A Perspective Observation of Power Generation using Wind Energy and its Benefits

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Abstract

With the advancement technology in the world, Energy plays a significant role in the socio-economic growth and welfare of a society. It is definitely a challenging performance to encounter the ever growing claim with least ecological possibilities. By means of the developing concern about country population, energy requirements and climatic disputes, it is tough to express an ecological energy strategy for the region. The capability of the Wind power has practiced remarkable development in the past years. Many consequent regions like isolated villages, islands, industrial sectors and ships are far away from the central grid. They need separate generator structure to afford their local electrical requirements. This obligation has directed to extensive research on improvement of different technologies for separate generators. Rural Indian societies, categorized by their remote locations, minor populations, and resulting low electric demands and great electric costs, have some of the highest wind possessions in India. The paper aims to recognize aspects that subsidize to and limit the prosperous development of wind power plans in rural area and to acclaim results to overwhelmed definite barriers. Such features must be an essential part of planning determinations with the aim of advance wind power development in rural societies. It also designates the modern advances in wind energy alteration systems, their arrangements, selection of generators and their social and conservational welfares, an assessment of the related concerns of distributed resources comprising wind power with electric power systems, hybrid power system and information the progresses.

Keywords: *Wind energy, renewable energy, wind turbine, Hybrid Power Systems*

I. INTRODUCTION

In India, many more villages are in need of electricity to fulfill their basic requirements. Certain of them are located in mountain regions where it is not able to supply electricity. In those areas, the speed of wind is more equating to normal earth level. In order to provide the electricity to them, use this current of air to produce electricity with the comfort of wind turbine. In particular villages it is not possible to mount large size wind turbine hence projecting small size wind turbine than can yield sufficient electricity for those remote villages. Improved electricity production from wind energy sources is deliberated as one of the main concern policies universally for decreasing CO2 emissions and conserving ecological commercial growth. Nevertheless, increased utilization of wind power upholds the challenges for power network operation, owing to the nature of irregularity and inconsistency of wind power. To report the challenge, various methods are under investigation, such as super-grids, flexible operation of power plants, demand-side response management, interconnectors and Energy Storage (ES). Among all the potential solutions, ES is recognized as one of the feasible options for decoupling the fluctuating power supply from the load demand. The most important constituents of a distinctive wind energy conversion method comprise a wind turbine, producer, linking tools and control systems.

Mostly recent wind turbines use a horizontal axis configuration with blades, functioning at either down-wind or up-wind. A wind turbine can be planned for a persistent speed or variable speed operation. The Turbine Apparatuses for Horizontal Axis Wind Turbine are: Blade which transfigures the energy in the wind to rotational shaft energy, The Post that maintains the blade and generator assembly, other tools including generator, electrical cable and ground support equipment. At a distance from impelled hydro, batteries, hydrogen, flywheels and capacitors for energy storage, Compressed Air Energy Storage is a recognized, manageable and affordable technology. Compared with other types of ES technologies, it is sustainable, does not yield hazardous waste and is appropriate for several scales of storage. It is previously deliberated to enable wind power and to recompense for the power supply variations. Many of the turbine constructors have chosen for drop gears between the low speed turbine rotor and the high speed three-phase generators. Straight drive arrangement, where a generator is joined to the rotor of a wind turbine openly, proposes high consistency, low maintenance, and feasibly low cost for assured turbines. More than a few constructors have selected for the direct drive structure in the current turbine designs.

II. DESCRIPTION OF THE SYSTEM

The descriptions of the proposed system have been demonstrated below. The figure shows the example of the wind farm structure. It is also one of the patterns that are used in some areas.

