

Indian Wind Power

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75
Azadi Ka
Amrit Mahotsav

50th
Issue
of

Indian Wind Power
MAGAZINE



Expertise and Research & Development for Wind and Solar Energy Stakeholders

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Wind Energy

- ◆ Carry out Nationwide Wind Resource Assessment
- ◆ Estimation of Wind Potential in the country through Wind Atlas preparation
- ◆ Design and implement the comprehensive Resource Assessment Programme
- ◆ Analysis of wind data to identify Wind Farmable locations
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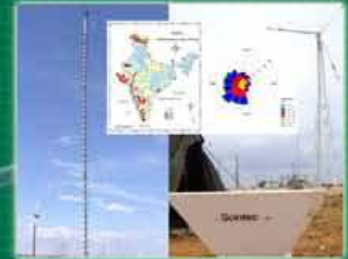
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नीवे NIWE

NATIONAL INSTITUTE OF WIND ENERGY

An Autonomous Research & Development Institution under the Ministry of New and Renewable Energy, Government of India

Velachery - Tambaram Main Road, Pallikaranai, Chennai - 600 100

Phone : +91-44-2246 3982 / 83 / 84 Fax : +91-44-2246 3980 E-mail : info.niwe@nic.in Website : <http://niwe.res.in>

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Indian Wind Turbine Manufacturers Association

4th Floor, Samson Tower, 403 L, Pantheon Road, Egmore
Chennai - 600 008.

Email : secretarygeneral@indianwindpower.com

associatedirector@indianwindpower.com

Website : www.indianwindpower.com

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From the Desk of the Secretary General – IWTMA

Dear Readers,

Greetings from IWTMA on the occasion of 75th year of Independence and Azadi ka Amrit Mahotsav!

Climate change is real and is clearly seen by change in rain pattern and melting of glaciers is staring at us. "Real Azadi" will happen only when the planet earth derives power from nature be it wind, solar, hydro or nuclear.

The 75th year of independence also coincides with 50th issue of your magazine "Indian Wind Power" a contribution to our readers on the various technological advancements in various fields of wind power.

Number of initiatives have been taken by the Government to promote the Wind Sector. It is our duty to thank Hon'ble Minister and officials of the Ministry of New and Renewable Energy (MNRE) for many initiatives taken to bring Wind back to its glory. Significant among them are –

- A separate Wind RPO which was otherwise clubbed as non-solar RPO
- ISTS waiver for projects up to 2025 and valid for 25 years from the time of commissioning
- Green Open Access which will open captive, group captive and bilateral trade markets.
- Procurement to change from e-Reverse Auction to Closed Bidding to cover the 8 wind states and bundling off tariff possibly with other RE sources for sale to DISCOMs
- Development of offshore wind

In a recent interaction of the RE stakeholders with the Hon'ble Minister, the wind sector requested the Government to consider –

- Power under GST which will finally help reduction in tariff to the final consumers.
- Promotion of Green Hydrogen and acceleration of Electrolyzer industry with PLI as the fuel of the future
- To consider ISTS waiver for all projects up to 2030 to achieve the target of 140 GW
- The industry has also pointed out the importance of Repowering as land is a finite source and should be considered as a national asset.
- There is a strong case for a special dispensation for MSME industry as there is no opportunity for retail investors whose investment portfolio is 10 or 15 MW per annum. The benchmark of State bidding is at 25 MW and Central procurement is at 50 MW.

The industry is sure that the initiatives taken by the Government will put the Wind Sector back in its 'sails' and build a robust supply chain back to its glory and providing one of the lowest costs of turbine in the world both for domestic and international markets.

Wishing the readers a Happy Dussehra.

With regards,
D.V. Giri
Secretary General

Wind Turbine Generator Foundations

Understanding their Health to Maximize Production



Felix Liebrich
Principal Engineer



Hossein Agheshlui
Senior Civil Structural Engineer



Binaca Harris
Senior Civil Structural Engineer

DNV, Australia

Introduction

The onshore wind industry has thrived since the development of the first commercial-scale wind farm. As the number and size of wind farms continue to grow, more resources are required to proactively manage operational assets. Proactive management and asset condition monitoring are critical to ensuring the long-term operation and viability of the life of onshore wind farms, particularly in the context of life extension.

Wind Turbine Generator (WTG) foundations are estimated to represent approximately 25% of the cost of the Balance of Plant (BOP) of a wind farm. This percentage is second only to that for the electrical elements of the BOP, yet the foundations are the least visible components and consequently often receive less attention than other aspects of the wind farm. Furthermore, despite the extensive remote monitoring and sensing capabilities of modern SCADA-connected wind turbines, there is generally no, or very limited information is available pertaining to the health of WTG foundations.

Wind farm owners and operators are put in a challenging position. The foundation supports a multimillion-dollar asset, without which revenue would be impossible; yet this asset is largely invisible and its operational health unknown.

Wind Turbine Generator Foundations

The role of a WTG foundation is to adequately support the wind turbine above-ground structure across a large range of environmental conditions. While many different types of WTG

foundations are used across wind farms, one thing is common to all: typically, only a small portion of the foundation is visible, with most of this support structure being buried below the ground.

From a structural point of view, WTG foundations are significantly different from other conventional tall structures such as buildings or towers. Typically:

- Wind loads are dominant and greater when compared with dead loads acting on a vertical cantilever beam.
- Aerodynamic and aeroelastic effects must be considered for wind turbines, unlike equivalent static wind loads on buildings.

Proactive management and asset condition monitoring are critical to ensuring the long-term operation and viability of the life of onshore wind farms, particularly in the context of life extension.



Figure 1: Wind Turbine Generator Foundations

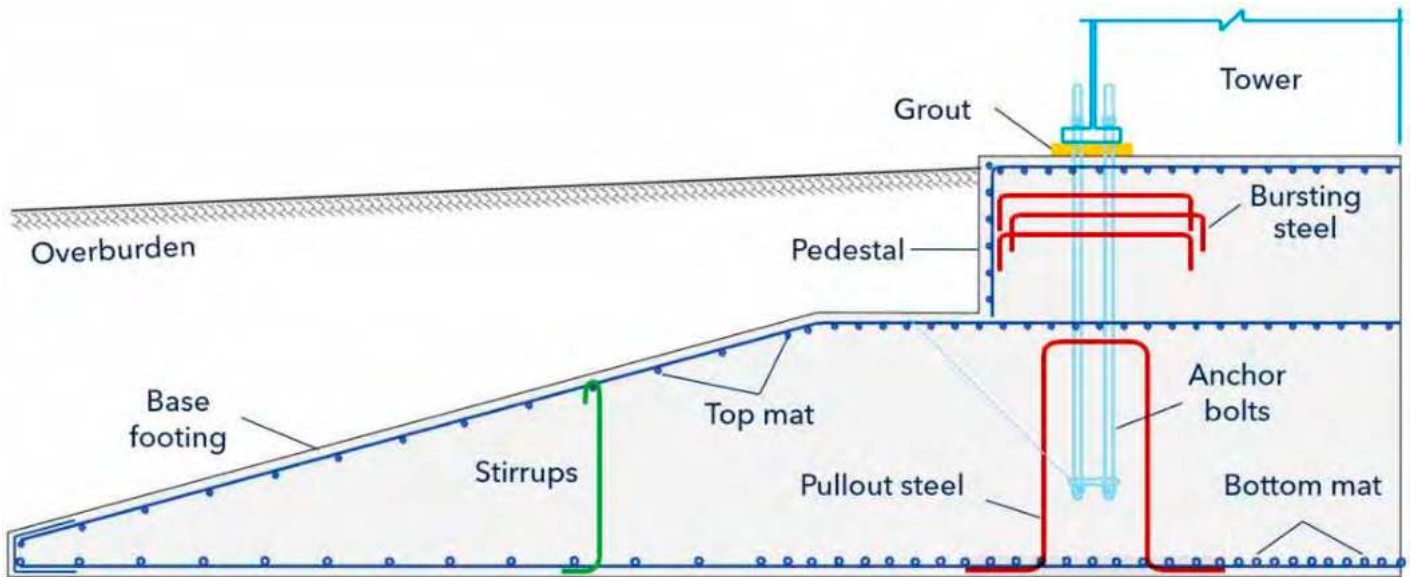


Figure 2: Cross Section of a Typical Wind Turbine Foundation

- Fatigue loading may govern the foundation design, as opposed to conventional buildings where wind fatigue loading is small and typically ignored.

An Evolving Understanding

The general goal of structural codes is to provide an acceptable probability of failure for the given design life of the structure. Considering that modern wind turbines and their foundations are a relatively new type of structure, and that their size continues to increase rapidly, understanding of their behaviour, likely damages and failure modes, and industry requirements are evolving. As such, the applicable knowledge and standards used when WTG foundations were being designed even just a few years ago are likely to be different from what applies today in the evolving understanding and standards related to foundation failure mechanisms.

Deficiencies can be, and are, identified when assessing previously constructed wind farms, often as part of a technical due diligence review or when abnormal behaviour is observed. Furthermore, analysis or inspection of the current state of an existing wind farm may result in the determination that the foundation design does not provide the level of reliability intended by the latest standards (i.e. a non-conformance with current standards is identified).

While this does not necessarily mean that the intended design life will not be achieved, it does indicate that further analysis and monitoring should be undertaken to better understand the current health of the foundation and the risk to the asset during its lifetime.

Structural Health Monitoring

Structural Health Monitoring (SHM) refers to a system comprising of a datalogger, sensors to monitor the health of engineering structures, and analysis tools to interpret measurements. In

the context of WTGs, this typically refers to the health of the tower-foundation system. As with many monitoring applications, the 'health' of a tower-foundation system cannot be directly measured but is inferred indirectly through the measurement of other parameters. These may include, for example, the first mode frequency of the tower-foundation system, or its flexural stiffness.

Foundation Monitoring Recommendations from Standards

Current international standards and guidelines related to wind turbine foundation design (such as IEC 61400-6 [1], DNVGL-ST-0126 [2] and DNVGL-ST-C502 [3]) provide recommendations for planning, defining inspection programmes and types of inspection, determining appropriate intervals between inspections and documenting inspection findings. They also provide guidance on specific items to focus on during the inspection. DNVGL-ST-0126 also recommends that inspections of foundations are used in conjunction with structural health monitoring. It also references DNV-RP-C210 and DNV-RP-G101. Whilst not wind turbine specific, these standards introduce the components that comprise a risk-based inspection programme.

Why Structural Health Monitoring is Needed

Structural health monitoring of WTG foundations and support structures provides an insight into the performance of what cannot be visually inspected without destructive testing such as drilling or excavation. Typically for ageing structures, such as road infrastructure, various levels of visual inspections are systematically carried out to check their serviceability and rate their condition. Where visual inspections cannot be carried out, other non-destructive testing mechanisms or data-driven analysis may be employed. While this has been standard practice in many other industries faced with similar challenges, it is not widespread



Figure 3: Aerial View of a WTG Foundation under Construction

in the relatively young wind industry. As multi-megawatt scale WTGs age, it will become an important factor in maximizing the revenue from any wind asset.

In short, SHM can provide greater certainty about the health of the system and how it is changing over time. Data from long-term monitoring can not only be used to detect whether a system is deteriorating; in some cases, the monitoring can be employed to determine when intervention is required to address structural integrity degradation or performance issues. It can also provide insight into what the sources of deficiencies are, and what retrofit options may be suitable.

Often in conjunction with a threshold value, SHM can help to determine if a certain limit has been reached or, in some cases, when it might be reached. This information is particularly useful in the planning of significant investments or in taking further actions or deciding on retrofits.

Increasing Certainty through Structural Health Monitoring

In the context of refinancing, long-term operation, life extension or sale of a wind farm asset, the condition of the foundations is often one of the largest unknown factors in the equation. This is where SHM truly can provide valuable input into the analysis.

Depending on the data recorded, it can be used to infer both the current state of the foundation and its behaviour over time. This helps to understand whether there may be more margin than anticipated for the foundations to keep performing efficiently, effectively, and safely, or if prompt action is required to address any deficiencies. Either way, SHM provides critical knowledge for

determining when and what to invest in for any life extension scenarios.

A purely theoretical analysis may result in a higher risk profile for the wind asset because of uncertainty in the environmental conditions. However, the presence of sufficient SHM data showing that there is no deterioration would provide a reliable basis to potentially downgrade the risk profile.

Structural Health Monitoring Approaches

There are currently two main viable approaches to Structural Health Monitoring (SHM) of wind turbine foundations. Both are highly dependent on the aim of the monitoring campaign and the existing equipment in the WTGs, but can in general be grouped as follows:

1. Utilization of existing measurement equipment installed in the nacelles of WTGs.
2. Installation of specific SHM monitoring equipment in the foundations, towers and/or nacelles.

While the first approach is generally more economical, its suitability is highly dependent on two main factors:

- Whether the existing condition monitoring equipment is suitable and accurate enough for the desired outcomes.
- Whether the data from the condition monitoring equipment can be made available to the asset owner/manager (on a near real-time basis) for the purposes of monitoring. This is not always the case.

In contrast, the installation of custom SHM monitoring equipment can be designed and engineered specifically for the desired outcomes. The cost of a custom SHM system is typically a tiny fraction of the value of the asset or its annual revenue, and the insights gained can be highly useful.

Structural Health Monitoring in the Real World

At some point in the design of a monitoring system, the question will arise: how many WTGs within the wind farm should be monitored? From an engineering perspective, the answer is 'ideally all', but typically this is impractical or uneconomic. Therefore, the answer will depend on the goal(s) of implementing an SHM system.

The priority generally is to monitor any tower-foundation systems that may be deemed at risk of not achieving their intended design life. In assessing whether particular foundations should be monitored, the following questions should be considered:

- Are visual inspections done in detecting physical indications of deterioration in any foundations?
- Have there been any design reviews which have identified particular foundation(s) or type(s) to be at risk of not achieving their intended design life?
- Have any environmental condition assumptions significantly changed since construction?

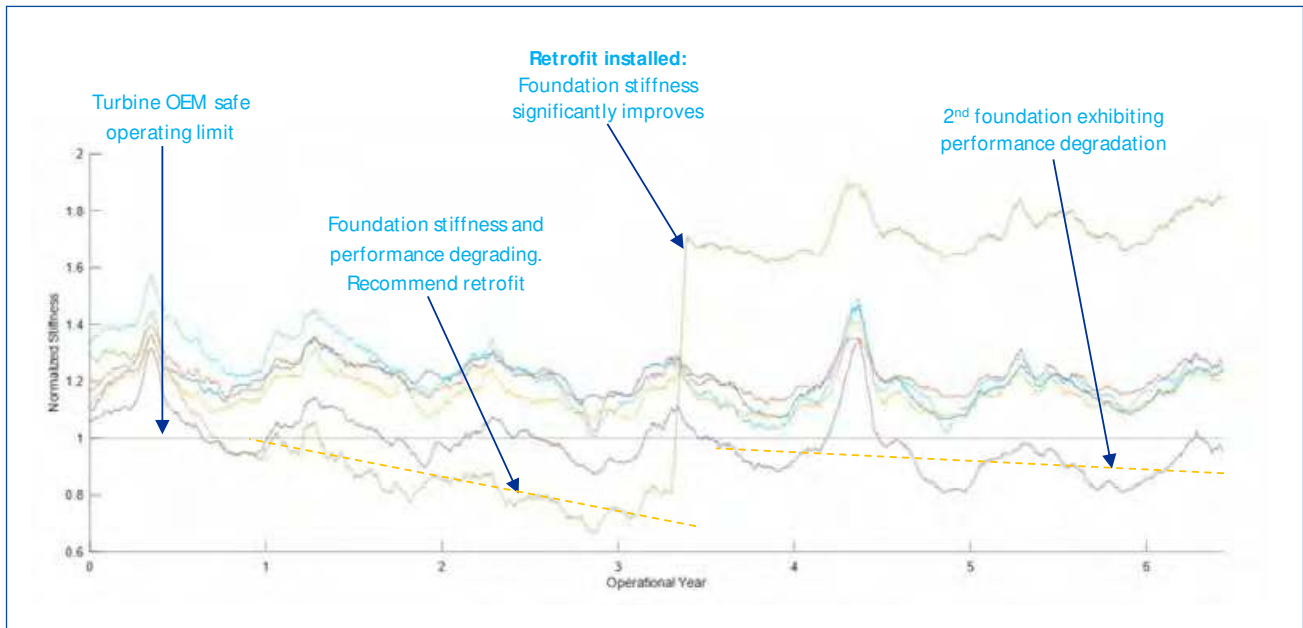


Figure 4: Real-World Example of Degradation in Foundation Stiffness and Subsequent Repair

- Have there been any significant event(s) occurring at any WTG location which may impact the integrity of the WTG tower-foundation system?

