

AN OCEAN OF POTENTIAL
Recommendations for Offshore Wind
Development in India

March 2023

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BACKGROUND

In recent years, uncertainties arising from the pandemic, war, and trade disruptions around the world have reinvigorated the need for resilient growth. This includes strengthening political priorities at home and internationally for a future that is sustainable and yet ensures economic growth and shared prosperity. As per the International Monetary Fund Managing Director, the theme of India's G20 Presidency: One Earth, One Family, One Future reflects these aspirations. Earlier, in this spirit, at COP26, the Indian Prime Minister announced the "Panchamrit" of India's climate action¹. This includes five pledges – 500 GW of non-fossil fuel energy capacity by 2030; 50 percent of its energy requirements from renewable energy by 2030; reduction of total projected carbon emissions by one billion tonnes from now to 2030; reduction of the carbon intensity of the economy by 45 percent by 2030, over 2005 levels and achieving the target of net zero emissions by 2070. The attainment of the country's COP26 commitments ushers a pool of tangible and non-tangible benefits for the country, region and the world through jobs creation, climate change mitigation, environmental benefits, economic growth, and energy security. The International Energy Agency (IEA), in its Advanced Pledges Scenario (APS) has estimated over 75 percent rise in the country's power demand between 2021 and 2050.

To meet its COP commitments as well as growing power demand, India aims to exploit a basket of its rich and abundantly available renewable energy resources including offshore wind. Offshore wind deployment eradicates the need for land for generating power from ultra-MW power plants. It also improves the availability of round-the-clock (RTC) green power which is essential for decarbonization in the industrial sector as well as in the commercial sector. Additionally, meeting the emerging demand for clean power from data centers, electric mobility and green hydrogen production. As per the National Institute of Wind Energy, an autonomous institute under the Indian Ministry of New and Renewable Energy (MNRE), over 70 GW of commercially viable offshore wind potential exists off the coast of Gujarat and Tamil Nadu. In June 2022, the MNRE notified a cumulative 37 GW offshore wind seabed lease tender trajectory for 2022-2030 and aims to add 30 GW of offshore wind installed capacity in the times ahead².

¹ <https://pib.gov.in/PressReleasePage.aspx?PRID=1795071>

² <https://coe-osw.org/strategy-paper-for-establishment-of-offshore-wind-energy-projects/>

NURTURING AN OFFSHORE WIND ECOSYSTEM: PROGRESS SINCE 2021

In April 2021, GWEC published a statement of recommendations for offshore wind development in India³.

POLICY AND TENDER

- Indicative auction trajectory for a total 37 GW offshore wind capacity allocation by 2022-2030:
 - In March 2022, the MNRE released its discussion paper entitled 'Establishment of offshore wind energy projects to achieve a target of 30 GW by 2030' which outlined two models for the development of OSW projects in eight demarcated zones each off the coast of Gujarat and Tamil Nadu. This was based on the earlier FOWIND studies.
 - In July 2022, the MNRE held consultations with a range of stakeholders and later published the 'Strategy paper for establishment of offshore wind energy projects'⁴. This document comprised an indicative auction trajectory for a total of 37 GW OSW seabed lease capacity and pronounced three business models.
- In November 2022, the MNRE also notified the "Draft Tender Document for Seabed leasing for offshore wind energy projects". It comprised tender terms for seabed leasing and for undertaking studies/surveys and development of OSW offshore wind projects under Open Access/Captive/Third Party Sale model in Zones B1, B2, B3, B4 and G1 off the coast of Tamil Nadu.
- As per the Ministry of Power, the transmission system for evacuation of 10 GW offshore wind located in Gujarat and Tamil Nadu would be developed in two phases at an estimated cost of 0.28 lakh crore by 2030⁵.
- The Government of Gujarat and Government of Tamil Nadu have agreed to purchase OSW power generated off their respective coasts at a tariff of INR 4 per unit for initial projects.
- Tenders by National Institute of Wind Energy (NIWE): (1) An e-tender for supply, installation and commissioning of an integrated floating buoy for mounting LiDAR at three locations in the Gulf of Mannar, off the Tamil Nadu coast floated 2-3 times since December 2021, remains un-awarded. (2) NIWE proposed a test centre site in Dhanuskodi, Tamil Nadu, and an invitation for service providers was opened in August 2022 to conduct offshore rapid environmental impact assessment studies at the proposed 20 MW wind farm at Dhanushkodi.

