Situation With Wind Farms In India

1) Introduction

A wind park or wind farm is generally also known as wind power plant or wind power station. Basically, it’s a group of wind turbine which contains more than one wind turbine at a same place or in a large area. The numbers of wind turbines can be vary as per the requirement from the surrounding (factories, houses, etc.) electricity consumption. There are mainly two different types of wind park, based on location onshore and offshore but typically Nearshore and Airborne are also two other types.

According to Global Wind Energy Council (GWEC), at the end of the year 2016 there were near about 341,000 wind turbines spinning to generate energy in different global wind farms. There are many onshore wind farms rather than others, because the development and maintenance is quite easy.

Normally in wind farms, all wind turbines are arranged in different layouts, based on the efficient power generation. Wind turbines are the key machines for the wind farms and there are mainly two types; Hori-zontal Axis Wind Turbine and Vertical Axis Wind Turbine. The working principle of power generation is same for all but the axis and type of the blade changes in each type of sub wind turbines.

For arrangement of the wind turbines in farms, there are many types of design layouts but the main are following; Line, Grid and Group. These are then after considered on the bases of the wind direction and its flow. Windspeed is the main criteria of the design centre.

In wind farms all the wind turbines are connected through a parallel power transmission to substation where power is manged on the bases of Voltage, Ampere and Cycles (Hz). Through subsidiary branches and connections these all generated electrical power then transmitted to residential and industrial areas.

2) Theoretical basics

There are many mega wind power parks in globe, which are located mainly in China, India and in US. The world’s largest producer of electricity onshore farm from the wind energy is “Gansu Wind Farm, China” which had a capacity of more than 6000 MW by 2012 and they are planning to increase the capacity till 20,000 MW. World’s biggest offshore wind park is “Walney Wind Farm, UK”. It generates near about 659 MW of electricity from sea wind. It could be resulting in fewer turbines need to the same achieved output.

There are many aspects which could influence the wind farm and its location. Weather and the geographical location are the foremost important because we can rely on the previous data and we can estimate about the weather conditions in a year and if there is cyclone activity or any other disasters then those data are very important with time and its related project decisions. Physical connectivity to power plant or our wind farm is very important, without this easy way employees cannot do their operations. While planning and designing the plant, designers and

decision-makers do several types of research regarding the government policies and easy to road transport but foremost access to electricity transmission and local prices. There are several types of wind farms based on location, which are described below.

Onshore wind park means that the complete wind park is located on a land that could be used by other facilities. The biggest problem of this kind of parks is that the park should be built on the wild, rural or hill area because generally they need more surface area as compare to other and foremost to build a wind park in urban area is quite expensive. Moreover, because of its visual impact, it could be a reason for declining tourism in the area of location. But wind parks can lead to Industrialisation; on the other hand, they are interfering with radar signals. Which is the biggest problem in area of aviation

offshore wind park means that the all designed wind turbines are situated on a sea which could be the best implementation and the use of area. The main purpose of this kind of park is that it requires less investment which could lead to cheap electricity prices. Due to the lower ratio of resistance and speeds over the sea area is 20% higher than the onshore area. Thus, this captures more energy than the other one. Because of the geographical location it contains less wind turbulence and enables wind turbines to reduce blade wears.

Nearshore wind parks are mainly located on the land but side to the seashore. Because of its special location it is the most likely wind farm type ever. The main reason behind is that the wind and its related aspects are well. To maintain and establish this kind of farm may result a good profitable and sustainable plant ever. The physical contact and its maintenance are quite easy than offshore. The electrical power transmission chain is also effective. This type of farm may face over flooding near the area of sea and its maintenance costs seem high. Sometimes its been noted that due to over flooding wind turbine felled out and destroyed.

Airborne wind parks can be located at any location where wind speed is high. The Airborne wind turbine and farm is a design concept for wind turbine which carries the rotor supported in the air without the tow-er. This option can give more aerodynamic and mechanical options. While avoiding the persistence of altitude and construction cost of wind farm.

- Near Shore Airborne
- Onshore Offshore

3) Technical description

There are many aspects that needs to be analysed before designing the plant. The altitude above the sea level, orographic conditions and surface properties are important information included in the research. A central aspect to analyse the ground and soil conditions to determine the necessary basement types for the individual their related costs of the foundation. The regional site geography is described and the seasonal conditions at the site are investigated, If there is potential risk of earthquakes and other calamities in the area. Many aspects regarding distance from port, road and residential area to consider because most of parts of the wind turbines are transported through port or by road; residential distance considered as for the employee transportation. At the point of feasibility study conducted, an environmental impact assessment must have been carried out and the environmental constrains are used to develop different types of farm layout.

4) Typical application

5) Contribution to climate protection

As compare to other power generation methods wind power energy has the lowest effect on environmental emissions. Unlike many resources of electricity production it significantly reduces carbon emissions, saves billions of gallon of water a year, from that it cuts smog and pollution which could be a reason for asthma attacks. Wind farms have small footprints after the relocation of the plan. It allows rural habitats and human economic activities to continue. That means farmers can earn more value from their land and wildlife can flourish with little disruption. Most studies show that the production of electricity from wind has the lowest impacts on wildlife and their surrounding habitats with respect to any large-scale way to produce electrical energy.

On the other side, wind farms cause some negative effects. This wind turbine makes a huge wind farm and they may visual impact the landscape. There are few wind turbines that caught fire, some have leaked lubricants, but this kind of occurrences are rare. Some people who live beside to the wind farm may don't like the sound of turbine blades when they rotate by wind. There are many cases of deaths of birds and bats, somehow it contributes to the decline of the rare species. Some institutes are nowadays finding the way to improve this impact of birds and other related species. More ever wind farm projects on land requires service roads and other facilities which are made from fossil resources.

