Campus Microgrid-EMS System considering multi-MG power trading

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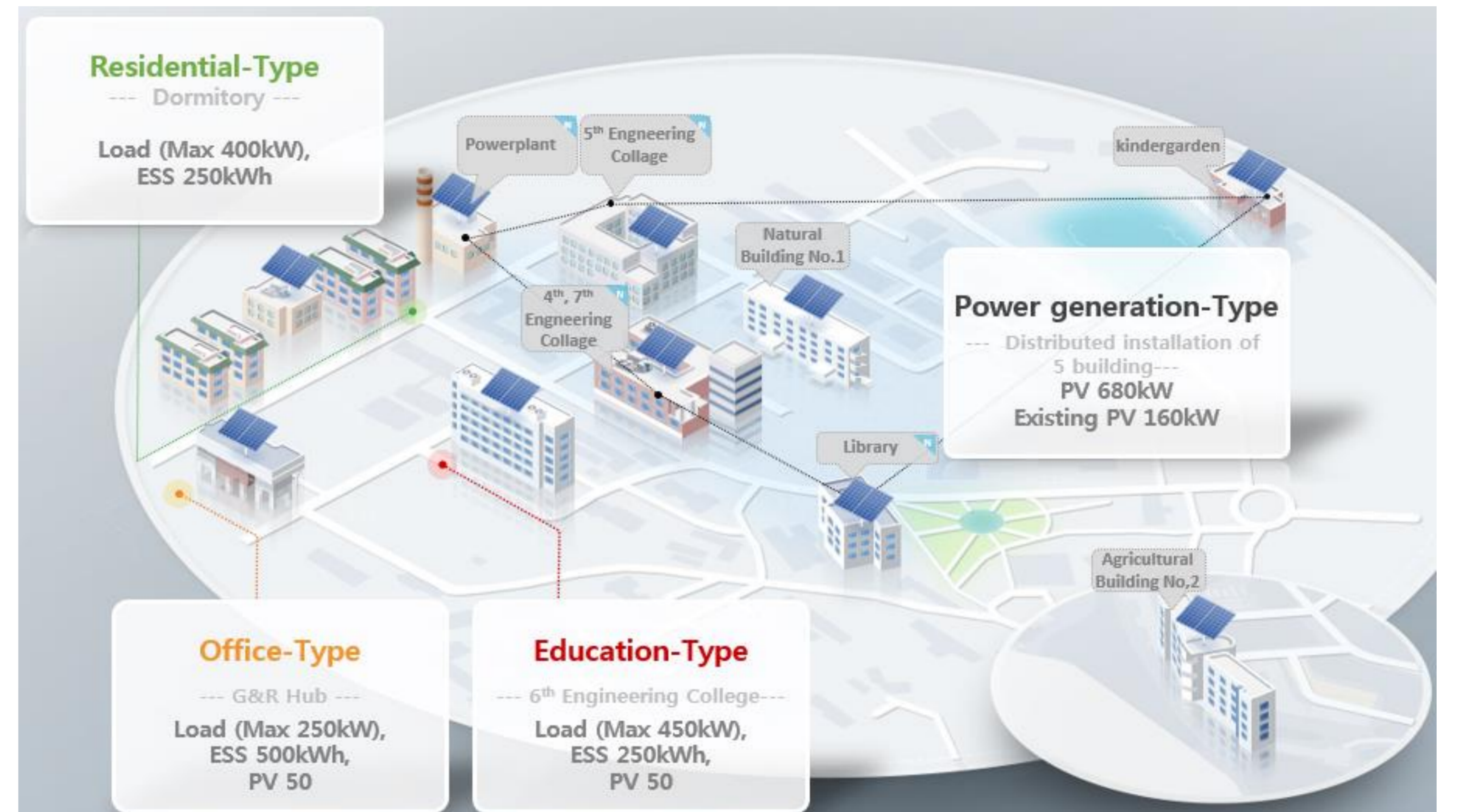Kbc_122047@kdn.com , hye-yoon.86@kdn.com , vitamin.2r@kdn.com

◼ Introduction

· Research project of demonstration of energy new business through the smart energy campus ('16.05 ~ '19.04)
· Introduction to Microgrid-EMS in Chonnam National University campus
 - Microgrid Cell Configuration Based on Various Load Patterns

Office-Type MG, Education-Type MG, Residential-Type MG Power generation-Type MG

<Focus On>

· **Multiple MicroGrid design and implementation considering power trading**
· **Database design considerations**
· **Application for optimum operation of microgrid**
· **Campus Microgrid-EMS operation Policy**

