



Smart Grid



Dr. B K Keshavan
Dean PESIT

Smart grid is defined as any combination of enabling technologies , hardware, software, that collectively make the grid more reliable, resilient and more useful to customers .

Existing Grid

Existing Grid is designed as a one way conduit.

Ill equipped to deal with renewable

No communication between the supplier and end users

Metering limitations have restrictions on pricing resulting in flat rates undifferentiated by time and location of use.

Another major factor affecting the power sector is distributed generation with many DG technologies.

Growing interest In energy efficiency

One more factor which complicates the existing grid is the hybrid and electric vehicles, which acts as a storage medium when unneeded and fed back when required.

Smart grid Features :

It must facilitate the integration of diverse supply side resources including intermittent and non dispatchable renewable resources .

It must facilitate and support the integration of distribute and on site generation on the customer side.

Allow and the active engagement of demand side resources and participation of customer load in the operations of the grid and electricity market operators.

Two way, intelligent conduit, allowing power flows in different directions at different time, from different sources and sinks.

Allow the inclusion of energy storage devices on customers premises or central devices to store increasing levels of energy when it is available and inexpensive and to be utilized when there is demand.

Optimal utilization of the network through efficient and dynamic pricing.

Must be more robust , reliable and more secure to interruptions and less prone to accidents

The benefits of smart grid can be obtained by adoption the following. but not limited to

1. smart metering: advanced metering infrastructure is helping these algorithms quickly locate outage sources and



greater control of energy demand. Help the users consumers to modify their consumption pattern.

2. Green energies : they integrate local power-renewable energy- generation sources into main grid.
3. Home energy management: the expansion of Internet of things schemes have reached the electrical appliance in homes , making it possible to get information about their onsumption, rates and connected devices.
4. Demand response programs : participation of end users in energy supply system to ensure the availability and quality of service during critical moments . Smart grid have greater control of demand in exchange for economic incentives for customers.

There are many challenges fields like demand , consumption, and energy creation. A communication infrastruc- ture must keep the whole system sharing information in two ways making it possible an operational grid energy generation, storage and trade. Moreover these must be regulated by policies that helps educating customers , guaranties cyber security , establish prices and less intermittency in service .

The key elements in the proposal, promotion and implementation of SG like public private partnerships, electric companies and users of the network. The factors like continuity In introduction of new technologies , increase in energy efficiency are the key elements .2. Changes in habits of network users, a greater integration of renewable distributed generation and storage .

From the point of energy efficiency

Main problems of current systems

1. Cyber attacks
2. Lossy networks
3. System malfunctions and environmental effects
4. Dynamics of home area network smartgrid communications
5. harsh wireless environment in operation of smart grid
6. Serious security flaws in SG

Opportunities that smart grid provides are:

- Efficiency in consumption
- Green communication in SG
- Allowing data mining in digital image and video processing applications
- Security protocols to detect security weakness in SG
- Emergence of micro grids with sensing technologies to build smart grids

What we need from smart grid

Smar grid includes complex network technologies , hardware , software , communicatins and controls which will provide both utility and users a high level of visibility and control

It should be affordable, clean, reliable and capable of supporting our society and economy

Plans, strategies and policy frameworks are gradually emerging around the world towards making the grid SMART Consumers ae beginning to understand and take decisions to manage their energy based on timely and accurate information.



Benefits

- More reliable power and quality
- Enhanced cyber security
- Reduced energy losses and extended capacity to meet peak demand
- Capability to integrate RES and EV'S

Change is hard for any organization and industry. It requires full participation from economists , regulators, lawers, policy experts, financial experts and other stakeholders .

Referene : Books & Research Materials