Indian Wind Power

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Wind Power NetZero by 2070

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NATIONAL INSTITUTE OF WIND ENERGY

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

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IWTMA
INDIAN WIND TURBINE MANUFACTURERS ASSOCIATION

Indian Wind Power

A Bi-monthly Magazine of Indian Wind Turbine Manufacturers Association

Volume: 8 Issue: 6 February - March 2023

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Indian Wind Turbine Manufacturers Association

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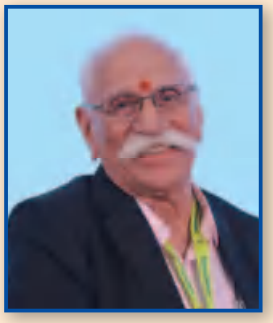

From the Desk of the Secretary General – IWTMA

Dear Readers,

Greetings from IWTMA!

2023 is a special year of Celebration to IWTMA. Established in 1998, we take pride and joy in celebrating the Silver Jubilee celebration of IWTMA later this year. A walkdown memory lane with a sense of pride and satisfaction on the milestones of the wind industry journey and the role of Original Equipment Manufacturers and Component Manufacturers to score many points like manufacturing state-of-the-art technology turbines at the lowest cost in the world, championing "Make in India" over two and half decades and to reach 70% indigenization.

Our contribution includes positive impact to rural economy where wind farms are situated and creating employment to rural youth. The saga doesn't end there, as we progress towards Offshore wind energy, products of Green Hydrogen and Green Ammonia as future power drivers.

The Association will celebrate Global Wind Day on 15th June 2023 and in October 2023, IWTMA will conduct its 5th edition of flagship event "Windergy India 2023", an international conference and trade fair, to be held from 4 – 6th October 2023 with support from all stakeholders for a grand success. We offer our humble gratitude and millions of thanks to Ministry of New & Renewable Energy, stakeholders, all other allied agencies and our esteemed readers who have been part of this beautiful journey.

The theme of this issue is "Net Zero by 2070 and Wind Power". Renewable Energy plays a very large role as the increase on reliance of fossil fuel generation is a major concern of environmental pollution. Fossil fuels account for more than 60% of total global power generation. Coal, a major source of GHG emissions, accounts for more than 35% with natural gas accounting for more than 23%. To achieve the net zero target, a greater emphasis has been placed on clean energy generation sources such as wind, solar, geothermal, and nuclear. Clean energy currently accounts for about 42% of total power generation with renewable energy accounting for around 30%.

"Net Zero Emission" target, the power generation scenario will change dramatically. The proportion of clean and renewable energies will rise dramatically. According to the International Energy Association (IEA), the share of clean and renewable energies will increase to 72% and 61% respectively by 2030 and 96% and 88% respectively by 2050, if countries pursue the "Net Zero Emissions target of 2050".

Happy reading and look forward to meeting you all at Chennai in October 2023!

With regards,
D.V. Giri
Secretary General

Baby Steps of Wind Power in India

Madhusudan Khemka
Wind Energy Veteran

IWTMA (Indian Wind Turbine Manufacturers Association (IWTMA) was established in 1998 and is celebrating its silver jubilee this year. We wish to bring interesting anecdotes from the veterans of Indian Wind Power Industry about the journey of wind power in India. The first Artefact is presented here from Sri Madhusudan Khemka, a veteran in wind power industry.

The initial journey of wind power in India is very interesting. The real commercialization of wind energy in India started in 1990 with DANIDA[1] project of 20 MW, out of that 10 MW was installed in Tamil Nadu by NEPC and 10 MW was installed in Gujarat by Vestas RRB[2]. This project was with 200 kW machines with 30 meter of hub height and to start with it was 28 meter rotor diameter. But that project really kicked in real commercialization of wind energy in India.

When DANIDA project was under execution and no machine was commissioned, NEPC took huge initiative in exploring private sector market and the very first private sector project was done by NEPC in the state of Tamil Nadu in Muppandal. Pandian Chemical Group including Metal Powder Company and Tamil Nadu Chloride were the 3 first customers who placed order for 2 wind turbines, each of 250 kW capacity.

Initial Challenges in Installation

As the machine hub height was 30 meter and a rotor diameter was also around 30 meters, even then there was a huge challenge in getting cranes and other equipments for erection.

NEPC persuaded one crane company which is Sanghvi Movers to buy a new crane for the purpose of installation of these machines. And unfortunately during the first installation itself the crane broke down and its boom was bent because of poor handling by the crane operator and we were facing regular challenges at sight.

The site was identified as Kartradi Malai (Windy Hill) near Muppandal and that was one of the highest generating site in the country apart from the open the site of TNEB. When the Director of Micon, who was collaborator of NEPC at that time landed at Muppandal site for the first time, he assured that Muppandal will be one of the best sites in the world. And that was proved later on. There was a huge initiative and a passion with which NEPC was working.

How Tamil Nadu Industries Took Lead and Benefitted with Wind Energy

Fortunately, I was part of that project and we were doing door to door canvassing people that they should get into renewable energy-wind energy projects and they can get benefit of a very cheap energy in long run apart from having tax benefits.

To give you an example, when people invested money and installed wind turbines to produce wind energy, they had some calculation for generation of power for next 20 years. That means they were freezing the power cost for next 20 years. And the machines which were installed in the beginning of 1990s, that cost of generation was working out closer to some 30 to 35 paise. Whereas during that period between 1990s to 2000, there was a huge increase in power cost year on year nearly 12 to 15%. So these companies made huge profits because they were mostly textile companies or cement companies or chemical companies, where power consumption was huge and power was contributing as a raw material in their production cost. But all these companies who had invested into wind energy, their power cost was predetermined and freezed and never went up. So they were very profitable in their production cost and they remained always highly profitable because of that. These are few things how the Tamil Nadu industries took lead in wind power and benefitted.

Of course, NEPC did huge amount of indigenisation. The very first contract of Danida came with the condition that few towers of those wind turbines will be made in India. There was no facility to make those towers in India. NEPC invested very big amount in creating a unique bending machine or a plate bending machine. And then slowly did a lot of indigenisation and

ultimately it had 100% indigenisation for its 250 kW and 400 kW machines. This is how it started.

To Powerful Machines

Then in my second innings in Regen Powertech, we came with a unique technology of gearless machines in 2007 and that was the biggest machine at that time with 1.5 MW capacity. It was a gearless machine with permanent magnet generator, again a unique technology and we were able to get into very quickly in the market and we made very good progress. Within no time, we became number 2 wind turbine manufacturer after Suzlon, who was very well established by that time. We were getting orders from all the big companies. The very first IPP (Independent Power Producer) order was taken by Regen Powertech that was from Indian Energy, a UK based company and the concept of IPP was introduced in the country by us.

Here again a lot of indigenisation efforts were made and almost 90% of the wind turbine of 1.5 MW machine was made in India and most of the things were made in Regen Powertech factory itself.

References

1. DANIDA (Danish International Development Agency) is the brand used by the Ministry of Foreign Affairs of Denmark when it provides humanitarian aid and development assistance to other countries, with focus on developing countries. DANIDA has helped Indian wind industry a lot with its technical and financial assistance.
2. Vestas RRB India Ltd. was a Joint Venture between Denmark-based Vestas Wind System and RRB Engineers and Consultants.

India Plans to Smarten its Transmission System

Government of India has approved recommendations to modernise the transmission system as necessary to improve the reliability and affordability of power.

While the full report of the task force chaired by the chairman and managing director of the country's national transmission utility Powergrid doesn't appear to have been made publicly available, a statement refers to a "modern and smart power transmission system" with features such as real time monitoring and automation, better situational assessment, enhanced utilisation of the transmission capacity, self-healing capability and greater resilience against both cyber-attacks and natural disasters.

The system also should be able to manage an increased share of renewable capacity in the power mix, to meet India's renewable energy goals.

Underlying this will be centralised and data driven decision-making, the development of predictive maintenance with AI and machine learning and the use of drones and robotics for the construction and inspection of transmission assets.

"A modern transmission grid is necessary to achieve the government's vision of 24/7 reliable and affordable power and to meet sustainability goals," said India's minister of Power and New & Renewable Energy, R. K. Singh, following the approval.

"A fully automated, digitally controlled, fast responsive grid which is resilient to cyber-attacks and natural disasters is the need of the hour."

The task force, which included representatives from the state transmission utilities, other ministries and research organisations among others, recommended a "bouquet of technological and digital solutions" which can be adopted to make the state transmission grids future ready, according to the statement.

These are broadly grouped under the categories of modernisation of the existing transmission system, the use of advanced technology in construction and supervision and operations and management; a smart and future-ready transmission system and up-skilling of the workforce.

These will start to be implemented and run over the next five years. With the adoption of the recommendations, the Central Electricity Authority was charged with formulating the necessary standards and regulations for the adoption of the solutions identified – SCADA, FACTS, WAMS, PMUs, etc. – and setting benchmark performance levels for the country's transmission network.

Courtesy: Smart-Energy.com, 10 March 2023

The Role of Wind Power in India's Net Zero Journey

Fostering Growth of Wind Power Projects in India

Jaideep Saraswat
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Varun BR
Senior Policy Officer, Clean Power, Electric Mobility & Green Hydrogen

Srinivas Krishnaswamy
CEO

Vasudha Foundation

As countries around the world are releasing their net-zero plans, wind and solar technologies are acting as important vectors to ensure effective implementation[1]. Technologically evolved, inherently abundant and innately carbon-free, these renewable sources can drive emission reduction momentum.

In August 2022, the Government of India submitted its enhanced Intended Nationally Determined Contributions (INDCs) to the United Nations Framework Convention on Climate Change (UNFCCC)[2]. In this, India aims to achieve net-zero emissions by 2070. This long-term target is buttressed with short- to medium-term targets like reducing the emissions intensity of GDP by 45 percent by 2030 in comparison to 2005 levels and deriving 50 percent of cumulative power installed capacity from non-fossil fuel sources by 2030[1].

As per the draft National Electricity Plan released by the Ministry of Power (MoP) in September 2022, the estimated renewable installed capacity will be around 569 GW in 2031-32[3]. Of this solar and wind will contribute around 467 GW as illustrated in Figure 1.

This underscores the importance to streamline the addition of these RE projects as around 45 GW[4] must be deployed annually to meet this behemoth capacity.

Tepid growth of WPPs

To date, the total installed wind capacity is over 42 GW[5]. Moreover, the wind sector has seen a tepid growth in the last few years with only around 1.5 GW of installation per year for the last

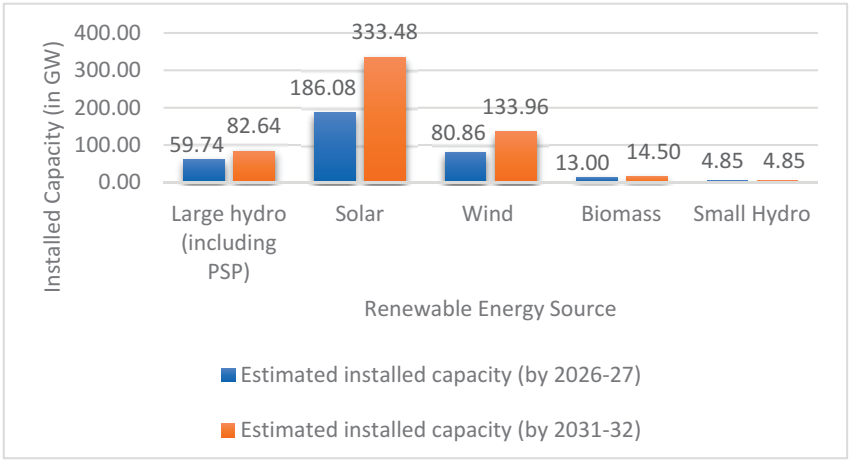

Figure 1: Source-wise breakup of projected RE capacity addition

5 years as observed in Figure 2. However, estimates by the National Institute of Wind Energy (NIWE) peg the total wind potential at 120 m hub height to be around 695.51 GW. Clearly, there is a stark dissonance between the targets set and the on-ground implementation. This can be attributed to systemic issues in the wind sector, especially around the tendering process based on reverse bidding.

Though reverse bidding has driven deployment of solar, the case is different for wind. The wind potential is not equally distributed across all states. Only 8 windy states[7] possess around 97% of the total wind potential in India[8]. Furthermore, even a higher Capacity Utilisation Factor (CUF) is obtained in only a few of these states. Thus, developers are virtually constrained to deploy wind installations in these states which has created operational bottlenecks owing to limited land and transmission capacity availability. This led to a ripple effect resulting in a decrease in the release of tenders from central and state entities which subsequently lowered interest among the developers.

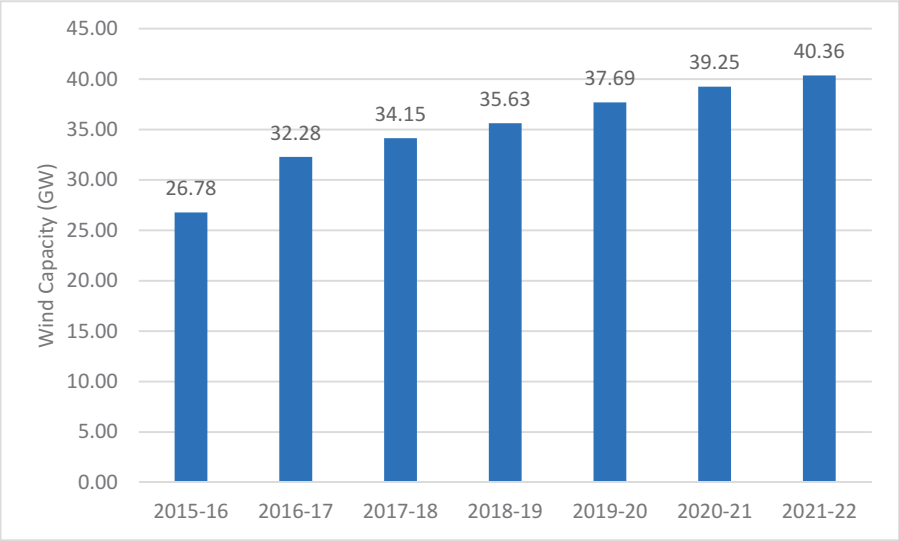

Figure 2: Installed wind capacity[6]

Changing the Course by Sticking to Old Practice

Cognizant of these issues the Ministry of New and Renewable Energy (MNRE) constituted a committee to furnish recommendations.

On January 9, 2023, MNRE released an office memorandum revising the competitive bidding mechanism for procurement of power from WPPs from reverse bidding to single stage two envelope (technical and financial) closed bid criteria along with a suite of other changes. The bidders meeting the technical requirements will be considered for the financial bid and subsequently, the lowest bidder will be awarded the project.

