Review on the LCT Planning of HANG TUAH JAYA CITY, MELAKA

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Green Energy and Environmental Labs

Industrial Technology Research Institute

The 1st APEC Low-Carbon Model Town Symposium
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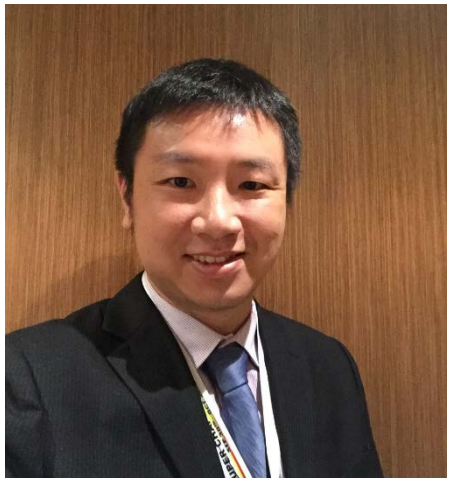
About Hung-Wen Lin

Experiences



- Project Manager, Green Energy and Environmental Labs, ITRI (2014 -)
- Project Deputy Leader, Bureau of Energy, Ministry of Economic Affairs (2011 -)
- Chairman, Chapter Technology Transfer(CTTC) of American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Taiwan Chapter (2016 -)
- Member, Zero Energy Building Technology Alliance (ZEBTA) (2014 -)
- Visiting Researcher, Lawrence Berkeley National Laboratory, USA (2010-2012)

Honors

- ASHRAE CTTC, The Presidential Award of Excellence, 2017
- Outstanding Young Engineer of Chinese Society of Mechanical Engineers, 2016

Specialties and research interests

- Energy management and analysis system
- Smart AC controller and thermal comfort
- Thermodynamics and fluid dynamics

Findings on the LCT Planning of Hang Tuah Jaya City

- **Basic Information**
  - **Malacca**
  - Population of 900,000
  - More than 14 million tourists per year
  - Aimed to achieve “green” status by 2020
  - **Hang Tuah Jaya City**
  - A township and state capital in Ayer Keroh, Malacca
  - Sustainable Development Green City
  - Development area of 5153 acres (= 20.85 km^2)
    - 8 MW Solar Farm Project (Completed Dec 2014)
  - All buildings and development shall comply with building rating certifications i.e. GBI, LEED, Green Star, Green Mark and Melaka Green Seal.

City Center

Rehabilitation Center

8 MW Solar Farm

Chronology of Implementation of LCCF in Hang Tuah Jaya Municipal Council

Timeline	Event
28th Jun 2012	Signing of Memorandum of Understanding (MoU)
December 2012	Brief project report
March-July 2013	Data collection for year 2012
July-August 2013	Data analysis and baseline report
July-November 2013	Implementation of action plan
11th October 2013	Provisional Certificate award
August-November 2013	Data collection for year 2013
December 2013	Data analysis and full report for 2013
2014	Reduction of carbon competition 2014
December 2014	Data collection for year 2014
2015	Data analysis and full report for 2014
2016	LCCF and Diamond Rating award

The First Local Council to Receive Diamond Rating


KeTTHA
KEMENTERIAN TENAGA, TEKNOLOGI HIJAU DAN AIR
GreenTech Malaysia

Certificate of Achievement

LCCF

awarded to

MAJLIS PERBANDARAN HANG TUAH JAYA

for successfully achieving a carbon emission reduction of

4.3% (Best Practice 1)

for the year

2014

under the

LOW CARBON CITIES FRAMEWORK AND ASSESSMENT SYSTEM (LCCF)

Location	:	Pilot Implementation Area
Approach	:	One System
LCCF Element	:	Urban Environment & Building
Project Area	:	627.61 ha 4.34% of the total area of Hang Tuah Jaya (14,461 ha)
Baseline Year	:	2013

DATUK SERI PANGLIMA DR. MAXIMUS JOHNITY ONGKILI
Minister
Energy, Green Technology and Water