³ <https://gwec.net/an-ocean-of-potential-recommendations-for-offshore-wind-development-in-india/>

⁴ https://mnre.gov.in/img/documents/uploads/file_f-1657882722533.pdf

⁵ <https://cea.nic.in/wp>

content/uploads/notification/2022/12/CEA_Tx_Plan_for_500GW_Non_fossil_capacity_by_2030.pdf



INTERNATIONAL STRATEGIC ALLIANCE

- Before 2020, two pre-feasibility studies were carried out under 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. Also, 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 for Gujarat EoI and provided capacity-building for Indian stakeholders.
- The UK and India signed a Memorandum of Understanding (MoU) on Cooperation in the Energy Sector in November 2015, after which a regular Ministerial Energy Dialogue was instituted in April 2017. The MoU was automatically renewed in 2020. Both countries have strengthened their bilateral partnership for advancing climate resilience and clean energy deployment. Climate is one of the pillars of the India-UK 2030 Roadmap. OSW is one of the key priorities as part of the “Smart Power, Renewable Energy and Storage Programme”, a joint initiative of UK and India.
- Indo-Danish Energy Partnership: A Centre of Excellence for Offshore Wind and Renewable energy has been established which has four work group projects. Under those, various reports have been published viz. Financial Modelling of Offshore Wind Farms in India (FIMO) part 2⁶ report bundled with LCOE and VGF calculation tools, Offshore Wind Port Infrastructure study for India, Maritime Spatial Planning for Gujarat and Tamil Nadu, Conceptual plan for 15 Indian offshore wind parks⁷.

⁶ Report published in May 2022 estimated the lowest possible LCOE by 2025 and 2030 could be in the range of 11.2-7.4 INR/kWh and 7.8-5.2 INR/kWh, respectively.

⁷ <https://coe-osw.org/>;

INSTITUTIONAL PARTNERSHIP

- Offshore Renewable Energy Catapult and NIWE's Joint Declaration of Intent (JDI): To establish a 5-year collaboration programme to support the UK and India's offshore wind industry mainly working on innovation and R&D, market and supply chain growth, new technology test and demonstration, as well as skills programmes, blade test facility, turbine and grid simulations.
- Catapult's India offshore wind supply chain exercise funded by UK Research and innovation, launched during the first UK-India offshore wind summit, is to be released during the second UK-India offshore wind summit.
- Accelerating Smart Power and Renewable Energy in India (ASPIRE) programme is a bilateral programme, being implemented by the Foreign, Commonwealth and Development Office (FCDO), Government of UK in partnership with the Indian the Ministry of Power (MoP) and the Ministry of New and Renewable Energy (MNRE). OSW is one of the seven thematic priorities of this partnership.
- To explore and jointly develop offshore wind, MoUs were signed between Oil and gas company ONGC and the National Thermal Power Corporation, the largest power generator utility; and Germany-based RWE Renewables and utility Tata Power Renewable Energy⁸.
- The World Bank and Asian Development Bank and the European Investment Bank are expected to support India's strides for harnessing OSW.
- The Department for Business and Trade India, a UK Government department operating in India to facilitate business, trade, and investment partnerships between the UK and India signed a strategic partnership with the Global Wind Energy Council (GWEC) India on the 10th of March 2023 to jointly work towards supporting India's offshore wind ambitions through targeted interventions including exchange of knowledge.

⁸ GWEC Global Offshore Wind Report 2022

CURRENT STATUS

In November 2022, the MNRE notified a draft seabed lease tender to tap 4 GW OSW capacity off the coast of Tamil Nadu. The draft tender targets model 3 of the Strategy Paper published earlier and is designed for open-access OSW projects. The India Offshore Wind Working Group, convened by GWEC India, has submitted industry representations and feedback to the MNRE on the draft seabed lease tender, strategy paper, and discussion paper. As per the 37 GW seabed lease tender trajectory earlier notified by the central government, India is likely to notify its first tender within the financial year 2022-2023.