It is further proposed that every year cumulative bid capacity will be 8 GW till 2030. And bid size for each state is capped at 2 GW. In the case of a single bidder, the remaining capacity will be transferred to the next tender. This will be achieved via composite state-specific bids for all 8 windy states (8 sub-bids). Consequently, the bidder for each state will be chosen independently. There are also provisions to penalize the qualified bidders in case of delay in project execution. Finally, the tariffs from all the bids will be pooled as per the notified Electricity (Amendments) Rules, 2022, and will be offered to Discoms.

This move will hopefully increase the pace of deployment of wind power capacity and help to achieve the wind potential estimated by NIWE.

Closing Remarks

Ambitious targets must be ably supported by conducive policies. In India's crusade to achieve its INDC targets, the wind has a significant role to play. Over 90 GW[3] in wind capacity is to be installed to keep up with the targets. However, we observe that one size fits all solutions have stagnated the growth in the wind sector. Cognisant of the wind sector's state, the recent amendments to the competitive bidding mechanism for procurement of power from WPPs is a welcome move. Further, exploring options such as open access provisions for the wind sector will aid in strengthening growth. There is a need to probe a unique approach to realise the wind sector's potential. With almost 80 percent[9] indigenisation achieved in domestic manufacturing, the odds are in the wind sector's favour, and this must be capitalised on.

To sum up, the Wind Sector indeed has a major role to play in India's Net Zero Journey. India already has immense in-house capabilities and expertise to manufacture wind turbines and so also has a robust supply chain in place in the form of competent medium and small enterprises to manufacture components in-country to scale up wind power capacity additions. Further, the wind industry can be a classic example of "Make in India" for which a strong push has been given by the government. A small push by the government in terms of adequate policy framework will give a major boost to the wind industry and result in the wind industry playing a significant role in India's net zero journey.

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2. *https://unfccc.int/sites/default/files/NDC/2022-08/India%20Updated%20First%20Nationally%20Determined%20Contrib.pdf*
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WE CREATE BALANCE

Sustainable business starts with LM blades. With our '10 steps to becoming a carbon neutral business' we share our experience as the first carbon neutral business in the wind industry

Find out why you need a carbon neutral blade manufacturer in your supply chain:

- **Be a leader,** we were the first in the industry to take this step. Act now! Take a leap forward with us towards a greener future.
- **Increase efficiency,** because sustainability is a great driver for efficiencies and cost reductions and keeps the business in balance.
- **Meet customer expectations,** your customers – global corporations, utilities and wind park developers – increasingly have goals to reduce carbon throughout their supply chain.

Start your journey at:
lmwindpower.com/en/sustainability/go-carbon-neutral

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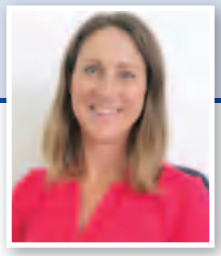
Reducing Greenhouse Gases with Circularity - A Team Effort



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When considering our impact on the environment, it's no surprise that companies often start by looking inward at their own processes and operations. This is often where we find the 'low hanging fruit' - the quickest and easiest targets for change. However, it is now well documented that most of a company's greenhouse gases are typically generated outside of its own factory gates, so the broader picture of the value chain, both upstream and downstream of an organisation must also be considered. This is invariably a more challenging task. So where do we start?

Data as a Limiting Factor

The concept of Circularity is a good place to start. Circularity, in a nutshell, is when a product can be returned into the supply chain after use, with no waste throughout the process or at the end. By considering the lifecycle of a product in a circular rather than linear way, and aiming to reduce the impact on the environment at every stage of a product's life, not just when it is within your hands as the manufacturer, you start to see where you can have the quickest and biggest results, as well as plan for longer term change and adaptation. But this has to be a team effort.

Understanding your product lifecycle is a complex process that requires input and collaboration not only from your own design and manufacturing teams, but also from suppliers, transport providers and end users. The data are not always available or reliable, so often assumptions must be made to get meaningful results. This isn't a quick process or a perfect one. But it is a starting point.

…considering the lifecycle of a product in a circular rather than linear way, and aiming to reduce the impact on the environment at every stage of a product's life, not just when it is within your hands as the manufacturer…

Let's look at some of the key stages of a lifecycle approach which fall outside the company's direct operations.

Starting with Sustainable Design

Designing your component from the outset with consideration to circularity is an ideal scenario, but many companies will also be looking at how they adapt current products to have a lower impact on the environment and be manufactured with reduced waste, formulated with fewer harmful chemicals or processed with lower energy requirements.

There are frameworks available to help you do this. For example, the Safe & Sustainable by Design (SSbD) framework is being established through the European Union Chemical Strategy for Sustainability in response to the European Green Deal ambition for a toxic-free environment. Criteria for chemicals to be regarded as safe & sustainable-by-design must address the three pillars of sustainability – environmental, social and economic – and take a life cycle approach, identifying points in a product's life where impacts can be minimized as effectively as possible.

Companies can take such frameworks as a starting point and integrate the principles into their own product development process. A key goal as a composites manufacturer might be, for example, to

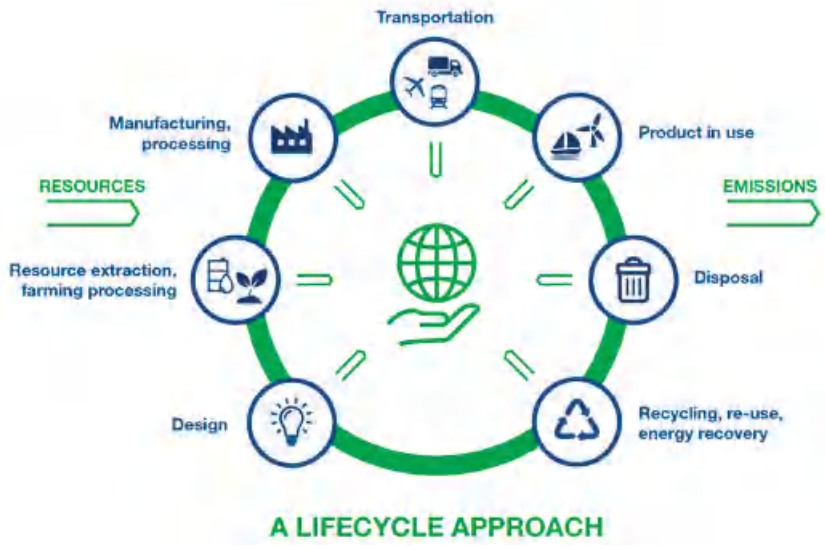

Figure 1: A Lifecycle Approach
(All images are Gurit copyright)

substitute or minimise the production and use of substances of concern, in line with and beyond upcoming regulatory obligations. However, the principles can also extend beyond safer chemicals

Figure 2: REPOXYBLE consortium members at the project launch in Jan 2023

and lower carbon footprint products by encompassing customer uses, product lifespan and end of life considerations.

Another route to addressing the design stage of the lifecycle approach is to work with others in your industry. By pooling knowledge and collaborating on common challenges, solutions can be reached more quickly and will likely be more effective. In the composites sector, the Horizon Europe #REPOXYBLE project, which includes universities, companies and end users from across Europe, aims to create a new class of high-performance materials to address recyclability and end of life issues. Guided by the principles of Safe and Sustainable by Design (SSbD), the approach will be holistic and multi-disciplinary, and demonstrate the power of teamwork.

Influencing the Supply Chain

Of course, to develop a more sustainable design, you need input from your suppliers. Data collection along the supply chain is a complex task due to the absence of standards and the unavailability of certain data.

Third party software platforms can be used in conjunction with a company's own processes and available industry databases to help collate data. They can perform preliminary screenings, based on sector and country risks, to provide a snapshot of the overall landscape of the company's supply chain. You can also

Figure 4: Spabond 800 epoxy adhesive can save wind blade manufacturers 2-3 hours of cycle time

request LCA (Life Cycle Analysis), EPD (Environmental Product Declaration) and GHG (Green House Gas) data from your suppliers, and use the platform to undertake more in-depth analysis of their ESG (Environment, Social, Governance) risk.

This allows you to understand and manage the sustainability risk of your procurement decisions, gives you the necessary inputs when developing your products and processes, and ensures that all parties are aligned in their commitments to sustainability and reducing their impact on climate change.

Reducing Energy Use for Our Customers

There is an opportunity in the circularity and lifecycle approaches for companies to consider how the product will be used and to develop products that help their customers reduce their own carbon footprint.

Initiatives like the Gurit OptiCore design platform that helps blade manufacturers optimise material use, reduce waste and minimise production time (see Indian Wind Power issue Dec 22-Jan 23); or Gurit Spabond 800 epoxy adhesive launched last

Figure 5: Opticore software enables kitting of core materials to reduce waste and minimize production time

Figure 3: Gurit strives to extend both the coverage and quality of GHG data from the supply chain

year, which saves blade manufacturers 2-3 hours of cycle time at 70-80 deg C, substantially reducing emissions, energy consumption and cost.

Composites Recycling Research Initiatives Continue to Expand

Recycling composites, and therefore wind blades, is not straight forward. Composite structures are inherently mixed material structures, which have been designed to withstand harsh environmental conditions over many decades of use and are therefore not easily recycled. Although several different recycling approaches currently exist, there is a trade-off between the economic cost of processing waste, the environmental impact, and the value of the reclaimed material.

More and more research bodies are initiating programmes which look at the recycling of composites, and it is important for material suppliers and blade manufacturers to get behind them so there can be an industry-wide approach. The University of Portsmouth (UK)'s Centre for Enzyme Innovation is a great example of this. It is a world leader in the research of enzyme-enabled solutions for the circular recycling of plastics, home to 30 scientists across a range of disciplines and custom laboratories. Their research has expanded to address a diverse range of plastics, including mixed waste streams and composites, materials that are often incinerated or end up in landfill and leak to the environment.

Other end of life options exist. Currently blades can be reused in sections in landscaping or geotech projects, or reused as a whole blade at another farm. And whilst chemical and mechanical processes to separate and recapture the raw materials exist, they are currently still limited by environmental or economic cost, or have low technological readiness. We still do not have a viable large-scale solution that deals with the ultimate end-of-life, other than landfill.

Reducing our impact on the environment and emissions through circularity is an industry-wide issue. Every company can put systems and processes in place internally and make changes to their own operations, and that is certainly a start, but it's not something that we can solve by ourselves, as individual silos. We must get involved with ground-breaking industry research projects, have open and transparent discussions with suppliers and customers, and encourage collaborative innovation. By working together, we can get the job done.

Eight-Fold Rise Seen In Jobs in Solar and Wind Energy Sectors, Says Report

India's solar and wind energy sectors added 52,700 new workers in project development roles in the last financial year, an eight-fold increase from financial year 2021, according to a joint report by the Council on Energy, Environment and Water (CEEW), NRDC India (Natural Resources Defence Council India), and Skill Council for Green Jobs (SCGJ). Nearly 99% all of the new workforce (52,100 workers) were employed in the solar energy sector, with the wind energy sector registering very small growth (600 new workers). India's solar and wind energy sectors employed 1,64,000 workers as of FY'22, showing a 47% increase from FY'21. 84% of this workforce is in the solar energy sector. Were these trends to continue, new on-grid solar (238 GW) and wind (101 GW) capacities — planned as part of India's commitment to ensure half its electricity, or nearly 500 GW, is from non-fossil fuel sources — can potentially create about 3.4 million jobs temporary and permanent jobs, the report suggests.

Source: The Hindu, February 11, 2023

Board of Power Grid Approves Investments of about Rs 4,071 Cr

Power Grid Corporation's board has approved investments of nearly Rs 4,071 crore for two transmission projects in the country one for Kurnool Wind Energy Zone/Solar Energy Zone (AP) Part-A and Part-B at an estimated cost of Rs 3,546.94 crore, scheduled to be commissioned by November 2024 and other for Eastern Region Expansion Scheme-XXIX (ERES-XXIX) at an estimated cost of Rs 524.04 crore, scheduled to be commissioned by November 2025.

Source: PSU Watch, 7 March 2023

Adani Commissions World's Largest Solar-Wind Hybrid Project

Adani Green Energy has announced that it successfully commissioned a 700 MW solar-wind hybrid project in the northern state of Rajasthan in Jaisalmer district, the world's largest hybrid power project. Adani has three other solar-wind hybrid projects in the district with a combined capacity of 1,440 MW. The company has claimed that the project will deliver power at a capacity utilization factor of at least 50%, making it the most efficient solar or wind power project in India.

Source: CleanTechnica, 9 March 2023

Power Ministry Panel Suggests Real-Time Monitoring of Grid

The country will soon have a modern and smart power transmission system with features such as real-time monitoring and automated operation of grid. Also, there will be better situational assessment, capability to have increased share of renewable capacity in the power-mix, enhanced utilisation of transmission capacity and greater resilience against cyber-attacks as well as natural disasters.

These are some of the main recommendations by a task force, set up by the power ministry to suggest ways for modernisation of the transmission sector and making it smart and future ready. The panel has also suggested centralised and data driven decision-making and reduction in forced outages through self-correcting systems. A modern transmission grid is vital to achieve the government's vision to provide 24x7 reliable and affordable power to the people and also meet the sustainability goals. A fully automated, digitally controlled, fast responsive grid which is resilient to cyber-attacks and natural disasters is also the need of the hour.

Source: IANS, 7 March 2023

Centre, Tamil Nadu Government Must Join Hands to Reap the Wealth in the Wind Off TN Coast

There is a win-win-win opportunity for Tamil Nadu economy, Sri Lanka's energy needs, India's green and foreign policy ambitions.

Arvind Subramanian, former Chief Economic Adviser, Government of India, he is currently advising the Tamil Nadu government on power sector reforms and the green transition.

Prime Minister Mr. Narendra Modi has laudably prioritised renewables in the government's domestic, economic and energy policy. He has also elevated its status in international discussions, notably, in the G20. The Chief Minister of Tamil Nadu, Mr. M K Stalin, has similarly embraced the green vision, committing the state to even faster adherence to the net zero target than the country (2050 versus 2070).

The two can come together in a bout of cooperative federalism to produce economic and energy benefits for Tamil Nadu and the country, and to advance India's foreign policy goals. The surprising opportunity is in off-shore wind energy. Consider how.