Cert. No: LCCF/OS/2016/C001

LCCF Performance Criteria: Based on Carbon Footprint

4 Elements for GHG Reductions in Cities and Townships

Urban Environment

- Site Selection
- Urban Form
- Urban Greenery & Environmental Quality

Urban Transportation

- Shift of Transport Mode
- Green Transport Infrastructure
- Clean Vehicles
- Traffic Management

Urban Infrastructure

- Infrastructure Provision
- Waste
- Energy
- Water

Building

- Low Carbon Building
- Community Services

4 Elements → 13 Performance Criteria* → 35 Sub Criteria

*Performance Criteria are **measurable strategies** to reduce carbon emission through:- Policy control, technological dev., better process & product management, change in procurement system, carbon capture, consumption strategies & others.

Performance Criteria for Urban Environment(UE)

UE 1 : Site Selection

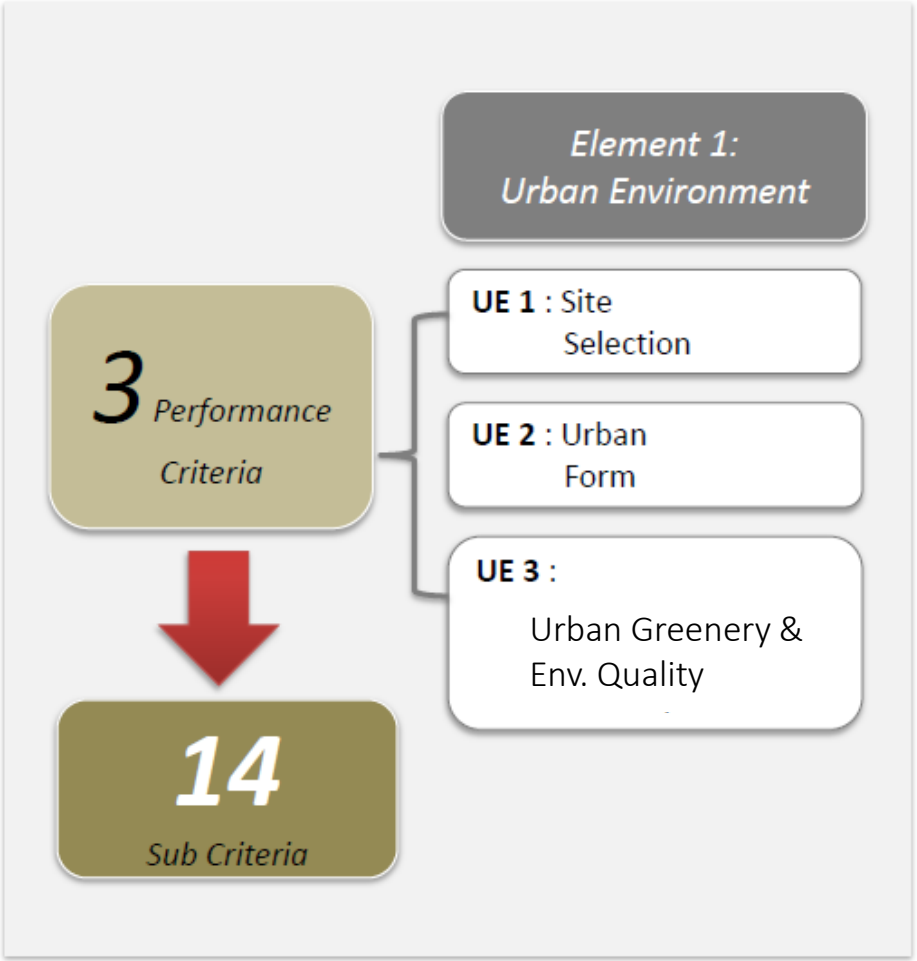
- 1-1: Development within defined urban footprint
- 1-2: Infill development
- 1-3: Development projects within transit nodes and corridor
- 1-4: Brownfield and Grey field redevelopment
- 1-5: Hill slope development

