Energy system, which is a critical infrastructure to support social and economic activities, is currently facing new challenges to achieve security, economy, and reduction of environmental burden such as carbon emission for sustainability. Energy system requires transition to holistic optimization involving centralized and decentralized resources through integration of newer forms supply, i.e. photovoltaic (PV), wind power, and other renewables, as well as novel demand devices including electric vehicles, heat pump water heaters, and energy storages.

The upcoming energy system is requiring decentralized management for the integration of demand into demand-supply balancing in an energy system so as to accommodate renewable generation characterized by constantly fluctuating output and newer types of electrical loads. The decentralized energy management will assure flexibility in operation and system configuration as well as enhanced robustness against risk factors.

Energy System of the Next Generation

Establishing long term view with firm technical and socio-economic basis

Energy / Energy technology strategy
Dynamic analysis and assessment of energy supply and demand
Analysis of variation and generation forecast of renewable energy generation
Unit commitment and load dispatch simulation

Distributed Energy System

Developing smart grid tightly integrated with overall energy system

The high penetration of fluctuating generation from PV and wind would lead to difficulty of supply-demand imbalance within a whole power system. Stabilization of the overall system requires active harmonization between the centralized power system including transmission/distribution system and distributed energy systems/resources including energy storage.

Our goal of the following research areas aims at the three axes of values, which are not only “energy and asset management for energy efficiency, economy and environment” but “contribution to overall energy/power system operation optimization” while enhancing “quality of life of living and working”.

Optimum operation scheduling of distributed energy resources
Distributed energy management, simulation and verification at COMMA House
Asset management of distributed energy systems
ICT technologies such as IoT and iDR