In the context of SHM where there are no specific foundations of concern (e.g. when SHM is utilized to inform possible life extension of an asset), it is recommended that a representative sample of foundation types and geotechnical conditions are considered for monitoring. A reference to compare against is highly desirable. This can be in the form of historical data and/or other monitored systems.

When implementing SHM on multiple WTGs within a wind farm, it is advisable that at least one of the systems monitored is on a foundation that is considered 'healthy' (one of each foundation type used at the site). This provides a solid reference system with which other systems can be compared as well as against each other.

Figure 4 illustrates a real-world example of structural health monitoring of multiple WTGs within the same wind farm over 6-plus years. In this case, the SHM of multiple WTGs allowed the retrofit of a foundation to occur before substantial damage had occurred, with a significant improvement in the stiffness witnessed after the retrofit. It also shows that a second foundation is also degrading.

As can be seen, monitoring multiple WTGs makes identification of outliers more apparent. Also, fluctuations in the normalized stiffness curves occur due to seasonal variations in environmental conditions.

Conclusion

Structural health monitoring is a useful tool to gain insight into the condition of an asset and to help inform further decisions for its maintenance. For remote assets or assets with limited access such as wind turbine foundations, SHM can be a highly valuable and economical monitoring approach, providing continuous or frequent access to the condition of an asset.

It is important that any Structural Health Monitoring (SHM) campaign is well-designed and that the analysis process is rigorous to ensure that the resulting information can be relied upon. When correctly implemented, SHM can provide increased certainty about the health of a tower-foundation system and how it is changing over time. This information is incredibly useful in understanding the condition of the asset and supports making informed decisions for the on-going operation and maintenance, refinancing, long-term operation, life extension or sale of your wind farm asset.

While there are multiple benefits to having structural health monitoring of WTG foundations, there are of course some limitations associated with it. For example, on its own, it may not detect or provide warning of abrupt or unexpected failures. However, in conjunction with other structural analysis and design reviews, potential failures may be identified beforehand, allowing time for appropriate remediation. Likewise, monitoring for a short or intermittent period does not usually provide useful information. Given the gradual influence that environmental conditions can have on the stiffness of foundation-WTG systems, to Structural Health Monitoring (SHM) provides the greatest benefit when implemented over longer periods in select environments across the wind farm.





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GWEC | GLOBAL WIND REPORT 2022 - INDIA

**Outlook for India in
2022 and 2023
is 3,200 MW and
4,100 MW**

At current rates of installation, we will have less than two-thirds of the wind energy capacity required by 2030 for a 1.5°C and net zero pathway.

GLOBAL WIND REPORT 2022

Foreword (Excerpts)

Welcome to the Global Wind Report 2022. As I write this foreword, the world is facing an unprecedented challenge to energy security and the vital goals of achieving climate targets and averting dangerous global heating. The current global power crisis has revealed the continued dangers of depending on fossil fuels for our energy supply, while the Russian invasion of Ukraine has seen entire countries held hostage to energy supply, used once again as a tool to achieve geopolitical aims. Economies and consumers have been left exposed to record high power and fuel prices, while at the same time, 2021 saw a historic high in global CO₂ emissions, putting the goals of the Paris Agreement at risk.

As the Global Wind Report shows, 2022 was another big year for wind installations and particularly for the fast-growing offshore wind sector, with a total of 94 GW of wind installed around the world – 21 GW in offshore.

However, despite progress in policy commitments and the hopeful messages from the world's governments at COP26 – many of whom met with GWEC in Glasgow – we need to be honest: We are not currently on-track to meet the objectives of net zero by 2050 or the aims of the Paris Agreement. For wind energy alone, we should be installing four times the current level of annual installations to stay on a net zero pathway.

There is strong appetite from both the public and business to move decisively, but governments are simply not acting fast or effectively enough.

The only permanent fix for the three related problems of energy security, climate change and affordability is a determined and accelerated effort to carry out the energy transition and move

away from fossil fuels to renewables. Policymakers have been both too slow and too hesitant in carrying out the transition, leading to what the IEA and others have referred to as a “disorderly transition,” where the world is exposed to extreme fossil fuel volatility.

Working together constructively and determinedly among policymakers, community, investors and industry, we can resolve today's challenges and those that lie ahead, and play our part in moving the world to a peaceful, prosperous and sustainable future.

Ben Backwell, CEO, Global Wind Energy Council

Wind Report 2022- India

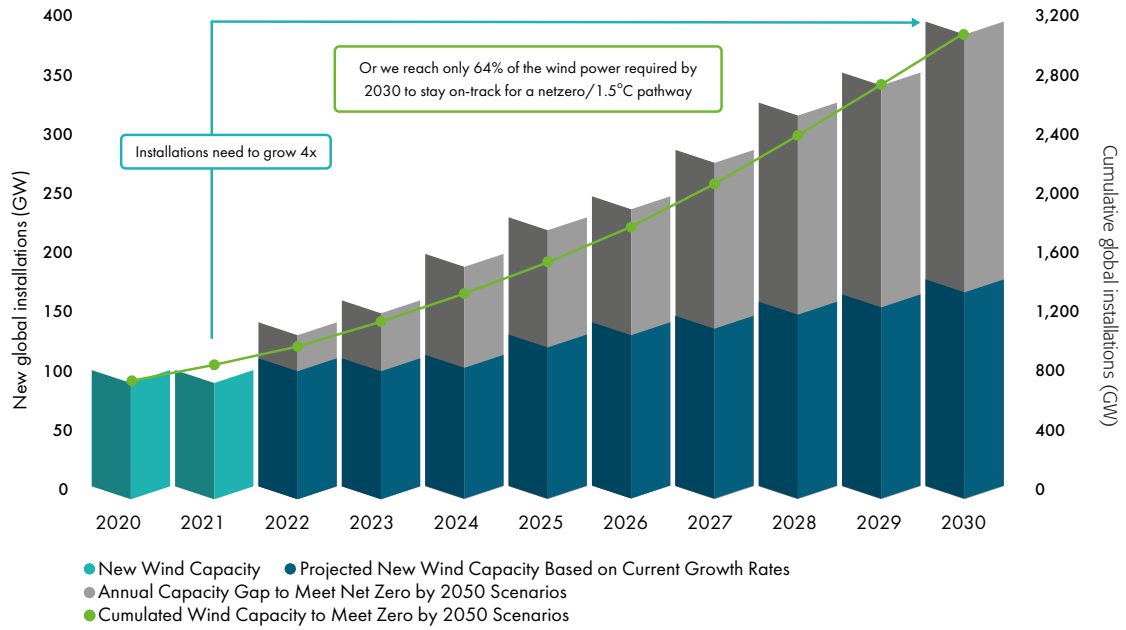
India's announcements at COP26 in November 2021 strengthened confidence in the country's renewable energy commitments. Prime Minister Mr. Narendra Modi announced a multi-pronged approach to bolster climate action:

- 500 GW non-fossil fuels energy capacity by 2030;
- 50% renewables in the energy mix by 2030;
- Reduction of total carbon emissions by 1 billion tonnes between 2021 and 2030;
- Reduction of the emissions intensity of the economy by 45%; and
- Achievement of net zero by 2070.

The current share of non-fossil fuels in overall generation capacity stands at 38.5% out of a total 395 GW. While wind currently accounts for 10.2% of this, to further realise its 2030 climate commitments, the Ministry of New and Renewable Energy (MNRE) has estimated 140 GW wind energy capacity is needed by 2030¹. Globally, India ranks fourth in installed wind capacity with 40.1 GW as of January 2022².

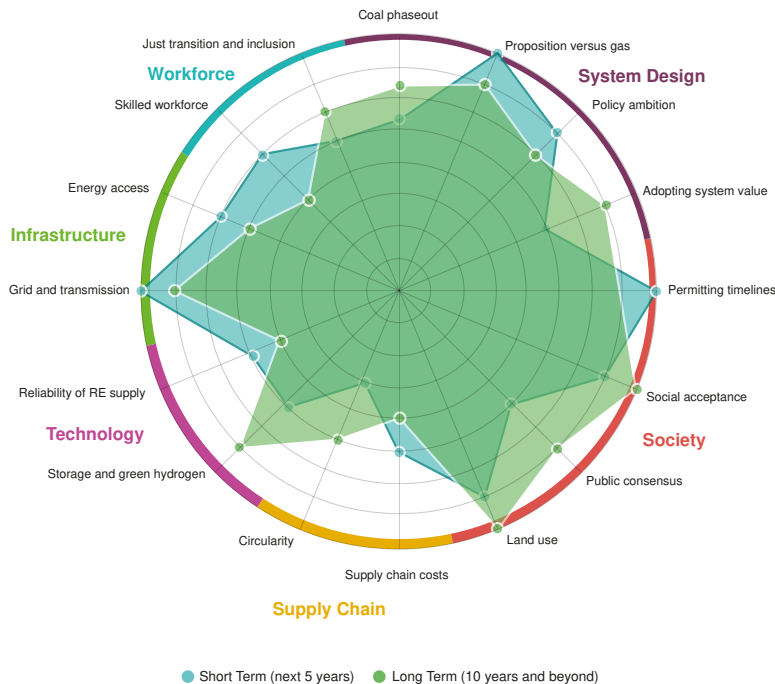
1. http://164.100.47.193/lsscommittee/Energy/17_Energy_21.pdf
2. Central Electricity Authority of India

Lagging Growth in this Decade leads to Wind Energy Shortfalls by 2030



Source: GWEC Market Intelligence; IEA Net Zero by 2050 Roadmap (2021). Projected new wind capacity from 2026-2030 assumes a ~6.6-7.0% CAGR, based on GWEC's projected CAGR from 2021-2026. It also accounts for ~34 GW in global decommissioned capacity from 2026-2030 based on 25-year turbine lifetime. Capacity gap figures are estimations based on the IEA Roadmap milestone for 2030. Cumulative global installations for wind energy are roughly in alignment with the IRENA World Energy Transitions Outlook: 1.5°C Pathway (2021). This data represents new capacity, cumulative capacity and decommissioned capacity, and does not include an estimate of repowering installations to replace the ~34 GW in decommissioned turbines globally.

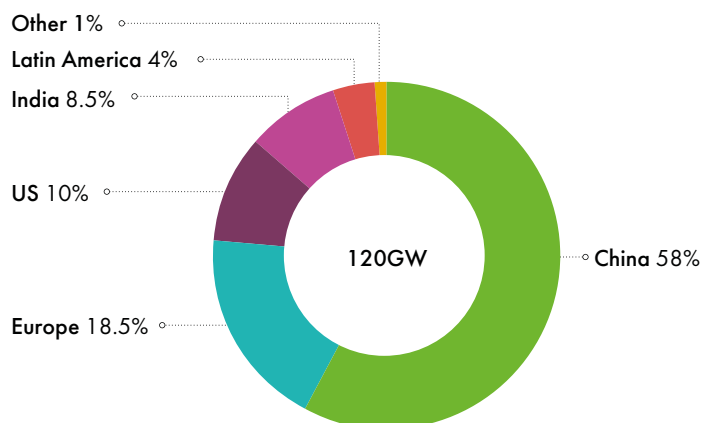
Transversal challenges to wind energy's growth in the short and long term



Short term (within next 5 years) and long term (more than 10 years ahead) challenges which could slow down deployment of wind energy. Nodes closer to the outer circle are considered more severe challenges, while nodes closer to the centre are considered low or moderate challenges

Sources: GWEC Market Intelligence and a survey of GWEC's national wind and renewable energy industry association members, Q1 2022. Note: This graphic is not inclusive of all challenges and factors impacting the growth of wind energy in different markets, and is meant to be used as a general guide to transversal issues.

Global wind turbine manufacturing capacity, 2020



Source: GWEC Market Intelligence, November 2021. Note: Wind turbine manufacturing capacity refers to wind turbine nacelle assembly capacity and does not represent actual nacelle production in 2020.

Pandemic Related Challenges Receded by Mid-2021

The second surge of COVID-19 from April to mid-June 2021 had a notable impact on India's wind industry. For instance, it slowed down production of wind towers as oxygen supply for industrial processes was diverted to medical requirements. Progress picked up again in the second half of the year.

More than 1.4 GW of wind was installed in 2021, exceeding the 1.1 GW of installations during the previous year. Auction activity also gained momentum in 2021, with nearly 2.7 GW of onshore wind and 1.95 GW of hybrid auctions awarded by state and central agencies. A 7.5-months blanket time extension has been granted to renewables projects on account of initial disruptions from COVID-19, but as supply chain challenges persist, GWEC Market Intelligence projects the market outlook for 2022 and 2023 as 3,200 MW and 4,100 MW of onshore wind installations, respectively.

Policy measures helped to catalyse recovery and maintain investment interest in the wind market. These measures include: an extension of the waiver of interstate power transmission system (ISTS) charges for renewables projects commissioned by June 2025, with compliance of must-run status for all renewables projects; innovative auction models for round-the-clock and hybrid generation; and a clean energy trading system through the launch of the Real-Time-Market platform/Green Day Ahead Market and Green-Term Ahead Market.

Measures to Accelerate Wind Sector Growth

During the recent period of global wind supply chain crunches, India has been increasingly acknowledged as a prominent hub in Asia for turbine component manufacturing and exports.

The keys to improving investors' sentiments for wind energy in India include prioritisation for timely attainment of targets, strengthening of the domestic supply chain and ease of doing business with lower production and labour costs.

In 2021, GWEC India made representations to the MNRE and Ministry of Finance, requesting support for an enabling duty and concessions regime for wind energy.

This would cover important aspects such as a surge in GST rates for wind components manufacturing from 5% to 12%, and the elimination or revision of Customised Custom Duty Concession benefits which have a direct implication on tariffs discovered through e-reverse auctions.

PPA sanctity and action to improve the financial health of distribution companies (DISCOMs) are also crucial for accommodating higher shares of wind into the transmission and distribution network.

To swiftly expand renewables capacity in India, policymakers can also encourage greater commitments from India's public sector undertakings (PSUs) to invest in renewables and participate in wind auctions. These PSUs are increasingly active in the sector:

- The largest state-owned utility NTPC has floated an Expression of Interest for shortlisting suitable land sites from seven windy states to set up wind projects.
- NTPC and coal mining company NLC India have begun bidding into SECI's ISTS wind and hybrid auctions during 2021.
- NTPC, oil and gas company ONGC, hydroelectric company SJVN and others are greening their energy portfolios through renewable energy targets and conversion of nonperforming fossil-fuel power generation assets into renewables assets.

