Issue 1 vol 4 ISSN: 2321-8134

IJFEAT

INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

A REVIEW ON
OFFSHORE WIND POWER GENERATION: NEED OF TODAY

Pranay Surana[1], Suraj Raut[2], Mayur Chavhan[3],K.Y.Naxane[4]

UG Student, Department of Civil Engineering, J.D.I.E.T, Yavatmal, Maharashtra, India, , pranaysurana8@gmail.com
UG Student, Department of Civil Engineering, J.D.I.E.T, Yavatmal, Maharashtra, India surajraut09996@gmail.com
UG Student, Department of Civil Engineering, J.D.I.E.T, Yavatmal, Maharashtra, India, mmayurchavhan1997@gmail.com
Asst.Professor, Department of Civil Engineering, J.D.I.E.T, Yavatmal, Maharashtra, India naxane.kiran007@gmail.com

Abstract

Our aim is to provide an overview on off shore wind power generation by setting up of a wind farm in water bodies (oceans, sea). This is a new concept and design with track record of long-term performance. The fundamental concepts related to the wind energy and understanding concepts behind it. Also type of offshore wind turbines and, it's specific uses in different cases. History of the offshore wind power generation and future development. It's need in India, and economical aspects related to Indian economy, that is its cost of construction and maintenance costs . Preliminary investigation to predict the future performance of the offshore wind power generation. Aerodynamic engineering for design of the wind turbines and it's important. We will also deals with the capacity or power generation capability of wind farm. Also about the different countries which are using this technology and about their capacity and their future development plan regarding offshore wind turbines, and India's development plans related to this . About the planning and permission related to the installation of the offshore farm and its impact on the environment. Key features of the offshore wind form, advantages, limitations, we will also discuss and sum up our knowledge to world largest offshore wind farm. Because its renewable recourses that are our life line for the future generation and we too have to think on it.

Index Terms: *offshore wind turbine, wind farm, economical aspect, aerodynamics, future development.*

---------- *** ----------

1. Introduction

The wind energy is a form of renewable energy recourses that deals with the generation of electricity via power of wind to rotate the turbines to produce electricity. This briefing sheet will provide an accurate and up to date on the current situation of the wind energy in the world. The offshore wind energy is used in the wind farm. Higher wind speeds are available offshore as compared to that of land, so offshore wind power's electricity generation is higher per amount of capacity installed. At the periodic end of 2017, the total worldwide offshore wind power capacity was 18.8 GW. The largest offshore wind power farms are currently located in the northern Europe, especially in the United Kingdom and Germany, which together account for over two thirds of the total offshore wind power installed worldwide. At the end of September 2018, the 659 MW walney extensions in the United Kingdom is the largest offshore wind farm in the world. The home sea farm under construction in the United Kingdom will become the largest when completed, at 1,200 MW. The including Dogger Bank in the United Kingdom at 4.8 GW, and Greater Changhua in Taiwan at 2.4 GW.

The cost of offshore wind power has historically been higher than that of onshore wind generation, but costs have been decreasing rapidly in recent years and in Europe has been price competitive with conventional power sources since 2017.

Wind as a source of power generation provides clean, ecofriendly, nontoxic and readily available renewable energy source. For effective generation of energy from wind, certain conditions must be met such as; availability of substantial amount of wind within a site, appropriate statistical analysis for the wind to study the nature of wind speed distribution

within a site, multi-criteria assessment of the site to ensure the liability for the location of the installation of wind energy conversion systems (WECs), cost implication of installing wind energy conversion systems and other logistic analysis. Furthermore, wind is stochastic in nature; hence it is necessary to develop models in accessing long term variation of wind within a particular site before concluding on whether the site poses the requisite wind resources for power generation.

Another important parameter in the wind energy studies are the wind power density. Wind power density is the amount of energy available at the particular site for the conversion of useful wind energy by a wind turbine. It's used to measure in watts per meter square, and it is a direct function of the mean value of the wind speed available in that particular site. It is necessary to ascertain the wind power density of particular site prior to installation of wind turbines.

1.1 History

The first offshore wind farm was installed in Denmark in 1991.In 2009 the capacity of offshore wind turbine was 3 MG. At the end of 2011 their where 53 European wind farm, of Germany, Ireland, Denmark, Finland, Norway, Sweden and United Kingdom with a capacity of 3183 MW. United Kingdom with Largest Capacity with 3681 MW followed by Denmark-1271 MW, Belgium-571 MW and so on.

