Town Island Project and HKU testing

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Power systems in Hong Kong

• Two power companies
  – CLP Power supplies electricity to Kowloon and the New Territories, and several outlying islands. It employs a fuel mix strategy of coal, gas, nuclear and oil.
  – Hong Kong Electric (HEC) supplies electricity to Hong Kong Island and the neighboring islands. It uses a combination of coal, liquefied natural gas and wind energy.
Fuel mix of power generation in HK by 2006

- Total installed capacity: 12,644 MW
  - This data includes part of the capacity of units 1 & 2 of Daya Bay nuclear power plant and Guangzhou pump storage station.

- Fuel mix

![Fuel mix chart](image)
Renewable energy in HK

- Lamma island wind power, 800 kW, 2004
- Solar power system, 550 kW, 2010

Source: Hong Kong Electric
Town island renewable energy microgrids

• Town Island (Dawn Island) is a remote island. One hour trip from Sai Kung Ferry Pier.
• Operation Dawn operates a non-profit drug rehabilitation centre.

Source: CLP Power
Town Island RE microgrids

- Town Island is currently powered mainly by three diesel generators with fuel transported there by boat.

- Overhead line and submarine cable were considered not applicable due to scenery and ecological concerns, as well as high cost.

Source: CLP Power
Solar and wind generations

• In 2008, CLP decided to use renewable energy to supply electricity to the Island using solar panels and wind turbines.
• Average daily solar radiation: 14.07 MJ/m²
• Average wind speed: 23.4 km/h
• Good enough for building a renewable energy based microgrid.
Two stage project – in total 192 kW

• Stage 1: 20 kW PV panels
  – Provides power to the existing Carmel Hostel, chapel, kitchen and farming area.

• Stage 2: 160 kW PV and 12 kW wind turbine
  – Provides power to new facilities, hostels and visitor center.

• Co-generation scheme: solar + wind

• Battery for excessive energy

• Original diesel units are kept for back-up purpose.
Microgrid

Source: CLP Power
HKU-CLP collaboration on Town Island project

- CLP and HKU research collaboration on Town Island renewable energy project
- Town island data
- Test the system in HKU smart grid laboratory
Objectives of HKU-CLP Joint Research

Town Island System model development

Optimal sizing of wind turbine, PV panel and storage

Study of demand management
Test the system in HKU smart grid lab

Diagram:
- PV panel emulation module
- PV panel converter
- AC grid interface
- Control module
- AC grid
Some results of the project

• Data analysis
  – Solar radiation
  – Load
  – Battery SOC, etc.

• Model the town island stage 1 system in the lab.

• Further study the future stage 2 system base on historical data.

• Suggestions to the configuration and others.