The waters between Tamil Nadu and Sri Lanka are amongst the world's best locations for generating offshore wind power (applied to wind not white whale, the sailors' shouts in the novel Moby Dick are resonant: "There she blows! - there she blows!") The sites are relatively close to the respective coasts and the winds are strong. Most distinctively, the energy generated is not intermittent. It is only available for about seven months, but during that period, the winds blow reasonably consistently, day and night. The readily exploitable energy potential for Tamil Nadu is estimated at about 15 GW, which is greater than its current renewable (wind and solar) capacity.

It is in the nature of off-shore wind that the investments to exploit it - turbines, cables, ports - and indeed to use the energy generated either require or benefit from proximity. Proximity means that less of the installation and maintenance of the large wind turbines can be done at sea and more on shore. It also encourages agglomeration via standardisation, sharing of logistics and reduced transmission expenses. Tamil Nadu, therefore, stands to gain significantly. India's green hydrogen initiative could also be a beneficiary as the ocean becomes the source and site of converting green electrons to chemical molecules. For example, ammonia could be produced and shipped to foreign markets directly from the Gulf of Mannar.

As in many areas of economic policy, both the centre and the state have to cooperate to maximise the benefits. Since the waters are international and sensitive, and the seabed a national property, the Government of India has to be involved. At the same time, investments can only be successful if the state government of Tamil Nadu addresses a number of implementation challenges, especially the politically sensitive ones of acquiring land, eliciting the cooperation of local communities (for example, fishing) and developing the local infrastructure.

Developing this off-shore potential is not proceeding as fast as it might. For example, even the detailed energy assessment that is a precondition for attracting investment has not been completed. But the centre and Tamil Nadu can together accelerate the process. Initially, the cost of generated power will be high (ranging from Rs 5-8 per kWh). Achieving scale will lower costs but that might require subsidisation by the centre and Tamil Nadu - both to guarantee minimum demand and trigger development of local supply chains. Once scale is achieved and unit costs decline to about Rs 4-5 per unit, the Indian model can be credibly exported.

This opens up the Sri Lanka opportunity. It is estimated that Sri Lanka's off-shore potential is even greater than India's. Sri Lanka needs the energy but in the current circumstances does not have the economic capability to exploit the potential on its own.

The central government can provide the necessary, complementary resources. India could even offer to buy the energy generated that might be necessary to ensure the financial viability of the investments in the first place. It is likely that the manufacturing benefits from the off-shore investments to exploit Sri Lankan wind could benefit Tamil Nadu because of the proximity factor. But other states will benefit too from the cheap, green energy that is generated. Effectively, India can leverage for itself some fraction of Sri Lanka's off-shore potential.

Currently, Indian firms are making investments in Sri Lankan wind power but that is on-shore; the significantly more important bounty is off-shore. Other actors, including the World Bank, foreign governments and especially China, are looking to help Sri Lanka. If China is able to establish a foothold, the economic and strategic consequences for India would be adverse. Since firms in the UK and Europe are the most competitive developers

in off-shore wind, India should engage with their governments both to exploit Tamil Nadu's potential but also eventually that of Sri Lanka. India, therefore, needs to act swiftly to cement its role and perception in Sri Lanka relative to those of China. The foreign policy gains, based on India's increasing and constructive role in the region, could be enormous. Another form of economic diplomacy could be meaningfully added to the arsenal of foreign engagement.

Cliched as it may sound, there is a win-win-win opportunity for Tamil Nadu's economy, Sri Lanka's energy needs and India's green and foreign policy ambitions. In the Ramayana, one of the key protagonists in the India-Sri Lanka encounter - more adversarial than amicable - is Hanuman, the son of Vayu, the Wind God. Today, wind offers an opportunity for improving relations between India and Sri Lanka. But to make that happen, the Centre and the state of Tamil Nadu will need to work urgently and cooperatively to realise Tamil Nadu's off-shore wind potential. Domestic cooperative federalism coming first could then sustain the strategic international cooperation to follow. Many answers could be blowing in the wind.

Courtesy: The Indian Express, 23 March 2023

SCHOTT enters PPA with CleanMax for Wind Solar Hybrid Project

The international technology group SCHOTT has entered into an agreement with CleanMax Enviro Energy Solutions, for purchasing green energy from a 5.5 MW renewable energy (Wind-Solar hybrid) project in Babra, Gujarat, India. The green energy will be utilized to run SCHOTT's operations at its glass tubing factory in Jambusar, Bharuch, Gujarat. This agreement comes under the aegis of SCHOTT's commitment to becoming climate neutral across its production by 2030.

Source: ANI, 23 March 2023

Delegates Discuss Energy Security, Climate Change at Second G20 Framework Working Group Meeting

The second G20 Framework Working Group (FWG) meeting under India's G20 Presidency concluded in Chennai on March 25. During the meeting, delegates discussed and agreed on the way forward for important deliverables, including those on macroeconomic consequences of food and energy insecurity and climate changes as well as transition pathways, G20 said in the press release. G20 delegates also discussed the impact of climate change as part of a side event in Chennai.

Source: ANI March 26, 2023

World Wind Power Installations 2022 Stay Below Expectations

The development of new wind turbine installations around the globe slowed down substantially in the year 2022. Against what many experts predicted during 2022, the added capacity has reached only 88.6 GW after close to 100 GW in 2022 and 95 GW in 2021. Global wind power capacity stands at 934 GW and 1000 GW is expected to be exceeded in 2023. With few exemptions, almost all of the markets have not achieved their projections for the year 2022. The reasons are challenges in the wind turbine supply chains and still unfavourable policies. These are the main findings of the preliminary statistics published today by the World Wind Energy Association.

Source: WWEA, Annual Report 2022

High-Level Indian Delegation Discusses Energy Cooperation with Sri Lankan President Mr. Wickremesinghe

A high-level Indian delegation called on Sri Lankan President Mr. Ranil Wickremesinghe in Colombo and briefed him on the development in the jointly-identified priority areas for bilateral collaboration in the crucial energy sector. Sri Lanka is completely dependent on imported fuel, which cost the cash-strapped which cost the cash-strapped country close to a whopping USD 4 billion last year.

Source: PTI March 26, 2023

Mann Ki Baat highlights India's success in Renewable Energy Field

Prime Minister Mr. Narendra Modi addressed the 99th edition of the 'Mann Ki Baat' radio program on 26th March 2023. He said that the people across the world talk about India's phenomenal success in the field of renewable energy. "The scientific understanding we have about the power of the Sun, the traditions of worshiping the Sun, are rarely seen in other places. This spirit of 'Sabka Prayas' is taking India's Solar Mission forward today. Diu has become the first district in India, which is using 100% clean energy for all day time needs."

Source: Livemint, 26 Mar 2023

Wind Sector Faces Supply Chain Crunch this Decade

The global wind sector will face a supply chain crunch this decade, as looming bottlenecks for key components and ships are set to squeeze the sector, an industry body has warned. The Global Wind Energy Council said "spare capacity" in wind energy manufacturing was "likely to disappear by 2026". The squeeze will hit the US and Europe particularly hard as they both target an ambitious rollout of domestic renewable energy projects even as much of the wind industry's supply chain is concentrated in China, the group said.

Source: Financial Tomes, 27 March 2023


Innovations for
a better tomorrow
Manufacturing wind turbines and
its components in India since 1996
With 14 manufacturing units and wind farms across 8 states, Suzlon creates local jobs at the grass-root level, energizes micro-economies, supports a local supply chain and reduces imports by making India more 'Aatmanirbhar' in the manufacturing of Wind Turbine Generators and its components. Suzlon is also a flag bearer of the ambitious 'Make in India' program for Wind Energy and a key partner in the nation's Renewable Energy mission. We are committed to energy security and low-carbon economy for the country by providing sustainable and affordable energy to power a greener tomorrow, today.
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India's Green Budget, Ambition to Net Zero by 2070 and Wind Power

Dr. Pranamika Bhuyan
Lead Consultant

Manoj Kumar Singh
Founder and CEO

Net Zero Think

The transition of Indian subcontinent in field of energy is a subordinate change towards a greener future and approaching a sustainable way to generate and consume resources. India's evolution towards its sustainable and green alternatives from the current dependence on fossil fuel derived is a high-priority assets and an opportunity towards developing employment along with growing industries which supports the overall economic growth. With ambition towards the reduction of the greenhouse gas emissions by the targeted years of 2030 and 2070, the Government of India has lead an emphasis by renewing the "Union Budget FY 2023-2024" providing a change in the tendency of India's budget spending to push the current key climate change mitigating schemes.

The government has accelerated the pace of green growth as India is facing the grave reality of depleting natural resources, limited supply of water, minerals and fossil fuels as it surpasses China to become the most populous country. Moreover, according to the Environment Performance Index of 2022, India was 169th out of 180 nations. According to another report, India suffered a loss of ~5.4% of its GDP and 167 billion potential labour hours owing to extreme heat in 2021. With the country experiencing 314 days of extreme weather events in 2022, and climate change making heatwaves in India 30 times more likely, green growth assumes greater significance.

In her speech Finance Minister Ms. Nirmala Sitaraman has stated the risk associated with climate change and its negative effects on India and other countries to be like negative externalities on sustainable growth and development. Mentioning about the honourable Prime Minister national statement, which was delivered on November 2021 in Glasgow during the Conference of Parties 26 (COP 26), where he announced five bold and ambitious targets to be achieved to enable the reductions in GHG emissions.

India is set to achieve the climate action plan towards net zero or Carbon neutrality target by 2070, during the proposal for a "Panchamrit" of five goals i.e.,

- Increasing non-fossil energy capacity to 500 Gigawatts (GWs),
- Fulfilling 50 per cent of energy requirements from renewable sources by 2030,
- Reducing carbon intensity of economy by 45 per cent, and
- Reducing total projected carbon emissions by one billion tonnes.
- Achieving the target of net zero emissions by 2070.

With the initiative of Panchamrit for the net zero action plan, Prime Minister also initiated a global initiative, "Lifestyle For Environment- the LiFE Movement" to promote efforts on the collective, anthropocentric and a robust action towards achieving the goals of sustainable development.

The LiFE initiative envisions a mixture of technology and institutional practices of the 3Rs i.e., Reduce, Reuse and Recycle for implanting the roots of Circular economy as the integral part of our culture and lifestyle.

The Green Growth actions include several pointed measures that will have a ripple effect. For instance, the allocation of Rs 35,000 crore of priority capital investment towards achieving net zero and clean energy transition ensures the country's energy security. The outlay of Rs 19,700 crore for the Green Hydrogen Mission will mobilise a green hydrogen production capacity of 5 metric million tonnes by 2030. This would facilitate the much-needed steady decarbonisation of Indian industries, reduce dependency on fossil fuel imports and establish technology and market leadership in this sunrise sector. India's announcement that it aims to reach net zero emissions by 2070 and to meet fifty percent of its electricity requirements from renewable energy sources by 2030 is a hugely significant moment for the global fight against climate change. India is pioneering a new model of economic development that could avoid the carbon-intensive approaches that many countries have pursued in the past – and provide a blueprint for other developing economies.

The scale of transformation in India is stunning. Its economic growth has been among the highest in the world over the past two decades, lifting of millions of people out of poverty. Every year, India adds a city the size of London to its urban population, involving vast construction of new buildings, factories and transportation networks. Coal and oil have so far served as bedrocks of India's industrial growth and modernisation, giving a rising number of Indian people access to modern energy services. This includes adding new electricity connections for 50 million citizens each year over the past decade.

The rapid growth in fossil energy consumption has also meant India's annual CO_2 emissions have risen to become the third highest in the world. However, India's CO_2 emissions per person put it near the bottom of the world's emitters, and they are lower still if you consider historical emissions per person. The same is true of energy consumption: the average household in India consumes a tenth as much electricity as the average household in the United States.

India's sheer size and its huge scope for growth means that its energy demand is set to grow by more than that of any other country in the coming decades. In a pathway to net zero emissions by 2070, it is estimated that most of the growth in energy demand this decade would already have to be met with low-carbon energy sources.

Wind Energy Sector- India's Growth Trajectory

Wind energy sector is considered to be potentially an impactful scenario for India's growth trajectory to raise demands for wind sector with desirable investments for development. Ministry of New and Renewable Energy (MNRE) has worked up a committee for the fast phase additions of renewable energy capacity in Indian wind sector. India is the fourth largest wind power capacity in the world having over 42GW capacity installed. With the development in this sector India could offset multi million metric tons of CO_2 over the lifetime of a wind farm which is considered to be 25 years.

The Government of India has notified the offshore Wind energy policy of October 2015, to harness the potential offshore wind energy alongside India's coastline. The Ministry of New and Renewable Energy is developing a strategy to harness the wind energy by installations of offshore wind projects off the coast of Gujrat and Tamil Nadu. The new Wind-Solar Hybrid Policy is to provide the framework for the promotion of large grids connected to wind-solar PV hybrid projects for optimal and efficient utilization of the transmissions infrastructure and land. The Central Electricity Authority (CEA) has estimated that about 17.13% (140GW) share of wind energy in the likely installed capacity in 2029-2030 out of which 30GW will be offshore wind.

The government of India has released a draft policy for the repowering of wind power projects which states that India's repowering potential is nearly 25,406 MW. The policy includes the installation of additional wind turbines of minimum 3 MW capacity each with hub heights above 120 meters, located in between the existing wind turbines in place of few existing turbines without any effect on one another's performance. Increasing the hub height also increases the average wind speed captured by the turbine, thanks to the wind profile power law. Spacing between wind turbines in a wind farm can be optimised by yaw control minimising the wake effect.

Wind power installations occupy only 2% of the wind farm area facilitating rest of the area for agriculture, plantations, etc.

The Indian government has installed over 800 wind-monitoring stations all over the country through the National Institute of Wind Energy (NIWE) and issued wind potential maps at 50m, 80m, 100m and 120m above ground level. The recent assessment indicates a gross wind power potential of 302 GW in the country at 100 meters and 695.50 GW at 120 meters above ground level. The estimated potential is found on the higher side as the present installed capacity is operating below 20% CUF on average against the minimum 30% CUF considered while assessing the wind potential.

The New directives issued by the Ministry of New and Renewable energy have given preference to long pending demands for wind energy sector in India. With the government's focus on issuing tender bids for 8 GW of wind power projects every year to fulfil it till the end of this decade by 2030.

By selecting a way with simultaneous co-existence of economy and ecosystem this can prove to be the most sustainable existence for India as it will be able to work upon the infrastructural development projects and also safeguard the interests of environment.

As per National Institute of Wind Energy (NIWE), India has the potential to generate 695 GW of wind power at 120m height above ground level. Seven states of India are considered as most promising for wind energy generation including Andhra Pradesh, Gujrat, Maharashtra, Karnataka, Madhya Pradesh, Rajasthan and Tamil Nadu.

