

Smart Energy Project at Chiang Mai University



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วัตถุประสงค์

เพื่อยกระดับมหาวิทยาลัยเชียงใหม่สู่การเป็น “มหาวิทยาลัยอัจฉริยะ (Smart University)” และเป็นต้นแบบเมืองอัจฉริยะ (Smart City) ของจังหวัดเชียงใหม่ และประเทศไทย โดยการนำนวัตกรรม ได้แก่ Block Chain, AI, IoT, Cloud Based, Energy Efficiency Platform, Power Generation & Consumption Platform, Battery และ Vehicle-to-Grid (V2G) มาช่วยบริหารจัดการพลังงานไฟฟ้าที่ผลิตได้จากโซลาร์รูฟท็อป และคำนวณการลดการปล่อยคาร์บอนที่เกิดขึ้นจากโครงการอย่างเต็มระบบ

เริ่มดำเนินการก่อสร้างในปี 2564 ปัจจุบันอยู่ระหว่างการก่อสร้างและพัฒนาระบบเพิ่มเติม

การสร้างคุณค่าต่อเศรษฐกิจ

นวัตกรรมช่วยสร้างมูลค่าเพิ่มแก่องค์กร



ช่วยลดค่าไฟฟ้าแก่มหาวิทยาลัยเชียงใหม่ 2565

↓ **12 mil-THB**
25.25%



8.1 mil-THB Net Profit

การสร้างคุณค่าต่อสังคม

ส่งเสริมให้เกิดการพัฒนาคุณภาพชีวิตที่ดีขึ้น

CMU Population 52,000 per day

- Student 26,000 people
- University Staff 11,200 people
- Visitor 15,000 people

การสร้างคุณค่าต่อสิ่งแวดล้อม

ช่วยลดการใช้ไฟฟ้าจากพลังงานเชื้อเพลิงเป็นการใช้ไฟฟ้าจากพลังงานแสงอาทิตย์



2565 Total Consumption

12,183 MWh



Carbon Emission Reduction

5,434 TC02e



Smart City
& Smart Campus

Energy Part

- Renewables
- Energy Management
- Efficiency Management
- Virtual Power Plant



15 MW

Total Solar Power



1.2 MWh
Energy Storage



Blockchain

P2P Energy Trading

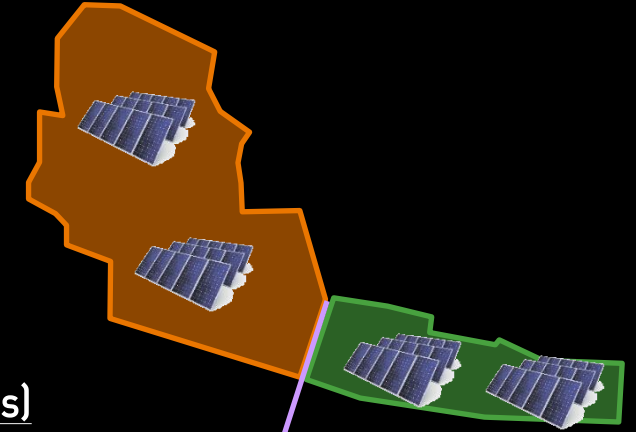


Power Ledger

3 campuses (2,300 Rais)

- Suan Sak
- Suan Dok
- Mae Hia

Zone 1
Suan Sak



Zone 2
Suan Dok

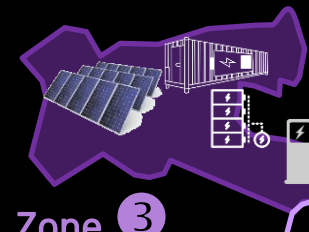
5.7 km

Population traffic 52,000 pax/day

- Student 26,000 people
- Staff 11,200 people
- Visitor 15,000 people

Vehicle traffic 60,000 units/day

- Car 25,000 units
- Motorbike 35,000 units



Zone 3
Mae Hia



- Energy tracking and trading
- Renewable Energy Credit Reporting and Trading
- Battery, EV and Smart Applications
- Grid Management



Energy trading & traceability



Environmental commodities trading



EV Charger Partners



Development Solutions



1

CLEAN ENERGY DEVELOPMENT

- Solar Energy
- Zero Export
- Automatic Metering and Billing Platform
- Renewable Asset Management Platform

