

A Review: Overcoming of Electrical Energy Crises in Pakistan

Ali Shan¹, Muhammad Zohaib², Israr Hussain³, Attiq Ur rahman⁴

^{1,2,3,4}Research Assistant Dept. of Electrical Engineering, Near East University, North Cyprus

Abstract - At present, the growing population of Pakistan will bring disaster situations relating to electrical energy and pollution; it will affect both the economy and the citizens and make a barrier in the path to compete with developed countries. To overcome the epileptic situation of electrical energy and make our environment clean and green, we need smart and sophisticated electrical grid to make our transmission and distribution system more efficient, and giving opportunities for renewable energy to address electricity generation. There is no other way to reduce complexity and eliminate load shedding in our country without smart grid. This paper gives us a review of energy shortage in Pakistan and the main aim is to focus that how we can overcome these electricity short falls in Pakistan.

Key Words: Renewable energy, Smart grid, solar energy, Wind energy

1. INTRODUCTION

For the social and as well economical development of our society and country, energy technology is a hellacious tool. Energy exists in different form but crucial one is electrical energy. Over the last two couple of decades, increasing electrical energy demand in Pakistan has create acute problem and this is a result of the supply being less than the demand so load shedding occurs to jam-pack increasing demand, eliminating load shedding and ensuring high quality of life electrical energy is a sine qua non[1].

For development in the economic growth, electricity is an important factor. While in Pakistan, electricity is the pillar of its growth as its economy expands, due to increase in population. Its demand for electrical energy multiplies and if available source is not enough to cover the deficiency properly a shortage will occur and become one of the crises proportions; it will be like putting a fence in the way of the growing economy. Pakistan is country with enough renewable energy sources and known as a giant of Asia, but still battling with huge amounts of power and energy crises. Still in Pakistan people faces, unexpected energy crises and problem become so serious in summer. And to prevent or eliminate load shedding over the generation station urban areas in Pakistan untouchable to electricity for 10-12 hour while rural areas are facing 16-18 hours load shedding, considerable amount of user disconnected from supplies therefore the economy is badly affected with a huge loss of capital [2]. To overcome the considerable amount of energy deficiency some very healthy source like hydro and thermal power in progress but failed due to limited fossil fuel and due to poor and weak economy. We are not able to import

fossil fuel in a large amount, to reduce the consumption of fossil fuel and to increase our supply more than our demand. Next we need to integrate renewable energy (solar and wind) to our main grid and make our electrical system smart and intelligent and manage our electricity in efficient way by changing conventional grid to smart grid we can also reduce emission and carbon foot print caused by fossil fuel to make our environment safe for future generation [2].

Nearly 7000 year ago the concept of solar and wind energies were present [7]. The first commercial turbine developed in late 1800. In 1900, rural areas in Europe extract electricity from wind turbine where it was use in small scale to charge their battery to draw water from the well and to run their radios [8].

In Pakistan solar and wind energy are abundant in summer where sunshine is about 8-10 hour and the speed of wind is 8m per sec at height of 80 meter above the sea level [9]. In the world, Pakistan is the sixth most fortunate country in term of solar radiation. Data analysis from md of Pakistan show that there is a wind-strip in the coastal area of Sindh province covering about 9700km² while estimated wind power of the area is 43000mw. In Pakistan the solar, wind and other renewable sources are extensively study by the researcher but due to lack of interest of politician and their short term policy unfortunately major part 38% is produce from expensive and imported fossil fuel and renewable energy is still in back seat and still not taken into account.

2. SMART GRID

To provide solution to future energy requirement and to evolutes current power grid system to be more efficiently deliver sustainable, economic, and secure electricity supplies we use smart grid [10]. Electrical engineers have developed a new technology in which we can easily integrate small local distributed power generation and different scattered energy storage device in to grid. This new electrical grid called smart grid, normally in smart grid; we are using digital technology to delivered electrical energy to the consumer and control the energy on other side, while educated consumer to save electrical energy, also increasing reliability, and transiency and reducing cost. By using smart grid our system will be more intelligent more attractive for costumer and will be distributed, to cope with energy balance and demand there is no other way with our distributed generation.

The term smart grid means more than single technology. Smart grid is a vision and idea that combine a verity of

different technologies like sensing communication, control, and different energy technologies, group together in a result electric power system can respond intelligently from generation to consumer and to those that do both consumption and generation [8]. The term smart in the combination of different individual tech under smart grid various technology of electric power system are consider both hardware and software. Smart grid is a type of electric grid which can endeavors fore cast and smartly and intelligent react to the behavior and action of all electric power users connected to it, by the use of available technology in Pakistan we can make our energy system more efficient. The major economic goal of smart grid is to improve the reliability, to minimize peak demand and total energy consumption [5]. Smart grid optimization it is very important to decrease our cost for the integration of smart grid technology in a conventional grid. Different technologies has been developed and integrated in electrical network to achieve the economic goal initial technology of smart grid was introduce with the idea of advance metering infrastructure but as requirement increase and technology become involved the smart grid vision involved.

3. RENEWAABLE ENERGY

Due to shortage of fossil fuels in Pakistan and many other issues like environmental problem, global warming, and carbon footprint renewable energy should be use as source for power generation. Pakistan is not utilizing properly. It is bad indigenous-energy sources, which are due to lack of efficient project planning and implementation.