UE 2 : Urban Form

- 2-1: Mixed-use development
- 2-2: Compact development
- 2-3: Road and parking
- 2-4: Comprehensive pedestrian network
- 2-5: Comprehensive cycling network
- 2-6: Urban Heat Island (UHI) effects

UE 3: Urban Greenery And Environmental Quality

- 3-1: Preserve natural ecology, water body and bio-diversity
- 3-2: Green open space
- 3-3: Number of trees



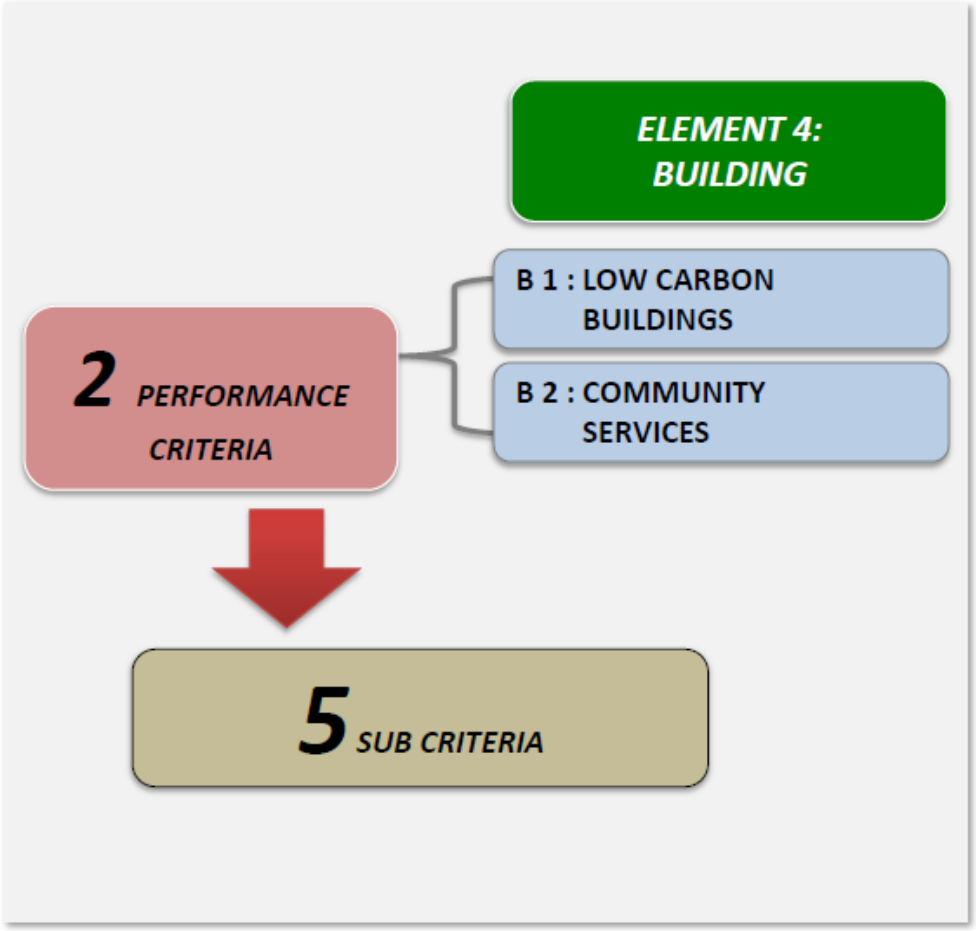
Performance Criteria for Building (B)

B1 : Low Carbon Buildings

1-1: Operational Energy Emissions
1-2: Operational Water Emissions
1-3: Emission Abatement Through Retrofitting
1-4: Building Orientation