The status of offshore wind site readiness⁹ 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 November 2017	No LiDAR installed; NIWE floated e-tender to install 3 LiDARs in zones B1, C1 & E2
Avg. Wind Speed	~7.51 m/s @100m HH as per 2-year LiDAR data analysis by NIWE in 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/m ² @50 m a.g.l.
Soil 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 strongly cemented sand up to a depth
Infrastructure and Logistics	Pipavav port is larger and more lively with high vessel availability and storage facility in the region but needs to be optimized for offshore wind	Ports are relatively smaller in size; need significant modification efforts for readiness for 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, a detailed EIA study for overall impact analysis is required	Strong tradition of fishing communities in the coastal area; precise geopolitical, EIA, and social acceptance study is required; Fisherman community protest on the offshore wind was noted in August 2022
Tender activity	EoI invited, in 2018, for Zone-B nearest to Pipavav port in the Gulf of Khambhat- Rapid EIA study, Geotechnical and geophysical analysis was done. First auction under Model 1 could be expected in 2023-24 as per the Indicative auction trajectory for offshore wind given under the MNRE strategy paper.	Draft offshore wind seabed lease tender for allocating 4 GW offshore wind equivalent area (B1, B2, B3, B4, G1) floated in November 2022; final tender is awaited in 2023. In the final tender, capping on the leasing fee, timeline provision for key activities/clearances/issuance of certificate(s), EIA guidelines and de-risk mechanism for possible delays should be specified. In addition to these, GWEC India Offshore Wind Working Group made detailed feedback representations to MNRE urging for a stakeholder consultation with MNRE before the final tender to make it highly effective.
Test Centre Site	-	75 acres of land is allocated to NIWE for setting up the first National Offshore Research & Testing Facility 2019-29

⁹ Based on FOWIND studies

SEIZING THE OFFSHORE WIND OPPORTUNITY

Currently, India is an offshore wind market “under creation”. The central and state governments are working with a range of offshore wind (OSW) stakeholders for creating an ecosystem for a thriving and world-class offshore wind industry. Tapping the OSW potential and underlying socio-economic, environmental and climate benefits requires a multi-pronged approach:



Attractiveness

As much as is important the “Ease of Doing Business”, it is also important to have the right set of business volumes along with time-bound targets. This must be complemented with facilitative policies, regulatory frameworks, permits, and clearances as well as needful infrastructure (such as ports and logistics). Further, needful regulatory frameworks must be introduced to facilitate the inclusion and absorption of OSW in the power system as well as ensure its co-existence in the larger socio-environmental architecture that is relevant to OSW projects. Additionally, the development of support systems for large/smaller vessels for the loading/unloading of heavy and big-size equipment/machinery as well as for ferrying resource persons is pivotal. **In a very short span of time, India has made commendable progress toward analyzing, estimating and planning for infrastructure to support the offshore wind industry.** The central government has taken cognizance of current gaps and is proactively working towards ecosystem development for OSW.



Co-operation

Synergistic partnership between the offshore wind rich states and the center is inevitable for the successful creation of an OSW ecosystem. By extending support through policy interventions, needful financial and non-financial incentives, and requisite standards and guidelines, the center must lay out the foundation. At the same time, states must develop a roadmap to support the graduation of the existing onshore wind industry to OSW, as well as to identify capacity development and community engagement plans for widespread acceptance of the benefits of harnessing OSW. Further, innovative public-private partnership channels, comprising an OSW developer, Central Transmission Utility, and a third-party power infrastructure developer, may be explored for the development of OSW power evacuation and transmission infrastructure where they all have a shared accountability for timely commissioning of requisite infrastructure.



Competitiveness

The Levelized cost of electricity (LCOE) of OSW power is expected to be relatively higher than the then prevailing LCOE of electricity generated from other renewable energy technologies such as onshore wind and solar energy. If the state governments partner with the center for the procurement of OSW power, the onshore ISTS network shall be set-free and any financial relief that has been proposed for use of ISTS infrastructure may be leveraged to bring down the LCOE. The United Kingdom (UK) leveraged “Contracts for Difference CfDs” to promote the growth of utility-scale renewable energy projects such as offshore wind (Box 1).



