



# Town Island Project and HKU testing

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# Power systems in Hong Kong

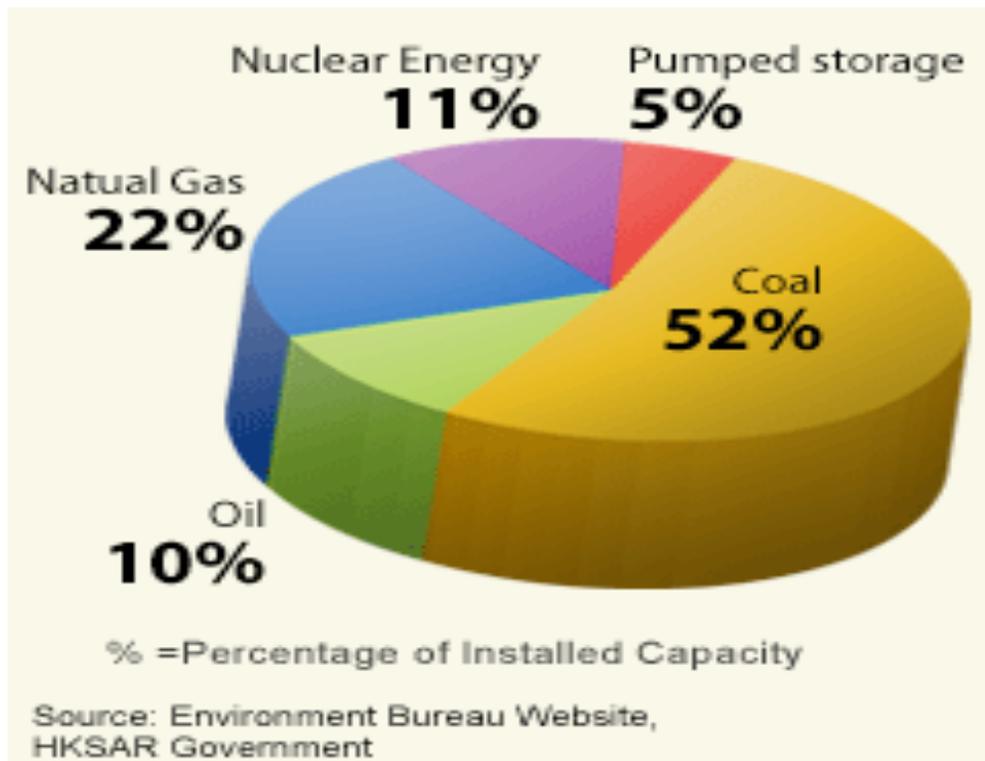


- Two power companies
  - CLP Power supplies electricity to Kowloon and the New Territories, and several outlying islands. It employs a fuel mix strategy of coal, gas, nuclear and oil.
  - Hong Kong Electric (HEC) supplies electricity to Hong Kong Island and the neighboring islands. It uses a combination 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



