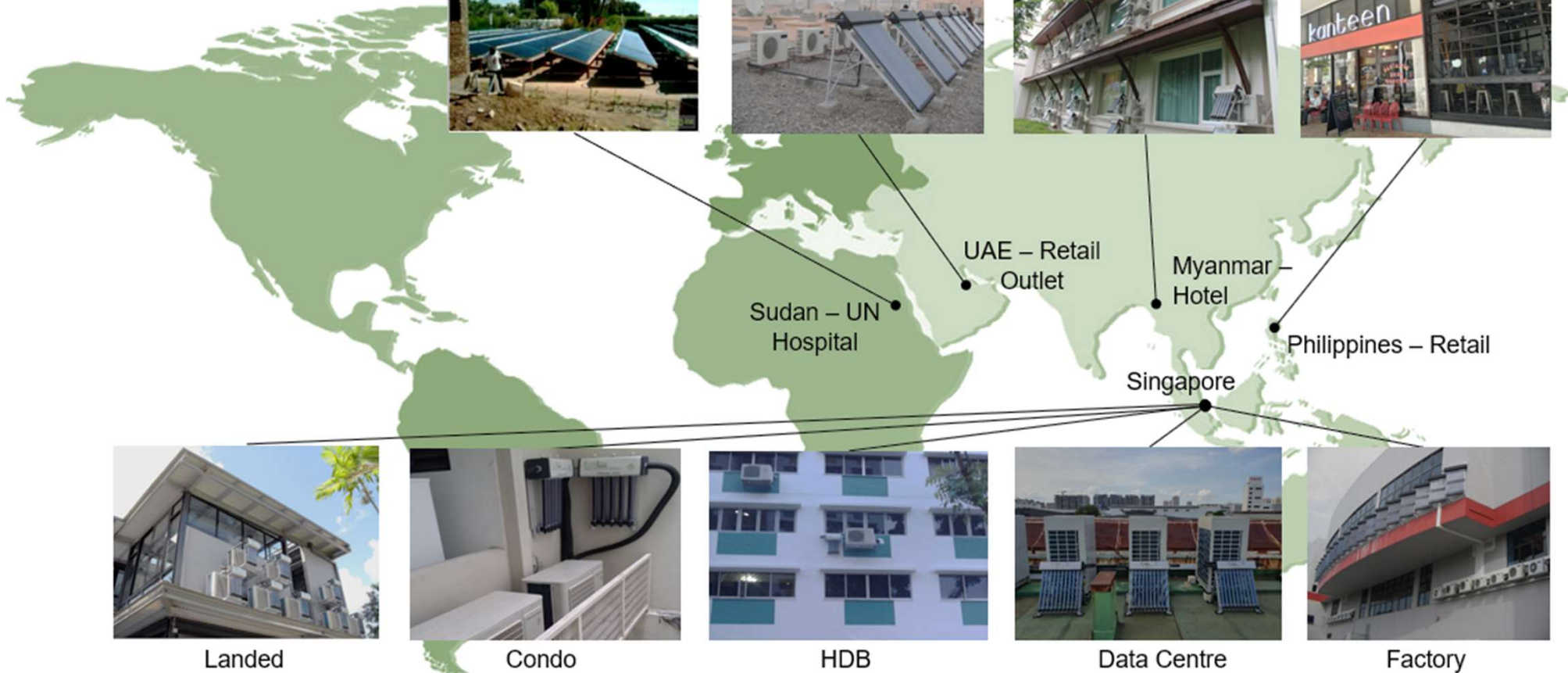
**Solar Panel**



**Unitary Air-con**

<b>Type  </b>	Thermal Solar Hybrid	Solar Panel	Energy Efficient
<b>Technology  </b>	Thermal	Solar	Inverter
<b>ROI  </b>	~2 years	~8 years	NA