BOX 1: LEVERAGING CFDs TO PROMOTE OFFSHORE WIND

The UK awarded the first round of funding for Contract for Difference (CfD) in the year 2014 to five offshore wind projects. CfDs is a contract between a green power generator and the Low Carbon Contracts Company (LCCC), which is a company owned by the Government. The LCCC is responsible for distributing the CfD contracts. As part of this contract, the successful bidding agencies and the LCCC enter into a contract. Under the contract, the bid winners are paid a flat rate for the contracted period of 15 years. In case the reference price, which is the average market price for electricity, is below the strike price, the LCCC is mandated to pay the power generator. This enormously mitigates business risk. At the same time, if the reference price is above the strike price, the generator is mandated to pay the difference to the LCCC. This eliminates the need to pay any subsidy for green electricity generation when the price of electricity is higher than the strike price.

The MNRE is pursuing support through viability gap funding for OSW projects under Model 2 specified in MNRE's Strategy Paper. It is certain that business shall evolve to fill gaps given a lucrative opportunity emerges. While the supply chain for OSW shall have to be developed in the due course, the initial few GWs are likely to be largely reliant on imports for components such as turbine, generator, and gearbox among others. Similarly, domestic capacities for services such as engineering, project management, operation & maintenance and insurance shall have to be nurtured for the long term. Waiver of taxes, import duties (including for the floating LiDAR buoy) and GST is recommended until the local supply chain is set up. Also, a ten-year tax holiday (80IA) and accelerated depreciation for offshore wind could be instrumental in determining the overall economics of offshore wind projects.



Utility

A range of procurers of OSW and its utility shall have to be identified and relevant business models shall have to be designed. While the business shall do the heavy weight lifting here, to support offtake, the central and state governments may introduce targets for blending OSW with power generated from other sources. At the same time, business models designed to appreciate the specific value, such as round-the-clock (RTC) power generation potential, can likely drive the commercial success of OSW in India. In a recent move, the states of Gujarat and Tamil Nadu have agreed to procure OSW power at a tariff of INR 4/unit. OSW tenders must be supported with facilitation for offtake and in absence of such support, development finance institutions must prioritize institutionalizing a business risk mitigation fund to support the development of the market.



