

Upgrading Electrical Power Systems to a Smart Grid

Yaser

The world is in an energy transition. Energy storage systems are one of the keys helping in integrating and utilizing renewable energy in an optimal level. However, energy storage is already an important part of the power system ranging from small applications as in the electronic devices to a bigger size of storage used in power stations and recently to be used as power sources to backup renewable energy in the form of community based storage banks. In addition, Electric Vehicles (EV) are considered as a mobile storage systems in different applications. With the demand increasing, environmental issues, fossil oil depletion and economic instability renewable energy sources (RES) became attraction and action all over the world. Due to the unpredictable changes in the environment phenomenon where RES use natural resources, the dependency on storage systems in different technologies and applications significantly increased. On the other hand, different optimization techniques have been introduced and others have been proposed in order to provide a technical and practical solutions for the best utilization of energy storage to the advanced and conventional power systems. In Japan, there are real practical implementation to the smart grid in the form of smart communities as in Kitakyushu city. The Smart Grid represents a vision for upgrading the electrical powersystems in a sophisticated manner. The deployment of Smart Grid idea into existing power system is leading to the optimization of grid operation, enhancing grid security, and creating new markets for the utilization of renewable and sustainable energy.