The growth of wind sector has added 160 GW of renewable energy by the end of 2022 along side of a short plan to achieve original of 175 GW. India's gear is to achieve the larger national target of 500 GW of installed renewable energy by 2030 with an aim to crate space of 160 GW for wind energy.

In the recent developments, Governments of India and Denmark have jointly initiated an offshore wind power project which will be generating the green energy as reducing the land consumption and also increasing the production capacity.

India is currently making important decisions to strengthen its foothold in global supply chain by setting milestones in renewable energy. By selecting a way with simultaneous co-exitance of economy and ecosystem this can prove to be the most sustainable existence for India as it will be able to work upon the infrastructural development projects and also safeguard the interests of environment.

The energy transition of India holds a significant capacity to influence the new world order and also a determination to influence geopolitical transitions.

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Wind Energy Generation Can Surge 4-5 Times on Policy Tailwinds, Add 6-8 GW Annually: Report

Positive policy moves by the New and Renewable Energy Ministry can crank up the annual wind capacity addition by 6-8 GW from fiscal 2026, around 4 times more than 1.6 GW of growth clocked in the past five fiscals, a report said. According to a CRISIL analysis, the aggressive tariff bids in reverse auctions since fiscal 2017-18 has been one of the key drivers of the wind energy growth.

The process led to discovery of irrationally low tariffs that were favoured by state distribution companies, but compromised returns left little incentives for developers to complete the projects. There were also delays in land acquisition and setting up of evacuation infrastructure.

Under reverse auction, bidders compete on an open e-platform, adjust tariffs within timeframes with their quotes visible to all participants. Prior to FY18, wind projects were awarded under the feed-in-tariff regime, where payments at fixed tariffs were made by discoms to producers under long-term contracts without competitive bids.

Only 41 per cent of projects awarded by the Solar Energy Corporation of India (SECI) during fiscals 2018-21 got commissioned till December 2022, while 23 per cent were cancelled and the remaining projects are delayed due to issues in land acquisition, and evacuation and supply-side constraints, the report noted.

While the annual solar capacity addition averaged 8.3 GW in the five fiscals through 2022, wind capacities grew a meagre 1.6 GW per annum during this period. All that can change now with the ministry introducing four key policy measures in January, the report said. The first of these four major policy changes include setting a goal to award 8 GW of wind tenders per annum. This is significant because wind tendering has been low at just 3.3 GW per annum in the past five fiscals. This can propel capacity growth at a faster rate if executed well.

Secondly, the ministry has replaced the reverse auction process with a single stage, two-envelope closed bidding, which will curb irrational bidding. The agency now expects tariffs to rise 20-30 per cent over the recent Rs 2.89-2.94 per unit, which provides more than 10 per cent internal rate of return, due to the change in bidding process, resource variability at newer sites etc. Thirdly, to ensure that higher wind power tariffs are conducive for state discoms, the ministry mandated that all discovered renewable tariffs for each state will be pooled and offered to discoms at an average pooled tariff by an intermediary such as the SECI.

Courtesy: Millennium Post, 20 March 2023

India Misses RE Capacity Target Due to Low Solar Rooftop, Wind Energy Project Installations: Parliamentary Panel

A parliamentary panel has attributed low installation of solar roof-top and wind energy projects as key reasons for the shortfall in achieving India's renewable energy capacity target of 175 GW by 2022. India set an ambitious target of installing 175 GW of renewable energy capacity by the year 2022, which included 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro-power.

However, a renewable energy capacity of 120.90 GW has been installed in the country as of December 31, 2022, which is about 69 per cent of the overall target, the Standing Committee on Energy said in a report. "Keeping in view the fact that renewable energy installed capacity has increased by more than 236 per cent since 2014; this is indeed a commendable achievement. However, it should also be mentioned that whatever shortfall has occurred in achievement of the target that is because of low installation of solar roof-tops and wind energy projects," the committee said.

Recommendations

Keeping in view India's commitment to increase our non-fossil fuel based energy capacity to 500 GW by the year 2030, the Ministry of New and Renewable Energy must ramp up its pace for timely achievement of targets, it suggested.

A strict timeline should be imposed for approvals/rejection of applications, installation of net-meter, inspection of the system, etc. by the discoms and reasons should mandatorily be provided by them in case of rejection of application on the national portal, the committee said.

Discoms may be incentivized so that their apprehensions regarding losing their high-paying consumers because of the installation of solar rooftops are addressed and they positively participate in the programme.

The Ministry should also monitor the implementation of the rooftop solar and wind energy projects and ensure adherence to the prescribed timeline for their commissioning so that renewable energy projects do not get unduly delayed.

Against the overall target of 40 GW, only 7.40 GW of rooftop solar projects could be installed in the country, the committee said adding it has been flagging the issues responsible for deficient performance under the solar rooftop programme like non-availability of information at the grass root level, lack of awareness about this scheme amongst the masses, apathy of discoms, among others.

As of February 27, 2023; 43,171 number of applications were received on the National Portal, of which 18,437 applications have been approved by DISCOMs, 3,031 applications have been rejected on technical grounds and approval is pending for 21,703 applications.

It further said that against the overall target of 60 GW, the cumulative installed capacity of wind power is 41.93 GW as on December 31, 2022. There is not even mention of wind energy in the subjects allocated to the MNRE.

The committee further noted that MNRE had projected the budgetary requirement of Rs 10,422.54 crore for the financial year 2023-24 and Rs 10,222 crore has actually been allocated with an increase of about 45 per cent against Revised Estimates of 2022.

"Since the Budgetary Estimates of the Ministry for 2023-24 has been considerably enhanced as compared to the previous years, the committee recommends that the ministry (MNRE) should increase its fund absorption capacity and focus on exhaustive utilization of the budgetary allocation," the report said.

Courtesy: PTI, 22 March 2023

Studies on Behavioral Effect of Wind Turbine Tower with Non-Linear Thickness of Flange Joint Using FEA




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Abstract

India has submitted its long-term Low Emissions Growth Strategy indicating low carbon transition pathways in key economic sectors. India has already pledged to phase down coal use along with other nations, and has become a big market for renewable energy projects. Achieving the targeted non-fossil fuel capacity and generation from renewables by 2030 is feasible. Even the working conditions for the wind turbine become worse now-a-days due to the natural causing factors like typhoon, gust wind, poor soil stability, etc., caused more load on structural elements. However, a well-planned strategy and action plan will be crucial in addressing the challenges in all aspect of execution till end of life. Determining and understanding onshore wind turbine component failure rates and resource requirement for repair has vital for modelling and reducing O&M costs and in turn reducing the levelized cost of energy. Present investigation is to verify that the effect of foundation of turbine observed 34mm settlement due to weak soil and to study the structural behavior of wind turbine foundation to tower joint in three different geometric boundary condition. To reduce the load caused by settlement on tower section by making the variable flange thickness instead of constant thickness to achieve stress on component within acceptable level and made soil compaction by lime grouting to avoid further slide. The model has analyzed using Numerical Method (Finite Element Analysis) and its result are correlated analytically.

Introduction

A wind energy converter (WEC) consists of moving machinery that exerts large, dynamic and highly variable loads on the support structure and its foundation. Wind industry's maturity and progress towards competitiveness with traditional electricity sources was made possible through increases in wind turbine size, sophistication of controls and efficiency in power extraction from wind. Design of wind turbine towers and their foundations evolved from classical procedures developed for traditional buildings to scattered design guidelines that attempt to address the load and response characteristics specific to wind turbine support structures. Mechanical and Electrical load characteristics of wind turbine are designed based on International Electrotechnical Commission (IEC) Standard and certain tests are mandatory for the Prototype turbine installed at site as per Standards are Mechanical load Measurement (MLM - IEC61400-13), Safety and Functional Test Measurement (SFT - IEC61400-1) and Power Curve Measurement (PCM - IEC61400-12-1) respectively to get type test for certification of product. To check the Design Load cases verification by triggering the turbine during operation in different Modes and the Impacts are measured with the help of Strain gauges fixed on respective location in Load transfer elements for validation and for electrical characteristics such as Power Quality Measurement (PQM), Low-Voltage Ride-through Capability (LVRT), High-Voltage Ride-through Capability (HVRT) are studied based on IEC61400-21. Wind turbines emit a relatively weak but characteristic noise. The noise is mainly generated by the movement of the blades through the air and has certain noise limit prescribed by IEC61400-11 to be follow. Turbine major component such as foundation, tubular tower,

converter, main bearing, gearbox, generator and blades are observed premature failures resulting an increase in operation and maintenance (O&M) escalation costs around 4 to 6% and production revenue loss. Currently, global onshore wind turbine operations and maintenance (O&M) spend around $15 billion annually [1]. Turbine performance degradation with aging and poor strategy of maintenance at fleet, especially after 10 years of operation O&M cost may lead huge expenditure as estimated.

Lack of collaboration between turbine original equipment manufacturers (OEMs), operators and suppliers in addressing turbine design, manufacturing and operation issues. Optimizing O&M strategies and therefore minimizing downtimes and cutting costs is a highly topical subject. Tall towers are amongst the critical classes of structures which are designed to resist a variety of dynamic and static loads, due to cyclonic winds, machinery and seismic loads. The design of wind turbine foundations should ensure to a pre-determined reliability level and the design lifetime of the foundation is safe against catastrophic failures as well as performance deficiencies that can hinder the proper operation of the wind turbine. In case of settlement the foundation may leads to the fatigue with unbalanced load and respective momentum distribution at joints, likewise there are many effects due to the worse conditions.

Wind Turbine Tower is a main structural part which carries whole Mass of Nacelle and rotor system and transfers gravity load, environmental load and cyclic load (i.e., bending and buckling) on tower to foundation. There are different types of towers in application like Tubular steel Tower, Lattice tower, Hybrid (Lattice and Steel) and Concrete tower. Most large wind turbines are delivered with tubular steel towers, which are manufactured in 4 to 5 sections of 20-30m length with flanges at either end bolted together on the site. The towers are conical (i.e., with their diameter increasing towards the base) to increase their strength and to save materials at the same time. Steel shell tower designed in a conventional way with flanges and both longitudinal and transverse welds. Due to transportation reasons the largest permitted diameter is 4.5 meters. In general, the cost per megawatt of wind turbine about 74MINR. The price of a steel tower for a wind turbine is generally around 16 percent of the total price of the turbine is about 12MINR (approx). It is therefore quite important for the final cost of energy to build towers as optimally as possible. Because wind speed increases with height, so taller towers enable turbines to capture more energy and generate more electricity.

The embedded can or the embedded ring is the one of the two solutions that using in the onshore wind farm floating foundations where it is placed on the foundation and the concrete will be poured. Basically, it is the steel cylinder with several holes to allow the radial steel reinforcement bars to cross it and to act as passage the medium voltage cables and the earth copper wires. The upper part of the embedded ring connected with the first segment of the tubular tower in means of holes and flanges with superior bolting system.

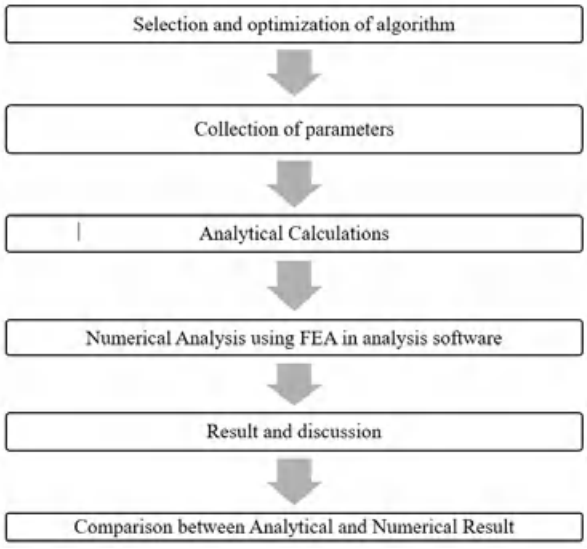
The most common Design Load Case for wind turbine towers is IEC 61400-1 and IEC 61400-13. According to IEC 61400-1 wind turbine tower design should include the following loading and requirements: Dynamic loadings, Static loads, Fatigue loading, Stiffness requirement and buckling strength. For Tower safety factor are considered during design are 3.67 and 7.98 for bending and buckling respectively to maintain safe mode of operation. The working condition of the wind turbine may become worse or unconditional to produce the energy due to the extreme external conditions. It may cause due to the loosing of the parts (1%), components failure (43%), plant control system (22%), unknown cause (4%), Grid failure (4%), Lightning strikes (3%), Icing (3%) and High wind (3%). The earthquake, soil erosion, poor soil strength and the heavy storm of the wind.

The wind turbine system may become failed, or the crack may development, settlement or the complete destroy of the turbine during 25 Years of service life. With the considering the cost it is most expensive and costly. Many scientists and scholars and the engineer have expressed their ideas and the solution to overcome the problems. Some ideas and the solution for the major problem of settlement of wind turbine will sounds good to satisfy functional requirement instead of choosing new foundation. Settlement is caused by soil erosion and it will start from the foundation-embedded Can and top of the tower can tilt from reference axis and leads to the aerodynamic asymmetry. And it will produce the problem of the low efficiency and the unbalancing conditions in the load and momentum. In this study we have concluded and gave the solutions to reduce the tilt of tower section by making the variable flange thickness instead of constant thickness to achieve tilt within acceptable Risk level, the tilted tower to balancing the load and the momentum in the different cases from the normal load to the extreme load and corresponding momentums. Numerous mathematical calculations are required for the study. The proper methodology is followed to analyses the wind turbine tubular tower using FEA.

Problem Identification

- Geometric imperfections of certain shapes can greatly increase the value of stress amplitude (i.e., concrete to embedded steel can adopter joint defect).
- Settlement due to the environmental conditions (weak soil at bottom foundation area), difference in aerodynamic loads and corresponding momentum.
- Fatigue failure is one of the common issues in tower flange bolt if problem persist.

Methodology



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Design Requirement for Wind Turbine Towers

The main objective of this study is to give a solution to the tilted wind turbine. In general, there are some common Engineering formulas used to obtain the stress in flange joint and the results are correlated with FEA.

Wind turbine tower design should include the following loading and requirements:

a. **Static loads** (called breaking strength) (tower-head weight, tower's own weight),

b. **Dynamic loadings** (sever earthquakes, extreme winds, aerodynamic rotor thrust),

c. **Fatigue loading** (dynamic loading caused by the rotor thrust, vibration behavior in cases of resonance) (this is an additional load),

d. **Stiffness requirement** (first and second natural bending frequencies are the most important one, natural torsion frequency should also be checked),

e. **Buckling strength** (resistance to local buckling of the steel tube wall should be checked).

