Operation of KEPCO Microgrid with Actual Load

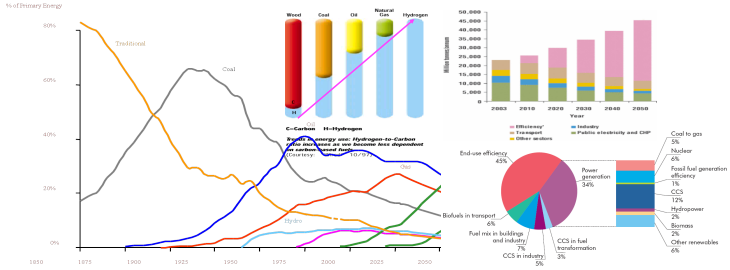
Jung-Sung Park, Hak-Ju Lee , Woo-Kyu Chae
KEPCO-KEPRI

Jaeho Choi
Chungbuk National Univ.

Introduction

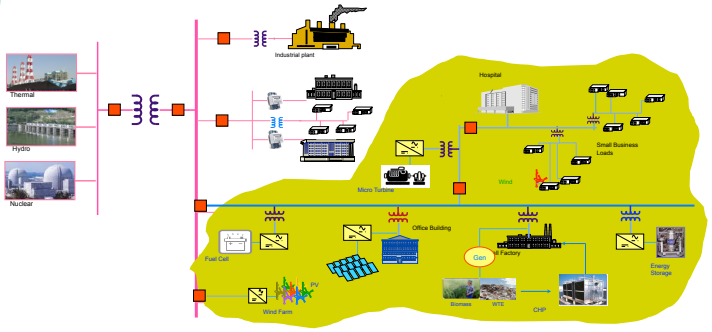
Enhancement and demonstration of KEPCO microgrid

- Control of 200 kW grid-connected microgrid field site
- Engineering to design the microgrid site
- Technology demonstration to validate the performance and operation cost



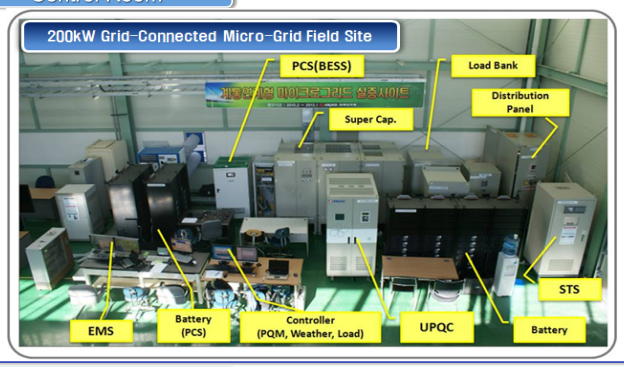
Power System
(Generation-Transmission-Distribution-Load)

MicroGrid System
(Distributed Generation-Load)

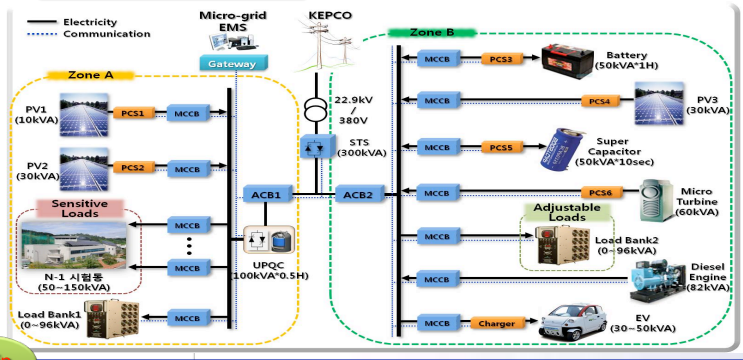


Field site/ Engineering & control

Control Room

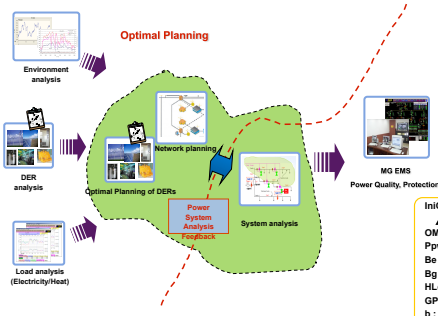


Configuration



Main

Engineering



DER: Distributed Energy Resources, PCS: Power Conditioning System
O&M: Operation & Maintenance, AGC/ED: Automatic Generation Control/Economic Dispatch

