GWEC INDIA
GLOBAL WIND ENERGY COUNCIL

AN OCEAN OF POTENTIAL

Recommendations for Offshore Wind Development in India

April 2021

Background

Offshore wind will have a prominent role in India's energy transition. As the world's third-largest producer and fourth-largest consumer of electricity, India's energy demand is forecast to grow between 6-7% year-on-year over the next decade. Current government initiatives like 24*7 Power for All, Make in India, Atmanirbhar Bharat (Self-reliant India) and the National Mission for Enhanced Energy Efficiency are aiming to create secure and low-carbon energy systems. This will in turn require a large-scale and reliable renewable energy supply.

As a clean, affordable, scalable and sustainable indigenous resource, offshore wind can become an important pillar for India to meet its power demand and wider strategic energy aims.

Under its Nationally Determined Contributions (NDCs) in line with the Paris Agreement, India has pledged that 40% of installed capacity for power generation will comprise non-fossil fuel-based energy sources by 2030, and its emissions intensity will decrease by up to 35% below 2005 levels by 2030. It is already nearing this target, with renewable energy currently accounting for 36% (136 GW, including large hydro) of installed power capacity, of which 10% (38 GW) is onshore wind capacity.[1] Emissions intensity is on-track to decrease by 37-39% below 2005 levels by 2030.[2]

But progress towards the Government of India's (GoI) near-term renewable energy targets is slower. Growth of wind and other renewable energy sources must accelerate to reach the government's 2022 target of 175 GW of renewable energy capacity, let alone its 2030 target of 450 GW. This will be particularly important to providing clean and secure sources of green power, as India's power demand is projected to rapidly expand over the next 20 years – requiring the addition of "a power system the size of the European Union (EU) to what [India] has now," according to the IEA.[3]

[1] As of October 2020
[2] According to Climate Action Tracker.
[3] https://www.iea.org/reports/india-energy-outlook-2021

Blessed with around 7,600 km of coastline and a roughly 2.3 million sq. km exclusive economic zone (EEZ), the GoI has recognised the potential of offshore wind to support its climate action plan by setting two ambitious offshore wind targets: 5 GW by 2022 and 30 GW by 2030. The National Institute of Wind Energy (NIWE) has earmarked potential sites off the coast of Gujarat and Tamil Nadu with 70 GW of technical potential, while the World Bank Group has estimated 195 GW of technical potential within 200 km of India's coasts.

Progress in offshore wind development to date

Two pre-feasibility studies have already outlined the zonal areas for offshore wind development in India:

- The Facilitating Offshore Wind in India (FOWIND) —2013-18 project, conducted by a GWEC-led consortium and supported by the EU, focused on Gujarat and Tamil Nadu.[4] It identified 16 zones through offshore wind mapping across an area covering 12 nautical miles off the coastline.[5] During this project, the GoI formulated a National Offshore Wind Policy in 2015 to provide a legal framework for the development of the offshore wind sector in the country, evolving the role for Ministry of New and Renewable Energy (MNRE) and NIWE as Nodal Ministry and Agency, respectively.
- The First Offshore Wind Project of India (FOWPI)—2016-19 project, conducted by a COWI-led consortium and supported by the EU, assisted up to the pre-FID (Financial Investment Decision) stage and provided capacity-building for Indian stakeholders. During this project, India's first commercial discussions around offshore wind economics began, resulting in an Expression of Interest (EOI) issued by NIWE in 2018 for a 1 GW project in Gujarat.
- The EOI received an enthusiastic response from leading multinational global and domestic players. However, due to high CAPEX and lack of a financial support scheme, the EOI has not progressed since 2018. In mid-2019, MNRE applied for an €800 million viability gap funding (VGF) to the Ministry of Finance, to support the construction of the first 1 GW project in Gujarat.
- The Financial modelling of offshore wind farms in India (FIMOI 2019-2021) entails partnership between the MNRE, NIWE and the Danish Energy Agency (DEA).[6] The project aims at supporting the Indian government in building information to develop the Indian offshore wind market in the short and long-term perspective. Draft reports on technology and LCOE have been made available for stakeholders' comments.