# Installations



Landed

Condo

HDB

Data Centre

Factory

Private & Confidential







Industrial



Industrial



Shop House



Factory



Data Center



Retail Outlet



Industrial



Retail Outlet Private & Confidential



Shop House

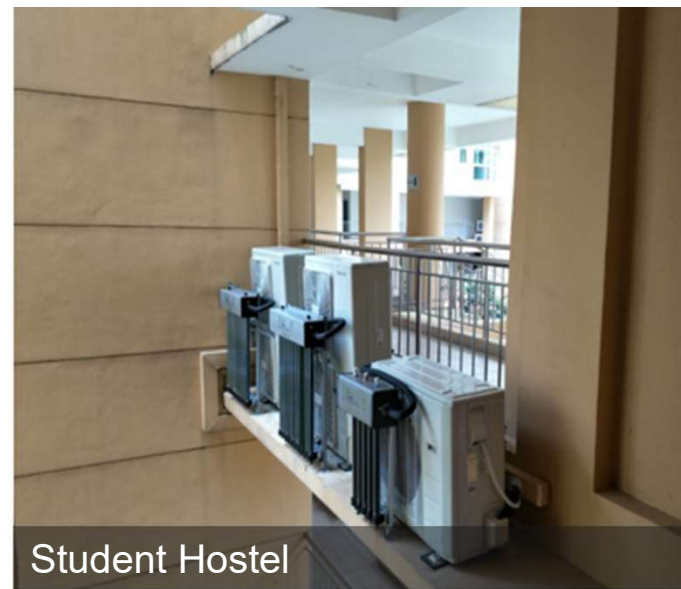




Student Hostel



Hotel



Student Hostel



School



School Private & Confidential



School

EcoLine  
Solar Thermal Air Conditioning

# Industry Partners & Customers



*Serve all with Love*





# Communities

## Research



## Industry

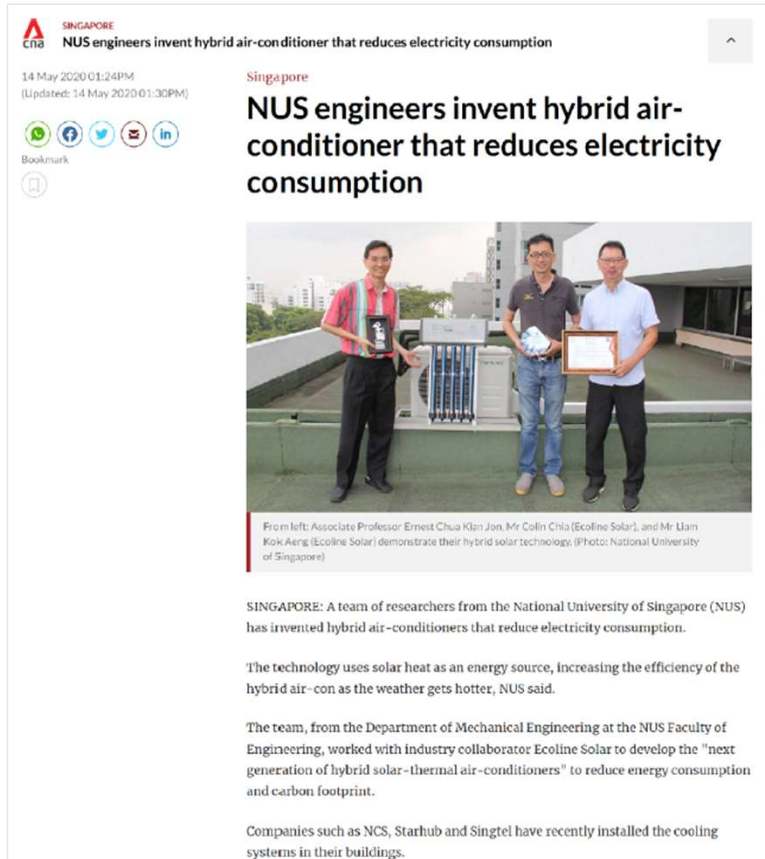


THE INSTITUTION  
OF ENGINEERS,  
SINGAPORE



HUMAN ENVIRONMENT  
WELLNESS STANDARD

# Awards & Recognitions



Source: <https://www.channelnewsasia.com/news/singapore/nus-engineers-invent-air-con-reduce-electricity-12731506>