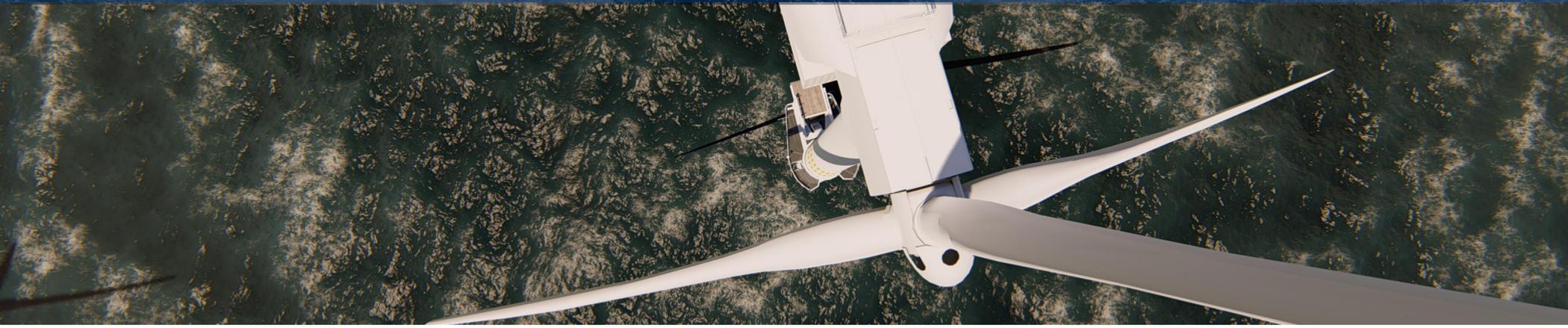
Resilient Supply Chain

As per GWEC's Global Offshore Wind Report 2022, in the year 2021, 84% of the new OSW installations happened in the APAC region—Other than China, Taiwan and Vietnam have emerged as markets of interest for OSW projects developers, manufacturers and other service providers. While the OSW project involves the engagement of a range of stakeholders from tendering to commissioning, there are only a limited set of stakeholders who have expertise in OSW projects. Further, the Indian OSW market, as it evolves, shall require customized turbines to be able to optimally harness available wind resources and meet the projected capacity utilization factor in local site conditions. Hence, to transition from a "market under creation" to an emerging market, India needs to ensure a resilient supply for its OSW ambitions. Steel, which constitutes almost 80-90% of offshore wind farm equipment, and other components such as rare earth metals are susceptible to price shocks arising from force majeure events leading to the unviability of originally agreed upon tariffs in the future. Hence, the GoI must introduce robust indexation mechanisms to accommodate tariff adjustments in such cases. Next, India must also leverage its leadership in shipping to support OSW vessel requirements at various stages of project development, commissioning, and post-commissioning. Finally, just like enterprises operating in Special Economic Zones, enterprises operating in designated OSW manufacturing and project zones must also be provided with attractive financial and non-financial support systems to ensure a thriving ecosystem that supports decarbonization as well as improves India's leadership in the global OSW supply chain.



Effectiveness through capacity building and institutional interventions

The central government has forged strategic partnerships with countries such as UK and Denmark. These collaborations are aimed at helping India benefit from their existing expertise to develop a comprehensive OSW implementation strategy that enables efficient, and cost-effective delivery. Going further, developing the OSW industry also requires a budgetary commitment by commercial banks, development finance institutions, and philanthropic institutions. This is going to be among the most important levers for addressing infrastructure, skills, and ecosystem gaps that exist at the moment. Interventions for capacity building must emphasize on greater inclusion of women in the OSW value chain. Next, the OSW tender administering agency and other relevant institutions must undertake planning to support long-term OSW activity. As the flourishing of an offshore wind industry has been found to create transformative change that gradually creates value for the local communities, institutional interventions for the creation of such an OSW ecosystem in coastal pockets are suggested (Box 2). **The offshore wind must be considered as an inherent component of blue economy roadmaps.** Additionally, OSW must be considered as an important avenue for just transition within the oil and gas and conventional power industry.



BOX 2: OFFSHORE WIND DRIVES THE LOCAL ECONOMY

Grimsby in the UK, which once boasted of its massive fishing industry, was counted among the world's largest and busiest fishing ports. Several decades of slowdown and an inability to match the pace that industrialization introduced, forced traditional fishing communities to put their traditional livelihood at a halt. At this time, Orsted, a leading offshore wind company invested over USD 15 million in Grimsby. This has created a new offshore wind economy in the region. The flourishing of the offshore wind industry, including training centers, offshore wind projects, and the world's largest offshore operations and maintenance unit. These have created hundreds of jobs for local community members, advanced educational opportunities, catalyzed income generation opportunities through booming local business units that cater to industrial and non-industrial needs, and improved infrastructure. Most importantly, Grimsby has harnessed abundantly available renewable energy that powers life and livelihoods.

India must also leverage high-level business and political dialogues that are scheduled this year as part of the G20, Clean Energy Ministerial, and the COP to advocate for synergistic partnerships that boost the growth of the OSW industry in the country as well as globally (Box 3).

BOX 3: INDIA MUST LEVERAGE ITS G20 PRESIDENCY AND CLEAN ENERGY MINISTERIAL (CEM) TO SUPPORT OSW

India's G20 presidency is a tremendous opportunity to spearhead the rapid deployment of offshore wind. Representing 85% of the global GDP, over 75% of the global trade, and about two-thirds of the world population, the power demand of the G20 countries is going to drastically increase. The clean energy transition is a massive priority for these nations that are likely to witness a deep in surge demand for 24x7 green power at all times to feed power demand across all sectors of the economy. Also, new investments in these nations are likely to be increasingly inclined toward sustainable practices and green power procurement. G20 comprises a big pool of countries that have already invested in the offshore wind or have untapped offshore wind potential. Offshore wind has the potential to meet this need at a cost that is competitive in mature markets such as the UK. However, emerging markets, for example, Japan and France, as well as markets that are "under creation" offshore wind will require a public support system for it to become competitive with other mature renewable energy technologies. [Innovative partnerships for harnessing the evolving blue bonds market must be prioritized.](#) The G20, and CEM countries and the Global Offshore Wind Alliance (GOWA), jointly launched jointly by the Global Wind Energy Council, the Government of Denmark, and IRENA during the COP 27 in Egypt, may identify synergies to promote government, financial institutions and private sector priorities for the clean energy transition through offshore wind.

