Review on Challenges and Issues in Smart Grid

Ragib Fasih Khan, Deepanshu Singh, Praveen Nadar, Lakshay Sharma, Neha Chaudhary
Department of Electrical &Electronics Engineering
Manav Rachna International Institute of Research and Studies

Abstract

Smart grid offers provision of two-way communication and it is the explanation for the actual power demand complications. During these days' communities, society's and higher powers have perceived the demand of their energy yield system much proficient and enlightened across the world but we must keep in mind to reduce our carbon footprints too so it is our answerability to make our grids supportable. Power flow is anyways regarded as a one-way actuality and thus designing our grids a lot improved in design, we can transmit the power originated in many ways in the system. This research conferred the designing of smart power grid system, throwing a fit-on performance of generated power from stations through substations to residential customers. In this paper, also attempt to sanctioned different challenges in the designing of grid and their improvement.

Keywords: Smart grid (SG), communication, power demand, challenges

I.INTRODUCTION

An electrical grid is the combination of various appliances, metres, inexhaustible energy resources (ER), energy proficient resources (EPR) and operation. Power modification of electronic systems, production control and distribution of electricity are some of the vital aspects in designing of smart power grid (SPG). There are numerous justifications are required to make grids better, there is customers wish for government checks, upgraded hardware and software technology. Nature should also be kept in mind as it also befalls under the policies of the government, various levels which is specifically premiering us to a much sustainable, proficient and inexhaustible source of energy, consumers are also aware and restraining their energy use in their routine lives [1]. The main emphasis of grid should to be balance the terms of demand of supply industry has made numerous heights. The overall layout of grid should consist the following needs and operations:

(i)The system should have some scope for implementation of natural resources to prevent damage of nature.

(ii)There should be customers in power saving criterion.

(iii)Safe connections for system safety

(iv)Allowing a balanced flow of energy for cutting Expenses and avoiding losses as well.

(v)Allowing absolute control over connections for higher safety norm.

It is concluded that the various steps written above shows the way and reasons to make the existing power grids better and advance, enforcing new ways on outdated machines and by just making small changes to the design i.e., power in the grid will be procured by the conventional method but more energy accumulating it by power produced by wind turbines, water shafts, solar panels [2]. It is a composition of two energy sources both are effectively utilized to power to be supplied. Perfect smart power grid design is proficient, less polluting & clean. Smart grid is only smart when it is able to adopt better methods, it should be able to implement new technologies into the design instead of any errors in the results. During those years, Nanotech and Nuclear fusion are some keywords that are widely accepted in the power grid designs. Modifying substance may help in cutting expenses and photoactive materials also reduce the cost level. Synergies help in reducing global warming and emissions. Nano fuel helps in starting at low temperatures. Quantum wiring helps well in power distribution at international level [3]. It will also help in deteriorating the factor of risk by smartly sensing the faults in lines.

II. SMART GRID TECHNOLOGY

A smart electrical network is one which has an electrical network as well as intelligent digital communication technology. Wind turbines (WT) and solar power systems (SPS) are the resources used to provide electrical power to smart grids.

With the use of new technologies and latest information natural resources can be controlled. First determined the technology of smart grid and then corresponding information is provided to providers for execution purpose. Smart grid (SG) is

based upon the digital automation technology (DAT), for monitoring, control purpose and also performed analysis through supply chain. Quick response can be achieved by using this type of systems and also reduced workforce of the existed systems [4]. The advantages include by this system are reliable system, safety and provides better quality of electricity to the consumers.

III. SMART GRID COMPONENTS

By inserting implementation process and developing new technologies the new concept of smart grid can be arises. These technologies are further divided in to key technologies. Following are the explanation of these key technologies.

a) Smart Appliances: According to the preferences of consumers, these appliances can consume the energy. The expenses of electricity generation can be minimized by the selection of lower peak loads. Also, to control the temperature of the boiler, smart sensors (SS) like temperature control sensors are used.

b. Intelligent Power Meters: To detect fault of the device and for the collection of billing data, intelligent meters (IM) are provides two-way communication between the consumers and the energy providers.

c. Intelligent Substations: Detection and control of critical & non-critical data also performed by the substations. For delivering the safe and reliable power, substations are used security concerned, status of transformer, factors affecting the performance and breaker also. For dividing the electricity path in to different directions, requirement of intelligent substation is must [5]. The main concern is about the cost of the substations. Due to the presence of transformers, different type of switches, capacitor banks and relay for protection reason makes the substation costly.

d. Super Conducting Cables: These are used to provide long distance energy transmission, and smart monitoring and analysis tools capable of detecting faults itself or even predicting cable and failures.

IV. ADVANTAGES AND DISADVANTAGES OF SMART GRID

The followings are the upsides of brilliant lattice:

(i)**Energy investment funds**: One of the primary focal points of shrewd networks is to reveal to us the use at a vitality meter at whenever, so clients are better educated regarding their genuine utilization. Also, with better use monitoring, declined force can be changed in accordance with meet the genuine need of every client.