## ASEAN Outstanding Engineering Achievement Award 2019



## IES Prestigious Engineering Achievement Award 2019



THE INSTITUTION  
OF ENGINEERS,  
SINGAPORE

# Summary

- Hybrid solar-thermal air-conditioning system
  - Harnesses ambient heat
  - Reduces energy consumption and carbon footprint
- Saves 30% ~ 55% of Electricity Bill
  - Eases the electrical load of equipment by up to 55%
  - Lowers cost of maintenance. Extends equipment lifespan
  - ROI ~ 2 Years
- Contributes to the reduction of Urban Heat Island (UHI) effect
  - Reduces outdoor temperature. Increases outdoor thermal comfort
  - Only Aircon Manufacturer that focuses on reducing HEAT WASTE with the 3Rs of Sustainability



# Case Studies

# NTU Hall 4



PLATINUM

GREEN MARK AWARD FOR BUILDINGS

## Test Result Summary

- **Estimate energy savings : 105,801.91kWh/year**
- Use of solar thermal air-con with COP > 6
- 30 ~ 35% Aircon Energy Savings
- LED lighting for common area with motion and photo sensor controls
- Common area such as corridors, staircases and lobbies are naturally ventilated
- Use of non-potable water for irrigation
- Use of sustainable products for renovation works
- Key card control of air-con units in student rooms

# Savings & ROI

## Eg: Server Room

36K BTU Single Split	<b>EcoLine</b> Solar Thermal Air Conditioning	Inverter Brand	Difference
Cost	\$5738	\$4860	\$878
kWh (day)	1.89	2.7	-0.81
Savings (1yr)	(\$525)		
Savings (5yrs)	(\$2624)		
ROI	20.07 months		
Cost (less savings after 5yrs)	\$3114	\$4860	36%

*Note: Savings is calculated is based on usage of 12 hours/day over 30 days at a rate of \$0.15 per kWh*

**30-40% energy savings with ROI of upto 2 years or less**



# Customer Testimonial

# Mt Alvernia Hospital



September 23, 2016

Attention : Mr Colin Chia

Letter of Recommendation

We installed several Therm-Aire 24K BTU Wall Mounted System in our hospital in early 2016 and would like to put on record that we are impressed with the performance of the Therm-Aire Solar Air-Conditioning System. We had prior to the installation taken measurements of the power consumption of the previous system (which was a well known Japanese inverter brand) and are pleased to note that the expected savings of more than 30% with Therm-Aire systems were achieved.

It is with pleasure that we recommend Therm-Aire for the energy savings and as a green solution for the Air-Conditioning requirements.

We expect our vendors to be reliable and we expect high standard in their equipment and service and are very happy with the service of EcoLine Solar Pte Ltd.

Regards,

A handwritten signature in black ink, appearing to read "Julius Duhaylungsod".

Julius Duhaylungsod  
Senior Engineer  
Facilities Management Dept.  
Mount Alvernia Hospital

**System. We had prior to the installation taken measurements of the power consumption of the previous system (which was a well known Japanese inverter brand) and are pleased to note that the expected savings of more than 30% with Therm-Aire systems were achieved.**

**It is with pleasure that we recommend Therm-Aire for the energy savings and as a green solution for the Air-Conditioning requirements.**

# Hotel Dawei



บริษัท เนาวรัตน์พัฒนาการ จำกัด (มหาชน)  
NAWARAT PATANAKARN PUBLIC COMPANY LIMITED