The government is also working on grid integration of almost 44 GW of new renewable power generation through Green Energy Corridors (GEC). GEC Phase 1 is due to be completed in 2022, and the second phase, which will run through 2026, was recently approved by the Cabinet Committee on Economic Affairs.³ For grid balancing, MNRE has asked the National Hydroelectric Power Corporation (NHPC) to exploit hydropower resources in the country.

Finally, addressing land availability challenges for onshore wind is critical. Significant delays are experienced regarding the lack of proper strategy for inter-state Right of Way and attaining defence and forest clearances. Provisioning support for land can open up the wide spectrum for the wind market in this decade.

3. In seven states- Gujarat, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Tamil Nadu and Uttar Pradesh. See: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1788011>
Source: GWEC Market Intelligence; NIWE

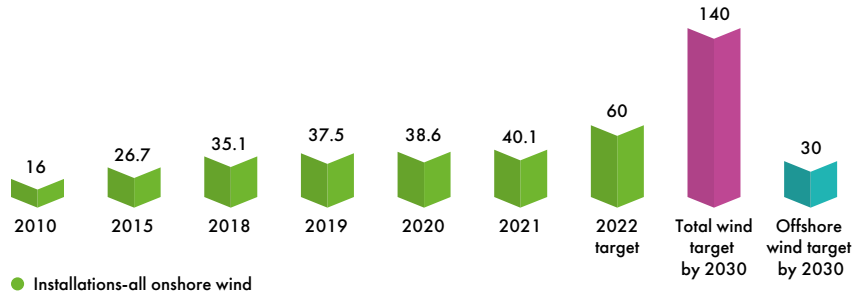
Exploiting Untapped Onshore and Offshore Wind Potential to Reach Net Zero

To meet the 2030 target of 140 GW installed wind capacity, policymakers should examine the vast, untapped onshore and offshore wind resource. Across the country, the National Institute of Wind Energy (NIWE) has assessed more than 300 GW of onshore wind potential at 100 meter hub height, as well as nearly 700 GW of onshore wind potential at 120 meter hub height.

Through repowering older kW-rated wind turbines through suitable repowering policy measures, India can add substantial wind capacity while optimising the utilisation of existing wind-rich and consented sites. Similarly, development of less windy sites by advancing support for suitable wind turbine technology is likely to be beneficial.

Regarding offshore wind potential, World Bank-Group ESMAP has mapped 174 GW of fixed and floating offshore wind potential off India's coastline; the strongest resource is found off Tamil Nadu, while good resource is also available off Gujarat. In March 2022, the MNRE conducted a stakeholder consultation meeting and proposed the initiation of offshore wind leasing auctions from H₂ 2022. Learnings from countries in Europe point to the promising

Cumulative wind installations versus targets in India, GW



Source: GWEC Market Intelligence; NIWE

role of offshore wind in supporting India's National Green Hydrogen mission and the demand from large C&I entities.

Preparing a long-term non-solar RPO trajectory specific to offshore wind and offering schemes such as production-linked incentives for domestic offshore wind manufacturing could be considered. Apart from this, a growing pool of innovative financing mechanisms such as blended finance and Green/Masala Bonds are likely to boost availability of finance for renewable energy projects, including offshore wind and onshore greenfield and brownfield projects.

Courtesy: Global Wind Energy Council (GWEC), Brussels, Belgium

4. <https://documents1.worldbank.org/curated/en/116871586892855375/pdf/Technical-Potential-for-Offshore-Wind-in-India-Map.pdf>

PM Modi Urges States to Clear Dues worth Rs. 2.5 Lakh Crore of Power Sector Companies

Prime Minister Sri Narendra Modi has asked the state governments to clear dues of power sector companies' engaged in electricity generation and distribution which are estimated at around Rs 2.5 lakh crore. He regretted that the state governments are yet to clear subsidy commitments amounting to Rs 75,000 crore to power companies.

Source: Press Trust of India, 30 July 2022

GreenSpur, Niron Develop Lighter Generator for Rare Earth-Free Offshore Wind Turbine

GreenSpur Wind has developed a rare earth-free generator it has been in development for five years. It has now passed detailed testing at the Offshore Renewable Energy Catapult (ORE) in Blyth, UK. Niron Magnetics is developing the world's first manufacturing process to mass produce permanent magnets using its proprietary Clean Earth Magnet technology based on iron Nitride. The companies are developing a rare earth-free, lighter, and more efficient generator for the offshore wind market.

Source: Wind Insider, 30 July 2022



ONGC and Greenko Partners to Invest \$6.2 Billion on Green Energy Projects

Oil and Natural Gas Corporation (ONGC) has signed a pact with Greenko to form a 50:50 joint venture for green energy projects. ONGC and its partners will invest USD 6.2 billion (Rs 50,000 crore) in green energy projects to produce carbon-free hydrogen and green ammonia as part of an ambitious decarbonization drive. The JV will set up 5.5-7 GW of solar and wind power projects, and use electricity generated from such plants to split water in an electrolyzer to produce green hydrogen, which in turn would be used for manufacturing green ammonia.

Source: PTI, 28 July 2022

NIWE Invite Eoi for Training Partners for Vayumitra Training

National Institute of Wind Energy (NIWE) Chennai has invited expression of interest for empanelment of training partners for imparting training under Vayumitra Skill Development Programme (VSDP) for 2022-23 to 2023-24. The empanelment of training partners may be considered for two years or beyond subject to the continuity of the program, based on satisfactory performance and mutual agreement. The online portal for submitting the application will be activated on or before 10.08.2022 at the NIWE website.



Power Plants can Now Sell Surplus Outside PPAs

The Government has allowed the coal based power plants to sell any surplus electricity to states other than those with which they have supply tie ups. They could sell the surplus electricity on the power exchanges if the beneficiary state does not buy the entire electricity generated,

Source: ET Bureau, July 05, 2022

NTPC-REL, NFL to Collaborate in Renewable Energy and Green Ammonia

NTPC Renewable Energy Ltd (NTPC-REL) has said that it has signed a MoU with the National Fertilizers Limited (NFL) to collaborate in the field of renewable energy and green ammonia. Firms also plan to explore opportunities to supply of 90 MW round-the clock renewable energy power in phases – 30 MW in phase-1 and 60 MW in phase-2 and synthesising 50 tonnes per day of green ammonia for captive use and production of industrial products by NFL.

Source: ET Energy World, July 04, 2022

NTPC Arm to Develop 10GW Renewable Energy Park in Rajasthan

NTPC Renewable Energy Ltd (NREL) has signed a MoU with Rajasthan government to develop 10 GW ultra mega renewable energy power parks (UMREPP) in the state. The power PSU has set a target of 60 GW renewable energy capacity by 2032. NTPC REL is developing one UMREPP of 4.75 GW capacity in Rann of Kutch, Gujarat and it has also entered into a joint venture agreement with DVC for developing RE parks.

Source: PTI July 03, 2022

MENA Region to Grow its Utility-Scale Wind and Solar Capacity Five-Fold by 2030

Arab countries in the Middle East and North Africa (MENA) are planning 73.4 GW of utility-scale wind and solar projects which corresponds to a more than five-fold increase in current capacity and marks a serious shift away from oil and gas.

Source: Renewables Now, 29 June 2022

Green Jobs Witness 31% Surge as Organisations Focus on Sustainability Practices

With the revolution of clean energy and sustainable practices across the globe, the demand for green jobs has grown 31 per cent in May 2022. There are close to half a million jobs, directly or indirectly related to the green economy, on the platform indicating an all-time high. While the classification of green jobs is on the way to maturing in India, the requirements across organisations today reflect the need of the hour and the increasing business focus by companies on ESG and CSR activities.

Source: ET Bureau, July 05, 2022

ACME announces Rs 52k-Crore Green Hydrogen, Ammonia Project in Tamil Nadu

Acme Group has announced developing a green hydrogen and ammonia project in Tamil Nadu at an investment of Rs. 52,474 crore. This will be one of the largest plants in India and perhaps the largest in the world to produce green hydrogen and ammonia, which will help to de-carbonise sectors such as fertilizers, power, refining and steel, among others.

Source: Livemint, 06 July 2022

All Existing Inter-State Power Transmission Lines Mapped on PM GatiShakti Portal

All existing inter-state transmission system lines have been mapped on the portal spanning across length and breadth of the country of the PM GatiShakti National Master Plan which was launched in October, 2021 to push infrastructure development in the country. 90% under-construction ISTS lines have been integrated to the portal and the remaining 10 per cent are to be integrated after finalisation of route survey by respective transmission service providers. PM GatiShakti NMP portal will ultimately aid in solving problems of development of infrastructure in the country by building a secure, sustainable, scalable and collaborative approach towards infrastructure planning for seamless connectivity to economic zones.

Source: Firstpost.com, 7 July 2022

Government has earmarked Refining, Fertiliser Segments for Green Hydrogen Consumption, Obligation

The government is planning to begin green hydrogen consumption obligation to kick-start the green hydrogen demand for which it has earmarked the refining and fertiliser segments, said Mr. S S V Ramakumar, Director (R&D), Indian Oil Corporation. Though this mandate has not officially come in but the talks are there at the Cabinet level," he said. He added that in the run up to this mandate all the refineries in the country have to prepare themselves to convert at least a part for their grey hydrogen to green.

Source: ET Energy World, June 18, 2022

Maharashtra Signs Rs 60,000 Crore Power MOU with Adani Group

Maharashtra state energy department signed a MoU for investments worth Rs 60,000 crore with Adani Group, which will bring 11,000 MW additional power to Maharashtra in five years. This will also generate 30,000 new jobs. The state is already facing a power deficit, especially during summer.

Source: TNN, June 29, 2022

PGCIL Bags Transmission Project to Evacuate Power from Neemuch SEZ in MP

Power Grid Corporation of India Ltd. (PGCIL) has bagged an inter-state transmission project for evacuation of electricity from Neemuch SEZ in Madhya Pradesh through a tariff-based competitive bidding process on Build, Own Operate and Transfer (BOOT) basis.

Source: Projects in India, 9 July 2022




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Digitalisation of Operations: Key to Reduce Wind Levelized Cost of Energy (LCOE)

India is the 4th largest wind market in installed capacity, a figure that continues to be accelerated with the consolidation of the market by supermajors and a strong manufacturing base accounting for 15 GW per year.

However, the industry has not focused on optimising and making turbine operation and maintenance (O&M) efficient which has led to limitations on the industry reaching its potential. Research suggests that average O&M costs account for 60 percent of wind farm operating expenses, and in India, this average is higher. There is an urgent need to reduce costs and improve services leading many owner/operators to start taking ownership of their own O&M workflows following a pattern already established in western markets.

Present maintenance strategies rely on often unreliable maintenance and servicing, compounded by a low supply of spare parts and a lack of asset health insights, leaving the wind industry underserved and inefficient.

Owner/operators are continually faced with challenges such as how to balance their growing fleet sizes, adoption of multiple new technologies, underperforming O&M contracts and falling energy prices with the need to have new operating models that reduce costs. This has led to IPP's needing to look for alternative approaches to develop their own operations and maintenance strategies to ensure asset longevity and subsequently moving away from OEM service contracts, in a move to self-perform with strong focus on improving the reliability and availability of growing wind-farms.

To optimise the maintenance strategies, asset managers need to find collaborative technologies and simpler solutions to enable them to access their data information, to have sight of it easily and preferably in one platform. This data centralisation enables them to effectively stick to budgets, whilst making informed, strategic decisions for maximum turbine efficiency and limited

Condition monitoring with intelligent analytics can significantly reduce downtime and unplanned maintenance and lower LCOE by up to 12%.



Sharath Prabhakaran
Business Development Manager – India,
ONYX Insight

downtime. The single most effective solution to this 'quandary' is monitoring, but not just 'any' monitoring.

As well as the promise of lowering the cost of energy by up to 12 percent through harnessing digital solutions and taking ownership of their maintenance, operators can also reduce downtime and unplanned repairs. Monitoring can provide a huge opportunity for the industry to increasingly extract additional value from their existing assets, as well as that data forming a key part of their decision support, to inform and predict life extension and repowering strategies.

To truly capitalise on previous turbine investment, the wind industry must look beyond 'just' monitoring wind turbine drivetrains, but to the long-term collection of all data from turbines from as many component sources as possible. Advanced analytics from monitoring CMS (Condition Monitoring System) are one of the most cost-effective tools operators have, enabling them to transform the way wind assets are run and slash operations and maintenance costs.

When combined with real-world engineering knowledge and powerful predictive analytics, drivetrain data – specifically vibration – provides months of lead time for major component faults, making catastrophic failures a thing of the past.

Extract the Bigger Picture of Your Fleet Health

Using long-term monitoring strategies can add more value for a bigger picture of turbine health, new technologies allow us to get data on rotor imbalance, detect early pitch bearing decline as well as give clarity over tower and foundation health.

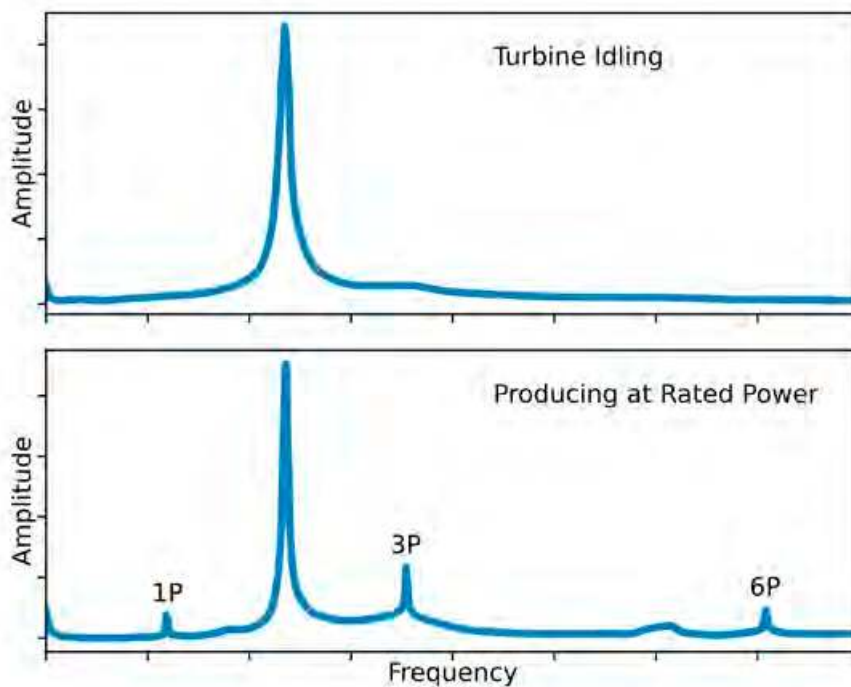


Figure 1: Clear identification of system frequency while idling and operating

Extending the functionality of a drivetrain CMS to infer tower and foundation health is not a substitute for other techniques. However, intelligent analysis, experienced experts and proper due diligence can transform a drivetrain CMS into a triage tool to decide if, when, and where to deploy conventional techniques in a targeted, cost-effective manner. In most cases, it provides more certainty at a lower price point by enabling continuous complete project monitoring to capture degradation and outliers that periodic snapshots will likely miss.

With ageing foundations, particularly in partial repowering scenarios, ongoing insight into foundation health is critical. In many situations, lenders or independent engineers will require regular foundation monitoring for life extension beyond the theoretical design life. Current theoretical calculations of design life are conservative, resulting in design lives that cannot support the desired operation timeframe of a project. This contradicts observation and detailed evaluation showing that many foundations perform acceptably far beyond the theoretical life.