CMU SMART CITY
CLEAN ENERGY

2

SMART GRID

- Virtual Power Plant
- Blockchain P2P
- Zero export
- Demand Response

3

NET ZERO CARBON BUILDING

- Solar Energy, Blockchain P2P
- Energy Storage
- Building Management System
- IOT, AI + Machine Learning
- Smart monitoring Energy Consumption
- Central cooling system

4

ELECTRIC VEHICLE

- EV Charging Station
- Energy Mixed Charging Platform
- V2G

5

CARBON MANAGEMENT

- Carbon Management
- Carbon Trading Platform

EV charger & V2G

Carbon Trading

Consolidated Platform

Battery

Energy Efficiency

Asset Management

Energy Trading



Trading Rule Stack

Allocation

Each building will be sold the solar energy from the panels on their roof.



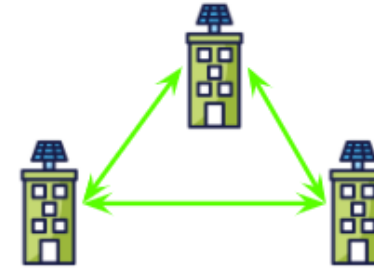
Peer-to-Peer with ERDI

Each building will then try to trade any excess energy they have with the ERDI building. The P2P rule will try to satisfy the demand of the ERDI building with the least number of transactions, for efficiency.



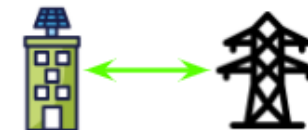
Campus Peer-to-Peer

Each building can then trade their excess with each other to try and satisfy all the remaining load. The algorithm will try to optimise trading to match producers and consumers in a way to have the least amount of trades. They all have the same cost ฿/kWh with a 25.25% discount relative to the GRID.



Trade with Grid

All remaining excess and demand that cannot be traded via P2P is then traded with the GRID



Development Solutions

Net Zero Carbon Building



SMART ENERGY MONITORING



Real-Time Data

- Solar Energy
- Energy Storage
- EV charging station
- Building Management
- Air-conditioning
- Chiller (whole area within university)

Solar Energy

- Generated electricity 144 kW
- System efficiency 97%
- Invertor status : **OK**



Green Building Certificate



Lighting



- Energy consumption 20 kW
- Status : **ON**

Energy Storage



- Power level : 80%
- Charging status : **ON**

Air-conditioning



- Energy consumption 100 kW
- Room temperature **25 °C**

EV charging station



มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี

Development Solutions

Energy Efficiency Platform



Dashboard BCPG Admin

Shjinno Building Real-time Alerts

6.63 °C

Overall CHWS Temperature

7.54 °C

Overall CHWR Temperature

2.71 kW/RT

Plant Performance

71.31 kW

Plant Power Consumption

26.36 RT

Cooling Capacity

Chillers Overview

Name	Efficiency (kW/Ton)	Power Consumption (kW)	Eva Entering (°C)	Eva Leaving (°C)	Status
Chiller 1 Chiller 1	0.90	24.27	7.54	6.63	On ● View Chiller

Chiller 1 Real-time Prev day 7D 1M

Chiller Efficiency [Change Scale Values](#)

Metric	Value	Baseline
kW / Ton	1.05	0.80 ~ 1.20
Cooling Capacity (RT)	23.98	123.00 ~ 450.00
Eva Entering (°C)	7.41	7.83 ~ 11.54
Eva Leaving (°C)	6.48	5.8 ~ 6.8

Efficiency Histogram

Chiller 1
Chiller 1

Brand: **Trane** Model: **Water-Cooled Chiller**

Serial number: **RTHDC2F2F3** Tonnage: **250 RT**

Refrigerant type: **Screw**

Chiller Efficiency: **1.05 kW / Ton** Power: **26.32 kW**

power_loading: **7 %** Cooling Capacity: **23.98 RT**

Eva Delta Temp: **0.93 °C**

[Data Details](#)

