

Lecture 4 : The smart grid

The smart grid can be defined as a smart electrical network that combines electrical network and smart digital communication technology. A smart grid has capable of providing electrical power from multiple and widely distributed sources. A smart grid is an electricity network based on digital technology that is used to supply electricity to consumers via two-way digital communication. This system allows for monitoring, analysis, control and communication within the supply chain to help improve efficiency, reduce energy consumption and cost, and maximize the transparency and reliability of the energy supply chain. The smart grid was introduced with the aim of overcoming the weaknesses of conventional electrical grids by using smart net meters. Many government institutions around the world have been encouraging the use of smart grids for their potential to control and deal with global warming, emergency resilience and energy independence scenarios.

smart grid technology is an extended form of analog technology that has also been introduced for controlling the use of appliances by employing two-way communication. However, the prevalence of Internet access in most homes has made the smart grid more practically reliable to implement. Smart grid devices transmit information in such a way that enables ordinary users, operators and automated devices to quickly respond to changes in smart grid condition systems.

Smart grid is equally advantageous for enterprises, retail stores, hospitals, universities and multinational corporations. The entire smart grid system is automated for tracking the electricity consumption at all the locations. Grid architecture is also combined with energy management software for estimating the energy consumption and its associated cost for a specific enterprise. Generally, electricity prices increase along with demand. By providing consumers with information about current consumption and energy prices, smart grid energy management services help to minimize the consumption during high-cost, peak-demand times.

A modern smart grid system has the following capabilities:

- It can repair itself.
- It encourages consumer participation in grid operations.
- It ensures a consistent and premium-quality power supply that resists power leakages.
- It allows the electricity markets to grow and make business.
- It can be operated more efficiently.

Benefits of Smart Grid

- Integrate isolated technologies: smart grid enables better energy management
- Protective management of electrical network during emergency situation
- Better demand, supply/ demand response
- Better power quality
- Reduce carbon emissions

- Increased demand for energy: Requires more complex and critical solutions with better energy management
- Renewables Integration