The most common design code for wind turbine towers has IEC 61400 1 (2005) that suggests the following approach for load combinations be used to verify the structural integrity of the wind turbine tower:

a. Normal design situations and appropriate normal and extreme external conditions,

b. Fault design situations and appropriate external conditions

Collection of Parameters

There are three types of parameters such as Independent parameters, Dependent parameters, and variable parameters. For our study we no need to involve in the dependent and independent parameters. Hence the variable parameter used in this study is the Flange thickness and others such as length of the bolt, area of the cross section of the bolt, a- minimum distance of bolt and inner diameter of the flange, b- minimum distance of the bolt center and center position of the tower's thin wall. The loading parameters such as pre-loading of the bolt and the loading conditions. Among those the flange thickness is made to change according to the study. S355 High-grade steel is most commonly used material in wind turbine towers. It is a plate with a high-strength low-alloy European standard structural steel covering four of the six "Parts" within the EN 10025-2004 standard. it meets requirements of both chemical and physical properties similar to ASTM A572 / 709. The numerical calculations are made with non-uniform flange thicknesses and examine the stress and deformation for different cases. The cases are:

- Zero tilt – no deviation in verticality of tower
- Tower with tilt of 35mm
- Flange with corrected tilt of 35mm

Analytical Calculation

The Analytical calculations are calculated with all the parameters such as Thrust force, Torsional moment, Moment of inertia of the hallow cross section of the cylinder, stress such as buckling stress, direct stress, etc. Let's discuss the calculations for the single set of values.

Calculation of Torsional Momentum, Mt

Dead weight at tower Top, w_1 = 863.28 kN

Dead weight at FC Flange = $w_1 + w_t$ of the tower
= 2217 KN

Thrust force on Turbine, F_t = 883.4922829KN

Bending Momentum at FC Flange = 72278.504kNm

r_o – outer radius of tower shell = 4.2/2 = 2.1 m

Torsional Momentum, M_t = F_t x r_o
= 883.4922829 x 2.1 kNm
= 1855.333794 kNm

Calculation of Moment of inertia for hollow cylindrical cross section, I

Flange Thickness = 40 mm

S_1 Thickness = 30 mm

Mean radius, r_{mi} = 4.013/2
= 2.0065 m

Thickness of Top face = OD – ID /2
= 4.2-3.823/2
= 0.1885m

Area of the flange = $(\pi ((r_{mi}+t)^2)-((r_{mi}-t)^2)))$ in m^2
$\pi((2.0065 + 0.1885)^2 – (2.0065 - 0.1885)^2)$
4.752918667 m^2

Moment of inertia for hollow cylindrical cross section, I = $(\pi(((r_{mi}+t)^4)–((r_{mi}–t)^4)))/4$ in m^4
= $\pi((2.0065+0.1885)^4 – (2.0065 - 0.1885)^4))/4$
= 9.6521663 m^4

Calculation of Buckling Stress

Direct stress, σ_n = $((F_z d)/A)$ in KN/m^2
= 2217.06/4.752918667
= 466.4628527 KN/m^2

Bending stress, σ_b = $(M_{res,d}/I_{flange})(r_{mi}+t)$ in kN/m_2
= (72278.50416/9.6521663) * (2.0065 + 0.1885)
= 16436.86052 KN/m_2

Total stress, σ_z = $\sigma_n + \sigma_b$ in KN/m^2
= 466.4628527 + 1643686052
= 16903.32337 KN/m^2

Polar Momentum of Inertia, J = $(\pi/2)((r_o^4)–(r_i^4))$ in m^4
= $(\pi/2)$ $(2.1^4 – 1.9115^4)$
= 9.578103216 m^4

Torque, T = M_{xy} in KNm
= 21921 KNm

Torsion shear stress, $T_{torsion}$, T_2 = $(T \times r_0)/J$ in KN/m^2
= (21921 x 2.1) / 9.578103216
= 4806.18124 KN/m^2

Force shear stress, T_{shear} = F_{resp}, d/A in KN/m^2
= 1848262.86 / 4.75918667
= 388.8690275 KN/m^2

Total shear stress, σ_{zv} = T_{shear} + $T_{torsion}$ in KN/m^2
= 5195.050269KN/m^2

Checking Cylinder satisfy circumferential shell buckling condition

$$(r/t \leq 0.21 * \sqrt{\left(\frac{E}{f_{yk}}\right)})$$

t- thickness of Shell

Radius of S1 r_{S1} in m = 1.8965 m & thickness t = 0.03 m

Radius of FC r_{FC} in m = 1.9315m & thickness t = 0.04 m

Modulus of elasticity, E in = 210 x 103 Mpa

Characteristic yielding stress, f_{yk} N/mm^2 = 345 N/mm^2

Circumferential Shell Buckling Conditions = $(r/t) \leq (0.21 \times (\sqrt{(E/fyk)}))$
= 0.0477875 ≤ 5.18106922

*Cylinder satisfy circumferential shell buckling condition

Drag Coefficient can be found k_w

Cylinder length between defined boundaries, l in m = 1.2

Buckling factor, C_θ = 1.5 (T4 top), 1.25(T4 bottom), 1(T3 top), 0.6(T3 bottom), 0 (T2 top), 0(T2 top), 0, 0- (6 combination of boundary condition)

Dimensionless length parameter, ω =

$$l/r * \sqrt{\frac{r}{l}} = l/\sqrt{(rt)}$$

1.2/(=4.235763155)

Drag coefficient, k_ω =

$$0.46\ (1 + 0.1 \sqrt{\left(\frac{0}{4.24}\right) \times \left(\frac{2.0065}{0.01885}\right)} = 0.46$$

Calculation of Von Misses stress

Density of air, ρ_{air} in kg/m^3 = 1.225 kg/m^3

Velocity of wind, Vwind in m/s = 22 m/s

Non-symmetric maximum wind pressure, = 0.5 x ρ_{air} x (V_{wind}^2) kg/m^2 x s

qW_{max} = 296.45 kg/m^2 x s

Equivalent axisymmetric pressure, q_{eq} = k_w x qW_{max} in Kg/m^2 x s
= 136.0887 Kg/m^2 x s

Hoop stress, σ_θ = (q_{eq} x r_{mi}) / t in N/m^2
= 14252.467322 N/m^2

Von Misses stress, σ_{ref} = $\sqrt{(\sigma z^2 + \sigma_\theta^2 - (\sigma_z \times \sigma\theta) + (3 \times \sigma_{z\theta}^2))}$ Mpa
= 191.428 MPa

It is found that the Von Misses stress, for flange Joint σ_{ref} is calculated as 191.428 MPa. Similarly for Foundation can and S1 section stress calculated as 78.56 and 108.196 MPa respectively. The calculated value have good correlation with numerical results shows.

Static Analysis Using FEA

The above-mentioned different cases are to be examined in the analysis software using Finite Element Analysis. Let's discuss the result from the analysis using the software for the each and every case.

Case (i): Zero tilt

The first case in this study is the zero tilt i.e., there is no change in the normal working conditions of the wind turbine and there is no change in the flange thickness. It is observed that there are flanges with 132 no's of bolt are used in the wind turbine. The applied values for the zero tilt are given below.

- with constant flange thickness is 90mm,
- the length of the bolt(LB) is 180mm,
- Thickness of flange, Hf is 180mm,
  - a (Min. distance of bolt center and ID of Flange) is 94.43mm,
  - b (Min. distance of bolt center and center position of tower thin wall) is 32.87mm,
- Area of cross section of the bolt is 1225mm^2,
- Pre-loading of the bolt is 710kN

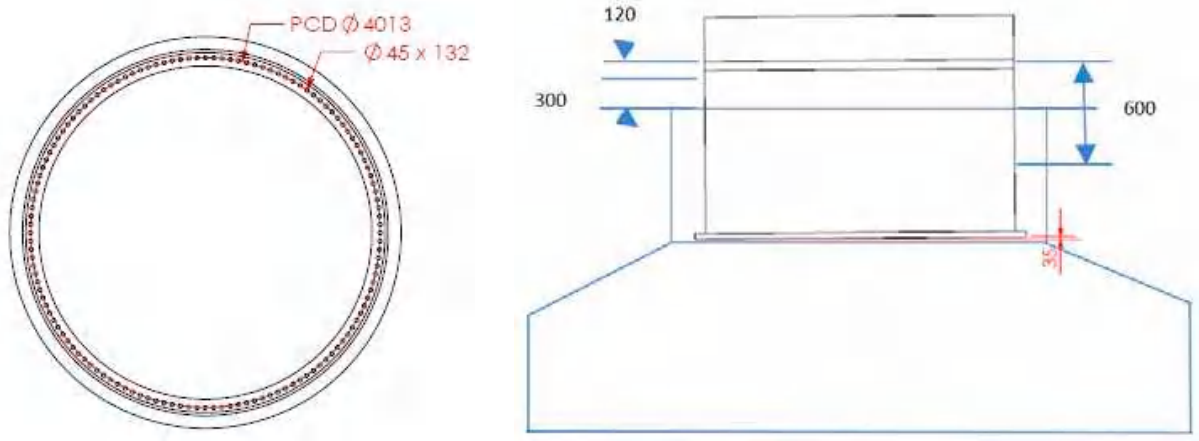

Figure 1: Floating Foundation with Embedded Cane having 35mm tilt

These values are given for each position of the bolt. All the above values are feed in the software for the result. The result show that the load distribution and their corresponding momentums and the stress acting on the body.

Analytical result for case (i)

The analytical results show the reaction of the wind turbine for applying the extreme and the service loads.