To Virtualize both Solar Generation and Load Consumption

RESYNC SMART BUILDING

ANALYSIS

Dashboard

Building

Floor

Unit

Asset

Reports

Forecast

Alerts

Optimisation

FACILITY MANAGEMENT

Jobs

Facility Team

ADMINISTRATION

Users Management



01 Jan 2023 - 11 Jan 2023

Analysis Portfolio

Overall Consumption

19.78 MWh -28.5%

Compared to last 10 days

Overall Generation

10.33 MWh -20.3%

Compared to last 10 days

Estimated Energy Cost

119678.79 THB -28.5%

Compared to last 10 days

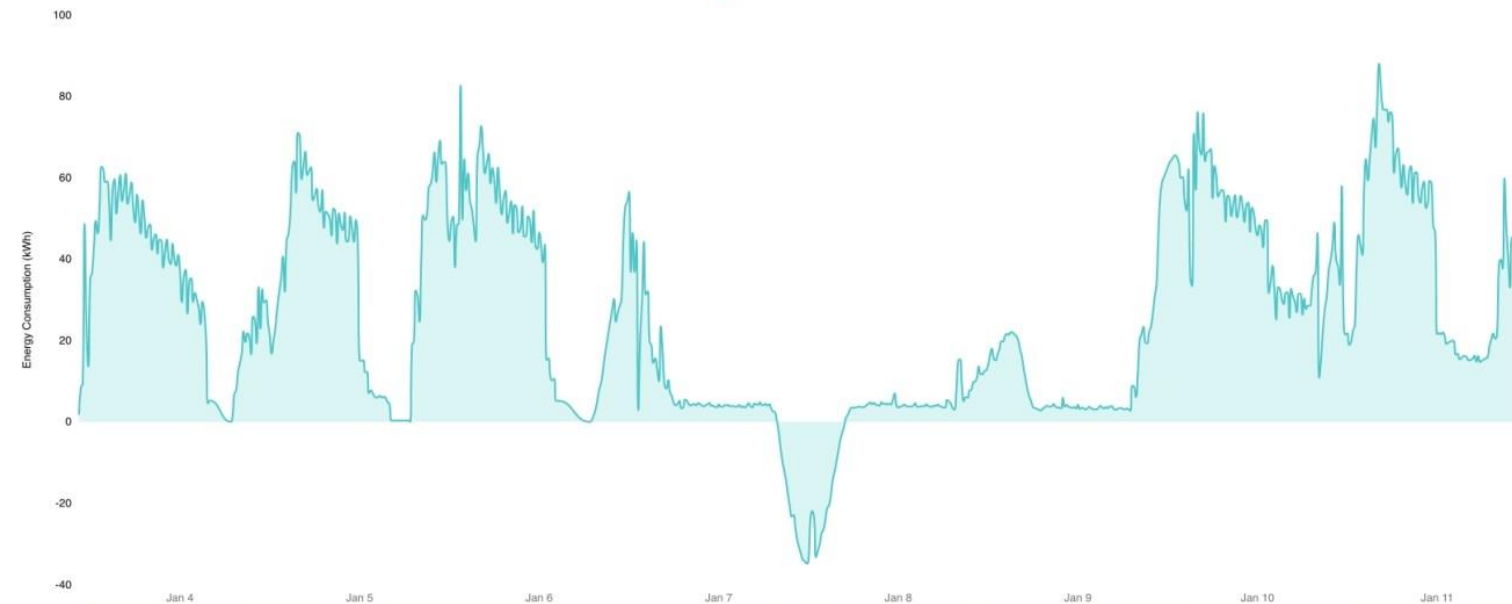
Carbon Footprint

11295.12 kg -28.5%

Compared to last 10 days

Consumption

Energy Consumption



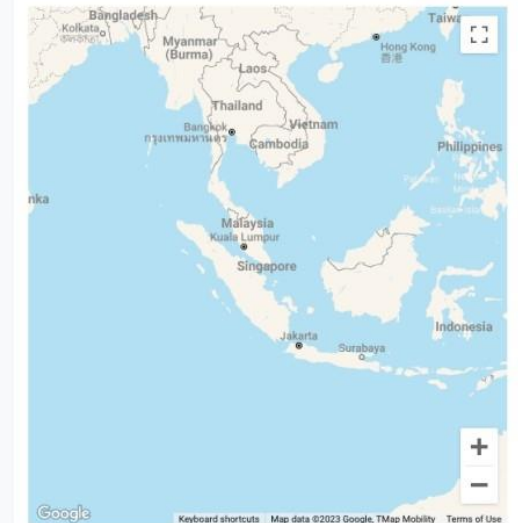
Organisation Overview

Company Logo

Number of Buildings 17

Number of Units 0

Number of Assets 16





Forward | Green | World