RECOMMENDATIONS

Building on its decades of experience in onshore wind, offshore oil & gas exploration, and a robust onshore wind manufacturing industry, India stands in a unique position to become home to a world-class offshore wind industry. GWEC makes the following short-term and mid-term recommendations:



01 Attractive tender volume

The draft seabed lease tender earlier notified by the MNRE proposes to tender for 4 GW capacity. This must be retained to attract active participation by project developers, manufacturers, and supply chain players.



02 Assurance for offtake of power

The central and state governments must work together with the industry to derive suitable measures for encouraging the offtake of power across all three business models notified by the MNRE in its Strategy Paper released in 2022. Specifically, in the case of model 3, the center and states must promote the relatively better round-the-clock generation profile of OSW among C&I consumers and facilitate attractive long-term partnerships. Also, offshore wind specific preferential ISTS charges waiver for a period beyond 2035 must be considered by the MNRE. Additionally, open access charges may also be waived to incentivize offtake by the Commercial and Industrial and/or captive consumers.



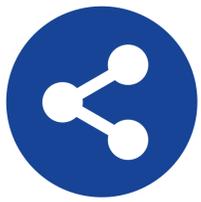
03 Standards and guidelines

Framing of necessary standards and guidelines for environmental impact assessment (EIA), sub-sea cables, underwater surveys, marine spatial planning and health and safety in offshore wind projects among others must be prioritized.



04 Robust tender design

Seabed lease tender must provide greater clarity on permits and clearances required as part of Stage 1 and Stage 2 clearances as well as introduce guarantees to project developers, where any business risk is perceived in case of delays or any such impediment that may affect timelines, and project execution or commissioning. Also, Offshore Wind Energy Lease Rules, 2022 may be published online by the ministry so that prospective bidders may refer to draft seabed tender rules in conjunction with the same. Further, a timeline to build a wind farm from the signing of the concessionaire agreement may be extended to 6 years as opposed to 4 years, as outlined in the draft seabed lease tender, to cater to complex and time-consuming offshore wind construction amid a lack of local supply chain necessitating the import of equipment, approvals, etc.



05 Adoption of PPP models for power evacuation infrastructure development

For the development of power evacuation and transmission infrastructure a PPP model encompassing shared accountability of CTU, offshore wind project developer and the third-party power infrastructure developer may be helpful during the execution of the initial few GWs. A similar approach is advisable for port infrastructure development. Alternatively, the tender must provision the development of offshore power evacuation and transmission infrastructure by the developer.



06 Working Group to support OSW project

It is recommended that the center and the states may work together to institutionalize a high-level OSW specific working group, comprising inter-ministerial and inter-departmental as well as intra-departmental representation, to support India's ambitions.



07 Benefits sharing between centre and state

While the MNRE is the nodal ministry and the NIWE is the nodal agency for the development of OSW in the country, synergistic partnership between the center and states for sharing a certain percentage of aggregate power produced from OSW projects with the Gujarat and Tamil Nadu may be explored and offered as one of the value propositions for their proactive participation.



08 Social-community engagement plan

The center and the states must work together to develop a local community inclusion plan. The roll-out of such a plan might help build awareness among communities and introduce them to massive underlying opportunities. The Gol is already undertaking its ambitious "Sagarmala Programme" for the development of coastal communities. The Ministry must also identify opportunities for leveraging synergies between India's emerging offshore wind sector and the Sagarmala Programme.



09 Digital interface to facilitate permits and clearances

The MNRE must facilitate access to a user-friendly online portal for application, review, status update and award of permits and clearances by state and central government agencies to the OSW project developers.



10 Budgetary allocations must be advocated by the G20 and CEM

To support offshore wind infrastructure development, business risk mitigation, and capacity building, the G20 and CEM discourses must advocate for budgetary allocations by development finance institutions, commercial banks and philanthropic institutions. These must also press for innovative partnerships to tap the evolving blue bonds market.

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