Residential-Type --- Dormitory ---
Load (Max 400kW), ESS 250kWh

Powerplant 5th Engineering Collage kindergarden

Natural Building No.1

4th, 7th Engineering Collage

Power generation-Type --- Distributed installation of 5 building --- PV 680kW Existing PV 160kW

Library

Agricultural Building No.2

Office-Type --- G&R Hub --- Load (Max 250kW), ESS 500kWh, PV 50

Education-Type --- 6th Engineering College--- Load (Max 450kW), ESS 250kWh, PV 50

[Figure.1] Structure of Microgrid Cell of Chonnam National University

◼ Research Content

System Architecture
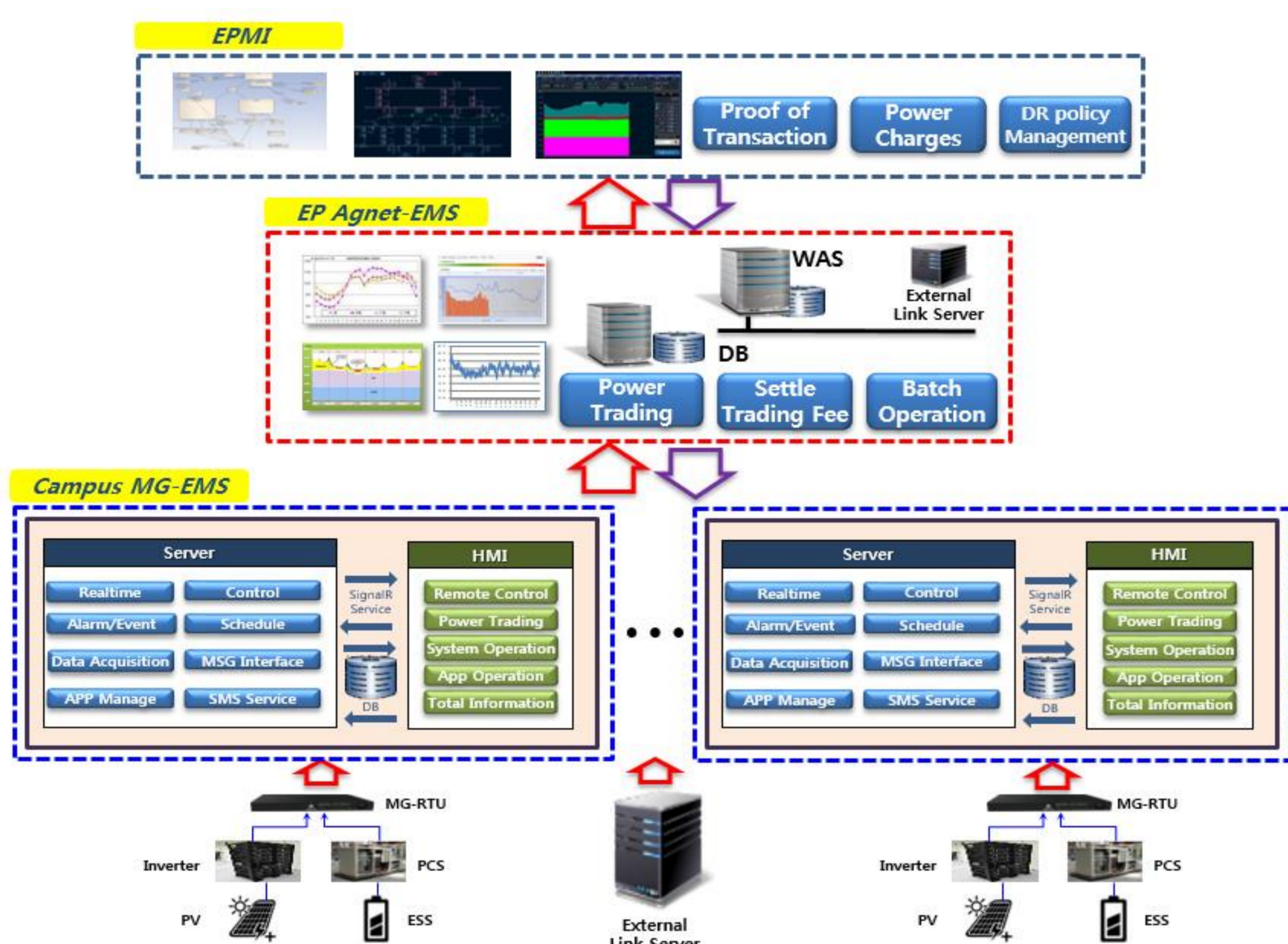
[Figure.2] Multiple Microgrid-EMS Design Considering Power trading