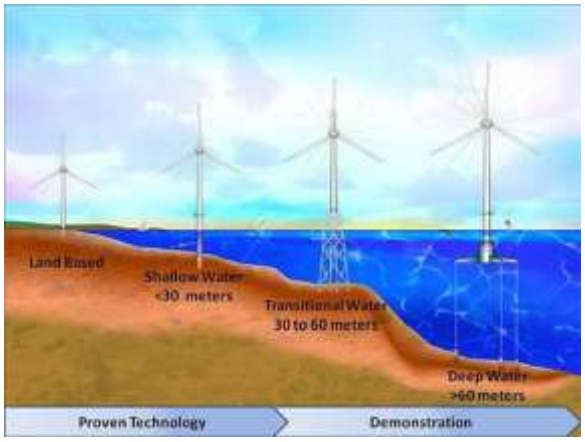
1.2 Offshore WindResources

Offshore wind resource characteristics the span of a range of spatial and temporal scales and field data on the external conditions. For the North Sea, wind turbine energy is approx 30 kWh/m^2 of sea area, per year, delivered to the grid. The energy per sea area is roughly independent of the turbine size.

2. TypesOf Offshore Wind Turbines

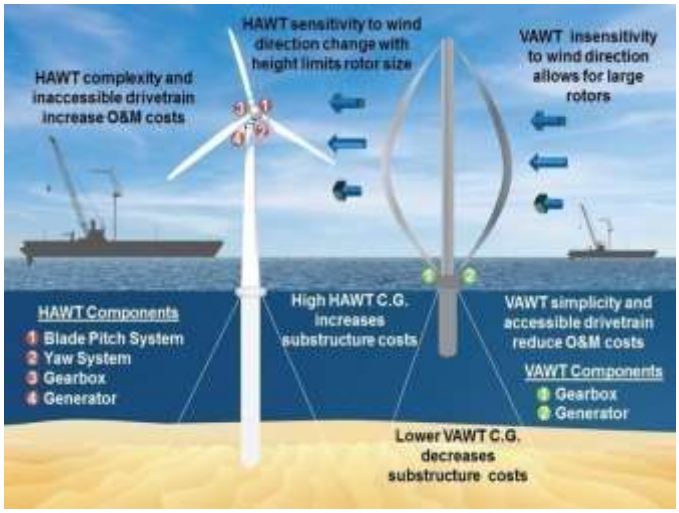
Fixed foundation offshore wind turbines: almost all of the currently operating offshore winds farms are employ fixed foundation turbines, with the exception of the few pilot projects. Fixed foundation offshore wind turbines have the fixed foundations Underwater, and are installed in the relatively shallow waters of up to 50–60 mm

Types of underwater structures include the monopile, the tripod, and the jacketed, with various foundations at the sea floor that including monopile or multiple piles, gravity base, and the caissons. Offshore turbines require different types of bases for the stability and accordance with the depth of water. To date a number of different solutions exist.A monopile (single column) base of six meters in diameter this is used in waters up to 30 meters deep. The gravity base structures are used for the exposed sites in water 20–80 m deep. The tripod piled structures is in water 20–80 m deep. The tripod suction caisson structures is also in water 20–80 m deep .Conventional steel jacket structures are used in the oil and gas industry for the water 20–80 m deep.Monopiles of 11 m diameter at 2,000 tonnes can be made and the largest so far is the 1,300 tons which is below the 1,500 tonnes limit of some crane vessels. The other components of the turbine are much smaller.



Floating offshore wind turbines: For locations with the depths over an about 60 – 80 m, fixed foundations are uneconomical and unethically and unfeasible, and floating wind turbine anchored to the ocean floor are needed.Hywind is the world's first full-scale floating wind turbine which is installed in the North Sea off Norway in 2009.Hywind Scotland is commissioned in the October 2017, was the first operational floating wind farm which had a capacity of 30 MW. Other kinds of floating turbines had been deployed and more projects are planned.