B2 : Community Services

2-1: Shared facilities and utilities within building



Findings on the LCT Planning of Hang Tuah Jaya City

Short Term	Long Term
Carry out a program to save the energy and water consumption up to 10% (without cost) (Energy management; Water management)	Plantation of tress with high absorption of carbon dioxide Eg. Local bamboo and Eucalyptus (Greenery)
Standardize air-conditioning temperature in every building involved at 24°C (Buildings; Energy management)	Using renewable energy which is Photovoltaic Solar Energy (Renewable energy)
Carry out Rain Water Collecting System (SPAH) for landscape, toilet and general cleaning (Water management)	Using energy saving equipment in every building (LED/T5 lamp, notebook, inverter air-conditioner) (Buildings; Energy management)
Using sunlight as light source in a building (reduce energy usage) (Buildings; Renewable energy)	Having at least 10% or more green open area than the total amount of buildings (Greenery)

Evaluation on the Application of the LCT- I System

Question	Excellent	Good	Average	Below Average	Poor
Information of the LCT-I Volunteer Town		✓			
Understanding of each LCT-I System indicators			✓		
Explanation (evidence) provided for the self-evaluation			✓		
Collection of data necessary for the evaluation			✓		
Calculation of CO_2 emissions		✓			

Overall Assessment

Overall Rank

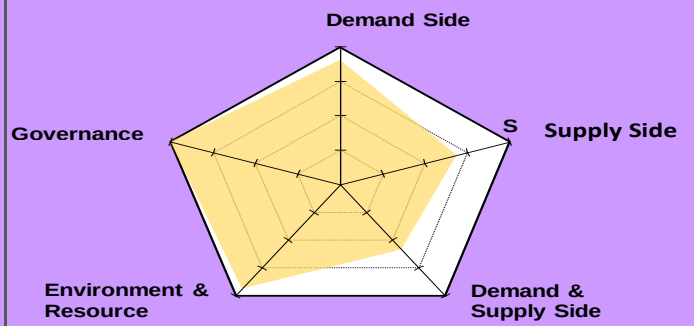
★★★★★

Total Point
average of (1) to (14) **4.4**

CO2 Reduction **434.0** t-CO2/year

Please fill Co2 reduction in the above cell and attach the source or evidence

Radar Chart

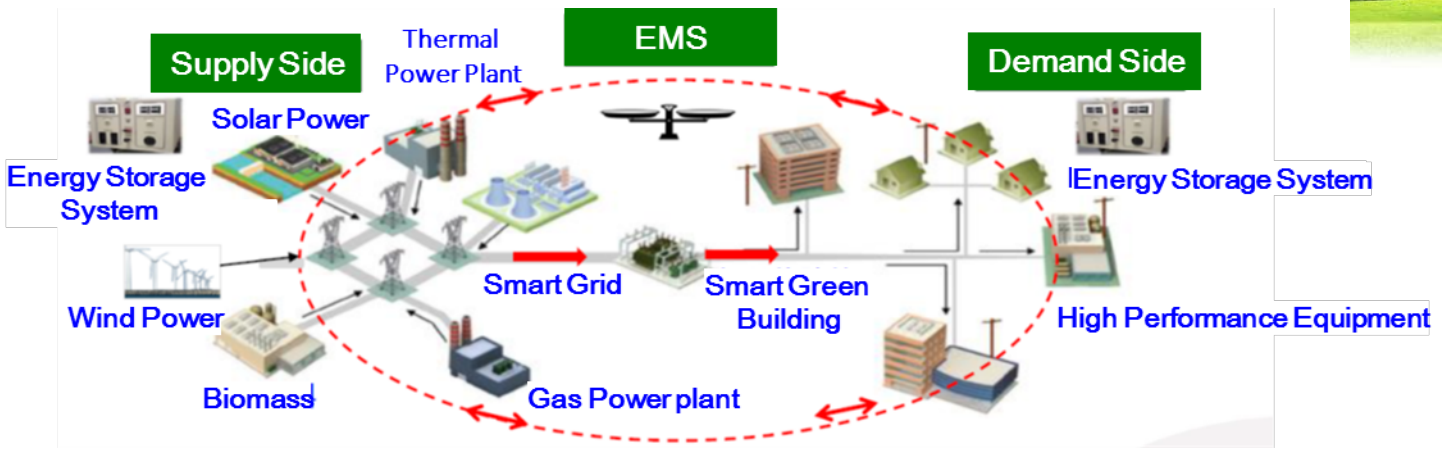


Feedback on the Self-Evaluation

Tier 1	Tier 2	Tier 3	Comments
Demand	• Town Structure • Buildings	• Land use • Energy Saving Construction	• Integrate the green area at the east side to the urban area at the west side will conduct good land use efficiency. • Several buildings has complied the green rating bldg. under Green Building Index (GBI) and Melaka Green Seal (MGS)