# 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.

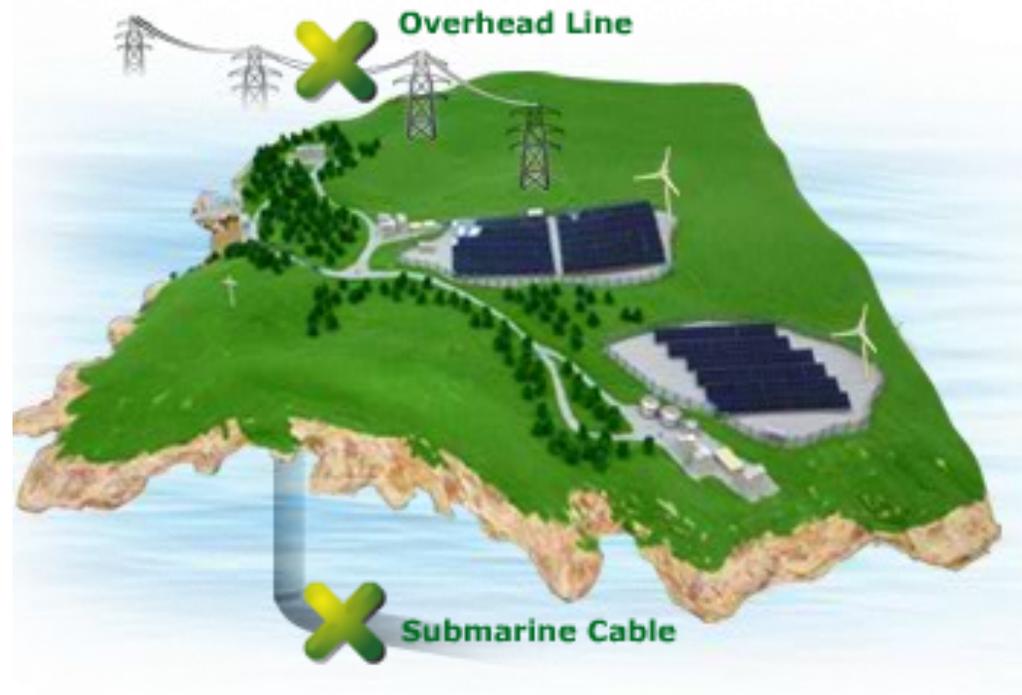


Source: CLP Power

# 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



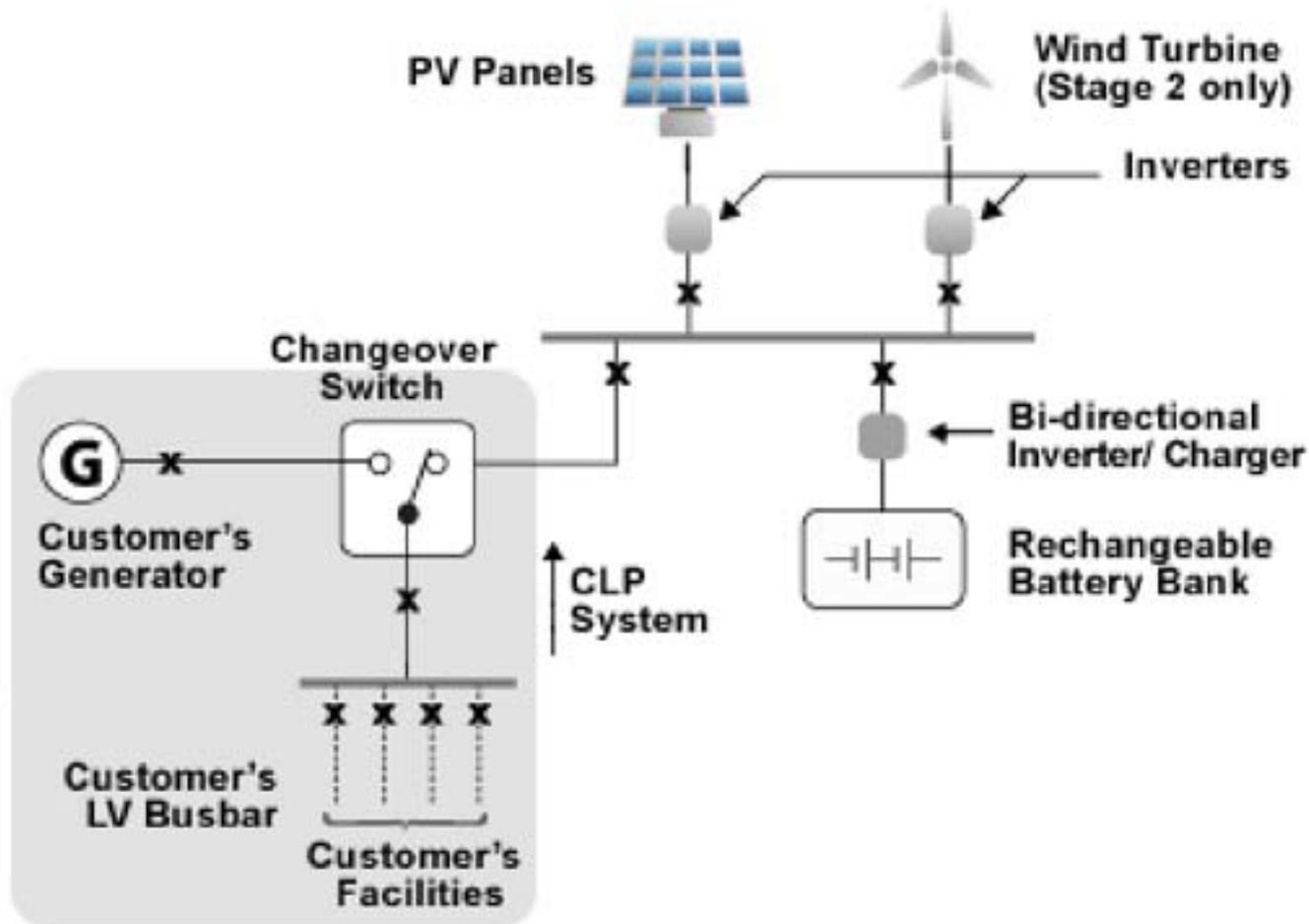
- In 2008, CLP decided to use renewable energy to supply electricity to the Island using solar panels and wind turbines.
- Average daily solar radiation: 14.07 MJ/m<sup>2</sup>
- Average wind speed: 23.4 km/h
- Good enough for building a renewable energy based microgrid.