<Campus MG-EMS>

· Operation of load and power equipment
· Optimal control for power, ESS and load
· Participate in Power trading and demand resource trading with other MGs

<Energy Prosumer Agent-EMS>

· Provides a platform for interagency and participation among multiple MGs
· Carry out resource trading and settlement functions
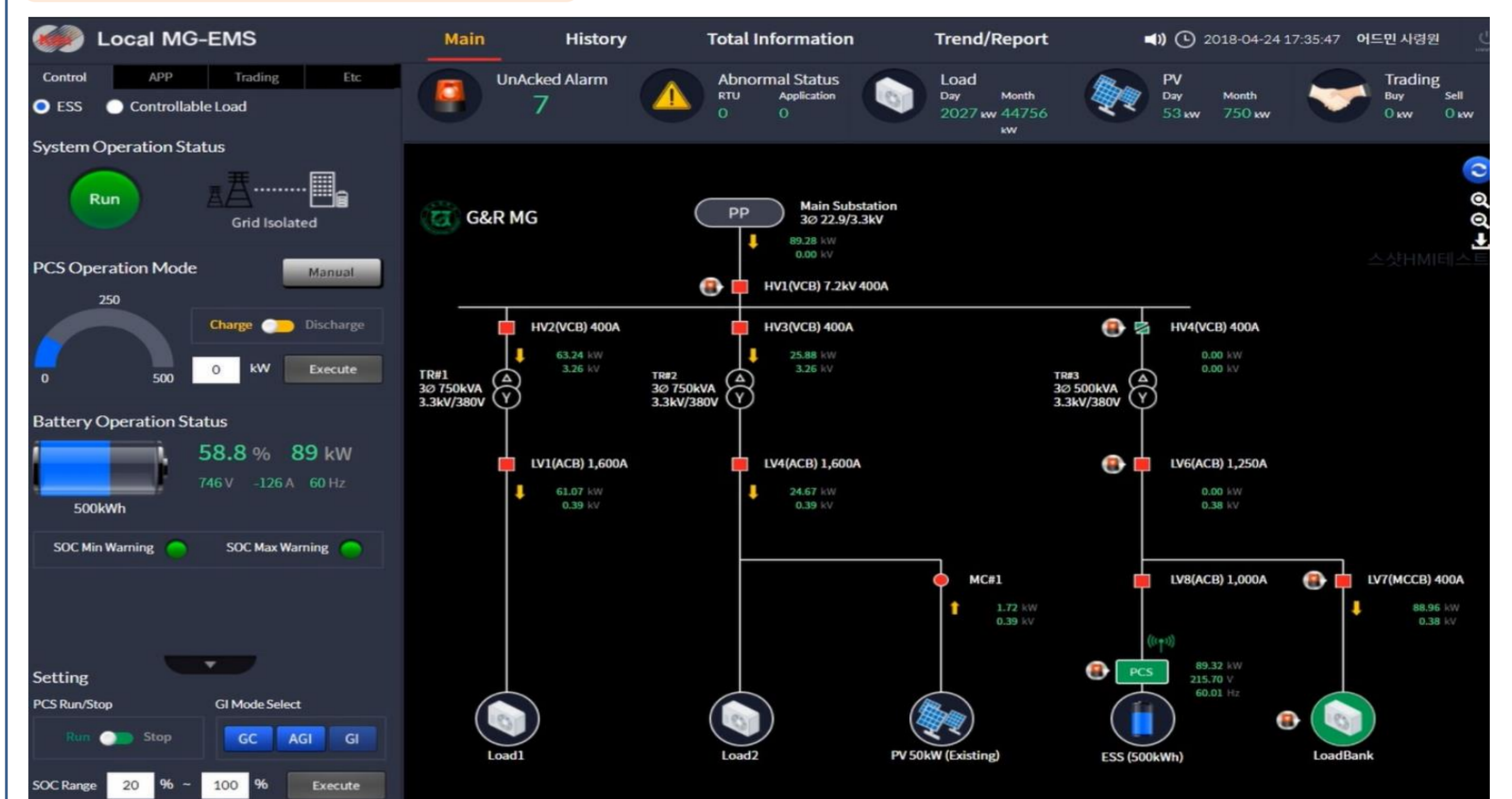
<Energy-Market Integrator>

· Operate services to participate in the electricity market for EP Agent-EMS
· Proof of transaction, power charges, demand response policy management