Demand	Transportation	All items	• Special parking rate for the low carbon vehicle. • Good green transportation(Electric Bus) can reduce carbon emission, set up intra city bike or bike share system in the future
Supply	Renewable Energy	Renewable Energy	8 MW Solar Farm(Completed Dec 2014)
Demand & Supply	Energy Management System	Energy Management of Buildings/Area	14 buildings in this area used a system that called "Building Consumption Input System"
Environment & Resources	• Greenery • Water & Waste Management • Pollutions	All items	• No data at evaluation sheet, need to describe more information to evidence effort in the part. • Enforce the Water & Waste Management plan • Reduce 434.26 tones of CO_2 emission (4.3%) from 2013 to 2014
Governance	• Policy Framework • Education & Management	All items	• No data at evaluation sheet, need to describe more information to evidence effort in the part. • Set up energy saving and carbon reduction target. • Declare food's carbon footprint

For the Improvement

Tier 1	Tier 2	Suggest
Supply	• Renewable Energy	• Accomplish the framework for solar power plant, biomass energy • Encourage people to set up solar panel on the building roof • Replace BIPV glass of regular glass to earn more power
Demand & Supply	• Energy Management System	• Establish a city or regional size Energy management System, for energy monitoring, prediction and smart control • Set up smart grid system to connect supply side and demand side
Governance	• Policy Framework • Education & Management	• Setup energy saving and carbon reduction target. • make performance measure standard and execute the performance verification regularly are good methods to maintain the low carbon city • Declare food's carbon footprint

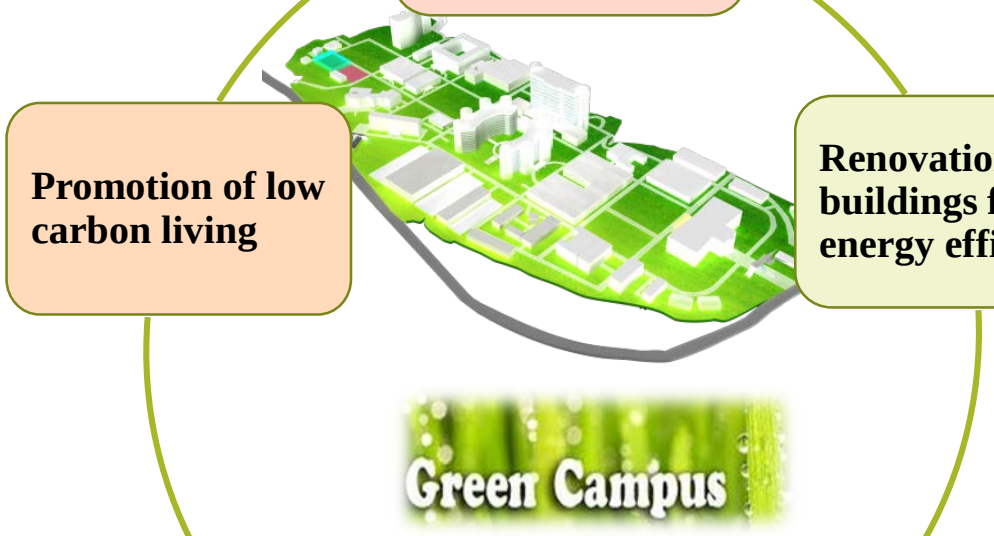


Smart Energy Management System

ITRI IPOWER Platform

ITRI Green Campus Program

- Goals (based on 2010)
  - Electricity use reduction : 30%
  - CO_2e reduction : 40%
  - Green coverage > 75%
  - Irrigation by 100% recycled water



