District Energy Management System

presented by

H B Gooi
Associate Professor & Deputy Head
Power Engineering Division
School of Electrical & Electronic Engineering

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District Energy Management System (DEMS)

The objectives of the project are:

(i) To explore new business opportunities of selling electricity to residential units, industrial and commercial buildings within the district;

(ii) To enhance the efficiency of DEMS by optimizing and managing its energy storage, electrical energy generation, load (includes air-con), G2V (may be V2G) exchange and electric energy sale/purchase with upstream networks;

(iii) To incorporate renewable energy resources such as PVs and combined cooling, heating and power (CCHP) or CHP micro-turbines; and

(iv) To lower the carbon footprint for the district and Singapore.
Project Scope

• Proposed Landlord-Tenant Concept
  – This concept is ideally suited for a community/district where the total annual power consumption is at least a few million dollars.
  – The landlord is the town council which engages MG-EMS to manage power generation (renewables and CHP/CCHP), household load, and common load facilities within the community and is interested in saving electricity expenses for the community.
  – Tenants are made up of residents who own/rent a HDB/private unit and industrial/commercial building owners within the community.

• Load Aggregation for Bulk Purchase
  – Individual household/building loads are combined together.
  – With sizable electric loads, the town council can negotiate a better bilateral contract with electricity retailers.
  – The same idea can be extended to gas and water supply for the community.
Project Scope (Contd)

• **New Business Model**
  – Instead of purchasing electricity from SP Services, residents/building owners can buy it from town council.
  – Metering and billing will be performed by MG-EMS.
  – Water/gas metering and billing could also be incorporated if town council succeeds in bulk purchase negotiation with suppliers.
  – If needed, the model could be extended to supplying hot/chilled water to residents if MG-EMS incorporates solar chillers, CCHP or CHP.

• **New Services for Residents and Building Owners**
  – MG-EMS could provide home alert service for old folks, home energy monitoring and management service for residents and security service for home owners when they are away from home.
  – Home owners could save electricity bill if they sign up for interruptible load services with town council.
  – MG-EMS could provide air-con optimization for buildings.
Project Scope (Cont’d)

- Seamless management services could be achieved via ICT between home, commercial/industrial buildings and MG-EMS.

- **MG-EMS incorporates**
  - Optimization of own power generation based on MG-EMS load forecast and upstream electricity tariff.
  - Efficiency Enhancement Initiatives such as power loss, reactive power management and power factor correction for each electrical load facility.
  - Demand Response Management to facilitate load control or short term load reduction during periods of high TOU electricity prices.
  - Peak Shaving via use of energy storage system and own MG-EMS generation.
  - Maximum Demand Management to avoid paying un-contracted capacity charge (can be as high as 50%)
Project Scope (Contd)

• **MG-EMS incorporates**
  
  – Business model for revenue generation by selling electrical energy to residents, building owners and/or upstream networks.
  
  – Operation of renewable energy sources such as solar PV and small wind turbines for a greener community of lower carbon footprint.
  
  – Micro-turbines for CCHP or CHP, i.e. power generation, cooling and heating.
  
  – Management of water, hot/chilled water and gas supply if needed.
  
  – Performance Monitoring System to track performance statistics for each electrical load/generation facility, e.g. corridor/car park lighting system and micro-turbines.
  
  – EV battery charging stations for future EVs or hybrid EVs.
  
  – EVs in HDB blocks selling electricity to MG-EMS will be treated the same as private properties selling their excess renewable energy back to MG-EMS.
Expanding Microgrid Energy Management System to Manage District Electrical Facilities

- Renewable Energy Sources and Energy Storage
-Interruptible Loads
-Peak Shaving & DRM; Efficiency Enhancement Initiatives; and Maximum Demand

Functionalities of Existing MG-EMS
- Upstream Networks
- Business Model to promote Landlord-Tenant Concept and to support Metering and Billing

Microgrid Energy Management System (MG-EMS)

Performance Monitoring System; Home Monitoring and Management; Security & Alert Services; air-con optimization service

EV Charging Stations

Micro-turbines

Control and/or Communication

Energy flow
Thank You!