Vertical axis offshore wind turbine: Although the great majority of onshore and the large-scale of offshore wind turbines currently installed are horizontal axis and vertical axis wind turbines which have been proposed for use in offshore installations. Thanks for the installation of offshore and their lowest centre of gravity in these turbines can be in principle to built bigger than horizontal axis turbines and, with proposed designs of up to a 20 MW capacity per turbine. This could be improved in the economy of scale of offshore wind farms. However, there are no current large-scale demonstrations of this technology as far as research.



3. Economical Aspect

The advantage of locating the wind turbines offshore is the wind is much stronger off the coasts than the unlike wind over the continents. Offshore breezes could be stronger in the afternoon and matching the time of the people is using the most of the electricity. Offshore turbines can also be located near to the load centres along to the coasts of large cities. And eliminating the need for a new long-distance transmission lines. However, there are several disadvantages of offshore installations are related to more expensive installation and difficulty of access and the harsher conditions of the units.

Locating the wind turbines offshore exposes the units to the high humidity, salt water and salt water spray which will negatively affect the service life of a wind mill. It may also

Cause corrosion and oxidation with the increase in maintenance and repairing costs and in general makes every aspect of installation. Operation much more difficult while time-consuming and more dangerous and far too more expensive than sites on land. The humidity and temperature is controlled by an air conditioning the sealed nacelles. Sustained high-speed operation and the generation also increase wear, maintenance and repair requirements proportionally to it.

Other limitations of the offshore wind powers are related to the still limited number of installations. The offshore wind industry is not yet fully industrialized. The most of the cost of The turbine represents the one third to one half of the total costs in offshore projects today. The rest comes from infrastructures, maintenance work, and oversight. Costs for foundations, installation, electrical connections, operation and maintenance are a large share of the total for the offshore installations compared to that of the onshore wind farms. The cost of installation and electrical connection also increases rapidly with the increase in the distance from shore and water depth.Offshore wind farms of worth €8.5 billion ($11.4 billion) was under construction in European waters in 2011.

4. Future Development

The offshore wind construction market had remained quite concentrated. By the end of 2015, Siemens wind power had installed 63% of the world's 11 GW offshore wind power capacity; Vestas had 19%;Senvion came third with 8% and Adwen with 6%. About 12 GW of offshore wind power capacity is operational and mainly in Northern Europe with the 3,755 MW of that coming online during 2015. Costs of offshore wind powers are decreasing as much as the faster than expected. By 2016, four contracts (Borssese and Kriegers) were already below the lowest of the predicted 2050 prices.

Projections for the year 2020 estimated an offshore wind farm capacity of 40 GW in European waters. Which would be providing 4% of the total European Union's demand of electricity. The European Wind Energy Association has set up a target of 40 GW to be installed by 2020 and 150 GW by 2030. The offshore wind power supply capacity is expected to reach a total of a 75 GW worldwide by 2020 with the significant contributions from China and the United States. The Organisation for Economic Co-operation and Development (OECD) predicted in 2016 .That the offshore wind power will grow up to 8% of ocean economy by the year 2030, and that its industry will be employed by 435,000 people by adding $230 billion of value.

5. Conclusion

Activities in the most of the cases imply the construction of an offshore farm. Such as monitoring programs and before-after-impact-studies carried out at the specific sites often represent the only possible way to achieve the exact knowledge or at least an improved understanding of the impacts from offshore wind energy, particularly on the environment.Furthermore, the offshore wind farms are already constructed or planned May yield the important information and concerning issues like the social acceptance and conflicts of interest will be there, if research projects dealing with these issues are carried out.It should not be regarded as barriers for the future development of the offshore wind energy on the contrary and it is necessary that the offshore construction projects are carried out, in many cases. It is necessary that some large-scale projects must be carried out in order to achieve the more information and knowledge regarding the especially environmental issues. So these projects must be subjects of investing national and Eu-funded researches in order to reach the conclusions about the impacts from offshore wind energy in relation to the future investment.

Acknowledgment

We are thankful to the guide and all the authors of the references for their guidance and their valuable data and type.

"OUR ENERGY CHALLANGES OUR ECONOMIC DEVELOPMENT OPPORTUNITIES "

By - 'Kevin Law ' (CEO of Long Island Association)

References

1. Wind energy Engineering, Handbook for Onshore and Offshore Wind Turbines 2017,By Robert Whittlesey
2. Wind Power, New York Times, 27 January 2002
3. Offshore wind, By John Rogers
4. Wind Energy, By Ben McAlinden