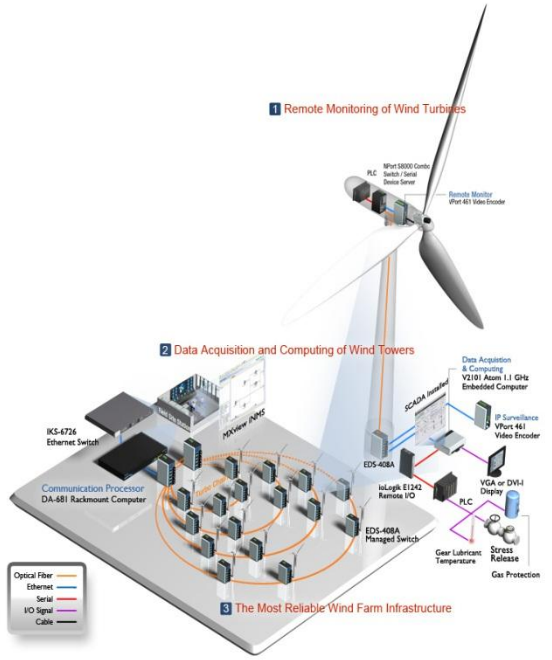

Fig.1: An Example of Wind Farm Structure

A. *Remote Monitoring of Wind Turbines*

- It should be capable to join too many consecutive devices, and entirely take part the devices with the network.
- The structure should reveal high consistency and performance, and take less effort to maintain.
- Rough IP investigation solutions for unmanned windmill observing.

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B. *Data Acquisition and Computing for Wind Towers*

- The tower necessarily needs a computer to gather and calculate the turbine's data that are in rotation and also sending it to the ground station.
- Extensive functional temperature range and small custom feature ideal for site connection in outside tough atmospheres
- Dependable video observation system for distributing real-time video monitoring for innocuous operation
- Isolated Ethernet I/O for remote monitoring and data acquirement

C. *Most Consistent Wind Farm Infrastructure*

- A communication access mounted at a field site station for data acquirement
- Uninterrupted and consistent Ethernet substructure with safe data communication and fast fault retrieval
- Network devices assisting fiber connections for long haul and noise-immune transmissions across big wind farms
- An extremely accessible network that provisions easy and hassle-free network developments so that future turbines can be suitably added

III. RELATED WORK

Jonathan O. Okoronkwo (2013) proposed Using reliability analysis for sustained wind farm Operation in remote and weak transmission areas. In this paper, implementing renewable energy generators in a power system network involves complex technical, financial and organizational framework, especially in developing countries like Nigeria. This paper describes the use of reliability analysis considering elements of WTGs in relation to design, operation, and stability of remote power networks to increase performance of an electric power network with a substantial proportion of wind generated power. The research study discussed provides guidance on WTG design and operation of the system network to achieve optimal levels of reliability at the lowest long run cost.

Hao-Tian Zhang et.al(2012) proposed Reliability and investment assessment for wind energy generation. In this paper, Smart grid has been proposed in both developed and developing countries to deal with the bottleneck of energy consumption recently. As an essential technology applied to smart grid, renewable energy integration plays a significant role on carbon emission. As an operator's perspective, system reliability and generation adequacy need to be re-considered when renewable energies are applied into the power system. This paper will make a comparison between reliability of centralized wind generations and that of distributed wind generations with investment perspective.

Liping Jiang, et.al (2011) proposedWind Energy in China. In this paper, According to the latest official release of the national wind energy resource assessment results, 50-m-high wind energy resource potential amounts to about 2,580 GW, of which 2,380 GW is onshore and 200 GW is offshore in the 5-25-m range of water depth. The areas suitable for developing large-scale wind power include Northeast, Northwest, and North China, as well as coastal areas in the provinces of Jiangsu and Shandong, where wind power potential accounts for about 80% of the wind energy resource potential of the whole country.

Meiqi Yao et.al (2011) proposed Integration of large scale wind farm into electrical grids. In this paper, the wind farm installations must meet the Grid

Code requirements for connections. Many difficulties have been encountered in meeting these requirements, especially for fault ride through, active power and frequency control, reactive power and voltage control requirements. This paper reviews the associated challenges for integration of large scale wind power into grids and investigates the development of Grid Codes from different countries. For existing problems the paper describes some solutions for connection of large scale wind power with power grid. These solutions include establishing accuracy wind power forecasting through advanced wind energy management system, making feasible connection comparison and selection and developing energy storage technologies to provide adequate margin to achieve the power balance and mitigate the impact of wind power intermittence.

IV. MAJOR DESIGN CONSIDERATIONS OF WIND TURBINE

Mainly, wind turbine is comprised of a number of subsystems: propeller, power sequence, control and protection system, tower and fundamentals etc. Current wind turbine constructor must consider many factors before choosing a final alignment for development. The projected wind atmosphere is the main consideration. Turbines intended for high wind or for use at extremely stormy sites will usually have propellers of smaller diameter and more vigorous than turbines for lower-wind sites. Reducing cost is another chief design criterion. Actually, cost is almost certainly the key strength that determines the designers near to the increased invention and diversity. Electricity produced by wind is still more costly than power from fuel-based generators, except conservational advantage of wind power are taken into account. The aim is to attain 30 to 50% discount has encouraged the designers to look for cost reduction by increasing size, modifying turbines for exact sites, discovering new organizational dynamic ideas, developing tradition generators and power electronics, in addition to implement modern control system approaches.