Embedded Can

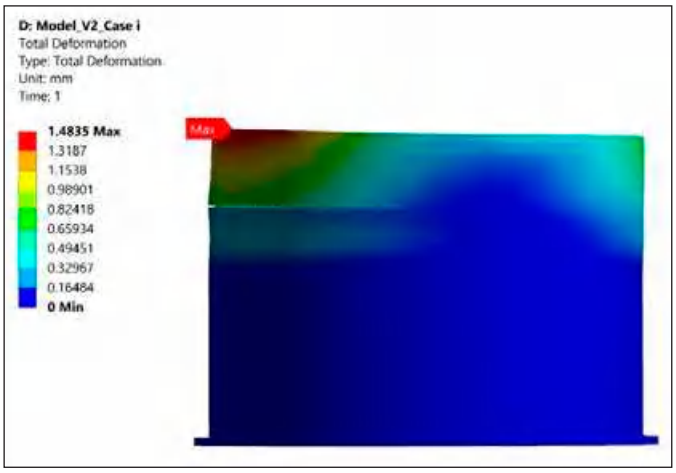

Figure 2: Deformation 1.48 mm

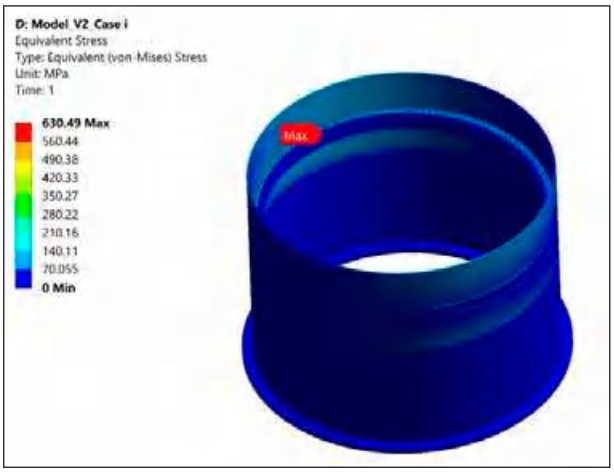

Figure 3: Stress observed = 630.5 MPa

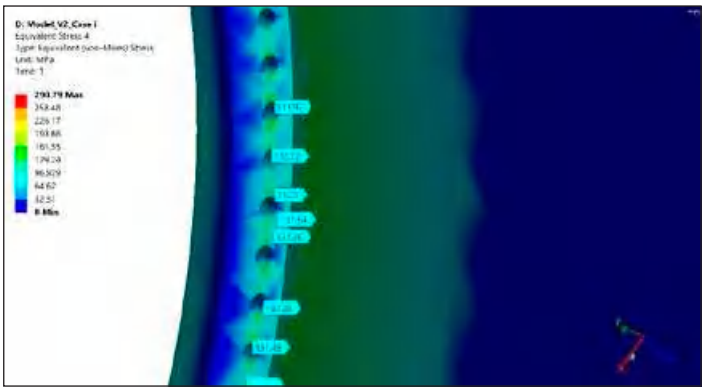

Figure 4: Stress observed =132 MPa

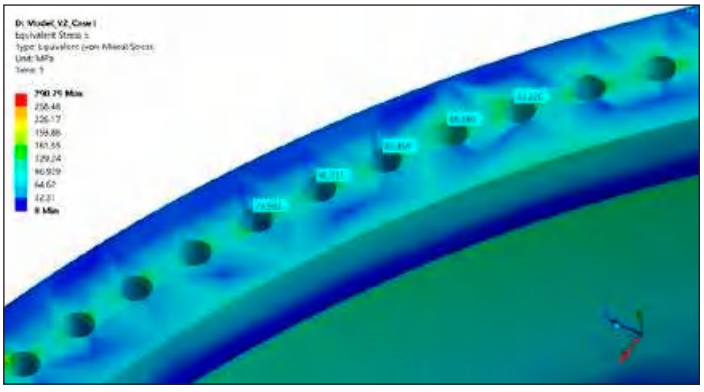

Figure 5: Stress observed = 93MPa

Flange

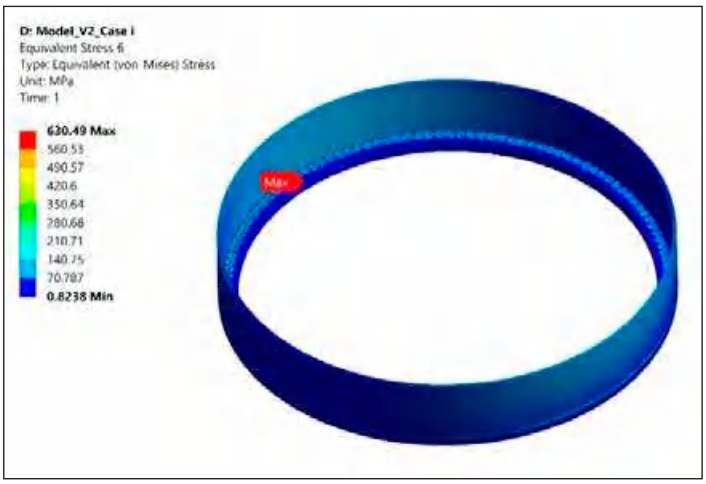

Figure 6: Peak Stress observed = 630.5 MPa
Stress observed = 160 MPa

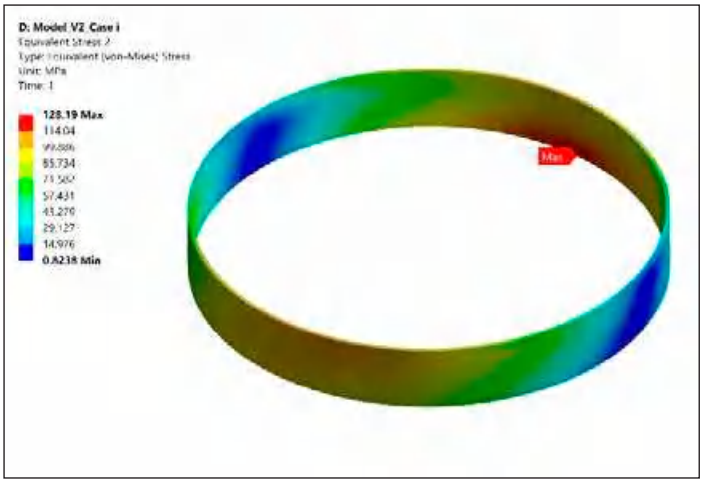

Figure 7: Stress observed =128 MPa

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Flange Rings

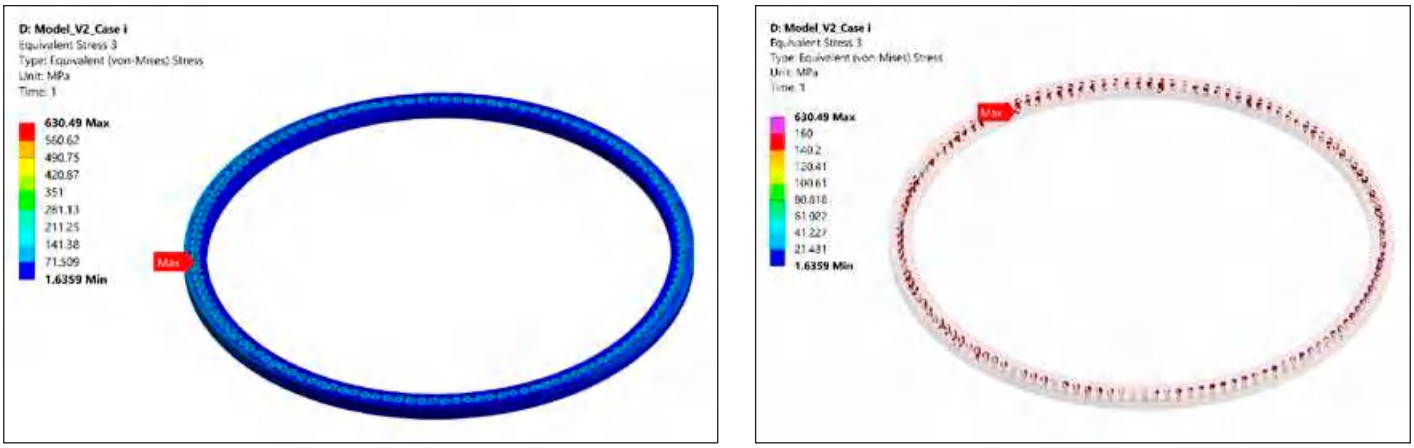

Figure 8: Peak Stress observed = 630.5 MPa Stress observed = 160 MPa

Fasteners

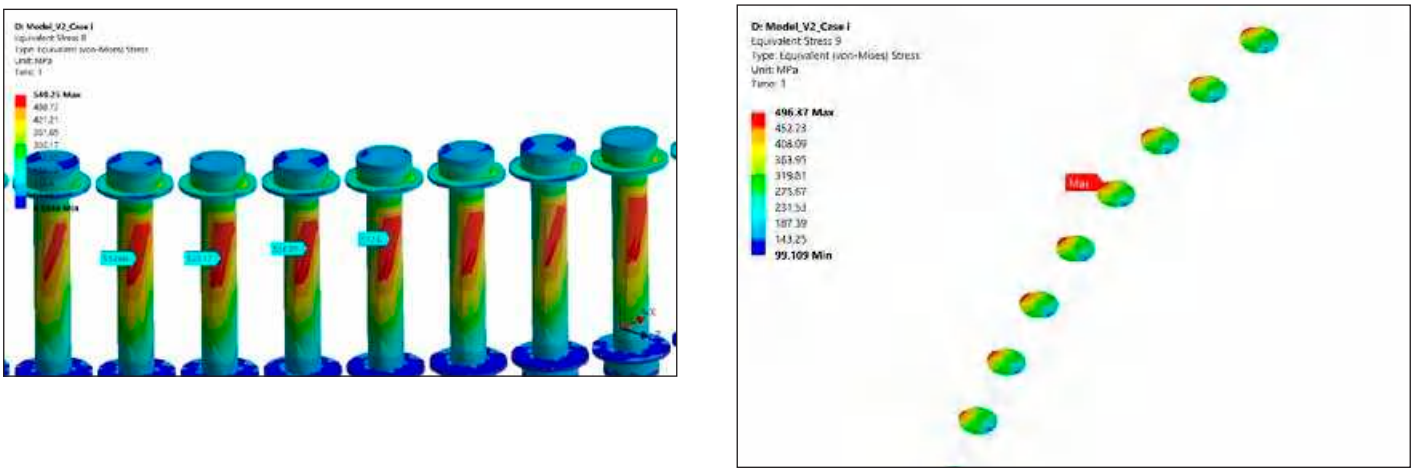

Figure 9: Stress observed at Bolt Joint

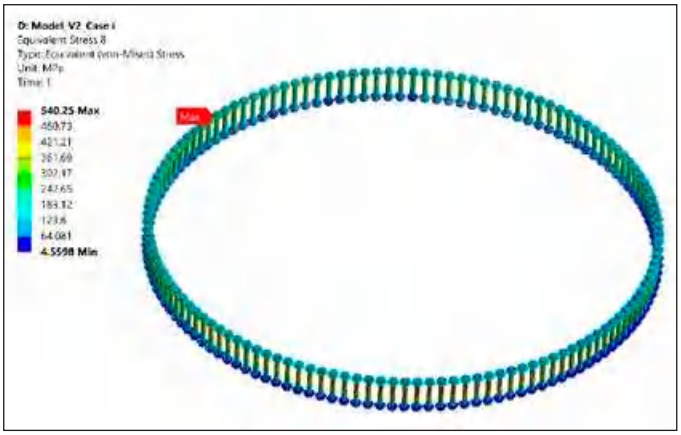

Figure 10: Stress observed = 540.25 MPa

Table 1: *Load and Momentum Acting on the Flange at Case (i)*

Load	Fz (kN)	Fxy (kN)	Mz (kNm)	Mxy (kNm)
Extreme Load	-2360	670	1940	49000
Service Load	-2360	225	570	21921

For above Load Condition without tilt of wind turbine and absorbs above extreme and service load distribution's develops stress values are presented in Table 6.

Case (ii): Tower with Tilt of 35mm

The second case in this study is with the tilt i.e., there is a change in the normal working conditions of the wind turbine and there is change in the flange thickness. It is observed that there are flange with 132 no's are used in the wind turbine as we saw on the case (i). The applied values for the 35mm tilt are given below:

- with constant flange thickness is 120mm,
- the length of the bolt(LB) is 240mm,

- Thickness of flange, Hf is 240mm,
- Thickness of Spacer, (both Top and Bottom) Hs is 10mm,
- Thickness of Spacer, (Top flange) is 5mm,
- Thickness of Spacer, (Bottom flange) is 5mm,
  a (Min. distance of bolt center and ID of Flange) is 94.43mm,
  b (Min. distance of bolt center and center position of tower thin wall) is 32.87mm,
- Area of cross section of the bolt is 1225mm^2,
- Pre-loading of the bolt is 710kN

These values are given for each position of the bolt. All the above values are feeded in the software for the result. The result show that the load distribution and their corresponding momentums and the stress acting on the body. The result shown is similar to the case (i) because we do make the constant values for the analysis. But they shows what we feed. The stress acting in the case (ii) are larger than the case (i) results.

Table 2: *Load and Momentum Acting on the Flange at Case (ii)*

Load	Fz (kN)	Fxy (kN)	Mz (kNm)	Mxy (kNm)
Extreme Load (at 52m/s)	-2360	670	1940	49000
Service Load (at 13m/s)	-2360	225	570	21921

For above Load Condition with tilt of wind turbine and absorbs above extreme and service load distribution's develops stress values are presented in Table 6.

Case (iii) Flange with corrected tilt of 35mm

The third case in this study is with the correction of tilt i.e., there is a need to change in the flange thickness to bring back the wind turbine to the normal working conditions. It is observed that there are flange with 132 no's are used in the wind turbine as we saw on the case (ii). The remedial action for the correction of the wind turbine from the tilted condition by gradually decreasing the thickness of the flange just opposite to the tilted direction within the safety limit. The correction made in the tower at some angles are given below. The applied values for the correction of the tilt are given below.

Table 3: *Dimension of Variable Flange Thickness*

Bolt Position	flange thickness at FC in mm	flange thickness at T1 Section in mm	Length of Bolt engagement, LB in mm	Thickness of flange, H_f in mm
0°	104.28	103.96	208.24	208.24
90°	112.47	112.23	224.7	224.7
180°	111.43	112.5	223.54	223.54
240°	104.28	103.91	208.19	208.19

a (Min. distance of bolt center and ID of Flange) is 94.43mm,
b (Min. distance of bolt center and center position of tower thin wall) is 32.87mm,
- Average Area of cross section of the bolt is 1225mm^2,
- Pre-loading of the bolt is 710kN

These values are given for each position of the bolt. All the above values are feeded in the software for the result. The result show that the load distribution and their corresponding momentums and the stress acting on the body. The result shown is similar to the case (i) because we do make the constant values for the analysis. But they shows what we feed. The stress acting in the case (ii) are larger than the case (i) results.

Table 4: *Maximum and Minimum Point of Flange Thickness*

Bolt Position	flange thickness at FC in mm	flange thickness at T1 Section in mm	Length of Bolt engagement, LB in mm	Area of Bolt Cross Section $(3.14X(39.2/2)^2)$ in mm^2	Thickness of flange, Hf
Min	104.27	103.91	208.19	1224.80	208.19
Max	120.77	120.48	241.03	1224.80	241.03

For above Load Condition with tilted wind turbine and flange are cut to make the correction to ground zero and its stress values are presented in Table 6.

Table 5: *Load and Momentum Acting on the Flange at Case (iii)*

Load	Fz (kN)	Fxy (kN)	Mz (kNm)	Mxy (kNm)
Extreme	-2360	670	1940	49000
Service	-2360	225	570	21921

The analysis results show the response of the tower of the wind turbine with respect to the stress at all the three cases. The von-mises stress or the Equivalent stress is considered as the response of the tower in all three cases are evaluated. Let's check the results are feasible or not with respect to the safety measures.

Result and Discussion

In a complex loading condition, the most preferred failure theory is Von Mises. Von Mises stress arises from the Distortion Energy failure theory. It states that, a design will fail, if the maximum value of stress induced in the material exceeds yield strength of the material. It works well, especially for ductile materials. The material recommended for the tower shell is S355 High-grade steel. It is ductile in nature and has minimum yield strength of 355 MPa. For safety, the maximum Von Mises Stresses induced in the tower must not exceed 355 MPa.

The below Table 6 shows the analysis of the assembly under service load and extreme load conditions. Resultant stress and strain distribution are computed. And the results are compared with the IEC standards.

Comparison of Numerical and Analytical Calculations

The study of the tower with different cases have been done by the both numerical and analytical methods. From the analytical calculation the final value of the equivalent stress(von-mises stress) is calculated as 78.56Mpa. Similarly, the stress analyzed in the embedded can of the tower using the FEA is also very close to the numerical value as 75 MPa. This comparison shows the

correction method of the tilted tower is feasible within the IEC standard limits.

Estimation of Fatigue Life

The local wind speed varies over a season from minimum (3.96 m/s) to maximum (11.34m/s). To have better factor of safety, wind speed range is increased (0, 20) m/s. It is assumed that tower is under repeated loading, where in F_t varies from at 0 to 883.50KN. ASTM defines fatigue life, N_f , as the number of stress cycles of a specified character that a specimen sustains before failure of a specified nature occurs. One method to predict fatigue life of materials is the Uniform Material Law (UML). The resulting, maximum stress, σmax, is the largest algebraic value of stress in the stress cycle and the minimum stress, σmin, is the least as shown in below Figure.

Table 6: *Stress & Strain Value for Different Cases*

	Case (i)		Case (ii)		Case (iii)	
	Service Load	Extreme Survival Load	Service Load	Extreme Survival Load	Service Load	Extreme Survival Load
	Assembly					
Deformation on assembly in mm	0.68	1.44	0.6	1.48	0.49	1.23
	Foundation Can					
Max. Stress observed in Mpa	75	131	71	132	100	160
Min. Stress observed in Mpa	48	91.5	49	93	45.5	110
	S1 Section					
Max. Stress observed in Mpa	160	160	160	160	150	200
Min. Stress observed in Mpa	60.7	123.7	64	128	65	130
	Flange joint					
Stress observed in MPa	160	160	160	160	150	200
	Bolt Joint					
Stress observed in MPa	416.4	490.65	481	540.25	746.5	755

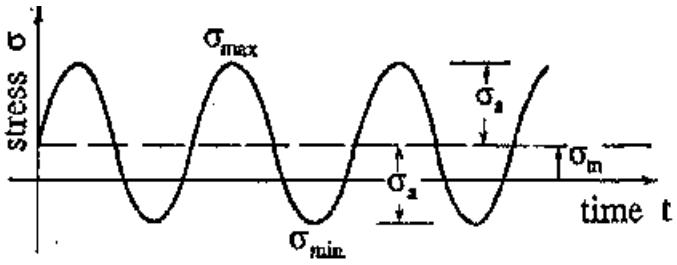

Figure 11: Stress Vs Time Curve

Tensile stresses are taken to be positive and compressive stresses are taken to be negative in Y axis.

The mean stress σm and stress amplitude Δσa are defined as

$\sigma m = \frac{1}{2}(\sigma max + \sigma min)$

$\sigma a = \frac{1}{2}(\sigma max - \sigma min)$

When the mean stress σm equals zero we have completely reversed stress. The stress variation σa is referred to as the range of stress. For sinusoidal loading, the stress-time relation is given simply as

$\sigma = \sigma m + \sigma a * \sin(2\pi/T)/t$

where T denotes the period of the stress cycle. The stress-time variation need not necessarily be sinusoidal for fatigue failure, though in many practical cases it is. The Ratio R= σmax/σmin.