Advanced drive-train CMS provides ongoing insight into foundation health - complementing traditional foundation stiffness monitoring when present - by providing data where stiffness measurements are not taken. Alternatively, it offers a triage approach for cost-sensitive projects to intelligently target more detailed evaluation on the right foundations when needed

by identifying the initiation of degradation. Partial repowering and lifetime extension result in towers and foundations with a planned service-life sometimes exceeding 40 years.

...promise of lowering the cost of energy by up to 12 percent through harnessing digital solutions and taking ownership of their maintenance, operators can also reduce downtime and unplanned repairs. Monitoring can provide a huge opportunity for the industry to increasingly extract additional value from their existing assets...

MEMS accelerometers are extremely powerful for monitoring low frequencies, such as structural frequencies of wind turbines (Figure 1). Low-frequency capable CMS can deepen operators' understanding of foundation health. These CMS are often already

installed on projects, and if not, the installation costs will be less than the cost of periodic foundation testing and inspections for a subset of the project's turbines.

Compared with the traditional approach, continuous observation of the entire population allows for:

- Statistical identification of outliers
- Definition of alarm levels to initiate further action
- Projections of when characteristics might exceed alarm levels

Early detection and clear decision criteria are vital when dealing with foundations. Quantitative results allow operators to set decision criteria confidently, and projecting future conditions allows proactive action. Prediction of future statutes is essential to allow time for the design of possible foundation retrofits, construction contracting, and implementation, without significant project downtime or running turbines with the possibility of collapse.

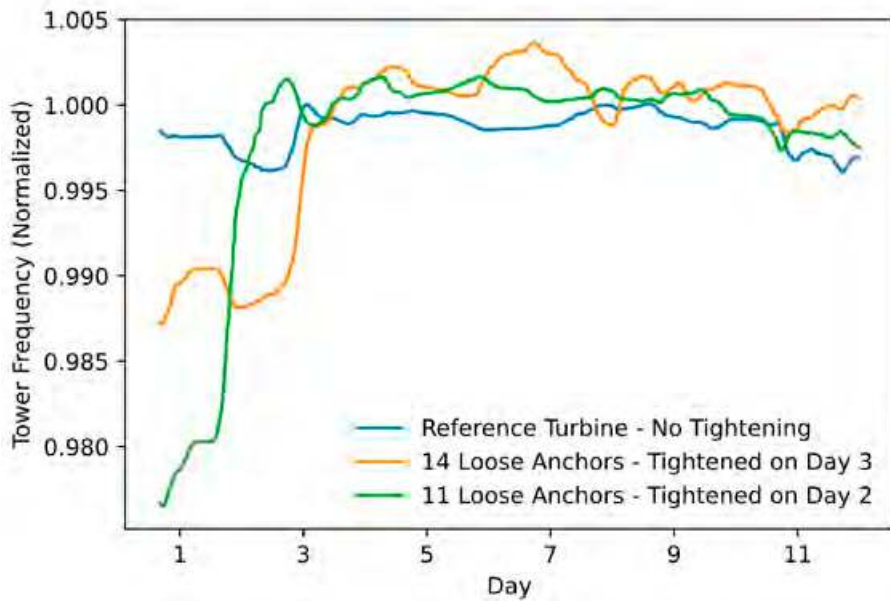


Figure 2: Clear evidence of soil anchor tightening

the effectiveness of the tightening program, and the analysis approach (see Figure 2).

Result: The site is now continuously monitored for foundation health, providing peace of mind for the owner.

Knowing the health of your turbine components is the key to simplifying your maintenance, maximising production and efficiency whilst reducing downtime. Digital solutions used in this way can help to empower India's growing wind industry and for owner/operators to accelerate with confidence to move to self-operation and self-monitoring and minimise any losses to production and profitability.



Global Case Study: Soil Anchor Degradation and Repair

Study of: Advanced sensor systems installed on over 1,500 turbines belonging to a global supermajor.

Problem: One of the wind farms experienced issues where the soil anchor bolts were loosening across the site. Monitoring service configured extended functionality for tower monitoring.

Solution: Over the course of the planned bolt tightening campaign, it was clearly demonstrated that the system captured the change in foundation stiffness post-tightening – validating

COP 26 President and NITI Aayog Launch Initiatives to Boost Electric Mobility, Promote Battery Reuse and Recycling Market in India

During the visit of COP 26 President Rt Hon'ble Alok Sharma to India on 21-22 July 2022, NITI Aayog has launched two significant initiatives — E-AMRIT (Accelerated e-Mobility Revolution for India's Transportation) mobile application to raise awareness on electric mobility and the Report on Advanced Chemistry Cell Battery Reuse and Recycling Market in India. These are launched by COP 26 President Rt Hon'ble Mr. Alok Sharma, Hon'ble Vice Chairman of NITI Aayog Mr Suman Bery and CEO of NITI Aayog Mr Parameswaran Iyer.

India is among 42 leaders to back and sign up to the UK's Glasgow Breakthroughs, launched at the COP26 climate summit. India is also a co-convenor of the Glasgow Breakthrough on Road Transport, together with the UK and the US. The Breakthrough on Road Transport aims to make ZEVs – including 2&3-wheelers, cars, vans and Heavy-Duty Vehicles – the new normal by making them affordable, accessible and sustainable in all regions by 2030.

Source: Emobility, 22nd July 2022

Japan Set to Expand Energy Transition Support to India

Japan plans to provide support to India to drive the transition to clean energy, expanding a programme it launched last year for Southeast Asian nations. Japan's 'Asia Energy Transition Initiative' initially targeted supporting countries in the Association of South East Asian Nations (ASEAN) pushing towards net-zero carbon emissions, including \$10 billion in finance for renewable energy, energy efficiency and liquefied natural gas (LNG) projects.

Source: Reuters, 13 July 2022



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IWTMA Wind Power Data Repository

One-Stop Collection of data on Wind Power Sector of India

IWTMA's Data Repository was launched on 6th April 2022 by Shri Dilip Nigam, Advisor, Ministry of New and Renewable Energy (MNRE), Government of India developed and compiled by Mr. O P Taneja. This compilation is a one-stop collection of data related to the wind power sector in India. Repository endeavours to provide data related to wind industry in India with the aim to benefit various stakeholders.

The Target Group of Repository

- Investors, who wish to create the manufacturing facilities of wind turbines and or their components.
- Independent power producers, individuals, corporate, government institutions, etc. who wish to invest in the wind farms for wind power generation.
- Stakeholders across the eco system and value chain.
- Banks, Financial Institutions, Private Equity institutions and Consultants involved in investments.
- Consultants, clean-tech specialists, lawyers, surveyors, content writers, etc.
- Students and Research Scholars and educational institutions.

Areas Covered by the Repository

Repository covers most of the aspects of wind industry. The following topics (not limited to) and will be reviewed and updated from time to time.

- Regulations notifications, guidelines, schemes of central government and wind rich states of India.
- Policies of center and states.

- Potentials of the Indian states at various hub heights.
- Entities catering to wind and renewable sector like Ministry of New and Renewable Energy (MNRE), Ministry of Power (MOP), Ministry of Defense (MOD), Central Electricity Regulatory Commission (CERC), State Electricity Regulatory Commissions (SERCs), Central Electricity Authority (CEA), Energy Exchanges, Power System Operation Corporation (POSOCO), etc.
- Skill development in wind energy.
- Nodal Agencies involved in the Renewable Sector.

Original/base documents, amendments, etc. are compiled from recent to past in a compendium Book form. Each document has the Index of contents and page numbers for easy use. The data are in PDF format (downloadable) and will be updated regularly. In most of the cases, the details will be available in one or several volumes depending upon the size of the documents. The Data Repository can be accessed on the website of Indian Wind Turbine Manufacturers Association.

IWTMA requests the users to point out and inform us any discrepancy. Your feedback is very important to us to make this work more useful for everyone. We await your suggestions for improvement and inclusion of relevant new topics by mail (iwtmarepo@indianwindpower.com) on the Data Repository is welcome. If you have any important data available with you on the subject, please share with us.

Please visit www.indianwindpower.com



Discoms Warned for Default on Payment

The new rules for discoms, which will lead to an automatic disconnection if there is a default on payments, are transformational, says Union Power minister Mr. R K Singh. He told that the rules will also help the discoms save large sums if they pay promptly.

Source: Financial Express, July 6, 2022

Siemens Gamesa's Recyclable Blades at Kaskasi Offshore Wind Power Project

Gamesa celebrates the delivery of green energy from the first world-wide turbine equipped with Recyclable Blades by Siemens Gamesa. RWEE's Kaskasi offshore power project in Germany recently saw the first commercial installation for recyclable wind turbine technology. This is a significant milestone in the long-term sustainability and viability of offshore wind power. The technology allows for full reclaim at the end of the product's life span. A mild acid solution is used to separate the resin, fiberglass, wood and other components. These materials can then be used to create new products such as suitcases and flat-screen casings in the circular economy without the need for additional raw resources.

Source: Wind Insider, 2 August 2022

Indian Financial System Needs a Green Taxonomy for Resilience to Climate Risks



Sustainable finance markets globally are grappling with two major issues – capital not reaching assets that need it the most and ‘greenwashing’. Both issues stem from weak policy frameworks and unclear implementation mechanisms.

Recent probes in Europe against DWS, Deutsche Bank’s asset management arm, and in the United States against Goldman Sachs regarding alleged greenwashing of their investment products are a case in point. Such cases highlight blind spots in the market. Their root cause is an unclear definition of green economic activities. This, in turn, prompts investment intermediaries to define sustainable assets arbitrarily.

Rapidly evolving sustainable finance markets are witnessing policy tools like green classification schemes called green taxonomies that provide a standard definition of green assets. These tools aim to increase financing of green projects, prevent greenwashing, and help develop a better understanding of the extent of climate risks faced by various financial sector intermediaries.

The European Union (EU) and several countries, such as China, Malaysia, Mongolia, and South Africa, have recently established their green taxonomies. India’s taxonomy is still in the draft stage. As the biggest owners of financial assets in India, banks and insurance companies will be at the forefront of effective taxonomy implementation in the country.

Banking Sector Perspective

With cumulative assets of US\$2.5 trillion as of 2021, banks are India’s financing backbone. However, most of these assets do not align with India’s sustainability goals owing to the banks’ unpreparedness to manage the climate and broader environment, social and governance (ESG) risks. A green taxonomy would bring much-needed clarity. It would nudge banks to set sustainability targets and align their business strategies with them.

Evaluating exposure to sustainable versus non-sustainable activities is difficult for banks without a taxonomy. Hence, banks are unable to assess the climate risk in their lending portfolio. A taxonomy would help banks evaluate the use of loan proceeds and alignment of their lending portfolio with green activities. This will help disclose the alignment of their portfolio to the taxonomy, mitigate the risk of greenwashing, enhance their reputation, and provide credible data points to the Reserve Bank of India (RBI) for ascertaining climate risks in the overall banking system.

Furthermore, the taxonomy-led disclosures should help expose the climate risks of non-green assets. Meanwhile, green activities will benefit from better pricing due to lower risks and, potentially, reduced capital adequacy requirements. The RBI, with a taxonomy as an important tool, can expedite climate risk discovery in the banking system and steer credit towards sustainable activities. Once climate and sustainability risks are correctly priced, green or sustainable activities could attract bank loans at more favourable terms.

A taxonomy provides a common language for banks and their clients, thereby improving engagement. To meet their sustainability targets, banks can nudge clients to adjust their businesses. Banks will also play an important role in advising clients about available sustainable finance solutions and building the required capacity to access them.

Insurance Sector Perspective

India is one of the most climate-vulnerable nations globally. It also has a growing and diverse insurance market with assets under management (AUM) of Rs 49 trillion (US\$636 billion) in the fiscal year (FY) 2020-21.

Domestic insurers have been weak in covering climate-related losses, and their climate disclosures are among the worst globally. As long-time risk managers, risk carriers and investors, insurers would benefit from a green classification system to ascertain assets with little contribution to climate risks. In doing so, they can promote stable investments in their portfolio and insurance underwriting practices.

On the liability side, without a green taxonomy, an unclear understanding of climate affected/aligned economic activities may deter the modelling and pricing of climate risks in underwriting.

Insurers underwriting risks in fossil fuel-aligned sectors like thermal power generation may face a scarcity of reinsurance cover from foreign firms. This is because insurers in jurisdictions like the EU are increasingly cutting cover for carbon-heavy sectors. Repricing insurance products for these sectors in alignment with emission thresholds established for taxonomy-aligned activities would become important. In 2019, a 3x increase in the cost of insuring power projects irked domestic thermal power generation companies, something which could happen more frequently.

On the asset side, there are two main climate change-related problems. First, impairment of asset values due to physical and transition risks will cause equity price shocks. Second, the deteriorating creditworthiness of borrowers will tank bond prices. India’s largest insurer, Life Insurance Corporation (LIC), has 16% of its equity investments in energy companies that are highly susceptible to transition risks. A green taxonomy will help insurers better understand the potential impact of individual investments on their portfolios.

As India marches towards energy transition, its financial institutions require a science-backed green taxonomy for resilience to any unintended consequences of climate risks. However, the central bank and the insurance sector regulator must work together to successfully launch and implement a green taxonomy.

Courtesy: Shantanu Jaiswal and Saurabh Trivedi, IEEFA, 9 July 2022

SG 3.4-145, our next -generation turbine

A large white Siemens Gamesa SG 3.4-145 wind turbine is the central focus, shown from a low angle looking up at its nacelle and blades. The nacelle features the 'SIEMENS Gamesa' logo and 'RENEWABLE ENERGY' text. The background shows a vast, hilly landscape with green and brown vegetation, and several other wind turbines are visible in the distance under a cloudy sky.

Delivering India's positive energy with SG 3.4-145, our next -generation turbine.

India's journey to become a sustainable nation is powered by a billion aspirations. We're proud to play a part in empowering India with clean and renewable energy, at affordable costs. Standing tall on a new 3MW platform, the SG 3.4-145 is a key milestone in India's clean energy story. This turbine delivers a remarkable 48% more



annual generation than its predecessor, in Indian low-wind conditions. Backed by smart monitoring system and optimized for all-weather conditions, the SG 3.4-145 is the right fit for the Indian market, delivering high profitability and reduced LCoE. The perfect turbine made for India, made in India. The SG 3.4-145 is indeed geared up to deliver India's positive energy.

SIEMENS Gamesa
RENEWABLE ENERGY

Computational Modelling of Wind Ramp using Weibull Distribution



Subarno Bhattacharyya
Ph.D. Scholar, School of
Mechanical Engineering



Prashant G. K.
Assistant Professor, School of
Mechanical Engineering



Abhik Kumar Das
Technical Director
del2infinity Energy Consulting

VIT Bhopal University

Introduction

Wind power is a key component of climate strategies being implemented by countries around the world. However, the variability and unpredictability of wind power raises a number of issues related to grid integration. With increasing wind power penetration and unscheduled fluctuations in wind power generation, system stakeholders face massive challenges in maintaining grid reliability; thus, statistical modelling useful for utility system planning, design and operation of wind energy systems is one of the most widely pursued areas of research^{1,2}. To analyse the variability in wind power generation, the fluctuation feature extraction of power output is required⁹. Wind power output fluctuation can be measured using the concept of ramp events, which is defined as large unscheduled variability in wind power output³. Simple statistical analysis of wind generation can provide insights into ramp events¹⁰, hence a simple probabilistic approach can be useful to generate the distribution of ramp events¹¹.