18 January 2016

Ecoline Solar Pte Ltd  
No. 7 Yishun Industrial Street 1  
#02-37/66 North Spring Bizhub  
Singapore 768162

For the Attention: Mr. Colin Chia

Dear Mr. Chia,

THERM-AIRE SOLAR HYBRID AIR CONDITIONING  
AT PROPOSED HOTEL DAWEI, DAWEI,  
THANINTHARYI REGION, MYANMAR

After the installation of 6 units of 18,000 BTU wall mount Therm-Aire Solar Hybrid AC system, our engineers conducted tests on the units installed in our hotel rooms over a 3-day period from Jan10 to Jan 12, 2016.

The running ampere consumed was monitored and recorded regularly on 1-hour period interval throughout most of the testing period with the following results.

The overall average running ampere consumed for the 6 units tested over the 3 days was about 2.5 amperes.

The performance in terms of energy efficiency results was better than projected. The rooms are consistently cool and I am extremely pleased with the results. I will not hesitate to recommend Therm-Aire Solar Hybrid AC system to our associates and friends for the interest of saving the environment with this revolutionary hybrid system.

Yours sincerely

Richard Kehl

Richard Koh  
Project Director  
for Nawarat Patanakarn PLC

Unit 18 and Unit 19 are for non-graduate students. • Unit 20 May 14 are for graduates. Tel. +66 2 2751-0884 • Fax +66 2 2751-0884 • E-mail: [info@bangkokuniversity.ac.th](mailto:info@bangkokuniversity.ac.th) • Website: [www.bangkokuniversity.ac.th](http://www.bangkokuniversity.ac.th) • Bangkok, Bangkok • Samprakan 10540, Thailand • Tel. +66 (0) 2751-0884 Fax. +66 (0) 2751-0884

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## Feliz Hotel

**BEYONDGREEN**Energy Innovations Inc.  
A subsidiary of Beyond Innovations Inc.

## Proof of Concept

## Data Monitoring

Client Project	Feliz Hotel
Competitor	General Electric Model: AA1AC12EKQ Split Wall Mounted 1.0TR
Unit Location	MBC Building (HR room)
Equipment Used	Therm-Aire Brand Model: STA-012WM Split Wall Mounted 1.0TR
Unit Location	MBC Building (HR room)
POC Findings	<b>50.20%</b> reduction of electrical consumption compared to existing General Electric Brand Basic Type unit.
Inclusive Data	Data Monitoring Log Sheet <ul style="list-style-type: none"> <li>- Electrical Readings</li> <li>- Room, Ambient &amp; Off-coil Temperature Results</li> </ul> Fluke Energy Analyzer <ul style="list-style-type: none"> <li>- Power</li> <li>- Current</li> <li>- Voltage</li> <li>- Electricity Consumption</li> </ul>
Validation Method	Temperature readings were gathered 3-6 times daily: <ul style="list-style-type: none"> <li>• Room Temperature was measured in 2 points to derive Room Average;</li> <li>• Off-Coil Temperature was measured with probes 5' from Evaporator.</li> </ul> Fluke® Energy logger was used to monitor electrical consumption.
Project Manager	Mary Jane Bascos Beyond Green Energy Innovations
Signature Date	
Client Name	Felipe M. Bayno, Jr. Elizalde Holdings Corporation
Signature Date	