Current status of the offshore wind market

The MNRE is pursuing an offshore wind measurement campaign to have at least 10 GW of valid and accurate on-site data for feasible offshore wind siting. NIWE is also planning to install five LiDARs (Light Detection and Ranging) in 2021 that would gather precise bankable data critical to developing offshore wind projects; five LiDAR locations aggregating to 7.4 GW

[4] In India, currently only one LiDAR commissioned in 2017 is installed in Gujarat coast.
[5] 8 zones in Gujarat and 8 in Tamil Nadu
[6] Centre of Excellence for offshore wind established as part of the India-Denmark Energy Partnership programme.

indicative installable capacity have been proposed, with two in Gujarat and three in Tamil Nadu.

The MNRE is currently seeking feasible cost interventions from stakeholders for the first 1 GW project in Gujarat. Meanwhile, the structures for offshore wind power purchase agreements (PPAs) and auction designs are being examined by government authorities.

Status of offshore wind site readiness and tender activity in Gujarat and Tamil Nadu presented in the table below shows that Tamil Nadu sites have stronger offshore wind resources than Gujarat sites.

Category	Gujarat	Tamil Nadu
LiDAR	One LiDAR commissioned at Zone-B in Nov 2017; Two are Proposed for zone A & B	No LiDAR installed; Three LiDAR proposed for Zone A, B, and C
Avg. Wind Speed	~7.63 m/a @100m HH as per 6-month LiDAR Data- Zone-B	NIWE's 100 m guyed mast installed at Rameshwaram shows 8.62 m/s average wind speed @100m HH and WPD of 603 W/m2 @50 m a.g.l.
Geotechnical Condition	Extensive weak clay or soft soil layers (~9m) found in Zone A & B; challenging and costly for foundation design and need customization	Better than Gujarat site– soil profiles for zone A indicate significant spatial variation in the southern Tamil Nadu offshore region; ranging from weak/ loose sands/clays to strong cemented sand to depth
Infrastructure and Logistics	Pipavav port is larger and lively with high vessel availability and storage facility in the region but needs to be optimised for offshore wind	Ports are relatively smaller in size; need significant modification efforts for readiness to OWF installation
Coastal Area	Rich in biodiversity and has fishing communities up to 10 km off the coast; Rapid Environmental Impact Assessment (EIA) study is done, however, detailed EIA study for overall impact analysis is required	Strong tradition of fishing communities at the coastal area; precise geopolitical, EIA, and social acceptance study is required
Tender or other activity	EoI invited for Zone-B nearest to Pipavav port in Gulf of Khambhat- Rapid EIA study, Geotechnical and geophysical analysis are done.	No tender is floated till date; **Plan is to award first project of 300-500 MW capacity in zone-B**[7]; 75 acres of land is allocated to NIWE for setting the first National Offshore Research & Testing Facility 2019-29

Key Challenges to the Offshore Wind Sector

Given the strategic importance of offshore wind to meet India's renewable energy targets, GWEC India highlights the following key challenges for offshore wind sector development:

1 National policy and regulatory framework

National policy lacks clear objectives towards long-term development, such as a long-term roadmap of at least 10 years and security for off-taker risks. The recurring financial instability of power distribution companies (DISCOMs) with no securitisation or guarantee mechanisms, power curtailment and delayed evacuation poses high risks for project developers and investors. The current National Offshore Wind Energy

[7] In the best case, cost of 7.2 INR/unit for zone-B of Tamil Nadu is estimated as per FIMOI 'LCoE for first offshore wind farms in India' report. Addition of VGF can certainly drive the cost further down.

policy does not specify a clear framework for planning and delivery of offshore wind grid infrastructure. Further, permits and clearance processes are also ambiguous, involving numerous ministries and coordination by NIWE for obtaining Stage-I and II Clearances as listed in the policy.

Transparent and streamlined regulation is crucial to attracting significant investment at the levels needed for offshore wind project development. Draft offshore wind energy lease rules need to be gazetted sooner to regulate and grant offshore wind project prospecting to private players.

2 High CAPEX

In India, solar and onshore wind tariffs are cheaper than any conventional or other renewable sources. Since the initial cost of offshore wind is comparatively higher, due to heavy component costs, and land is still available for ground-based projects, there is resistance around the cost of energy from both the government and consumer perspectives. A decision on VGF support for the first offshore wind project from the Ministry of Finance has been delayed in light of the pandemic, but should be accelerated to send a positive market signal.

3 Job creation and economic benefits

The onshore wind sector has already spurred a robust local industry and supply chain in India. Offshore wind is likely to create opportunities for direct employment and inward investment, which will exceed the public support required at an early stage many times over. However, currently, these job creation or investment benefits of offshore wind have not been factored into the undertaken cost-benefit analysis, and these positive economic effects need to be articulated and presented to the appropriate ministries in India.