Wind speed and direction vary greatly over time as a stochastic phenomenon. A Weibull distribution can be used to represent the probability function reflecting the pattern of wind distribution as¹²:

$$f(v) = \frac{k}{\lambda} \left(\frac{v}{\lambda}\right)^{k-1} \exp\left\{-\left(\frac{v}{\lambda}\right)^k\right\} \quad \dots (1)$$

Where k is the Weibull shape factor, λ is the scale factor and v is the wind speed under consideration. The cumulative distribution function $F(v)$ of (1) can be represented as:

$$F(v) = \text{Prob}\{\tilde{v} \leq v\} \quad \dots (2.A)$$

$$= \int_0^v f(\tilde{v}) d\tilde{v} \quad \dots (2.B)$$

$$= 1 - \exp\left\{-\left(\frac{v}{\lambda}\right)^k\right\} \quad \dots (2.C)$$

Though different statistical distributions are useful to represent the wind pattern, the distribution (2) is commonly used for simplification of computational analysis with an acceptable level of approximations. In this paper we have shown that how the Weibull distribution can be used in analysing the wind ramp distribution.

Wind Power Distribution

Wind energy output can be thought of as an exponential function of wind speed v^1 . For simple algebraic manipulation, consider the following equations¹²: If W_v represents the power output at the speed v , the following equations hold:

$$W_v = av^n \quad \text{for } v \leq v_r \quad \dots (3.A)$$

$$= W_{max} \quad \text{for } v_r \leq v \leq v_0 \quad \dots (3.B)$$

$$= 0 \quad \text{for } v > v_0 \quad \dots (3.C)$$

Here, v_r and v_0 represent the turbine's rated and cut-out speeds, respectively. The constant values a and n are determined by the turbine characteristics and differ between turbines. Consider a cumulative distribution for the sake of simplicity. Let $G(\omega)$ represents the fraction of time that the turbine's wind power output is equal to or less than a certain value W_{max} , i.e.

$$G(\omega) = \text{Prob}\{W_v \leq \omega \leq W_{max}\} \dots (4)$$

It is easy to see that $G(\omega) = 1$ for $\omega \geq W_{max}$. Hence using (3) replacing v with $(W_v/a)^{1/n}$ we can state that:

$$G(\omega) = \text{Prob}\{W_v \leq \omega\} \quad \dots (5.A)$$

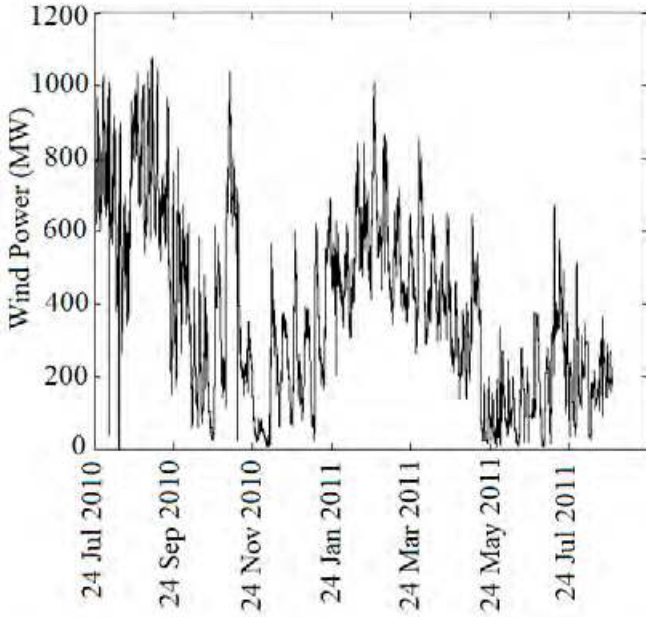


Figure 1: Sample Wind Power

$$= \text{Prob} \left\{ v \leq \left(\frac{\omega}{a} \right)^{\frac{1}{n}} \leq v_0 \right\} \quad \dots (5.B)$$

$$= F \left\{ \left(\frac{\omega}{a} \right)^{1/n} \right\} = 1 - \exp \left\{ - \left(\frac{\omega}{\lambda^n a} \right)^{\frac{k}{n}} \right\} \quad \dots (5.C)$$

Considering, $K = \frac{k}{n}$ and $\Lambda = a\lambda^n$,

$$G(\omega) = 1 - \exp \left\{ - \left(\frac{\omega}{\Lambda} \right)^K \right\} \quad \dots (6)$$

It is interesting to note that the distributions in (6) and (5.C) are similar, but the parameter value differs. As a result, for a utility scale wind power plant, the power generated roughly follows the Weibull distribution with Weibull shape factor $K=k/n$ and scale factor $\Lambda=\lambda^n a$, where n depends on the Turbine characteristics. The distribution $G(\omega)$ of a sample wind power generation (figure1) is shown in figure 2.

Wind Ramp

Let $P(t)$ denotes the wind power generated at time t . Though the function $P(t)$ is a continuous function of time t , it can be represented as a discrete time event using the fixed time interval due to data acquisition feasibility (generally the wind power data points are considered in 2 minutes or 5 minutes intervals). Wind power's discrete data set can be represented as:

$$\Omega = \{P(t) | t = 0, 1, 2, \dots, T\} \dots (7)$$

Where T is considered as the total time period under consideration. Consider a new stochastic variable defined as:

$$m_{\Delta t}(t) = \frac{P(t+\Delta t)}{P(t)} \quad \dots (8)$$

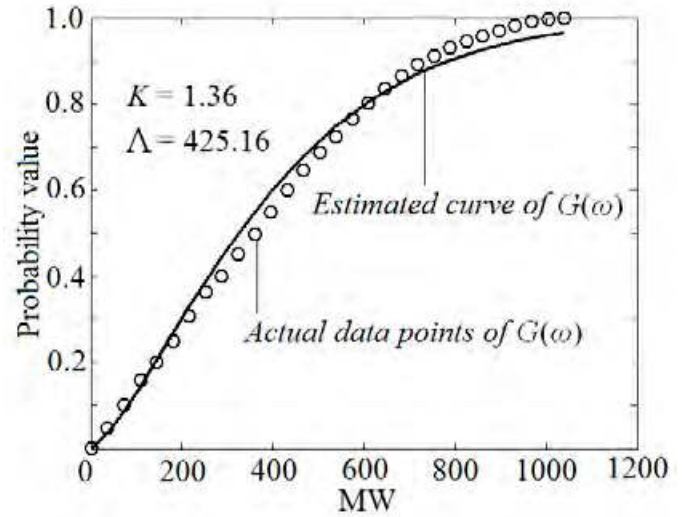


Figure 2: Actual and Estimated Distribution of Wind Power

For $t = 0, 1, 2, \dots, T - \Delta t$. Here $P(t + \Delta t)$ is the wind power generation at a time Δt ahead of t and $\Delta t > 0$. If $P(t) = 0$, we can consider that the value $m_{\Delta t}(t)$ is defined and can take a very high value (tends to infinity). It is interesting to see that since $P(t) \geq 0$, the minimum value of $m_{\Delta t}(t)$ is 0 (see Figure 3). Since the ramp up (ramp-down) events are defined when the rate power change is positive (negative) [10-12], using $m_{\Delta t}(t)$ we can say that:

$$\text{For ramp-down events } m_{\Delta t}(t) < 1 \quad \dots (9.A)$$

$$\text{For ramp-up events } m_{\Delta t}(t) > 1 \quad \dots (9.B)$$

Ramp Distribution

Let us consider the cumulative distribution of $m_{\Delta t}$ as $H_{\Delta t}(\mu)$ which represents the probability that the value of $m_{\Delta t}$ is equal or lower than a certain value μ i.e.

$$H_{\Delta t}(\mu) = \text{Prob} \{m_{\Delta t} \leq \mu\} \quad \dots (10)$$

For analytical simplicity, let us consider $\mu = 1 + \alpha$, where α can be represented as the ramp-limit under consideration. Hence we can state that, $m_{\Delta t} \leq \mu$ implies that $P(t + \Delta t) \leq \omega + \alpha\omega$ whenever $P(t) = \omega P(t) = \omega$. Considering the distribution $G(\omega)$ we can state that:

$$H_{\Delta t}(1 + \alpha) = \text{Prob} \{m_{\Delta t} \leq 1 + \alpha\} \quad \dots (11A)$$

$$= \int_0^{\infty} \text{Prob} \{P(t + \Delta t) \leq \omega + \alpha\omega\} \text{Prob} \{P(t) = \omega\} d\omega \quad \dots (11B)$$

$$= \int_0^{\infty} G(\omega + \alpha\omega) g(\omega) d\omega \quad \dots (11C)$$

$$= \int_0^{\infty} \left[1 - \exp \left\{ - \left(\frac{\omega + \alpha\omega}{\Lambda} \right)^{K(\Delta t)} \right\} \right] g(\omega) d\omega \quad \dots (11D)$$

Since $\int_0^{\infty} g(\omega) d\omega = 1$ ($g(\omega)$ is a probability distribution), (14) transforms into:

$$H_{\Delta t}(1 + \alpha) = 1 - \int_0^{\infty} \left[\exp \left\{ - \left(\frac{\omega}{\Lambda} \right)^{K(\Delta t)} (1 + \alpha)^{K(\Delta t)} \right\} \right] g(\omega) d\omega \quad \dots (12)$$

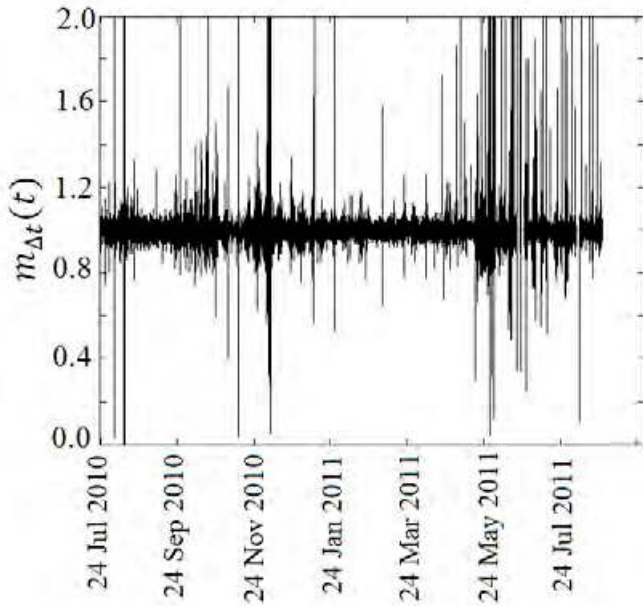


Figure 3: $m_{\Delta t}(t)$ of the wind power shown in figure 2

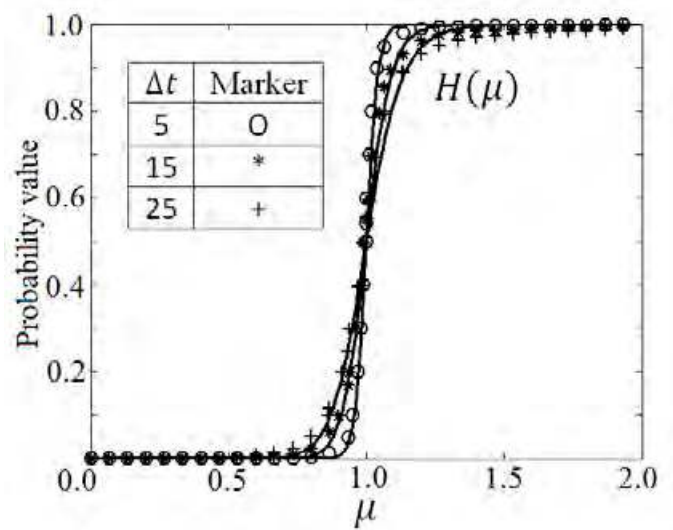


Figure 4: Wind Ramp Distribution. The Marker Shows the Actual Data Generated From Figure 1.

Replacing $g(\omega)$ ($g(\omega)$ is obtained by differentiating equation(6)) in (12), by integration of (12) we get:

$$H_{\Delta t}(1 + \alpha) = 1 - \frac{1}{1 + (1 + \alpha)^{K(\Delta t)}} \dots (13)$$

Replacing $1 + \alpha$ with μ , we get the mathematical expression of wind ramp distribution (10) as,

$$H_{\Delta t}(\mu) = 1 - \frac{1}{1 + \mu^{K(\Delta t)}} = \frac{\mu^{K(\Delta t)}}{1 + \mu^{K(\Delta t)}} \dots (14)$$

The distribution of $H_{\Delta t}(\mu)$ is shown in figure 4.

Conclusion

In wind power research, Weibull distribution is massively used in wind speed distribution through which the probability distribution of wind power generation can be obtained. Here it is shown the wind power generation also follows the Weibull distribution and using Weibull a simple mathematical relation of wind ramp distribution can be obtained. The wind ramp distribution depends on the shape factor (not scale factor) of the wind power generation and the turbine parameter (n).

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The Electricity (Amendment) Bill, 2022 *Proposals*

Ministry of Power, Government of India has proposed some amendments in the Electricity Act, 2003. Power Minister Mr. R K Singh had introduced the Electricity (Amendment) Bill 2022 and requested Lok Sabha Speaker Sri Om Birla to refer it to a parliamentary standing committee for wider consultations to address concerns raised by the opposition. The deliberations of the Parliamentary Committee will revolve around the following major points as suggested in the bill:

Proposals of the Bill to be Dropped

1. Delicensing of Distribution business
2. Cross Border Trade of Electricity
3. Sitting judge of High Court as chairman of the Selection Committee for selection of members of State Commission
4. Section 63-Timeline for adoption of Tariff and deemed adoption of tariff

Proposals of the Bill to be Retained

1. Trajectory of RPO by Government of India and penalties for non-compliance of RPO
2. Improvement in functioning of the Appropriate Commission
 - Powers of Civil court
 - Increase in no. of Members from three to four (in case of State Commission)
 - Separate benches
 - Accountability of Members to ensure compliance of provisions of the Act
3. Entrusting functions of any State Commission to any other State Commission to ensure proper functioning in case of vacancies
4. Amendment in qualifications for the post of Chairperson and Members in CERC and SERC
5. Payment Security Mechanism, as may be prescribed by the Central Government, mandatory for scheduling of Power by Load Despatch Centres (NLDC/RLDC/SLDC)
6. Ensuring Safety and security of the grid- Detailed NLDC functions (Section 26(4)-(7))
7. Creation of mechanism in State Commission for monitoring the compliance of the Act and the rules. (Section 91(1A))

Proposals of the Bill modified based on stakeholders comments and consultations

1. Choice to Consumers through Multiple Distribution Licensees (Enabling existing provision in the Act)

- Proviso 6 of Section 14—phrase “through their own distribution system” to be omitted: To facilitate operation of multiple Distribution licensee in the same area
 - Mandating Non-discriminatory open access to other distribution licensees in same area of supply
 - Ceiling and floor Tariff to be determined by State Commission
 - Management of Cross subsidy in case of multiple distribution licensee
 - Sharing of power and associated costs from the existing PPA with the existing distribution licensee among all the distribution licensees in the area of supply (Section 60A)
2. Section 15 - Subsection 6(b) - Deeming provision added to avoid delay in granting license to distribution company
 3. New provision for streamlining process of grant of license in more than one State by CERC
 4. Number of Members in APTEL—Maximum 5 instead of 7 as proposed
 5. Qualification for the post of Member (Law) in CERC/SERC to be made broadbased.
 6. Section 61(g)— Modified to ensure cost reflective tariff by linking with Tariff Policy.
 7. Section 64(3)—Reduction in time limit for issuing of tariff orders by Appropriate Commission from 120 days to 90 days and new provision for interim tariff in case the tariff is not determined latest by 31st March.