Database

· PostgreSQL 3.5 (Open Database)
· System facilities and App management, operation and history, logs are managed in one schema
· Line-based topology configuration
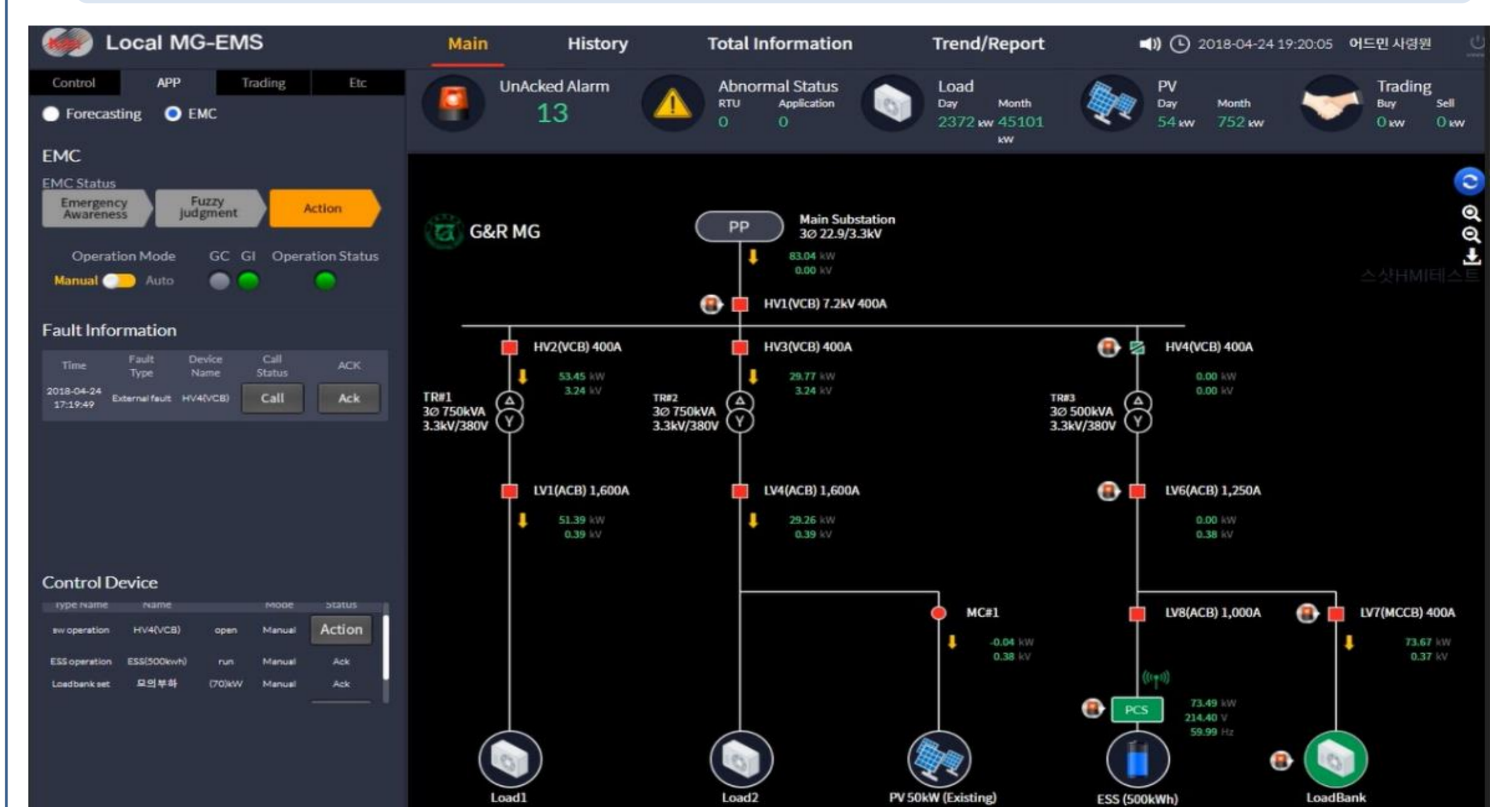· Using the PGSQL library

MG-EMS Operation

[Figure.3] Office-type Microgrid-EMS Operation Screen

<Common>

· Status monitoring and facility control using MG-RTU
· ESS scheduling based on load prediction and solar power prediction
· Grid Connected operation using ESS (GC Mode)
· Unmanned driving system

Energy cost and peak reduction through Power trading between MGs

[Figure.4] Fault Situation determination and fault recovery

<Special Operation for Office-type MG-EMS>

· Grid Isolated operation using ESS (GI Mode)
· Simulated load and actual load control
· Emergency Control(EMC)