- 100% solar thermal water heater for dormitory
- Integrating heat pumps in central cooling systems
- Recycling gray water for grass field irrigation
- Street lamp using 100% LED lighting

- Renovating 84 buildings
- iBEMS control system
- District cooling/heating plant in certain districts

- iPower web management system
- iPad App software

- Public Relations promotion
- Internal communication and education

- Water recycle
- Waste recycle
- Ecological built environment
- Green transportation
- Green procurement
- Carbon foot-print labeling restaurant

ITRI Green Campus Program- 1. Low-Carbon Infrastructure

- Hot water: solar heaters, HPs for dorm and offices
- Efficient lighting: LED street lights, T5 fixtures, IR triggers
- Others: power system upgrade, storm water mgnt system, waste recycling, and water recycling, etc.

Solar heaters

HPs

Power system upgrade

LED Lighting

T5 fixtures

IR triggers

ITRI Green Campus Program-2. Building Renovation

- Totally 84 buildings in the campus will be renovated in 6 years (2012~2017)
- B10: the very first model that has successfully saved 33% energy by deploying ITRI's own technologies.
- B64: currently the 2nd highest performance bldg and undergoing several new techs demo.
- DHC: remodel B15, 17, 23 and a new green house to become a DHC system.

Human factors design (@ B64)

Piping (@ B15 + B17)

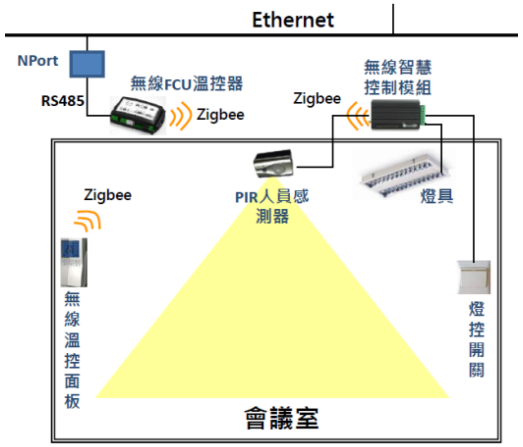
Piping (@ B17)

VFD Centrifugal Chiller

ITRI Green Campus Program-3. Power Monitoring and Management

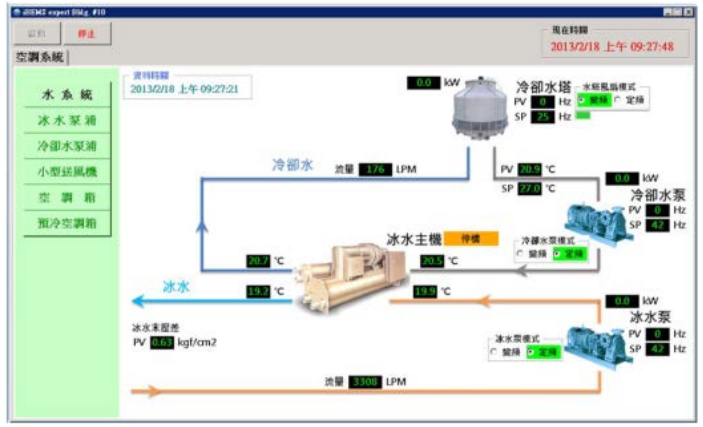
- iPOWER: campus wide power monitoring system
  - A 6-tier metric structure covering each campus buildings
- iBEMS: individual bldg. energy management system
- Office and conference room automation
- iExpert: water loop VFD control