Proposals based on stakeholders comments and consultations

1. Inclusion of Energy Storage System in definition of Power System
2. NLDC being enabled to procure power and dispatch through a scheme notified by Central Government for ensuring stability of the grid (Section-26)
3. New Proviso to enable consumers of more than 1 MW to get open access directly from inter-state transmission system
4. Licensees to comply and report compliance with guidelines notified by Central Government for robust Corporate Governance (Section-59)
5. Additional function to SERCs to facilitate financial sustenance of the licensees (Section-86)
6. Provision for periodic review of Resource Adequacy by SERCs (Section-86)

7. Making compounding of tariff related offences mandatory (Section-152)
 - Decriminalization of the offences
8. Enabling provisions for making Rules for improving concurrence process by the Authority (Section-176)

3. Simplification of the procedure for Hydropower project clearance by the Authority under Section 8
4. Provisions enabling only experienced person is appointed as Member of the Commission

Source: Ministry of Power Presentation

Other Suggestions

1. Definition of Area of Supply
2. Monitoring of RE by Forum of Regulators



Tata Power to Skill 3,000 Youths to Work in RE Sector

Tata Power has said that it will give training to 3,000 youths this fiscal in the field of renewable industry. The company aims to train a total of 5,000 youths by 2025 to work in the sector, Tata Power said in a statement. Tata Power Skill Development Institute (TPSDI) has so far trained 1.4 lakh people across its courses both conventional and renewable energy technology. It is expanding its training initiatives to equip youth with skills for green energy jobs.

Source: Business Standard, July 16, 2022

Need To Ensure 100 Per Cent Renewables Alongside Electric Vehicles To Tackle Climate Crisis: Environmentalists

Though electric vehicles are expected to cut oil consumption and lower carbon dioxide emission, they said it alone will not help fight the global climate crisis. There is an urgent need to ensure 100 percent renewable energy alongside electric vehicles to tackle the climate crisis, Greenpeace India's Mr. Avinash Chanchal said. He told PTI that since the transportation sector is one of the significant contributors to climate change, a paradigm shift in the industry is needed to phase out internal combustion engine cars.

Source: PTI, 7 July 2022

States Get a New Green Power Mandate

States must meet a quarter of their power demand by means of renewable power sources within the present year, scalable to 47% within the subsequent eight years as per a new trajectory issued by the central authorities. The renewable buy obligation (RPO) specified by the union power ministry for the final three monetary years was 17.5% in FY20, 19% in FY21 and 21% in FY22. However, compliance by state distribution corporations has been very low.

As per the trajectory ready until FY30 by the union ministries of power and renewable power, the RPO targets will improve progressively from 24.6% in FY23 to 47.33% in FY30. The authorities have fastened separate trajectories for wind power, hydro power, power storage and different power sources. The wind RPO begins this year with 0.81% until 6.94% in FY30. Similarly, the hydro power obligation will probably be elevated from 0.35% within the present fiscal to 2.82% in eight years.

Source: Pahal News, July 23, 2022

Germany Wants to Work with India on Climate Adaptation

Prime Minister Mr. Narendra Modi recently participated in the G7 Summit held in Germany where he urged the developed nations to support India's efforts towards battling climate change and scaling up clean energy. Germany and India has signed a partnership on sustainable development where Germany is looking to see how it can support India in achieving its goals. The potential global significance of India's goals (500 GW from renewable energy by 2030) is very important and inspiring.

ET Energy World, July 01, 2022

Centre to Lift Curbs on CPSEs' Renewables Imports from China

Central Public Sector Enterprises (CPSEs) involved in renewable energy projects will soon be permitted to import components from China, overriding restrictions imposed on them in 2020 to procure items from countries which share a land border with India. The exemption will enable NTPC and other CPSEs engaged in RE projects to cut costs by directly importing from bidders/companies from China without mandatory requirement of registration in India.

Source: ET Bureau, July 20, 2022

Centre Set to Abolish Reverse Auction Bidding in Wind Energy Sector

The government has in-principle agreed to stop electronic reverse auction of wind power projects, Renewable Energy Secretary Mr. Indu Shekhar Chaturvedi said on 14 July 2022. Sources said the e-reverse auctions for other renewable projects would also be taken down as the ministry has in-principle agreed with the industry's claims that such bidding leads to unhealthy competition. Since 2017, the wind energy sector has witnessed nil or single-digit growth in capacity addition, as tariffs fell in the auctions and industry leaders shied away from participating.



IREDA Committed to Increasing Participation of MSMEs in RE by offering more Loans

Indian Renewable Energy Development Agency (IREDA) is committed to increasing participation of MSMEs in the green energy sector by offering more loans. MSMEs only represent 1.86% of the company's total loan assets of Rs 33,884 Crores as of May 2022. IREDA is attempting to address the issues of MSMEs in order to increase their participation in the renewable energy (RE) sector.

Source: PTI, July 09, 2022

RE Sector has Potential to Employ 10 Lakh Individuals by 2030: IREDA

IREDA Chairman & Managing Director Mr. Pradip Kumar Das has said that the country's renewable energy sector has potential to employ 10 lakh individuals by 2030, which would be ten times more than the existing workforce of an estimated 1.1 lakh employed by the sector.

Source: PTI, July 13, 2022

Hindustan Power Exchange begins Operation

The Hindustan Power Exchange (HPX) promoted by BSE, PTC India and ICICI Bank began operations after receiving all necessary approvals from the Central Electricity Regulatory Commission (CERC). HPX is the third power exchange in the country. Backed by the latest technology and a series of innovative features, the exchange promises to offer speed, transparency and better price discovery in the execution of trades.

Source: PTI, July 06, 2022

ReNew becomes First Indian Renewable Energy Firm to Refinance Dollar - Denominated Bonds

Renew has announced that it has become the first Indian renewable energy company to refinance dollar-denominated bonds. "ReNew Energy Global plc (ReNew) has successfully refinanced its 2024 maturity dollar-denominated bonds with amortising project debt from an Indian non-bank financial company, becoming the first Indian renewable energy company to do so." ReNew issued bonds worth USD 525 million in 2019, which were set to mature in 2024. By refinancing the dollar-denominated bonds ahead of time, ReNew has shown strong and continued access to domestic debt capital, as well as an ability to proactively manage refinancing risk. This refinancing has cut the bonds' rupee interest cost by 200 basis points, with the interest rate fixed for three years while pushing out the maturity to the end of fiscal year 2027.

Source: PTI, July 13, 2022

Torrent Power gets Rs 2600-Cr Wind Energy Project from SECI

Torrent Power has bagged a 300 MW wind energy project worth Rs 2,600 crore in Karnataka from Solar Energy Corporation of India (SECI) with 25 years PPA from the scheduled commercial operation date at a tariff of 2.94 per kWh. The estimated date of commissioning of the project is 24 months from the date of execution of the PPA.

Source: PTI, 15 July 2022

REC for Selling PFC Stake in Company to PGCIL

The state-run REC Ltd has suggested the government consider selling Power Finance Corporation's (PFC) stake in the company to Power Grid Corp of India (PGCIL). PFC had in March 2019 acquired the government's 52.6 per cent stake in REC for Rs. 14,500 crore to consolidate the two power sector lenders. The government holds a 56 per cent stake in PFC.

Source: ET Bureau, July 15, 2022

India needs USD 15 Bn Funding to set up 15 GW Hydrogen Capacity by 2030: V K Saraswat

NITI Aayog Member Mr. V K Saraswat has said that India will need a funding of \$15 billion in public and private funding to set up 15 GW of green hydrogen capacity by 2030. Green hydrogen is the fuel of the future but its price continues to be prohibitive for sectors like fertilizer and refinery which need to use it.

Source: PTI, July 15, 2022

Offshore Wind: UK-India Collaboration Leading the Path

The Ministry of New & Renewable Energy through its implementing agency will issue the first bid in the next 3-4 months for leasing out offshore wind energy blocks equivalent to 4.0 GW off the coast of Tamil Nadu. And this is where the UK-India partnership can fit like a hand in a glove. Opportunities for collaboration exist across policy and regulation frameworks, technology, knowledge and commercial partnerships, research and innovation, and project development, which are being delivered through the India-UK Joint partnership program announced as part of the 2030 roadmap.

Source: ET Energy World, July 14, 2022

BRICS Nation Recognise Promotion of Green Jobs

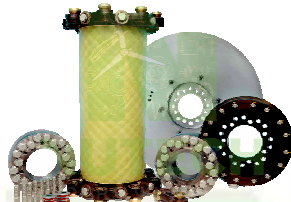
BRICS Labour & Employment Ministers' Declaration has recognised the need for promoting green jobs for sustainable development, strengthening of cooperation in skills development and protection of workers' rights in new forms of employment, the labour ministry has said. Union Minister for Labour & Employment Mr. Bhupender Yadav attended the meeting held under the Chinese Presidency.

Source: PTI July 15, 2022

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GWEC | Global Offshore Wind Report 2022

Global Wind Energy Council (GWEC) has brought out Global Offshore Wind Report 2022. A summary and the prospects of offshore wind in India are given below.

Countries globally are now grappling with the unprecedented twin challenge of ensuring secure energy supplies and meeting climate targets to stem the worst effects of global heating. 2021 saw 21.1 GW offshore wind reach grid connection worldwide, three times more than in 2020, setting a new record in the offshore wind industry. The 21.1 GW of new installations brings global cumulative offshore wind power capacity to 56 GW, showing year-over-year (YoY) growth of 58% and representing 7% of total global cumulative wind installations. Of the 21.1 GW in new offshore installations, 80% was contributed by China.

Meanwhile, the industry is seeing new build-out targets announced that would be almost unfathomable just a few years ago. These targets hold promise that the record installations seen in 2021 will not be a one-off event.

Offshore wind is ready to play its part in mitigating climate change and tackling the energy crisis. Now is the time to redouble our efforts, working collaboratively with policymakers, communities and wider stakeholders, to accelerate the transition towards a renewable future.

India Offshore Wind

India's offshore wind sector has gained momentum as a result of the Prime Minister's announcement of net zero targets at COP26 and the country's strengthened strategic ties with bilateral institutions for harnessing green energy. In a multi-pronged approach to bolster climate action at COP26, India also announced its increased ambitions of installing 500 GW of non-fossil fuels-based power generation capacity by 2030, inclusive of 30 GW offshore wind capacity.

Auctions to 2030 to include Offshore Wind Blocks

In March 2022, the Ministry of New and Renewable Energy (MNRE) held an industry-wide consultation on its discussion paper "Establishment of Offshore Wind Energy Projects to achieve a target of 30 GW by 2030". On behalf of the offshore wind industry, GWEC presented and submitted inputs to the MNRE outlining enabling features and prospective gaps.

After a detailed review, in June 2022, the MNRE announced India's offshore wind bid trajectory as per below:¹

- Beginning with financial year (FY) 2022-2023, offshore wind bids of 4 GW capacity per year for a period of three years to be rolled out off the coast of Tamil Nadu and Gujarat for sale of power through open access/captive/bi-lateral third-party sale/ merchant sale.
- For the subsequent five years, an annual bid volume of 5 GW planned until FY 2029-2030.
- Power from all offshore wind capacities that will be bid out up to FY 2029-2030 shall be evacuated and transmitted from offshore pooling substations to onshore transmission networks free of cost.
- The first 8 GW of capacity bids shall be eligible for the benefits of green attributes such as carbon credits.

These figures convey that India would award bids totalling 37 GW of capacity from 2022-2029, which can offset the impact of unfulfilled target of 5 GW by 2022. It is not yet clear how much of the capacity allocated through bids would be installed by 2030, against the target of 30 GW of installations by the end of the decade. While this development invites enthusiasm, the following must be prioritised ahead of any capacity bidding:

- Result of Floating LiDAR by NIWE: NIWE is yet to award the E-tender for supply, installation and commissioning of integrated floating buoys for mounting LiDARs at three locations in Gulf of Mannar, off the Tamil Nadu coast.² The E-tender has been opened up three times, with the last occasion noting closure in early March 2022 and an award by April 2022.
- Approval of Viability Gap Funding by the Ministry of Finance: Viability gap funding or other financial incentives can help to build confidence and drive stakeholder participation.
- Policy and regulatory clarity: GWEC's India Offshore Wind Working Group is working with government and industry stakeholders to share global experience and advocate for reduction strategy, and offshore wind roadmap.

Important aspects to outline include: socioeconomic awareness among indigenous/fishing communities; developing a robust MSP framework; building out port and grid infrastructure; ensuring vessel availability; and offshore wind tailored regulation

and standards. Timely approval of permits and allocation of clearances, power evacuation and transmission infrastructure commissioning and adherence to PPA signing timelines will also be required to ensure an expedient installation timeline.

Through strategic alliances and institutional partnerships, the Government of India is already strengthening its existing expertise of offshore wind:

- Renewable Energy Catapult and NIWE have announced a Joint Declaration of Intent (JDI) to establish a 5-year collaboration programme to support the UK and India's offshore wind industry.³
- Under the MoU between India and Denmark, a knowledge hub called the Centre of Excellence for

Offshore Wind and Renewable Energy (CoE) was launched in September 2021 for the adoption of a comprehensive and coherent approach leading to cost-effective offshore wind power, with a view to mobilising significant investment. An initial report 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.⁴

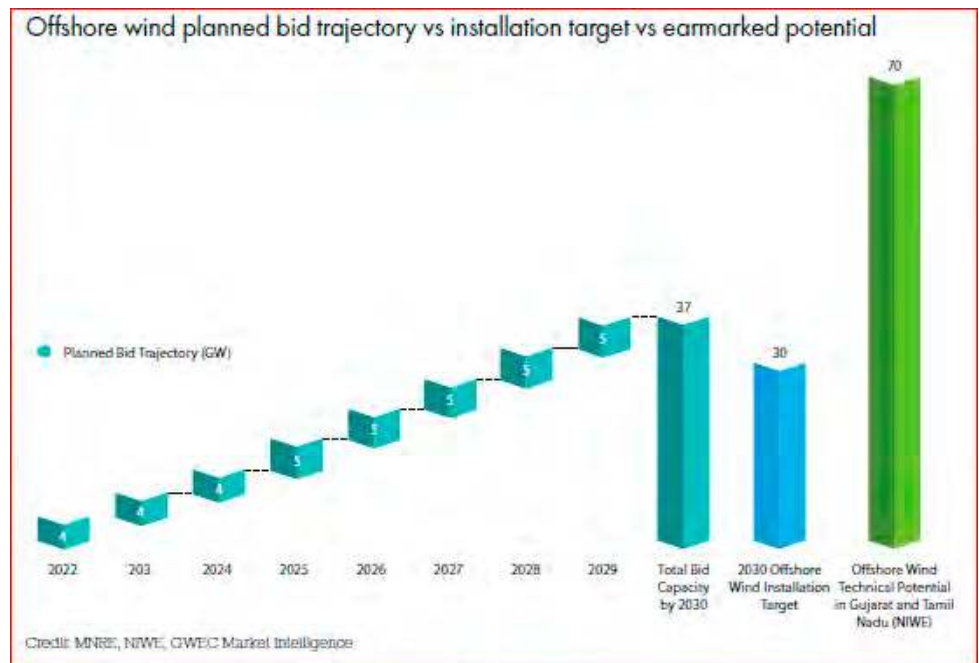
The Indian public sector undertakings (PSUs) have also been encouraged by the government to scale up their renewable energy portfolio by participating in the forthcoming offshore wind bids. This has opened a door for win-win partnerships between international offshore wind players and PSUs.

In recent years, oil and gas company ONGC and the National Thermal Power Corporation (and largest power generator utility NTPC) have entered into a Memorandum of Understanding (MoU) to explore offshore wind opportunities.