V. REGULAR ISSUES RELATED WITH WIND ENERGY

Some of the major issues that are contributing the transmission network in the power generation system. They are listed as follows as:

A. *Poor Grid Stability:*

For commercial utilization of wind energy, a dependable grid is as significant as accessibility of strong winds. The loss of generation for lack of steady grid can be 10% to 20% and this shortage may possibly be the chief causes for low definite energy output associated to the projected output in recognized stormy areas with sufficient wind data

B. *Low Frequency Operation:*

It disturbs the production of the system in many ways. Most of the systems does not acquire cut-in, when the frequency is less than the assigned frequency over wind circumstances are satisfied, with subsequent loss in output. This scarcity apart, the production of the system at low frequency process is significantly reduced, because oflow speed of the blade. The loss in output could be about 5 to 10% on the account of low frequency action.

C. *Power Flow:*

It is confirmed that the interrelating transmission or spreading lines will not be burdened. This kind of exploration is required to confirm that the overview of extra generation will not excess the lines and other electrical equipment. Both active and reactive power requirements should be investigated.

D. *Power Quality:*

Fluctuations in the wind power can have straight influence on the quality of power supply. Consequently, large fluctuations may affect in voltage variations exceeds the regulation restrictions, along with destructions on trace and other power quality principles.

E. *Short circuit:*

It is essential to decide the influence of further generation sources to the short circuit current assessments of prevailing electrical apparatus on the network.

VI. ENVIRONMENTAL ASPECTS OF POWER GENERATION

Pure energy resource: Wind energy shouldn't affect the air corresponding to other power generation methods that depend on explosion of fossil fuels. Wind energy processes don’t yield distinctive discharges that cause acid rain or greenhouse gases.

Domestic source of energy: Wind is renewable source of energy. It is available in the nature abundantly. So the initial perception is tremendous whereas thermal power plant needs coal as their raw material and it is expensive.

Cost effective. It is one of the lowermost estimated price renewable energy technologies offered nowadays, subject to the wind supply and the specific project’s supporting.

A. *Challenges of Wind Power*

- Wind power should play with conservative generation causes on a cost origin. Subject to the robust a wind site is the wind farm might not be cost economical. Whereas the cost of wind power has reduced affectedly in the past few years, the technology necessitates an advanced early asset than fossil-fueled generators.

- Better wind locations are often situated in distant locations, moreover distance from cities where the electricity is needed. Transmission lines need to be built to fetch the electricity from the wind farm to the urban areas

- Wind supply improvement could not be the maximum commercial use of the land. Appropriate Terrestrialareas that are suitable for wind-turbine connection must finish with different uses for the land, which is to be more extremely respected than power generation.

- Turbines may cause noise and aesthetic pollution. While wind power plants have reasonably light effect on the environment related to conventional power plants, disputes occurs over the noise generated by the turbine blades and pictorial effects to the landscape.

- Turbine fins may possibly hurt local animals. Fowls have been slaughtered by flying into rotating turbine blades. Most of these complications have been determined or greatly concentrated through technical development or by properly mounting wind plants.

B. *Financial Issues of Wind Power Systems*

The determination of all types of energy generation eventually depends on the financial matters. Renewables in common and wind in specific have realized generation costs dropping over current years. It is projected that this type of energy is already economical with other types of sources, if economic expenses are deliberated. Mounted charge of the system is the charge of turbine, land, tower, and its fixtures and it financial records less any municipal or central tax praises Preservation cost of wind system is usually precise and yearly conservation rate could be about 2% of total system cost .The cost of supporting to obtain the wind system can complement considerably to whole cost of wind system.

VII.CONCLUSION

In this paper, we just analyzed the issues and concerns related to the wind energy generate electricity for the small remote areas where the regular supply of electricity is not possible. Some of the most important factors affecting wind power are selection of generators, main project concerns design, difficulties related with grid relations, wind-diesel independent hybrid power systems, sensitive power control of the system, and ecological features of power generation. Finally, we also deliberate the future ideas of wind power generation from off shore sites. Today wind power accounts for about 0.4% of world's electricity demand. It is possible only if the government should take the necessary to achieve such massive profit in the field of power generation. It is also economical when compared with other source of power generation and is also safe for the surroundings. Particularly there is no emission that harms the society.

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