Name= Jawad shah ID= 15550 Subject= Smart grid technologies

Q1. ?

Ans : Our old Grid system cannot fulfill our country current energy requirements. To make improvement in current conventional Grid we don't have that much budget, because there are several factors which we have to improve, which means we need again to start from zero to make out Grid system according to our current requirements, some of factors which want improvement are given below,

Obsolete system layout

Older areas requires additional substations, because that substations is very old and was for fulfilling the requirements of that population, now population is increased and that substations is not able to meet the current requirements of energy.

Aging Infrastructure of Current Grid

Mostly our equipment's are old ehich have high failure rate, leading to customer interruption rates affecting the economy and society, and that older equipment's have high maintenance, repair and restoration cost.

Outdated engineering of Current Outdated engineering of Current Grid

Traditional tools for power delivery planning and engineering are ineffective in addressing current problems of aged equipment, obsolete system layouts, and modern deregulated loading levels.

Old cultural value

Planning, engineering, operating of system using concepts and procedures that worked in vertically integrated industry exacerbate the problem under a deregulated industry.

Coventional Grid and Smart Grid

Now days, consumers are looking for more secure and reliable energy supply. The conventional system has posed several problems for the supplying agencies, such as faults and disturbance, if we improve the current conventional grid then may be the energy demand is fulfilled, but instead if we install the smart grid which very beneficial, the main comparison between the

Conventional grid and smart grid are given below in the chart, which clearly shows that the Smart grid will be more beneficial for Pakistan.

COMPARISON

Existing Grid	Smart Grid
Electromechanical	Digital
One-way communication	Two-way communication
Centralized generation	Distributed generation
Few sensors	Sensors throughout
Manual monitoring	Self-monitoring
Manual restoration	Self-healing
Failures and blackouts	Adaptive and islanding
Limited control	Pervasive control
Few customer choices	Many customer choices

Q2. (a) ?

Ans

Steps seen in system blackouts

1. Line overload with active power flow
2. Voltage drop/ transit voltage avalanche
3. Decrease in line carrying capacity
4. Large scale tripping of transmission lines
5. Large scale load tripping
6. Large scale tripping of generators by overload protection
7. Stability loss / Frequency Avalanche
8. Large scale outages of power plant
9. Complete or partial collapse of power system

Self Healing For example three poles (while sensors are installed in each pole) are connected to each other for to give electricity toa colony, suddenly fault occurs in pole b, so here the self healing process is start where the system island pole b and make a connection from pole a to pole c directly from control room automatically and again the supply of electricity starts again and prevent the area from blackout.

Q2 (b)

Pakistan Blackout

On 25 jan 2015 a blast, reportedly carried out by separatists in south-western Balochistan province, damaged a line connected to the national grid. Pakistan was plunged into darkness after a power transmission line broke down That was one of the worst power failure Pakistan has experienced, which caused electricity to be cut in 80% of the country, including major cities and the capital Islamabad. As on the time the self heling system was not available so that's why the blackout takes more than a day in repairing of the transmission lines and restoration of electricity.

Q3 ?

Ans Communication Network of Smart Grid

Home Area Network (HAN)

HAN is a network used in apartment or residential dwelling, which support functions, such as washers/dryers, cycling heaters or or turning air conditioners off during peak hours and also controlling the charging/ discharging of PEVs. HANs covers the area up to 200 m^2.

Building Area Network (BAN)

BAN is similar to HAN and it covers the entire building which consists of multiple apartments, BAN is responsible for controlling smart devices and exchanging information with utilities. A BAN can be collection of HANs connected with building smart meter which is typically installed at building power feeder.

Industrial Area Network (IAN)

IAN is a network installed in factory floors and incorporates connected sensors, controllers and building management software. The IAN handle building or multi building operations like automation , management envoirmental performance etc..

Neighbor Area Network (NAN)

It is responsible for smart meter communication that exchange information between customer premises and utility companies

Field Area Network (FAN)

It connects smart devices to transmission and distribution grids and substations. It also monitor breaker controller, voltage regulator, capacitor bank controller etc.., FAN and also collects data.

Wide Area Network (WAN)

WAN recive data from different NANs and send the data to utility companies and private networks. It also enables communication for generation plant, substations, transmission distribution grid etc, it's also responsible for two-way network needed for substation communication, automation and power quality monitoring.

Communication necessary in Smart Grid environment

The communication that are necessary for smart grid environment is to keep updated the customer continuously, also communicate with the customer about the new packages, price plan's and other benefits which customer can take from smart grid.

Q4. (a)

"Smart Grid id Customer Oriented" This terms means that they putting customer on the center of the focus, with understanding to create meaningfull customer value and relly putting customer on first priority.

This is related to efficiency of the grid because for every business and industry the main foucus is customer, if the customer is satisfied from all the services of the grid, then it will be beneficial for efficiency of the Grid.

Q4 (b)

Communication Network of Smart Meter

The communication network selected has to support operation of the smart meter system even on power outage detection and support distribution automation. In addition, the selected

network and its components must be cost effective and must prioritize the delivery of data based on its time and direction sequence Communication technologies to be chosen have to be cost efficient, should provide good transmittable range, better security features, bandwidth, power quality and with least possible number of repetitions.

Q4 (c)

Monitory benefits for customers and other stake holders

The monitory benefits for customer is to monitor his home appliances and with the help of monitoring they will be able to inform the customer about use of energy and saving of energy, when the customer is satisfied from the service he/she will suggest the service in their premises and also to their relative so on that way more peoples will be try to avail the service, due to which company will and also directly benefical for all the stake holders.