Germany-based RWE Renewables and utility Tata Power Renewable Energy have signed a MoU to jointly develop offshore wind projects.

Offshore Wind is Critical to Net Zero by 2070 Goal

Meeting India's net zero target requires a massive push for decarbonisation and renewable energy capacity. This will support the transition from fossil fuels to clean energy as well as meet evolving power demands. While utility-scale renewable energy technologies such as wind and solar face land allocation delays for project development, offshore wind has an opportunity to mitigate or even avoid this legacy challenge.



The MNRE could exploit India's massive offshore wind potential in the medium to long-term to strengthen efforts for climate resilience and energy security. Learnings from countries in Europe showcase the promising role of offshore wind towards supporting India's National Green Hydrogen mission, clean power demand from the commercial and industrial segment and energy exports.

Enabling offshore wind policies will thus be pivotal for driving investor participation and project risk mitigation. A long-term non-solar RPO trajectory specific to offshore wind and a production-linked incentives scheme for domestic offshore wind manufacturing could support a thriving offshore wind industry in the country. Alongside other renewable energy technologies, offshore wind must be provided "deemed generation" status.

Furthermore, a growing pool of innovative financing mechanisms such as blended finance and Green/Masala Bonds for the initial phase of offshore wind market development could be leveraged to support early project financing.

1. <https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1832708>
2. (Zone B1, Zone C1 & Zone E2)
3. <https://www.ukri.org/news/ukri-india-announces-new-initiatives-during-uk-pms-visit-to-india/>
4. These revised estimates are based on recent market changes compared to the 2021 FIMOI report version-1. See: <https://coe-osw.org/first-indian-technology-catalogue-with-offshore-wind-data/>.
5. Global Wind Report 2022, GWEC.

Courtesy: Global Wind Energy Council (GWEC)

Wind Power Bidding Information



To enable DISCOMs of the States to fulfill their non-solar Renewable Purchase Obligation (RPO), through purchase of wind power at a tariff determined by transparent bidding process, Ministry of New and Renewable Energy (MNRE) through Solar Energy Corporation (SECI) has auctioned wind power projects in 11 tranches. Further, States of Gujarat, Maharashtra and Tamil Nadu have also auctioned wind power capacities. The details submitted to Lok Sabha Energy Committee by MNRE in this regard are given below.

Details of Bidding submitted to Lok Sabha Energy Committee by MNRE

S.No.	Bidding	Bid Capacity (MW)	Capacity Awarded (MW)	Capacity Cancelled (MW)	Net Capacity (MW)	Capacity Commissioned (MW)	Bidding Agency	Min. Tariff (Rs./kWh)
1.	SECI-I	1000	1049.9	50	999.9	999.9	Central	3.46
2.	SECI-II	1000	1000	19.9	980.1	750.1	Central	2.64
3.	SECI-III	2000	2000	0	2000	950.2	Central	2.44
4.	SECI-IV	2000	2000	0	2000	636.7	Central	2.51
5.	Tamil Nadu	500	450	0	450	49.5	State	3.42
6.	Gujarat (GUVNL)	500	500	30	470	470	State	2.43
7.	Maharashtra (MSEDCL)	500	500	0	500	274.4	State	2.85
8.	SECI-V	1200	1190	0	1190	0	Central	2.76
9.	NTPC	1200	1150	1150	0	0	Central	2.77
10.	SECI-VI	1200	1200	0	1200	386.5	Central	2.82
11.	SECI - VII	1200	480	0	480	103.5	Central	2.79
12.	Gujarat GUVNL Ph.II	1000	202.6	0	202.6	165	State	2.80
13.	SECI - VIII	1800	440	0	440	0	Central	2.83
14.	SECI-IX	2500	970	0	970	0	Central	2.99
15.	SECI-X	1200	1200	0	1200	0	Central	2.77
16.	SECI-XI	1200	1200	0	1200	0	Central	2.69
Total		20000	15532.5	1249.9	14282.6	4785.8		

August 02, 2022



Tesla and PG&E Launch Virtual Power Plant Programme

Pacific Gas and Electric Company (PG&E) and Tesla Inc. have launched a pilot programme that creates a virtual power plant (VPP) to help support electric grid reliability and save customers money. Through this collaboration, Tesla is participating in PG&E's Emergency Load Reduction Programme (ELRP) pilot by enrolling and combining residential Powerwall home battery systems into a virtual power plant to discharge power back to the grid in California during times of high electricity demand. Participating customers will receive compensation for the energy their Powerwalls discharge.

Source: Smart Energy, July 14, 2022

REC, CEEW Ink Pact on Improving Discoms' Operational, Financial Sustainability

REC Ltd has said that it has signed an agreement with Council on Energy, Environment and Water (CEEW) to collaborate on activities to improve the operational and financial sustainability of discoms, through holistic deployment of smart meters, strengthening of power distribution networks and improved quality of service for electricity consumers.

Source: PTI, 7 July 2022

Hydraulic Systems, Hydraulic Sub-Assemblies and Cooling Systems for Wind Turbines

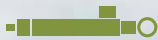
HINE's strong service and aftermarket business division delivers a comprehensive range of hydraulic spare parts and services to help ensure continued high performance:

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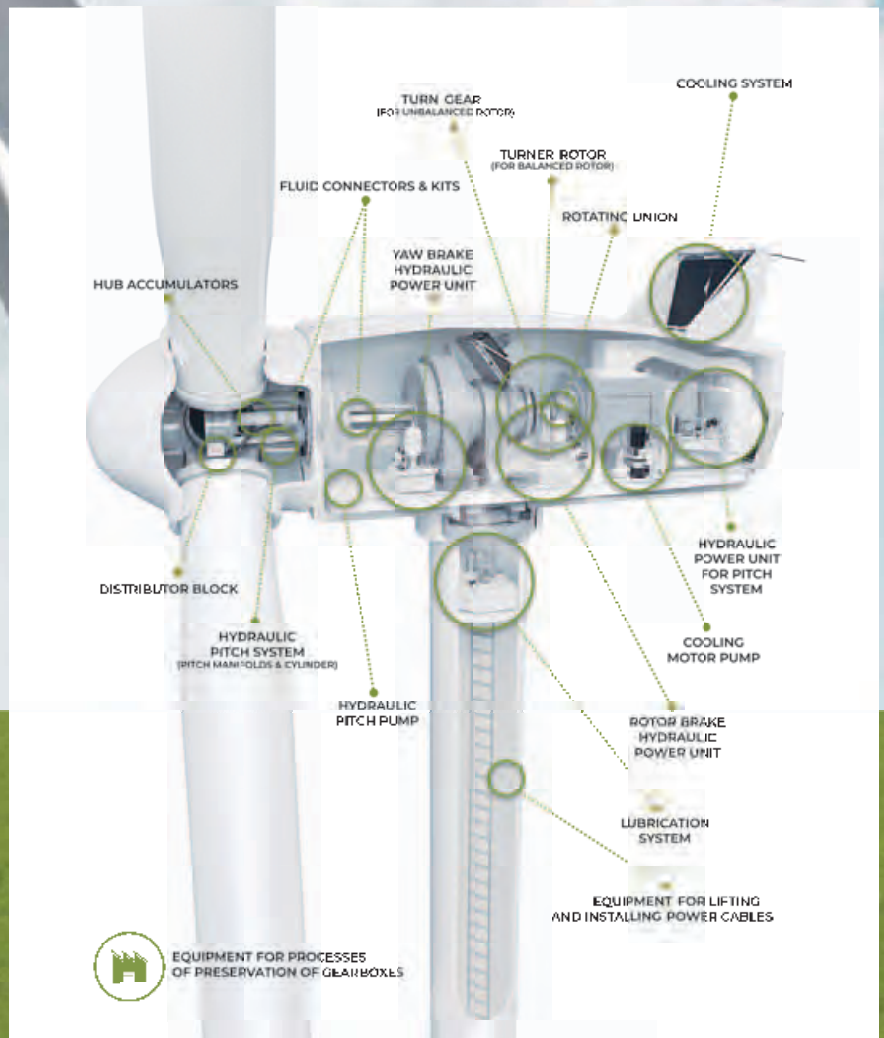
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www.hinegroup.com



India will require \$20 Trillion Capex to achieve Net Zero by 2070: Report

India will need capital expenditure to the tune of a whopping \$20 trillion in order to achieve its ambitious target to achieve Net Zero by 2070, according to a new report. “We developed an in-house India energy model – identifying need for solar, battery and hydrogen – to estimate the total capex needed to achieve net-zero, which we estimate at \$20 trillion over the next 50 years,” research firm UBS said in a report.

Since India’s commitment last year to net-zero carbon by 2070, investors have debated the implications for global commodities given India’s status as a top-five importer of oil, LNG and coal.

“In that period, we expect India to stop importing 3%/3% of current global coal/oil demand and expand its solar generation capacity by 100x. By 2040, we see global trade flows and supply chains rearranging to accommodate India’s changing status from primary energy importer to an exporter of renewable supplies,” the report said.

India’s primary energy demand is likely to nearly double by 2070, with renewables share rising to 72 per cent by 2070, from just 1 per cent in 2019, and 9 per cent of energy from bioenergy and 9 per cent from green hydrogen.

“We estimate \$20 trillion capex to achieve this – 1.2 per cent of GDP over the period – mainly led by private investment. But in the short to medium-term, India’s dependence on fossil fuels will rise, peaking around 2040, further complicating the dynamics of the global energy transition,” the report said.

Significantly, India is expected to overtake China as the leading growth market for oil during this period and continued import dependence would mean sustained pressure on India’s import bill, with current account deficit to last at least till 2045.

Commenting on whether India can achieve self-reliance in solar cells, batteries and electrolyzers, the report points out that although India’s entry into solar PV and battery manufacturing is later than China’s, past experience – example, in 4G implementation – suggests fast-tracking is possible, assuming we see supportive government policies, financing incentives and large corporates backing the transition.

“India’s 265GW/1000GW of renewables installations and 600/7400GWh of battery additions by 2030/40E could support domestic manufacturers, as we expect Indian utilities and OEMs to invest \$2 trillion by 2040,” the report stated.

India can achieve manufacturing capacities of 80 GW per annum of solar PV and 190 GWh per annum of batteries by 2030, placing it among the world’s top-three producers. The country’s solar PV manufacturing capacity target, if achieved, could reposition it in the next decade as a net exporter versus a net importer now.

Courtesy: Energy News Beat, July 28, 2022



Information Regarding Installation of Wind Masts

Ministry of New & Renewable Energy has come to know that numerous wind masts are being erected by WTG companies without any kind of notice or intimation to the defence authorities dealing with flying activities (Army/Air force/Navy). The height of these towers at places is 470 feet and owing to their structural shape, most of the times they are difficult to spot during flying. Thus, these structures need to be incorporated into Aviation Obstruction profile. Accordingly, all developers were requested to furnish the information about all the masts installed by them in a format through email at vishal.mnre@gov.in, at the earliest, latest by 25.07.2022.

Strategy Paper for Establishment of Offshore Wind Energy Projects

Government of India has notified National Offshore Wind Energy Policy-2015 on 6 October 2015 for the development of offshore wind power in the country. Ministry of New & Renewable Energy and the National Institute of Wind Energy (NIWE) has prepared “Strategy Paper for Establishment of Offshore Wind Energy Projects” for detailed information about the offshore wind projects.

27 ——— 30
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Power Generation Capacity to Hit 820 GW by 2030, Over 500 GW from Non-Fossil Fuel Sources, Says Mr. R.K. Singh

In his message at the unveiling of a report -Roadmap to 2030 of The Energy Resource Institute (TERI), Union Power and New & Renewable Energy Minister Mr. R.K. Singh. Mr. Singh said: "By 2030, the total capacity for power production would be about 820GW. Out of that, more than 500 GW will be non-fossil." Pointing out that India had already started adding storage capacity to renewable energy, the Minister said the government had come out with one of the largest bids on storage and was trying to bring down the storage cost by adding volume.

Source: PTI, New Delhi, 27 July 2022

\$369 Billion in to US Energy Security and Clean Energy Programmes

In a historic move, Senator Mr. Joe Manchin stated that he had reached a deal with Majority Leader Chuck Schumer on a budget reconciliation package. Part of the Inflation Reduction Act of 2022, this package allocates \$369 billion for energy security and clean energy programmes over the next 10 years. The extensive energy investment is seen as the most ambitious climate and clean energy package in history.

Source: Smart Energy, 29 July 2022

India and Egypt Sign MoU to Set Up a Green Hydrogen Plant with Investments of \$8 Billion

India and Egypt have signed a MoU to set up a green hydrogen plant with investments of \$8 billion and a capacity of 220,000 tonnes annually in the Suez Canal Economic Zone. The MoUs was signed by a number of government agencies as the first party: New & Renewable Energy Authority, General Authority of the Suez Canal Economic Zone, the Egyptian Electricity Transmission Company, and Egypt's Sovereign Fund; and Renew Power Private Ltd. of India, as the second party. According to the MoU, the Indian company will set up a plant to produce green hydrogen with a capacity of 20,000 tonnes annually, which can be raised to 220,000 tonnes annually, by using renewable energy sources at one location in the Suez Canal Economic Zone.

Source: ET Bureau, 29 July 2022





Roadmap to India's 2030 Decarbonization Target - TERI

Excerpts

The pace of installation of renewables, which has been high, would have to be accelerated very rapidly. Larger shares of variable renewable energy (VRE) need greater flexibility and resilience in grid management, creation of large-scale storage would be essential for providing this resilience and also for fully utilizing the huge increase in solar power generation. Fortunately, solar power with storage has now become cheaper than electricity from new thermal power plants.

Following suggestions have been given in the Roadmap related to wind power and related subjects for achieving India's 2030 Targets:

2. Increase Momentum of Wind Power Growth

- Reintroduce banking. Banking makes it worthwhile for industrial consumers to set-up captive wind farms.
- Incentivize repowering of older wind projects at high-resource sites.
- Commence off-shore wind power development.

3. Introduce Time-of-use (TOU) tariffs

- Have large difference between peak and off-peak consumer tariffs to incentivize flattening of the demand curve.
- Distribution companies (DISCOMs) to undertake separate peaking power procurement.
- DISCOMs to give choice to all consumers, starting with Commercial and Industrial (C&I) consumers to buy carbon free electricity.

3.3 Start Off-shore Wind Development

According to forecasts, global off-shore wind capacity would exceed 2000 GW by 2050 with the Indian region expected to have 140 GW of this installed capacity (MNRE, 2017). According to the National Institute for Wind Energy, total onshore wind energy potential is 302 GW at 100 metres and 695.50 GW at 120 metres hub height. Approximately 36 GW of off-shore wind

13. Details available at <https://mnre.gov.in/img/documents/upload/s/3debfe9158b643d8a3e06a7a007f2ef9.pdf>

14. Details available at http://164.100.47.193/lsscommittee/Energy/17_Energy_17.pdf

potential exists off the coast in Gujarat and nearly 35 GW exists off the Tamil Nadu coast.

However, there are significant challenges to the deployment of off-shore wind farms. These include subsea cabling, turbine foundation, installation of turbines including logistics, and development of transmission connectivity to the state/national grid (National Offshore Wind Energy Policy).¹³ The per megawatt costs of offshore wind turbines are at least 2–3 times higher than onshore wind turbines, according to the MNRE. However, the price of offshore wind turbines and tariffs are expected to decline as the country begins and increases deployment.¹⁴ As in other sectors, with volumes and competition, costs should decline. Further, with the provision of long-term debt, the tariff from such farms could become lower.