The Constant Life Diagram (CLD) is a representation of S-N data. The constant-life lines in the CLD connect points with the same estimated lifetime, as a function of the mean stress and stress amplitude.

Figure 12 illustrates a three-dimensional representation of a group of S-N curves and lines connecting identical lifetimes. CLD can be seen as projection of the constant amplitude fatigue data on a plane perpendicular to the life axis, at N=1 mark. Each S-N curve is determined at a fixed R-value, and is therefore in a flat plane, at an angle to the horizontal plane. Different straight lines from the origin are lines of constant R-value, since mean stress

Table 7: *Numerical Vs Analytical Result*

	Case (i) Numerical Result	Case (i) Analytical Result
	Service Load	Service Load
Assembly		
Deformation on assembly in mm	0.68	
Foundation Can		
Stress observed in MPa	75	78.56
Stress observed in MPa	48	
S1 Section		
Stress observed in MPa	160	108.196
Stress observed in MPa	60.7	
Flange joint		
Stress observed in MPa	160	191.428
Bolt Joint		
Stress observed in MPa	416.4	

and stress amplitude are directly proportional to each other. The ordinate is located with the R=-1 line (zero-mean stress line). The highest alternating stress value for N=1 (the 'top' of the CLD) is assumed to be on, or very near to, the ordinate. In metals, the CLD is typically symmetric if static strength in tension and compression are same.

Component exhibits a maximum fatigue life of $1X10^6$ cycles, under the given loading conditions. It is much above the theoretical estimation of 1.95e5 or 1.95 x 105 cycles.

Conclusion

The studies on correction of the tilted wind turbine is concluded that,

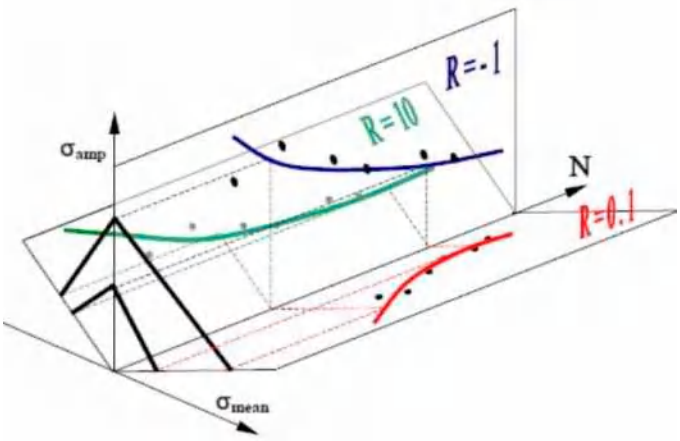

Figure 12: Relation between S-N Curves and CLD

- It is feasible to make change in the thickness of the foundation embedded can to tubular steel tower with tilted to nullify the effect of gravity shift.
- The flange thickness can be machined gradually.
- The stress developed even the extreme load is also obey within the allowable stress limits.
- The same technique can be done for any part of the hollow tower or blade with uneven flatness of mating parts.
- Maximum fatigue life of the component has 1 x 10^6 cycles, under the given loading conditions. It is much above the theoretical estimation of 1.95e5 or 1.95 x 10^5cycles, so the fatigue load also within allowable range on tower flange joints. But need to take care during service phase if there is any loss of pretension it is recommended to replace all the bolt every 5 year once.

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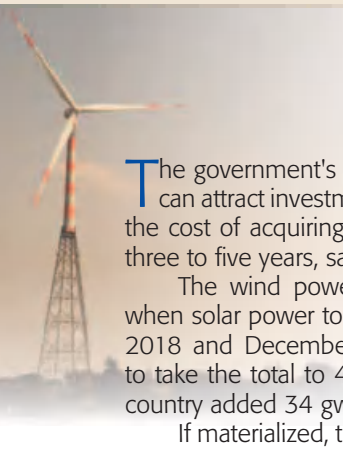


Wind Repowering Could Attract Rs 40,000 Crore Investments: CRISIL

The government's proposed policy to re-power old windmills can attract investments worth over Rs 40,000 crore, including the cost of acquiring and dismantling old plants, over the next three to five years, says a report.

The wind power capacity has been stalling since 2018 when solar power took off at a faster pace and between March 2018 and December 2022, the net addition was only 8 gw to take the total to 42 gw while between 2010 and 2018 the country added 34 gw.

If materialized, this will lead to a nearly three times (3x) the average annual wind power capex seen in the past four fiscals, according to an assessment by Crisil Ratings.

The Union new and renewable energy ministry had in October 2022 came out with a draft policy proposing repowering of old solar farms, which according to the agency is a step in the right direction to increase wind power generation as this can lead to lower open access tariffs.

According to Ankit Hakhu, a director at the agency, the move, if accepted well may lead to replacement of about 5 gw of old windmills with new wind power plants with 2x more generation ability, because such projects can generate double-digit returns at tariffs of Rs 4 per unit for the incremental capacity.

Such a tariff can attract more customers through open access, because their average power purchase cost today is Rs 4-5 per unit.

Total installed capacity wind power nearly tripled from 13 gw in 2010 to 34 gw till March 2018 and then lost pace and touched 42 gw as of December 2022. But most of these entailed windmills with hub height less than 100 metres, and narrower turbines of less than 1.5 mw capacity which can generate less per unit of capex compared with newer technologies.

After 2018, wind capacity additions slowed and reached 42 gw as of December 2022. One of the key reasons for this slowdown has been shortage of wind sites with high generation potential leading to higher capital cost compared to solar projects. That meant wind projects needed higher tariffs, which discoms were chary of.

New windmills can operate at hub heights over 150 metres and generate more electricity using higher capacity turbines of over 3 mw. For instance, a new 3 mw windmill with a plant load factor of 34-36 percent can potentially generate 200 per cent more electricity than a 1 mw old turbine at the same site with a plant load factor of 22-24 per cent, he said.

According to Varun Marwaha, an associate director at the agency, the draft repowering policy paves the way for over 5 gw of repowering investments, especially in Gujarat and Tamil Nadu. The policy provides clarity on extending eligibility of older machines from 1 gw to 2 gw to be repowered, on sale of incremental generation under open access route.

However, capex per mw will be higher for repowered units than greenfield projects as developers acquiring old wind sites will likely pay a premium and also incur dismantling expenses of Rs 80-100 lakh per mw.

While generation will increase by 200–300 per cent, projects may still need higher tariffs of at least Rs 4/unit than the recently discovered bids of Rs 3/unit to generate double-digit returns.

Commercial and industrial customers will find Rs 4/unit tariffs lucrative compared with grid tariff of Rs 7-8/unit in Gujarat and Tamil Nadu. Developers can prefer repowering over greenfield capacity because the risks will be lower given the proven generation track record of existing windmills.

The pace of adoption and success will depend on the speed at which the policy is implemented and approvals granted by state-run discoms and regulators because repowered projects will typically be linked to state electricity grids and will also have to service the remaining life of their extant power purchase agreements.

Courtesy: Press Trust of India, 12 January 2023

SnipPets

Special Purpose Vehicle to transform T.N. into a Green Power House

Tamil Nadu government intends to double the installed capacity for power generation in the State by adding 33,000 MW by 2030, giving high priority to development of renewable energy sources. The present contribution of green energy to the state grid at 20.88% is proposed to be increased to 50% by 2030 through additional capacity creation. To transform Tamil Nadu into a green power house with more than 50% of the power generation from renewable sources by the year 2030, the state government will create a dedicated Special Purpose Vehicle. Further, a new policy on repowering windmills in the state will be evolved.

Loss of TANGEDCO Expected to Reduce

Tamil Nadu government has announced that as a result of the structural and systemic reforms undertaken by the government, the fiscal position of Tangedco has improved slightly and it is expected that the loss of TANGEDCO will be reduced to Rs. 825 crore in 2022-23 from Rs. 11,955 crore in 2021-22. An allocation of Rs. 14,063 crore has been provided in the Budget Estimates towards various subsidies provided to TANGEDCO.

Source: The Hindu, February 11, 2023

Flagship Siemens Gamesa Offshore Wind Turbine Sparks to Life

Siemens Gamesa's Largest Ever Wind Turbine SG 14-236 DD prototype with 115-metre-long blades and a rotor diameter of 236 metres has produced its first power and delivered it to the grid. The turbine's capacity of up to 15 MW with Power Boost allows it to produce 30 per cent more energy than its predecessor, the SG 11.0-200 DD, Siemens Gamesa said. The prototype wind turbine was fully installed at the Danish national test centre for large wind turbines in Østerild in February 2023.

Source: Siemens Gamesa, March 23, 2023

Energy Conservation Awareness: Lights Turned Off at Landmark Sites

Lights at public places and some temples in various cities of India including Mumbai, Kolkata and the national capital were turned off between 8.30 p.m. to 9.30 p.m. as part of the global 'Earth Hour' event. The annual event is observed in order to raise awareness about energy conservation.

Hexagon puts data to work to overcome challenges in renewable energy technology manufacturing, such as cost, durability and efficiency.

Our solutions optimise processes from design to quality inspection, delivering efficiency gains at every step.

Hexagon offers an unrivalled portfolio of end-to-end solutions, each focused on automating processes for more efficient manufacturing and more reliable, high-performance systems. Our technology accelerates progress towards a sustainable future for all. Find out more at **https://hexagon.com/industries/energy-power-generation**

Or write to naveen.chakradhar@hexagon.com

HEXAGON

IREDA Gets Infrastructure Finance Company Status

The Reserve Bank of India (RBI) has granted an 'Infrastructure Finance Company (IFC)' status to Indian Renewable Energy Development Agency (IREDA). It was earlier classified as 'Investment and Credit Company (ICC)'. With the IFC status, IREDA will be able to take higher exposure in RE financing. The IFC status will also help the company to access wider investor base for fund mobilisation, resulting in competitive rates for fund raising. The recognition of IREDA as an IFC will increase the investors' confidence, enhance the brand value, and generate positive outlook in the market. The grant of IFC status is recognition of IREDA's 36 years of infrastructure financing and development with focused development of Renewable Energy. With IFC status, IREDA will keep contributing towards Govt. of India's target of 500 GW installed capacity of non-fossil fuels by 2030.

Source: PTI, 13 March 2023

TN Comprehensive Policy for Pumped Hydroelectric Storage

Tamil Nadu government has announced in its budget for 2023-24 that it will bring out a comprehensive policy to promote investment in pumped hydroelectric storage in the State.

Wind Energy Projects Generated 64.54bn Electricity Units in April-Jan of FY23

The electricity produced from wind energy projects was 64.54 billion units during the April-January period of 2022-23, according to the Ministry of New and Renewable Energy data. Tamil Nadu and Gujarat are the two states which lead in terms of generating electricity through wind energy.

During April 2022-January 2023, Gujarat produced 17,062 million units and Tamil Nadu 15,703 million units of electricity from wind energy.

Source: IANS March 20, 2023

GUVNL Invited Bids for 500 MW Wind Projects

Gujarat Urja Vikas Nigam (GUVNL) has invited bids to procure power from 500 MW of grid-connected wind projects (Phase V) with a *Greenshoe Option of an additional capacity of up to 500 MW. The bidders can bid for a minimum capacity of 25 MW for intrastate projects and a minimum capacity of 50 MW for interstate projects. Bidders should ensure pre-bid tie-up with not less than three manufacturers for the project's design, engineering, supply, procurement, construction and operation & maintenance. The project should be designed for interconnection with state or central transmission utility substation through a dedicated transmission. The successful bidder will be responsible for getting grid connectivity. The declared annual capacity utilization factor (CUF) should not be less than 22%. The successful bidders will have to maintain generation to achieve annual CUF within +20% and -20% of the declared CUF during the PPA duration of 25 years.

Source: GUVNL, 14 March 2023

NTPC, IOCL Ink Pact to Set up Renewable Energy Projects

NTPC Green Energy Limited (NGEL) and Indian Oil Corporation Limited (IOCL) have inked pact for setting up of renewable energy projects to meet round-the-clock power requirement of IOCL refineries. This will also enable to meet the government's clean energy targets in their respective core business. NTPC Ltd, through its wholly-owned subsidiary, NGEL, has set an ambitious target of building a renewable generation portfolio of 60 GW over the next decade to aggressively pursue its green energy business.

Source: PTI March 21, 2023

Modi's Atmanirbhar Bharat push: India Can Achieve Energy Independence by 2047: US Report

India, the world's fifth largest economy, can achieve energy independence through clean technology by 2047, a report of top research institute aid, highlighting Prime Minister Mr. Narendra Modi's Atmanirbhar Bharat push that spans from a massive renewable capacity addition to electric mobility saving billions of dollars in imports. Lawrence Berkeley National Laboratory, a federally funded research and development centre, along with The India Energy and Climate Center (IECC) located at UC Berkeley's Goldman School of Public Policy published a report, 'Pathways to Atmanirbhar Bharat', that highlights the steps taken by India towards the adoption of clean energy. India is 80-85 per cent dependent on imports to meet its oil and coal needs.

Source: PTI March 20, 2023

UN To Deliver Diagnosis, Prescription for Climate Crisis

The United Nations was poised to release a capstone report Monday distilling near decade of published science on the impacts and trajectory of global warming, and the tools available to prevent climate catastrophe. The Intergovernmental Panel on Climate Change's 30-odd page "summary for policymakers, ---compressing 10,500 pages authored by more than 1,000 scientists -- is as dense as a black hole and will deliver a stark warning. "We are nearing a point of no return," UN chief Antonio Guterres said last week as diplomats from 195 nations gathered in Interlaken, Switzerland, to hammer out the final wording, finalised on Sunday night by exhausted and sleep-deprived delegates two days behind schedule.

Source: AFP, 20 March 2023

West Has Lot to Learn From Modi on Economic, Green Policies: Former UN Environment Head

The West also has a lot to learn from economic policies and green commitment of Prime Minister Mr. Narendra Modi, who systematically uses the state as an economic tool, much like South Korea did with thundering success a few decades ago, writes former UN Environment Programme executive director Erik Solheim. Modi launches government programmes called "missions" for green hydrogen, production of solar panels, electric batteries, or green transport. The missions select some Indian companies that receive special support, while everyone is encouraged to invest green, wrote Solheim in a full-page op-ed, titled 'Why India is the nation to follow in 2023', published recently in Dagens Naeringsliv, a Norwegian newspaper specialising in business news.

