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Is India Prepared for Offshore Wind Farm Development?

The offshore wind industry has significant potential as a long-term solution. However with the current costs being high, we need to study the factors that will make it viable and plausibly cheaper in the years to come.

India's Ministry of New and Renewable Energy (MNRE), National Institute of Wind Energy (NIWE), and a consortium of partners signed an agreement in October 2014 to build the country's first offshore wind power project of 100 MW capacity off the coast of Gujarat. This 100 MW demonstration project is expected to act as the starting point for the future expansion of the offshore wind market in India. Further, the launch of a Draft National Offshore Wind Energy Policy in 2013 set the stage for initiating activities in this domain.

Creation of new offshore infrastructure is expected to throw up tantalising challenges if the tentative target of 1 GW is to be achieved by 2022. A thorough scop-

ing of ground-level bottlenecks (in policy, technology and administration) is necessary before financial institutions and developers allocate resources towards achieving the national objective of securing sustainable energy from offshore wind.

Offshore Wind – Why in India?

As of March, 2015, the onshore wind sector contributed 65% of India's renewable capacity. However, this sector still suffers from inadequate grid connectivity, delays in acquiring land, obtaining statutory clearances, etc. With a national target of installing 60 GW of wind power by 2022 and meeting the energy demand of consumers, the existing scale of onshore wind farms is inadequate. More than 85% of In-

dia's wind farm projects were found to be less than 10 MW in FY 2012-13. Further, the size of onshore wind turbines is often limited by restrictions on height and rotor diameter, resulting in under-utilisation of the country's wind potential. Also, India has a limited number of high on-shore wind zone sites available, which are often embroiled in land-related conflicts. In view of all these hurdles, it has become extremely difficult for investors to set-up large-scale onshore wind power projects in India.

On the other hand, assessments conducted by various agencies and institutions like UNEP-NREL, DTU Riso, INCOIS, etc. show that the Indian coastline does have high-potential zones for offshore wind development. According to the preliminary assessment conducted by the National Renewable Energy Laboratory (NREL), India's theoretical offshore wind potential is estimated to be 1100 TWh. This potential can be tapped using large-scale turbines which would contribute a high Plant Load Factor (PLF) as compared to onshore wind turbines. Further, by pursuing the development of offshore wind, challenges related to land availability can be overcome. Although, environmental, social and security aspects need to be studied in detail as part of thorough feasibility assessments.

Based on the preliminary findings of the EU-funded offshore wind assessment project, FOWIND, the areas below Saurashtra in Gujarat and the stretch between Kanyakumari and Nagapattinam in Tamil Nadu have been identified as potential areas for



Figure 1: Offshore Wind Farm off the Coast of Denmark (Source: GWEC).

offshore wind development. The mean wind speeds at 120 m hub height in the zones off Gujarat and Tamil Nadu are 6.8-7 m/s and 7.1-8.2 m/s, respectively. While developers are continuing to explore onshore infrastructure development prospects, stakeholders could be encouraged to consider evaluating the possibility of harnessing wind power in high-potential offshore zones as well.

Infrastructure Development

Offshore wind project development can be a complex puzzle for planners and policy makers as it requires several seemingly disparate pieces that need to fit together perfectly. With offshore wind being a new endeavour for India, proper power evacuation facility, the possibility of expanding the grid, vessels for transportation of wind turbine components, and supply-chain logistics should be planned well in advance.

According to the NREL report, about 20% of the Levelised Cost of Energy (LCOE) can be attributed to installation activities like hiring installation vessels and ports and staging activities. The non-availability of sufficient infrastructure in addition to delays in construction activities would not only halt progress but also have an adverse impact on the overall project costs.

The construction period of any port or harbour requires a minimum of 4-6 years, which can increase due to the complexity of structures and foundations that have to be laid and the hostile marine environment. At the same time, the construction period of a 300 MW offshore wind farm typically ranges between 2-6 years. Hence, if India plans to achieve the tentative target of 1 GW of power from offshore wind by 2022, then existing ports need to be modified and if necessary expanded to facilitate the construction of offshore wind farms. Alternatively, new ports can be set-up which will also have other commercial prospects in addition to the offshore projects.

In the early years of offshore infrastructure development in Europe, developers adopted practices implemented by companies that were involved in manufacturing onshore wind components and surveying the seabed for oil and gas availability through customised vessels. These

industries were already proficient in certain technical abilities such as windmill component manufacturing, refurbishing vessels for oil and gas industry sites, fabrication facilities for foundation structures, etc. Based on the lessons learned from Europe, India's upcoming offshore wind industry may consider utilising the existing infrastructure assets of the oil and gas industries in the near term. Nevertheless, going for a dedicated supply chain and building the necessary human resource base for the construction of a large-scale offshore wind farm might be required in the long run.

India's Status

Currently, there are 43 ports in Gujarat and 26 ports in Tamil Nadu which could be assessed for offshore wind development. But there are several differences between traditional port facility features and those required for the delivery, storage, handling and deployment of large offshore wind farm components. Some of the key factors for handling these heavy structures in the ports and vessels with higher draft, such as ground bearing capacity, water depths in channels, channel width and distance from the wind farm need to be assessed right at the planning stage. Additionally, identification of staging ports, availability of transportation facilities to carry heavy wind turbine components, and availability of sufficient space to accommodate future

vessel movement for operations and maintenance activities need to be considered.

It would be desirable to have turbine manufacturers, cable suppliers, vessel operators and marine installation companies situated close to the port to reduce transportation time and cost. As of today, few ports in Tamil Nadu have these facilities in the near vicinity. The Central or State government could consider providing comprehensive incentive schemes for developing a national manufacturing facility alongside the proposed ports in the state.

Further, the development of port infrastructure, operation and maintenance activities and localisation of supply chain could result in job creation and skill enhancement. Local bodies/agencies should be encouraged to develop ports in view of the job potential that will be created because of the offshore wind industry.

Summarising, the offshore wind industry has significant potential as a long-term solution. However with the current costs being high, we need to study the factors that will make it viable and plausibly cheaper in the years to come. Based on a preliminary examination of existing port infrastructure in India, it is evident that enormous reinforcement efforts will be required in order to service our future offshore wind energy projects along with establishing regulatory and institutional frameworks that will guide the local stakeholders ◀



Figure 2: Tuticorin Port, Tamil Nadu (Source: FOWIND).