This is the right time to initiate the development of offshore wind in the country. For offshore wind, suitable wind farm sites need to be identified and a few promising ones may be taken up for development. Tariff bids may be invited successively providing wind data and other site details to discover the tariff. The transmission system for evacuation from the off-shore wind farm to the grid would have to be separately developed and provided to synchronize with the commissioning of the offshore wind farm. With price discovery through successive rounds of bidding and development in the next 4–5 years, it would be easier to take a call on the pace at which to scale up offshore wind power development.

In wind power, India has established a globally competitive manufacturing industry.

Achieving 2030 goals though challenging is feasible. A rapid acceleration of the pace of new solar and wind power capacity creation has to take place primarily with private investment. Improving the financial health of DISCOMs at the earliest is essential. Markets, domestic as well as international, must not see the risk of delayed payments to RE generators as being real and growing. The central government needs to give this the highest priority and ensure timely payments to maintain market confidence and flow of the higher levels of capital needed for investments for the attainment of the 2030 targets.

Way Forward- Wind

Increase momentum of wind power growth



Keys to the Achievement of India's 2030 COP26 Targets

The following are the key to the achievement of India's 2030 targets announced at COP26:

Renewable energy expansion has been taking place primarily through large grid-scale projects. The unlocking of the potential of decentralized renewable energy generation needs focus and appropriate policies. This paper presents a case for implementation of feed-in-tariff in the kW range for solar generation in India. This would bring benefits to DISCOMs, increase in farmer incomes, create jobs and improve the quality of power supply in rural areas.

Bidding for utility scale wind and solar power projects would need to be scaled up substantially. In addition, offshore wind power development should be initiated.

Solar and wind power generation is variable, intermittent and depends on weather conditions. The integration of solar and wind requires an adequate amount of flexibility in power system. Flexibility would be a key necessity. This would require an ongoing process of power system studies including transient and dynamic stability studies and transmission planning. From these,

the requirement of ancillary services, transmission, and storage will emerge.

India should initiate storage projects using mature technologies for pumped storage plants (PSP), concentrated solar thermal plants (CSP) and batteries. The state would need to take leadership for the development of pumped storage plants after identification of sites in order of priority. With price discovery, and a more realistic assessment of potential of cost reductions, decisions on scaling up in the later part of this decade would become easier.

India should try to become a cost effective and competitive manufacturing hub of RE. The PLI scheme should be extended to cover the full spectrum of renewable energy equipment production, solar panels, mirrors and sensors for solar thermal, batteries for grid use and hydrogen. In addition, public procurement from a prospective date should be used to achieve full value addition in RE manufacturing.

In addition to the Ministry of Power's recent guidelines for green energy open access rules, the DISCOMs need to take the next step and give Commercial and Industrial (C&I) consumers the choice to buy carbon free electricity on a real time basis with separate tariffs. This choice may then be extended to all consumers. This

would give consumers the ability to accelerate the transition to carbon free electricity by paying more initially. Many would choose to do so.

Early action in implementation of the full range of measures needed for achieving 2030 targets is essential. India could be at the global frontier in decarbonization of electricity. At the same time, it could become a competitive manufacturing hub. India could realize its vision of Aatma Nirbhar Bharat with greater energy security.

The projections for various sources of energy for 2030 are given in the adjacent table.

Annexure-I: Projections for 2030

Table 6 shows the share of installed capacity envisaged in 2030 in India by CEA and TERI.

Table 6: Projections of Installed Capacity of India by 2030

S.No.	Source	Unit	Installed Capacity		
			CEA	TERI - BCS	TERI - HRES
1	Coal	GW	267	263	263
2	Gas	GW	25		
3	Nuclear	GW	19	17	17
4	Hydro	GW	61	74	74
5	Solar	GW	280	229	189
6	Wind	GW	140	169	129
7	Other RE	GW	25	33	33
Total Capacity		GW	817	785	705
Non-fossil share		%	64.26	66.50	62.61
Fossil share		%	35.74	33.50	37.39
Battery Energy Storage		GW/GWh	27/108		60/120

Source: CEA, TERI Analysis, 2020

BCS: Baseline capacity scenario

HRES: High renewable energy scenario

Courtesy: The Energy and Resources Institute, 2022



Developed Countries No Match to India in Speed at Achieving Clean Energy Goals

Developed countries are no match to India in the speed at achieving their pledge for clean energy as it has concern for the environment and is working towards becoming self-reliant in the energy sector, Minister of Power and New and Renewable Energy Mr. R K Singh said in the Lok Sabha on 5th August 2022. He made the remarks after moving the Energy Conservation (Amendment) Bill in the House for consideration. The Bill seeks to make it mandatory for buildings with a minimum connected load of 100 kW to meet their energy requirements from renewable sources.

Source: PTI August 06, 2022

Clean Energy Meets 50% of Tamil Nadu's Demand

For the third consecutive day on 8th August 2022, more than 50 per cent of power consumed in the state came from renewable sources including wind, solar, and hydro energy. Thanks to heavy rainfall in Kerala, hydel plants here have been harnessing almost 23 million units daily. It exceeded 25 MU on Monday. Generation of wind energy, too, increased over the week due to favourable wind patterns.

Source: TNN, August 10, 2022

JSW Energy Unit to Buy Renewable Assets from Mytrah Energy for Rs. 10,530 Crore

JSW Neo Energy, a wholly owned subsidiary of JSW Energy will acquire a portfolio of 1,753 MW of Renewable Energy generation capacity from Mytrah Energy (India) Private Limited for Rs 10,530 crore, the company said today. The Mytrah Portfolio consists of 10 Wind SPVs with a generation capacity of 1,331 MW and 7 Solar SPVs with a generation capacity of 422 MW (487 MWp DC), operating primarily in the southern, western and central parts of India.

Source: ET Bureau, August 10, 2022

SJVN to Set up 10,000 MW Clean Energy Projects in Rajasthan

New Delhi: SJVN Ltd on Wednesday said the Rajasthan government has approved signing an MoU with the company for developing 10,000 MW renewable energy projects in the state entailing an investment of Rs. 50,000 crore. These projects/parks will usher in socio-economic development in the state and will open up multiple direct and indirect employment opportunities. company will establish the renewable energy projects on the land banks to be allocated by Rajasthan Renewable Energy Corporation Ltd.

Source: PTI, August 10, 2022

Extraordinary General Meeting Indian Wind Turbine Manufacturers Association (IWTMA) 15th July 2022 at New Delhi

Indian Wind Turbine Manufacturers Association (IWTMA) conducted an Extraordinary General Meeting on Friday, 15th July 2022 at Hotel Le Meridien, New Delhi to elect New Executive Committee and discuss other matters. The following members were nominated as Executive Committee Members for 2 years term (2022-24). Photograph of the meeting is given below.

Executive Committee Members

1. **Mr. A. Gurunathan**, Head - Public Affairs, Siemens Gamesa Renewable Power Private Limited, Chennai
2. **Mr. Anant Naik**, Vice President, Suzlon Energy Limited, New Delhi
3. **Mr. R. V. P. Prasad**, CEO-India Region, Envision Wind Power Technologies India Private Limited, Mumbai
4. **Mr. Saurabh Shankar Srivastava**, Head (Regulatory & Advocacy), Senvion Wind Technology Private Limited, Mumbai
5. **Mr. K. R. Nair**, Director, Emergya Wind Turbines Private Limited, Chennai
6. **Mr. Aman Bansal**, Lead-Sales and Commercial (India Region), Nordex India Private Limited, Bangalore
7. **Mr. Murali Sivaperumal**, Head- Sales and Marketing, ZF Wind Power Coimbatore Limited, Coimbatore
8. **Mr. Hemkant Limaye**, Senior Director - Sales & Marketing APAC & ME & Africa, LM Wind Power, Bengaluru
9. **Mr. U. B. Reddy**, Managing Director, Enerfra Projects (India) Private Limited, Bengaluru



Climate Change: Cabinet Approves India's Updated Nationally Determined Contribution

The Union Cabinet chaired by the Prime Minister has approved India's updated Nationally Determined Contribution (NDC) to be communicated to the United Nations Framework Convention on Climate Change (UNFCCC). The updated NDC seeks to enhance India's contributions towards achievement of the strengthening of global response to the threat of climate change, as agreed under the Paris Agreement.

India at the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Glasgow, United Kingdom, expressed to intensify its climate action by presenting to the world five nectar elements (Panchamrit) of India's climate action. This update to India's existing NDC translates the 'Panchamrit' announced at COP 26 into enhanced climate targets. The update is also a step towards achieving India's long term goal of reaching net-zero by 2070.

India's NDC do not bind it to any sector specific mitigation obligation or action. India's goal is to reduce overall emission intensity and improve energy efficiency of its economy over time and at the same time protecting the vulnerable sectors of economy and segments of our society.

Source: PIB Delhi, 3 August 2022



India to Witness Sales of 5 Crore EVs by FY 2030

While India's initial journey towards e-mobility has been encouraging, the current rate of growth of EV sales shows that India is projected to witness sales of 5 crore EVs by FY 2030.

Source: Emobility + India, 2nd August 2022

Renewable Energy: Power Ministry Proposes Central Pool with Uniform Tariffs

The Power Ministry has suggested creating a central pool of renewable energy (RE) sources from which an intermediary company will procure power to be supplied to an entity that will undertake distribution and retail supply to more than one State. The Ministry has also proposed that standalone Energy Storage System (ESS) will be a delicensed activity at par with a generating company (Genco) as well as timely recovery of power purchase costs by distribution licensees (Discoms).



Regulatory Update on Wind Power

Central Nodal Agency for Setting Up and Operating a Single Window Green Energy Open Access System For RE

Recently on June 6, 2022, the Ministry of Power had notified the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022. Now the Ministry of Power, Government of India has notified the Power System Operation Corporation Limited as Central Nodal Agency to set up and operate a single window green energy open access system for renewable energy (RE) vide Notification dated 8th July 2022.

Renewable Purchase Obligation (RPO) and Energy Storage Obligation Trajectory till 2029-30

Ministry of Power, Government of India has issued the order F. No. 09/13/2021-RCM dated 22nd July 2022 regarding Renewable Purchase Obligation (RPO) and Energy Storage Obligation Trajectory till 2029-30. A joint committee under the co-chairmanship of Secretary, Ministry of Power and Secretary, Ministry of New and Renewable Energy was constituted on 17 December 2020. On the recommendations of the joint committee and further discussions with the MNRE, Ministry of Power has specified the RPO Trajectory (See adjacent Table) from 2022-23 till 2029-30.

Year	Wind RPO	HPO	Other RPO	Total RPO
2022-23	0.81%	0.35%	23.44%	24.61%
2023-24	1.60%	0.66%	24.81%	27.08%
2024-25	2.46%	1.08%	26.37%	29.91%
2025-26	3.36%	1.48%	28.17%	33.01%
2026-27	4.29%	1.80%	29.86%	35.95%
2027-28	5.23%	2.15%	31.43%	38.81%
2028-29	6.16%	2.51%	32.69%	41.36%
2029-30	6.94%	2.82%	33.57%	43.33%

- Wind RPO shall be met only by energy produced from Wind Power Projects (WPPs) commissioned after 31st March 2022.
- HPO shall be met only by energy produce from LHP (including PSPs), commissioned after 8th March 2019.
- Other RPO may be met by energy produced from any RE power project not mentioned in (a) and (b) above.

F.Y.	Storage (on Energy Basis)
2023-24	1.0%
2024-25	1.5%
2025-26	2.0%
2026-27	2.5%
2027-28	3.0%
2028-29	3.5%
2029-30	4.0%

Storage Obligation

The adjacent table shows the percentage in of total energy consumed shall be solar/wind energy along with/through storage.



India's Annual Green Finance is Just One-Fourth of its Needs, Finds Study

An analysis and advisory organisation has released an update on India's "first-ever effort" to track green investment flows, which are falling far short of the country's current need for its ambitious climate targets. Climate Policy Initiative in its report titled 'Landscape of Green Finance in India', has claimed that "the tracked green finance in 2019-2020 was Rs. 309,000 crore (nearly USD 44 billion) per annum, which is less than a fourth of India's needs". The report estimates that for India to achieve its Nationally Determined Contributions (NDCs) under the Paris agreement, the country requires approximately Rs. 62.5 lakh crore (USD 2.5 trillion) from 2015 to 2030 or roughly Rs 11 lakh crore (USD 170 billion) per year, the US-based organisation said in a statement.

Source: PTI August 11, 2022

Parliamentary Panel Suggests Viability Gap Funding for Offshore Wind Projects

The Parliamentary Standing Committee on Energy has suggested offering viability gap funding (VGF), which is estimated at more than Rs. 27,700 crore, for setting up offshore wind energy projects and related transmission infrastructure to evacuate power. Emphasising the higher capacity utilisation factor (CUF) of offshore wind energy farms compared to onshore ones, the panel suggested that the Ministry of New & Renewable Energy (MNRE) should launch time-bound environmental impact assessment studies for setting up such projects.

Source: Business Journal, August 15, 2022

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Editor: Dr. Rishi Muni Dwivedi



Axis Energy Venture India Private Limited

Axis Energy Venture India Private Limited ("Axis Energy") is exclusively into the renewable energy sector. Its mission and associated activities revolve around the notion of sustainable development and an environment friendly vision to impart zero carbon footprints. Axis Energy Group is known for its successful implementation of projects that it has committed to and is well recognized for its success in every project it takes up.

With an accelerating growth and a potential to grow beyond boundaries, Axis Energy is now a successful integrated project developer with strong implementation capabilities and highly intensive technical team. The sheer hard work and the grit to achieve nothing less than success attitude of Axis Energy has attracted many big players in the market to associate themselves with Axis Energy. Suzlon, one of the world's largest wind turbine manufacturers has collaborated with Axis Energy to develop 4 GW of wind power projects in the State of Andhra Pradesh out of which more than 1 GW of projects have been delivered. A manufacturing unit for manufacturing the wind turbine rotor blades was also set up under this collaboration.

Based on strong technical and project implementation capabilities inherent to Axis Group, Brookfield, a Global Alternative Asset Manager with over US\$725 billion of assets under management and one of the largest FDI investors in India with over US\$ 16.1 billion of assets under management has partnered with Axis Energy for establishing Renewable Energy projects in India through a Joint Venture platform "**ABC Renewables**" and a capacity of more than 1.7 GW under this platform is under various stages of implementation. Recently, Axis Energy through this platform has commissioned 445MWp solar project in a record time of 6 months in Jodhpur, Rajasthan. This commissioned project is estimated to contribute towards minimizing carbon emissions and progressively move towards preservation of environment and promotion of sustainability.

The project is expected to avoid ~600,000 tons of CO² emissions per year or the equivalence of planting 24 million trees while generating 800 GWh of clean energy annually.

Apart from this, Axis Energy Group actively promotes clean energy through clean mobility alternatives and has become one of the successful winners for the Production Linked Incentive Scheme of Government of India for 'Automobile and Auto Component Industry' under the non-OEM category as is in the process of setting-up of clean mobility business.

Mr. Ravi Kumar Reddy, Chairman and the Managing Director of Axis Energy Group is a well grounded and a versatile personality who thinks beyond the company and always aims at intensifying the concept of sustainable and eco-friendly development all over and promote the renewable energy sector. He is the Chairman of ASSOCHAM, Telangana, Founder trustee member of NSEFI, President Andhra Pradesh and Telangana statechapters of IWPA, an active member of the WIPPA and IWTMA.



Mr. Ravi Kumar Reddy
Chairman and the Managing Director
Axis Energy Group





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INDIAN WIND TURBINE MANUFACTURERS ASSOCIATION

is happy to be associated with achieving India's long term goal of reaching Net-Zero by 2070.

Wind is the Answer