3. SOLAR ENERGY

In the world Pakistan, receive high solar radiation in most areas geologically and with high potential of renewable energy sources [5]. The rural area in Pakistan still not facilitated with electricity because it is away from the national network or it is very expensive to connect this area to the main grids. Due to sunny belt, Pakistan can advantage of solar energy. Due to the use of photovoltaic cells from the last two decades, Pakistan has shown a well enough progress. While in Pakistan the energy, which is, obtains from solar energy are uses in hospital, parks, school and different parts of our country. Government has to look on this and develop these sectors. We can overcome these energy crises Countries like Mauritius and India installed the solar geezers at residential areas can cope the energy disaster. Same example can adopt in Pakistan especially in Lahore and Karachi where government can easily address the issue to install and interest free solar geezers. We can develop the urban and rural part not only in the mega city of the country specially Sindh, Baluchistan and other areas of the country.

To upgrade photovoltaic system in our country the private sector are also playing a vital rule. If we use this technology

in a large and commercial scale generation can substantially be reduced [3].



Fig-1. Solar Panel

3. WIND ENERGY

In 5000 B.C it was first utilized by sailors around in the Middle East to propel boats along river Nile. While in 21st century, the fastest growing energy in the worldwide is wind energy. Especially along the state near to the ocean in Pakistan wind energy has a huge positional. 150,000 megawatts can generate energy through wind according to USAID Pakistan while only in Sindh 40,000 megawatts can generated.

1.1 USE OF PAKISTAN 1

In Sindh, wind turbines are mostly set now. While in Punjab and Baluchistan there are few planned to be set up, but they have not approve yet. By the development of Turkish Firm Pakistan first wind power plant in Jhimpir in Sindh developed. 50 megawatts energy can generates from that wind plant. Another plant, which called three Gorges it is first wind farm in Pakistan it can also build at Jhimpir and can, generates 50 megawatts electricity.

1.2 BENIFITS FOR PAKISTAN 2

For Pakistan, wind energy is a good option. Wind energy does not needs any fuel, which are benefits. In Pakistan the power plant already, require fuel, which increases the cost of electricity per unit whenever the rate is increased [4].



Fig -2. Wind power plant in Sindh

3. CONCLUSION

In this paper we discuss review of inefficiencies in energy system of Pakistan while smart grid technology is the concept of well-organized electrical energy system. The authorized and policy makers of Pakistan is planning about setting up new nuclear power plant and making dams but having ignorance about the significance of sustainable energy sources like wise geothermal energy, solar and wind etc. They are economical and speedy methods for electricity generation. Luckily, Pakistan is a country where solar radiation is available for maximum time in a day in a good number of cities all year round. In winter wind energy is sufficiently available in the coastal areas of Pakistan such as Baluchistan. If we extract these available source of energy we easily fill the increasing gap between supplies and demand because of this increasing gap we face load shedding.

In our future work, we will convert conventional grid in to smart grid and we will focus on how to integrate renewable energy in smart grid by using multilevel inverter to decrease our losses.

Table -1: Public sector Power Plants

Public Sector Power Plants		
Company	Location	Capacity
WAPDA(Thermal)	Jamshoro Thermal Power Plant	850MW
	Minzaffargarh Thermal Power Plant	1350MW
	Guddu Thermal Power Plant	1655MW
	Ghazi Barotha HydroPower Project	1450MW
WAPDA (Hydel)	Mangla Dam	1000MW
	Tarbella Dam	3478MW
PAEC	Karupp and Chasrupp 1-4	1467MW
PEPCO	Nandipur Power Project	425MW
SOLAR	QASP,Bahawalpur	400MW

Table -2: Public sector Power Plants

Private Sector Power Plant		
Company	Location	Capacity
KESC	Thermal Power Station Bin Qasim I	1260MW
	Thermal Power Station, Korangi	560MW
	CCPP, Bin Qasim II	316MW
IPPs	Aes Pak gen, mehmoor kot	365MW
	Aes lahmir limiten mehmoor kot	362MW
	Hubco hub power plant hub	1292MW
	Kot adda power comp limited	1638MW
	Lucky electric power company limited	660MW
	Uch land 2 power limited	990MW
	Engo power gen qadirpur limited	226MW

REFERENCES

[1] Farooq M, Shakoor A. Severe energy crises and solar thermal energy as a viable Option for Pakistan. J Renew Sustain Energy Rev 2013; 5:013104.

[2] Water and Power Development Authority. (<http://www.wapda.gov.pk/>).

[3]<http://nation.com.pk/business/20-Aug-2015/solar-energy-can-help-overcome-power-crisis>.

[4]<http://loadshedding.pk/can-wind-energy-help-pakistan-overcome-energy-crisis>.

[5] H. Bilal Khalil, S.J. Hussain Zaidi / Renewable and Sustainable Energy Reviews 31 (2014) 194–201

[6] N.KODOMA, T.Matzuzaka and N.inomita, "power variation control of a wind turbine using probabilistic optimal control,

[7] L. L. Freris, "Wind energy conversion systems," Englewood Cliffs, NJ, Prentice-Hall, pp. 182–184, 1990.[34] E. Muljadi and C. P. Butterfield, "Pitch-controlled variable-speed wind turbine generation," IEEE Transaction on Industry Applications, Vol. 37, No. 1, pp. 240–246, January 2001.

[8] Diagnostic Study for Wind Power Potential in FATA Region in Comparison to NRELs Projection, available on http://www.pakmet.com.pk/wind/Wind_Project_files/D.Study_Fatar.pdf, accessed on 23rd May, 2010

[9] H. Bilal Khalil, S.J. Hussain Zaidi / Renewable and Sustainable Energy Reviews 31 (2014) 194–201

[10]<http://www.globalSMARTgridFederation.org/smart-grids/>

BIOGRAPHIE



Attiq Ur Rahman was graduated from the Department of Computer Science in 2015 from University of Peshawar. Mr Attiq studying M.Sc. Degree from the Department of Computer Engineering in 2016 and he have been serving as a Research Assistant at the Electrical & Electronics Engineering Department from March 2017.