iPOWER



Office mngt system

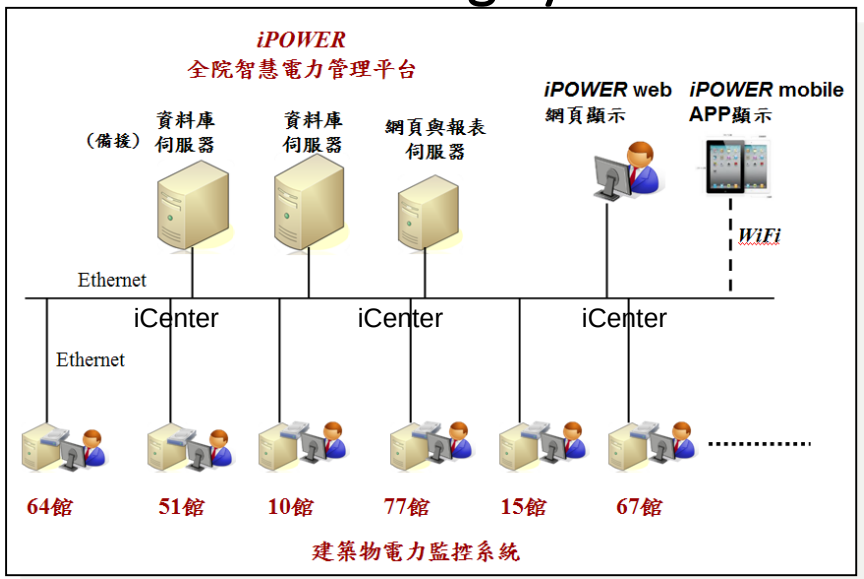
iBEMS



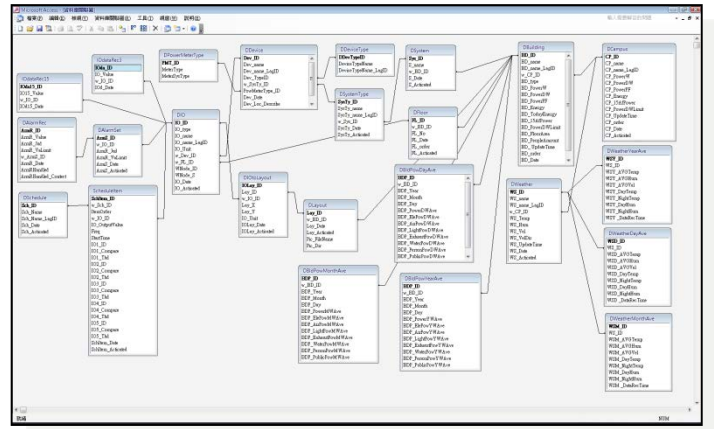
iExpert

ITRI Green Campus Program-3. Power Monitoring and Management

Campus Wide Power Monitoring System



iPOWER System Structure



Power use SQL database

iPOWER iPAD APP

iPOWER Web

Mobile energy information service is used to increase user awareness.

ITRI Green Campus Program-4. Eco-environment

- Landscaping: eco-pond, external shading, etc.
- Green IT: Conf.-call system (Lync) has saved at least 20% of commuting time for meetings and 600 thousand pieces of papers a year
- Off-time alert system for computers: idle rate drops from 16.3% to 3.4% during non-office hours
- Low carbon transportation system
- Carbon footprint meals

U-bike, e-scooters, coach btw ITRI to THSR station

Eco-pond (@ B64)

External shading (@ B51)

Carbon footprint meals

ITRI Green Campus Program-4. Eco-environment

Low-Carbon Transit and Food Services

EV Shuttle

Electro-motorbike

u-BIKE

Food labeled by CO2e

ITRI Green Campus Program-5. Promotion

Conclusions

- LCT-I System indicators is a good system to diagnose the performance of the selected town.
- For Hang Tuah Jaya City, more effect data or evidence would be better to estimate the energy saving benefit for low carbon city.
- ITRI's Green Campus Program has exemplified a paradigm of green low-carbon campus.
- This program offers test-beds for ITRI developing technologies to improve the levels of technology readiness and acceptance by industries
- With intensive collaboration among laboratories in ITRI, it also facilitates the technology innovation and integration.

Thank You

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