## POC Findings

**50.20%** reduction of electrical consumption compared to existing General Electric Brand Basic Type unit.

# Astoria Hotel and Resorts

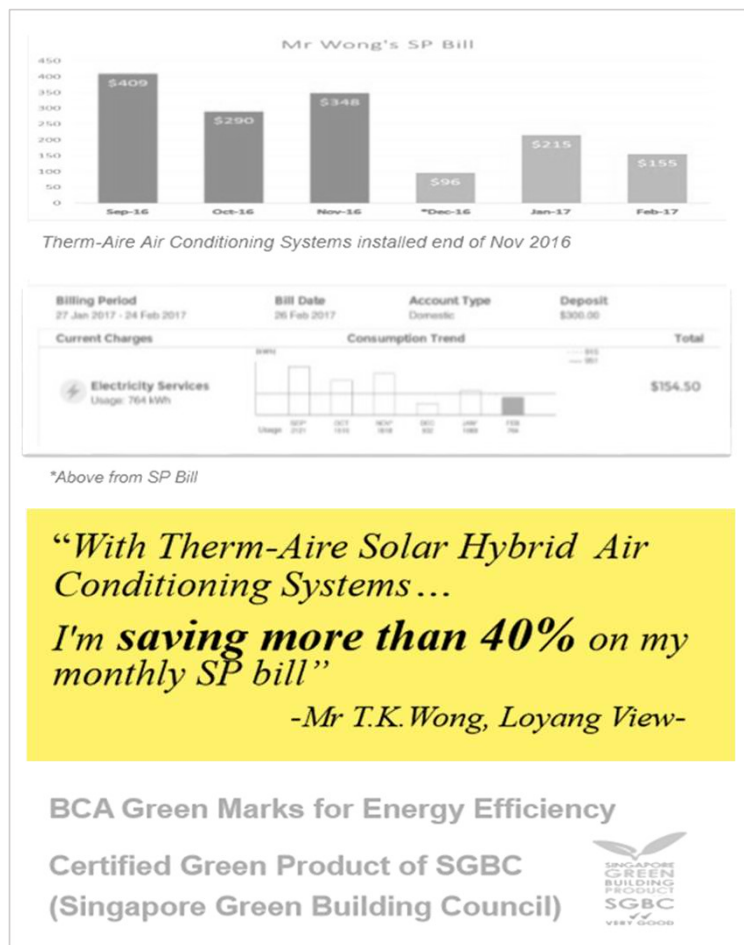
**BEYONDGREEN**  
Energy Innovations Inc.  
A subsidiary of Beyond Innovations, Inc.

## Proof of Concept Acceptance

Client Project	Astoria Hotels and Resorts - Astoria Plaza: Security Room
Solution Delivered	STA-012SPWM-FC STA-012SPWM-C 1TR Wall Mounted
POC Settings	Thermostat Settings: 20°C Fan/Blower Speed: Medium Mode: Cool
Acceptance Criteria	20%++ Savings vs Inverter ACUs Average Off-coil Temp ≤ 5°C of Thermostat Setting
POC Findings	<p><b>Therm-Aire 1TR WM:</b></p> <ul style="list-style-type: none"> <li>Ambient Temperature: 35.00°C</li> <li>Average KWH: 0.93</li> <li>Average Off-coil: 13.27°C</li> <li>Average Room Temp: 25.24°C</li> </ul> <p><b>Mitsubishi 1.5HP WM:</b></p> <ul style="list-style-type: none"> <li>Ambient Temperature: 34.89°C</li> <li>Average KWH: 1.92</li> <li>Average Off-coil: 13.10°C</li> <li>Average Room Temp: 25.56°C</li> </ul> <p>Savings/Efficient Increment: <b>51.56%</b></p> <p>Please refer to Annex A for POC data and graphs below.</p>
Validation Method	<p>Each unit cooled the room independently.</p> <p>Temperature readings were gathered 3-4 times daily:</p> <ul style="list-style-type: none"> <li>Room Temperature was measured in 5 points to derive Room Average;</li> <li>Off-Coil Temperature was measured with probes 1" from Evaporator.</li> </ul> <p>Fluke® Energy logger was used to monitor electrical consumption.</p>
Project Manager	Leo Veroy Beyond Green Energy Innovations
Signature Date	23 May 2016
Client Name	Engr. Dante Atendido Head of Engineering Astoria Hotels and Resorts - Astoria Plaza
Signature Date	23 May 2016