Optimization Modeling

$$\min F = \sum_t IniCost_t \cdot Rate\{1-\rho(1+Rate)^{-life}\}/(1-(1+Rate)^{-life}) + \sum_t OMCost_t + \sum_t \sum_i \sum_y GP_{iy} \cdot Fuelcon_{iy} + Bg + \sum_t \sum_i Ppwr_{it} \cdot E\cos t_{it} + Be$$

$$s.t.\quad ELoad_t \le Ppwr_t + \sum_i GPE_{it}$$

$$HLoad_t \le \sum_i GPH_{it}$$

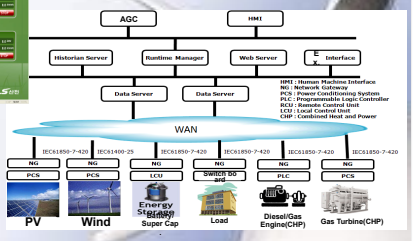
$$GPE_{it} = a_i \times Fuelcon_{it} + b_i$$

$$GPH_{it} = a_i \times Fuelcon_{it} + b_i$$

$$FuelMin_{it} \le Fuelcon_{it} \le FuelMax_{it}$$

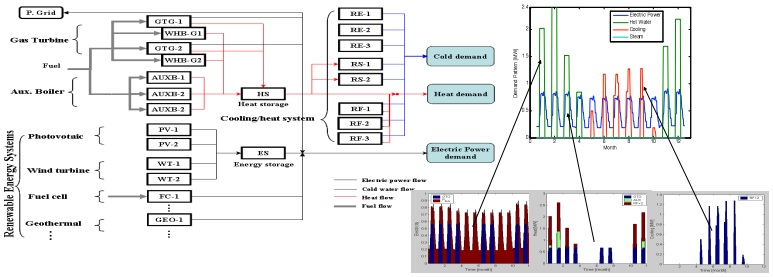
IniCost : Initial cost
Residual value
Rate : Interest rate
Life : Life time
OMCost : Operation & maintenance cost
GP : Power generation
Ppwr : Power purchase from Utility
Ecost : Electricity cost
Be : Electricity base cost
Fuelcon : Fuel consumption
Bg : Fuel base cost
ELoad : Electricity load
HLoad : Heat load
GPE : Power generation
GPH : Heat generation
a : Coefficient of generators
b : Coefficient of generators
FuelMin/Max : Fuel Min/Max.

Control



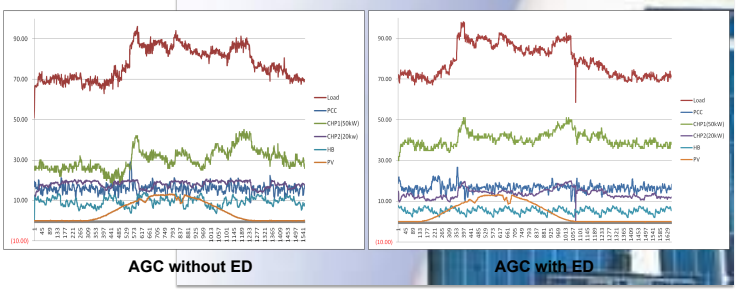
Results and conclusion

- Microgrid can be designed to meet the special needs; enhance local reli ability, reduce feeder losses, support local voltages, provide increased e fficiency, etc.



• Engineering & tie-line constant control example

- Distributed generators in microgrid can be controlled using AGC (Auto matic Generation Control) with ED (Economic Dispatch) for stable and ec onomical operation.



AGC without ED

AGC with ED