There is a scarcity of water and climate change worldwide. Wind power can help to overcome from water storage and their shortage. Globally, power plants use nuclear or fossil fuel, which produces 78% electricity. It uses water for cooling and condensing the steam that operates the turbines. Wind power requires almost no water for cooling or operating so it can save near about 2,000 liters of water per MWh of producing electricity.

6) Current market description worldwide and in your home country

Wind power and their farm is the fastest growing renewable energy technologies. Usage of this technology is going to the top worldwide because costs are falling. Globally installed both offshore and onshore farms have increased by factor of almost 75 in the past two decades, jumping from 7.5 GW in 1997 to near about 622 GW by 2019. Meanwhile, production of wind electricity doubled between 2009 and 2013, and in 2016 its reported that out of total produced energy 16% was produced by renewables. There are different weather conditions in the globe, so wind speed can differ from each other. According to IRENA's report offshore wind farms has tremendous potential to generate electricity.

With respect to previous data of 2010 total wind power generated was near about 180 GW (Onshore – 177 GW, Offshore - 3 GW), but it increased continuously 622 GW (Onshore – 594 GW, Offshore – 28 GW). Which had inclined total growth worldwide approximately 245% in 9 years means 12% / year.

There are tons of benefits of renewable energies and for that reasons investors and scientists are focusing on more development of it. Accordingly, International Renewable Energy Agency in year 2005 wind energy market was just 27.3 Billion USD and it increased to 131.5 Billion USD by year 2018. On the mean side solar power is also a source of renewable energies and it got

market in year 2005 Appx. 25.3 Billion USD but it also received tremendous growth of 131.5 Billion USD by year 2018.

For any industry or any achievement, men power is highly important everywhere. Worldwide wind farms have created new jobs, in year 2018 it created 1,116 jobs which was 753 in 2012. So, wind farms creating new jobs every year by one thousand. But by the solar parks, it is generating new jobs near to 3,605 per year.

Globally China is one of the leading wind electricity generating country with 221 GW, 96.4 GW by USA, 59.3 GW by Germany, 35 GW by India, 23 GW by Spain.

Wind power generating capacity in India has increased in previous years. In Feb 2020 the total installed capacity of wind power was 37.669 GW, the fourth largest wind power capacity in the world. In India these farms are spread across north, west and south regions. The cost of producing electricity is decreas-ing and reached to 2.43 Rupees per KWh (3.4 USD Cents) without any other direct indirect subsidies in 2017.

By 2019-20 installed capacity was 37,669 MWh and generating capacity was 64,485 MWh, which was in year 2014-15 near about 23,447 MWh installed capacity and 28,214 MWh power generation capacity. Foremost in 2006-07 it was only 7,850 MWh. In December 2017, the European Investment Bank (EIB) and India’s Yeas bank has jointly initiated financing 400 Million USD for solar and wind energy projects in India with plan of reaching 60 GW wind electrical energy. National Institute of Wind Energy (NIWE) has shown that India has energy potential of 302 GW at 100-meter hub height.

According to the data released by the Department for Promotion of Industry and Internal Trade (DPIIT), FDI that Indian non-conventional energy sector between April 2000 and December 2019 stood at 9.1 Billion USD. Previously more than 42 Billion USD has been invested in India’s renewable energy sector since 2014. New investment reached at 11.1 Billion USD by 2018.

The Indian government is taking many initiatives to boost the renewable energy sector. Recently government announced to add 30 GW of renewable energy capacity to it’s the desert area of Gujarat and Rajasthan. In between this time many polluting power plants will be closed, and it will help to decrease the emission of carbon in the climate. For new employment renewable sector has the potential to create new employment opportunities. The Ministry of New and Renewable Energy (MNRE) has set an ambitious target to set up power generating capacity of the renewable sector to tune till 175 GW by 2020 of which 100 GW is for solar, 60 GW for wind power and other for hydro, bio and among other.

It is expected that by the year 2040, near about 49% of total electricity will be generated by renewable energy, new batteries will be designed to store the power and it will cut the solar energy cost by 66%. After this all renewables can save almost 54,000 Crore Rupees (8.43 Billion USD) annually.

7) Summary and outlook for the near future

The global market for wind power and their farms is expected to have growth of approximately

7.9% CAGR during the period of 2020 – 2025. There are many aspects which may influence this growth like govern-ment policies, increased inflation of wind power price my led to other options of gas plant and solar plant, this could hinder the market of wind energy.

Onshore wind market is nowadays one of the most valued energy resources, worldwide. Meanwhile, the off-shore sector has been gaining momentum in global wind power and its been expected to have fastest ever growth in the near future. The emerging markets in Africa and South America offer a good opportunity for business in the wind energy market including countries Brazil, South Africa, Chile etc, are on the cusp in the future of the market. The declined cost of power may lead to new product manufacturing prices which may affect human lifestyles, but it may create new challenges.

Offshore sector set to be the fastest-growing segment in the future. According to the data, in year 2018 UK and Germany were both had offshore wind capacity of 8.221 GW and 6.446 GW respectively, but it has been estimated to grow until 2030 by 26.9 GW for UK and 17.2 GW for Germany. Considering a period between 2020 – 2030, the European Union may reach near to 80 GW of the installed onshore capacity, but it will be largely dependent on the fast track administrative action procedures and EU member states. EU target-ed 27% renewable energy target. According to estimates, offshore wind energy will cost 80 EUR/MWh in 2025.

Renewable resources have the highest capacity to provide enough electrical power. Foremost, there is and there will be huge market for wind farms in near future, but solar and other renewable projects may influ-ence this area in several way. Worldwide there are normally many onshore wind farms but due to shortage of land offshore projects will thrive. These plants can produce electrical energy at the cheapest rate and can distribute it efficiently.