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# Private Residence

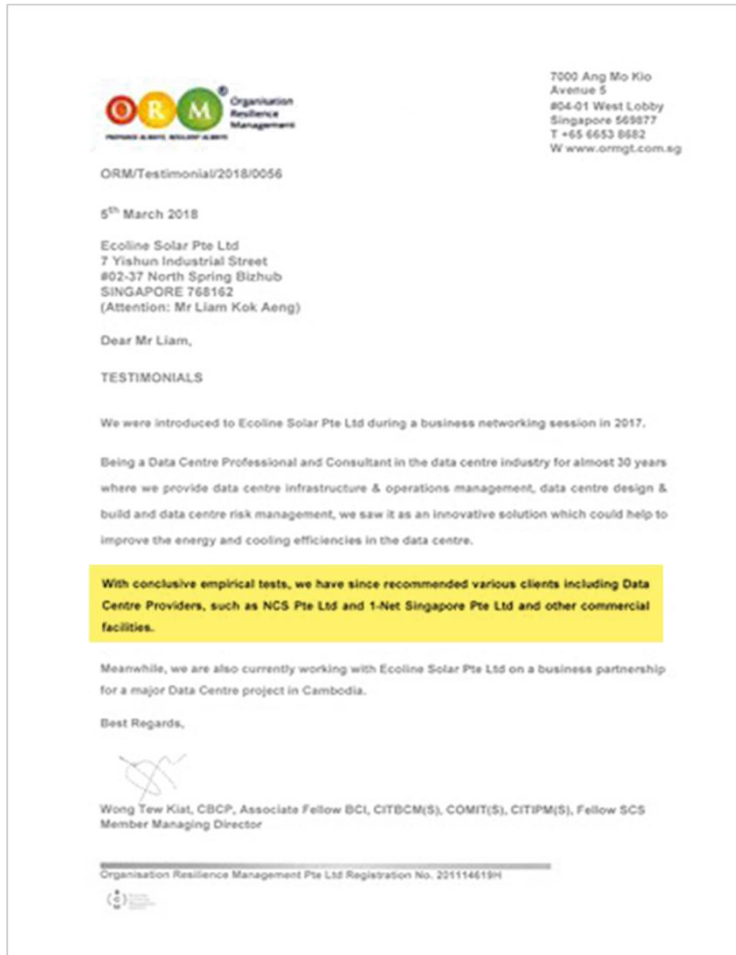


Savings  
on  
monthly bills  
**>40%**





# Data Center Consultant



**With conclusive empirical tests, we have since recommended various clients including Data Centre Providers, such as NCS Pte Ltd and 1-Net Singapore Pte Ltd and other commercial facilities**

# Energy & Facilities Manager

11 July 2018

To whom it may concern,

As a Singapore Certified Energy Manager (SCEM), part of my job requires that I look for energy efficient equipment for my company.

I came across Ecoline Solar Pte Ltd in my search. I was very interested in their thermal hybrid air conditioning technology for its potential in energy saving. As Highway International has over 50 ACs in our building, the potential saving is significant.

We have installed Therm-Aire ACs to compare to our existing ACs and found Therm-Aire to be more energy efficient.

I highly recommend companies and organizations to consider Ecoline Solar's thermal hybrid AC technology.

Regards  
Steven Tan  
Energy and Facilities Manager  
SCEM 0634  
Highway International Private Limited

***“As a Singapore Certified Energy Manager (SCEM) part of my job requires that I look for energy efficient equipment for my company....I highly recommend companies and organisations to consider Ecoline’s Solar Thermal Hybrid AC technology.”***

**Steven Tan (SCEM 0634) / Energy and Facilities Manager  
of Highway International**

# Thank You

Reduce | Reuse | Recycle  
Cooling with sustainable energy for a  
Greener World

[www.ecolinesolar.com.sg](http://www.ecolinesolar.com.sg)

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