(ii**) Improved client care and progressively intense bills**: Another key preferred position offered by Tele Management frameworks is that bills are increasingly intense. The use of manual arrangement of meter reading can be reduced by using this new technology. Notwithstanding having the option to road data about the establishment remotely, issues become simpler to decide and arrangements can in this manner be accomplished quicker, improving client care Nowadays clients need to advise organizations for them to take action [6]. Yet, with remote administration the framework itself naturally reports all occurrences to the electric organization so it can react quicker to clients.

(iii) **Decreased adjusting cost**: Smart Grids (SG) substantially collected more information as compared to manual vitality meter (MVM) understanding framework [7]. This award the utilization of information investigation methods and the planning of exceptionally sensible usage gauges the same number of more illustrations are thought of. Administrations would then be able to all the more likely tailor their creation to usage (balances) and lessen vitality balance.

(iv) **Contraction of carbon outflows**: All the advantages above includes decreasing usage, which involves a constriction in CO2 emanations. We would like to state that now more promising time to come for Smart Grids (SG) [8]. This will legitimately profit the charging frameworks of the electric vehicle (EV) on the mains in future. The circulation of sustainable power source frameworks is additionally made simpler as administrations deal with their lattices. Along these lines, we can accomplish the upsides of keen framework in following way:

(1) Smart framework encourages better vitality the executives.

(2) Defensive administration of electrical system during crisis circumstance.

(3) Better interest, flexibly/request return.

(4) Better force nature.

(5) Reduce carbon emanations.

(6) **Increased interest for vitality**: Requires more system and basic arrangements with better vitality the executives [9].

The followings are the impediments of keen network:

(i)**Privacy Problems (PP)**: In a keen lattice framework (KLF) the greatest concern is security. Few smart meters are utilized by network framework, which are further modified and gives communication between the power supplier and client [10]. Some type of the brilliant meters (BM) may control the entire section by flexibly.

(ii) **Grid Volatility (GV)**: Smart Grid organized a lot of knowledge from its edges to the end point of client meter [11]. If the matrix has not enough knowledge, then accordingly administration can exchange the functions. Due to this less incorporation in advancement makes the framework a very light system [12]. The edges of the systems are designing assets (DA) and client vitality utilization (CVU) which affected the system. By adding excessive number of clumps in to the system before building up the product, this condition will lead to result a light brilliant grid (LBG) [13].

V. CONCLUSION AND FUTURE SCOPE

In recent years attraction towards smart grids has grown solid and enormously worldwide. For further exploration in this specific field of smart grids this picture could be seem as a supportive cause. From power stations to the consumers the upcoming generation of smart grids will be capable of managing brisk parts of energy production. In both research and harnessing point of view smart grids have now become a huge challenge for developed lands. In comparison to their siblings, i.e., developing nations, application of smart grids on the other hand in evolving nations is still underdeveloped. Nevertheless, Quiescent of some plans and designs/ a couple of research projects are presently being examined by a multiple number of evolving nations. The discoveries represent that decent preparations and growth in this industry is done by a number of countries such as China, India and Brazil. In certain cases, the actions are said to be identical with developed nations like United States of America. Thus, China, India and Brazil play as figure of reference for various developing countries especially for those who follow the development advancements for smart power grids. In the different fields of the smart power grids acres of evolution and development deeds still persist untouched.

REFERENCES

[1]https://www.powergridindia.com/benefits-smart-grid

[2] Smart Grid: Fundamentals of Design and Analysis by James A. Momoh

[3] https://ieeexplore.ieee.org/Xplore/home.jsp

[4] Li, H. Jiang, “A Novel Hierarchical Section Protection Based on Solid State Transformer for the Future Renewable Electric Energy Delivery and Management System”, IEEE transactions on smart grids, issue99, pp.1-9, 2012

[5] Lloret, Jaíme, Gilg, Marc, García Miguel, “A Group-Based Protocol for Improving Energy Distribution in Smart Grids”, IEEE International Conference on Communications, 2011.

[6] Leeds, David J, “The Smart Grid in Market Segments, Applications, and Industry Players,” 2010.

[7] P.K. Lee, L.L. Lai, “A practical approach of smart metering in remote monitoring of renewable energy applications”, Power & Energy Society General Meeting, PES, pp.26-30, 2009.

[8] J. J. Grainger and W. D. Stevenson, Jr, Power System Analysis. New York: McGraw Hill, 1994.

[9] A. J. Wood and B. F. Wollenberg, Power Generation, Operation and Control, New York: Wiley, 1996.

[10] Y.M. Atwa, E.F. El-Saadany, M.A. Salama, R. Seethapathy, “Optimal renewable resources mix for distribution system energy loss minimization”, IEEE Transactions on Power Systemm, pp.360-370 ,2010.

[11] Ali Babak Fahimi, Alexis Kawasinski, Ali Davoudi, Robert S.Balog, and Morgan Kiani , “Reinventing the electrical power system” IEEE power and energy spectrum , pp 4-15, 2012.

[12] C. S. Chang, Zhaoxia Wang, Fan Yang, and W. W. Tan, “Hierarchical Fuzzy Logic System for Implementing Maintenance Schedules of Offshore Power Systems”, IEEE Transactions Smart Grids, VOL. 3, 2012.

[13] Marco Liserre, Thilo Sauter and John Y. Hung, Future Energy Systems, IEEE Industrial Electronics 2010.