## 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

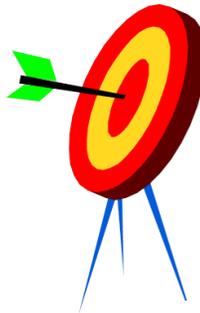
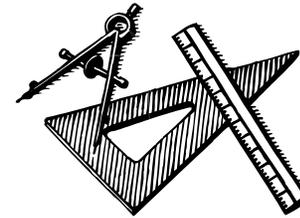


- CLP and HKU research collaboration on Town Island renewable energy project
- Town island data
- Test the system in HKU smart grid laboratory

# Objectives of HKU-CLP Joint Research



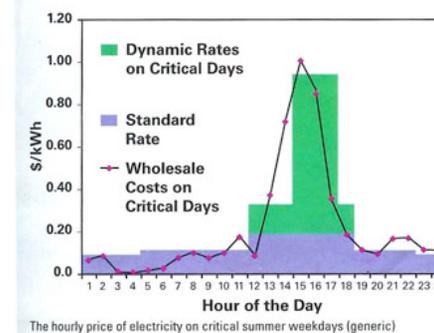
## Town Island System model development



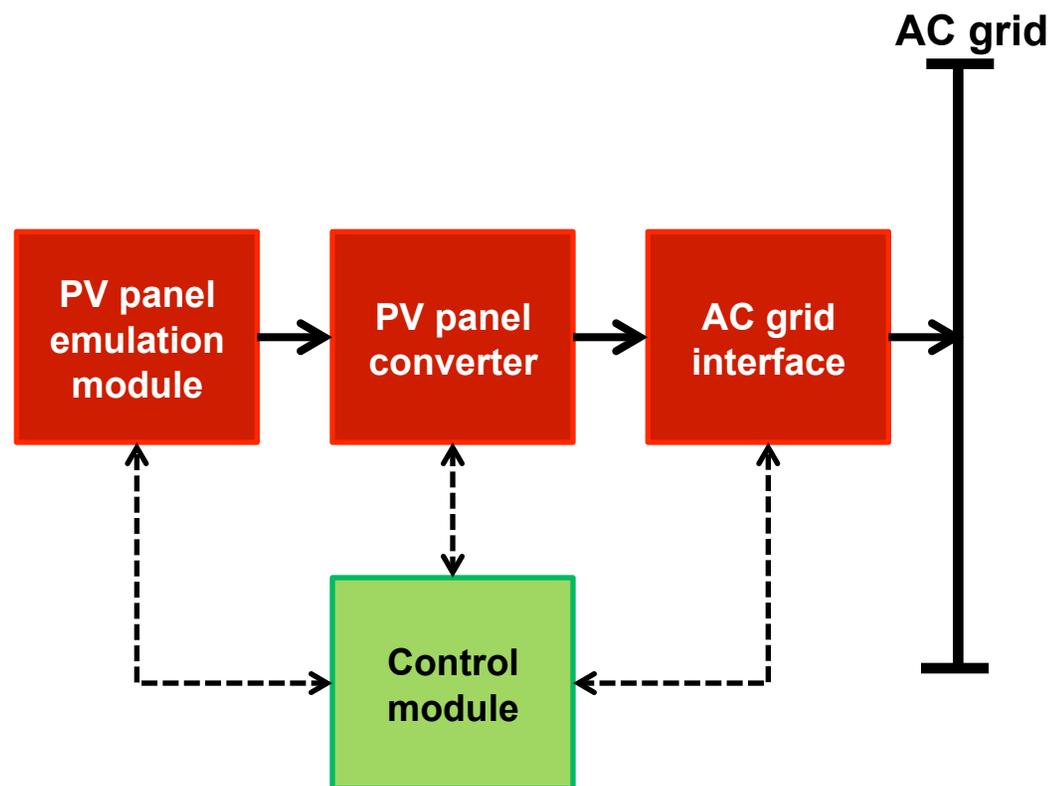
## Optimal sizing of wind turbine, PV panel and storage



## Study of demand management



# Test the system in HKU smart grid lab



# 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.