4 Mapping and data access

There is uncertainty associated with inefficient and largely inaccessible bankable offshore wind data and studies based on GIS data. In the identified offshore wind development zones, precise mapping of exclusion zones and areas for other ocean uses (e.g. shipping lanes, defense areas, fishing areas, ecologically protected areas, oil exploration, mineral extraction and dredging regions, submarine communication cables, and coastal tourism) is partially or fully unavailable. This has contributed to delays in the consenting process. Ideally, a 12-month hatching period would be required to identify bankable offshore wind project sites, once LiDARs are installed under MNRE and NIWE's current measurement campaign.

5 Tender design and consenting

The 1 GW EOI for Gujarat attracted more than 30 global and domestic players in the wind sector. Although the bidding process of the EOI had stringent timelines it has created uncertainty at many stages. This could be better managed with clear and transparent timelines for the different sub-stages of tenders, and sufficient lead times for investors and developers to prepare their bids.

6 Infrastructure, logistics, and marine spatial planning (MSP)

Narrow transportation routes are not suitable for delivering longer blades for offshore wind turbines. Local eco-system development must consider the requirements for offshore wind components, vessels, construction, and installation, particularly in ports where supply chain/OEM establishment can reduce transportation infrastructure costs by having *in situ* manufacturing and assembly of components. Currently, the Pipavav port in Gujarat is large with high vessel availability and storage facilities, but needs to be optimised for offshore wind; Tamil Nadu ports, largely surrounded by the defense and fishing activities, are relatively smaller in size and need significant modification for offshore wind readiness.

7 Socioeconomic challenges vis-à-vis local fishing communities

Most coastal areas of Gujarat are rich in biodiversity and home to fishing activity up to 10 km off the coast. A rapid environmental impact assessment (EIA) study was conducted for the EOI; however, a detailed EIA study for overall impact analysis is still required to meet international standards for project bankability and attract global financing entities. Similarly, in Tamil Nadu, there is stronger offshore wind resource, but also a longstanding tradition of fishing communities which requires a detailed EIA and stakeholder engagement and coordination for social acceptance.

8 Technological suitability and competence

Through FOWIND and FOWPI, the GoI has recognised that economies of scale would be required to exploit appropriate technologies for Indian offshore wind sites. Generally, these sites may require specific foundation technology and customisation, instead of standard wind turbine generator technology.

9 Federal-State cooperation

Ever since the 2015 political shift, the GoI's push for decarbonising the energy sector has been strong. However, a mismatch in priorities at the Federal and State level has led to a degree of inertia for offshore wind development. As seen in the US, China, Brazil and other markets, local states often have a particular interest in offshore wind and experience friction at the national level. Strong cooperation between different levels of government can support the achievement of national targets and coordinate activity around the highest potential sites first to build investor confidence.

Recommendations

There is a strong need for an action-oriented approach to progress the offshore wind market in India, beginning first with a demonstration project and then commercialisation. GWEC India makes the following recommendations:

1. **Frame a visionary policy** articulating clear objectives towards cost reduction and long-term security regarding off-taker risks, with a minimum 10-year roadmap for procurement and grid infrastructure.
2. **Implement legislation on the leasing of seabed** to developers.
3. **Provide clarity on the bidding process and timelines for the tender**, possibly adopting a "one-stop shop" approach, setting aims for a project pipeline, and conducting research on site-specific technological optimisation to encourage and attract leading developers and financing entities for participation.
4. **Identify the potential zones for bankable offshore wind projects** by widening the government's offshore wind measurement campaign to advance detailed site-specific studies.
5. **Award a feasible scale of demonstration project** along with a support scheme framework, which can "myth-bust" cost comparison views on the offshore wind through data and evidence on economies of scale, capacity factors and technology optimisation.
6. **Establish regular engagement** between decision-makers, bilateral countries trade representatives, local civil institutions and industry, to establish fit-for-purpose infrastructure, supply chain, ports, and networks for offshore wind.
7. **Strengthen understanding of the socio-economic benefits** of offshore wind at state and national levels, drawing on case studies and lessons learned from existing offshore wind markets.
8. **Align offshore wind strategy between Federal and State ministries**, which will require targeted knowledge-sharing and capacity-building on the benefits and building blocks for an offshore wind sector.