Source: IANS March 13, 2023

UK-India Offshore Wind Summit 2023

The 2nd UK-India Offshore Wind Summit, organised by the UK Government's Department for Business and Trade (DBT) at Taj Wellington Mews, Chennai on Friday, 10th March 2023 was a grand success with over 250 delegates participating from India, the UK and across the globe. The summit was designed to create a platform to discuss all things Offshore Wind in India and how best to leverage each other's expertise, experience and knowledge to accelerate the growth of the industry in the country. The summit was organised in partnership with the Global Wind Energy Council India as Knowledge Partner and the Indian Wind Turbine Manufacturers Association as Supporting Partner.

The summit was inaugurated by Mr. Alex Ellis CMG, British High Commissioner to the Republic of India along with Dr. Rajesh Katyal, Director General of the National Institute of Wind Energy, Mr. Oliver Ballhatchet MBE, British Deputy High Commissioner Chennai, Ms. Libby Green, Climate Change Lead and Mr. Srijith Menon, Offshore Wind Lead.

The Honourable Chief Minister of Tamil Nadu Thiru M.K. Stalin visited the summit ahead of the inaugural to meet with the UK Delegation and had a private meeting with the British High Commissioner ahead of the summit. About 20 UK companies participated in the summit.

Inaugurating the Summit, Mr. Alex Ellis CMG, British High Commissioner to the Republic of India impressed upon the following points:

- Offshore Wind is an extremely important component in our fight against climate change.
- Political commitments to net zero already put Offshore Wind in a vital position for helping achieve this. The energy crisis and the Russian invasion of Ukraine has seen Government's across the world further raise their Offshore Wind targets as they look to secure their energy supply.
- The UK has a target of 50 GW installed Offshore Wind capacity by 2050 and 5 GW coming from innovative floating wind creating up to 90,000 direct and indirect jobs by 2030.
- The UK has circa 50% of all European Offshore Wind installed capacity, as well as the largest Offshore Wind market in Europe and the second largest installed capacity in the world, after China. Offshore Wind is and will continue to play a key role in the UK's transition to energy independence and remains an integral part of this Government's strategy.
- Not only are we committed to the development of Offshore Wind in the UK but also towards supporting the development of the industry in other markets such as India, who has the world's largest energy transition target of 500 GW by 2030, of which India has already crossed 100GW recently.
- At the heart of India's Offshore Wind journey is Tamil Nadu and Gujarat. Two states with the biggest potential.
- The UK aims to support the development of Offshore Wind in India, through engagements with you all, respective state governments, the Government of India.

The Summit was addressed virtually by Mr. Dinesh Jagdale, Joint Secretary, Ministry of New and Renewable Energy, Government of India.

Ms. Libby Green, Climate and Energy Lead, British High Commission, New Delhi spoke on UK-India Offshore Wind Technical Assistance Program – ASPiRE

Dr. Rajesh Katyal, Director General (Additional Charge), National Institute of Wind Energy Government of India spoke on India's Offshore Wind Journey- Studies, Tender Documentation, Future Path, Supply Chain.

The summit saw the release of GWEC's India Offshore Wind Statement Paper funded by the UK Government's Department for Business and Trade and the release of the Supply chain and logistics report prepared by MEC+ on behalf on the Offshore Renewable Energy Catapult UK and the National Institute of Wind Energy, funded by UK Research and Innovation (UKRI).

During the summit, the UK Government's Department for Business and Trade signed a strategic partnership agreement with the Global Wind Energy Council India to work together on the development, promotion of the offshore wind and onshore wind sector in India.

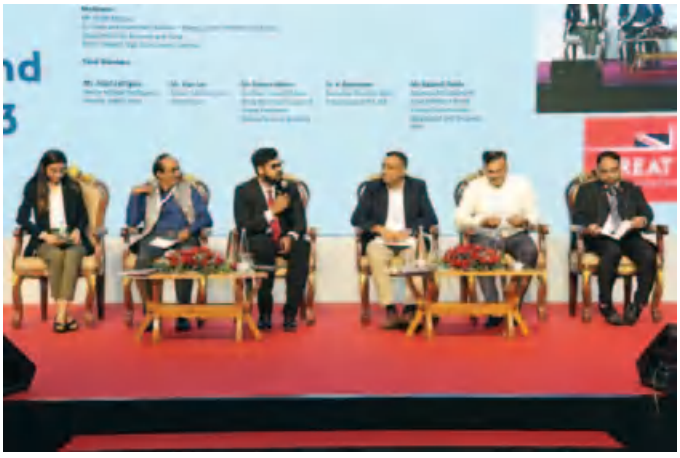
Mr. D. V. Giri, Secretary General, Indian Wind Turbine Manufacturers Association (IWTMA) elaborated on the History of Indian Wind Industry and where it is today.

He emphasized the following points:

- Wind power potential is 695 GW in India at 120 meter hub height.
- Government target is to achieve 500 GW of Renewable Energy by 2030 off which 140 GW from Wind.
- Industry has achieved an average of 60% localization and in some cases up to 90%.
- There is strong need to encourage participation of MSME in Wind Sector.
- The positive impact of wind industry on rural economy encompassing tertiary business and employment opportunities for rural youth.
- Major shift in procurement by e-reverse auction has resulted in an average of 1.5 GW addition per annum in the last 6 years while industry is having manufacturing capacity of 15000 MW per year.
- Government to focus on other avenues of business such as Open Access for C&I customers, Sale to Exchange and Incentivizing Exports.
- Renewable Energy/Wind Parks to be considered as a National Movement.
- IWTMA in partnership with PDA Trade Fairs is organizing an International Conference & Trade Fair titled "Windergy India 2023" from 4th to 6th October 2023 at Chennai.

Other sessions represented by the experts in the respective areas at the Summit were:

- Infusing Competitiveness for offtake of Offshore Wind in India
- Presentation on UK's Offshore Wind Journey



- De-Risking, Investing and Financing Offshore Wind Projects
- Presentation on Importance of Geotechnical Survey in Offshore Wind
- Supply Chain and Infrastructure for Offshore Wind in India
- Offshore Wind Potential in Sri Lanka
- Offshore Wind & Carbon Credits Business to Business Trading
- R&D, Skilling and Training in the Offshore Wind sector

The Summit concluded with the Interactive Session with delegates by Mr. Srijith Menon, Senior Trade and Investment Adviser – Energy, Lead – Offshore Wind India, Department for Business and Trade, British Deputy High Commission, Chennai.

For engaging with UK business on Offshore Wind in India, please reach out to:

Mr. Srijith Menon, Senior Trade and Investment Adviser – Energy, Lead – Offshore Wind India, Department for Business and Trade British High Commission at Srijith.Menon@fcdo.gov.uk

MNRE Signs Agreements with Australia, Finland, Germany and UAE for Promotion of Bilateral Cooperation in RE

The Ministry of New and Renewable Energy enters into various kinds of agreements with foreign countries from time to time to promote bilateral cooperation in the field of renewable energy.

Since 2022, the Ministry of New and Renewable Energy has signed the following Memorandums of Understanding/ Joint Declarations of Intent/Letters of Intent:

i. A Letter of Intent (LoI) on New and Renewable Energy Technology cooperation was signed between Ministry of New and Renewable Energy, Government of India and Ministry of Industry, Energy and Emissions Reduction, Government of Australia on 15th February, 2022.

ii. A Memorandum of Understanding (MoU) on cooperation in the field of Renewable Energy was signed between Ministry of New and Renewable Energy, Government of India and Ministry of Economic Affairs and Employment of the Republic of Finland on 29th April, 2022.

iii. A Joint Declaration of Intent (JDI) on the Indo-German Green Hydrogen Task force was signed between the Ministry of New and Renewable Energy (MNRE), Government of India and the Ministry for Economic Affairs and Climate Action (BMWK) of the Federal Republic of Germany on 02nd May, 2022.

iv. A Joint Declaration of Intent (JDI) regarding Renewable Energy Partnership was signed between the Ministry of New and Renewable Energy, Government of India and the Ministry for Economic Cooperation and Development of the Federal Republic of Germany on 02nd May, 2022.

v. A Memorandum of Understanding to promote discussion and cooperation between the Parties in the Potential Areas of Cooperation in the Spectrum of Green Hydrogen Development and Investments in India and the UAE was signed between the Ministry of New and Renewable Energy, Government of India and the Ministry of Energy and Infrastructure, Government of the United Arab Emirates on 13th January 2023.

Courtesy: Press Information Bureau, 14 March 2023

Snippets

Government Seeks Comments on Draft Carbon Credit Trading Scheme

The Union Ministry of Power has come up with the much anticipated draft Carbon Credit Trading Scheme and sought comments from stakeholders including states by 14 April 2023.

The ministry, in the draft proposed to set up an Indian Carbon Market Governing Board with the Secretary for the Ministry of Environment, Forest and Climate Change as its Chairperson for direct oversight of its administrative and regulatory functioning of the market. The board will recommend procedures for institutionalizing the Indian carbon market, recommend to the central government the rules and regulations for the functions of the market, recommend methodologies to be used under voluntary mechanism, guidelines regarding sale of carbon credit certificates outside India. It would also recommend the Centre or the designated agency for issuance of carbon credit certificate (CCC), among other functions. The Bureau of Energy Efficiency (BEE) would be the administrator for the carbon market and also operate as the as the secretariat for ICMGB.

Source: Share Price India, 27 March 2023

Record New Wind Capacity to be installed by 2027

A record 680 GW of wind energy capacity is expected to be installed by 2027 but policymakers need to ensure supply chain bottlenecks do not slow growth to avoid missing climate targets, according to an industry report released. The Global Wind Energy Council (GWEC) report said policies have set the scene for accelerated deployment of onshore and offshore wind, with the industry expected to install 136 GW a year to 2027.

Source: Reuters, 27 March 2023

Regulatory Update on Wind Power

Name of the Policy	Date of Issue
CEA issues draft Construction of Electric Lines in Great Indian Bustard Area Regulations, 2023	01-Feb-23
CERC issues new deviation settlement guidelines to maintain grid security	06-Feb-2023
MoP issued draft guidelines to promote the development of Pump Storage Projects (PSP) in the country	15-Feb-2023
MNRE issues PM-Gati National Master Plan related to renewable energy	15-Feb-2023
CERC approves IEX proposal to introduce HP-DAM in I-DAM segment at IEX	16-Feb-2023
STATE	
APERC sets levelized tariff of INR 2.64 per unit for the 11th to 20th year of operation for wind projects in AP	06-Feb-2023
KSERC sets tariff of INR 2.69/kWh for Average Renewable Power Purchase Cost for FY 2022-2023	23-Feb-2023

Monthly meeting with OEMs of WTGs availing CCDC Benefits

Ministry of New and Renewable Energy, Government of India has issued the office memorandum dated 20th February 2023 that the Ministry will hold monthly virtual meeting with all the stakeholders seeking Concessional Custom Duty Certificate (CCDC) to import the parts/component etc. of the wind turbine generators under the chairmanship of Joint Secretary (Wind). This will help in understanding the issues relating to the difficulties faced by them in submission of the applications as well as the procedure to avail the concessional custom duty benefits. The monthly building is the tentatively scheduled to be held on 2nd Friday of each month. In case the 2nd Friday falls on gazetted holiday, the meeting may be held on the next Friday. A meeting notice and the link for the meeting shall invariably be sent by email to all concerned.

CERC Issues Order on Deviation Settlement Mechanism

Central Electricity Regulatory Commission, New Delhi has issued Order dated 06th February, 2023 as directions in the interest of grid security, in pursuance of the provisions of the Electricity Act, 2003 and the provisions of the Central Electricity Regulatory Commission (Deviation Settlement Mechanism and Related Matters) Regulations 2022. The Commission observes that though some improvement in the frequency excursions above 50.05 Hz was observed, the overall frequency profile still remains a matter of concern. Based on the feedback and consultation, the Commission, felt it expedient to invoke its powers under Regulation 11 and Regulation 12 of the DSM Regulations, 2022 to relax and to remove difficulty in implementation of DSM Regulations highlighted by various stakeholders, as an interim measure, so as to ensure smooth and secure operation of the grid. The detailed order has been issued in this regard.

APERC Determines Wind Tariff from 11th year to 20th years

Andhra Pradesh Electricity Regulatory Commission has issued order dated 6th February 2023 determining the Tariff/Power Purchase Price from 11th year to 20th year from COD in respect of Wind Based Power Projects. The Commission, in the absence of Regulations and also with a view to encouraging wind power which was at that time still in a nascent stage, determined a levelized tariff of Rs.3.50 per unit for the first ten years of operation but kept open the option to review the same after ten years of operation keeping in view the future changes in the wind energy scenario. Therefore, while not accepting the submissions of the learned counsel for the petitioners, it has decided to examine various parameters for fixing the tariff from the 11th year onwards. The Commission, having perused the records and after careful examination of the various contentions made by the rival parties in the written and oral submission and their claims as indicated in Annexures I & II, analyzed the various key elements that influence the determination of tariff. Detailed order can be read for full details.

The tariff determination is subject to the following terms and conditions:

A) The tariff at Rs. 2.64/-per unit determined in this order shall be applicable from the 11th year to the 20th year from the date of commercial operation of the projects.

B) The DISCOMS shall have the first right of refusal on Power Purchase if the projects continue to operate after the 20th year of operation from the COD. The tariff beyond the 20th year shall be as mutually agreed by both parties and consented to by the Commission.

C) The developers shall be entitled to dispatch 100% of the available capacity without reference to the Merit Order Dispatch subject, however, to any system constraints.

D) The developers shall abide by the orders, rules, regulations and terms and conditions as approved by the Commission from time to time.

E) The CDM benefits shall be shared in the ratio of 90:10 between the developers and the DISCOMs.

F) The Energy injected in any financial year over and above the specified CUF of 23.50% shall be treated as inadvertent and shall not be paid.

Ministry of Power Seeks Comments on Guidelines for Promote Development of Pump Storage Projects

Energy Transition entails an increasing presence of variable and intermittent Renewable Energy Sources (VRES) like solar and wind in the energy mix. This presents a grid-level challenge, that would require incentivization of technologies offering storage and ancillary services attributes. Pumped Storage (PSPS) is a MW scale, domestically available, time tested, and internationally accepted technology available for addressing this requirement of slorage and ancillary services. The positive aspects of PSPS are not limited to the attributes of storage and ancillary services, rather PSPs are clean, green, safe and non-explosive. They do not produce any poisonous/ harmful by-products or pose problems of disposal. Ministry of Power, Government of India, has sought the comments of the people vide their communication dated 15th February, 2023 on draft guidelines to promote development of Pump Storage Projects (PSP) in the country.

Manual on Transmission Planning Criteria Revised

Manual on Transmission Planning Criteria was first brought out by CEA in 1985 setting the planning philosophy of regional self-sufficiency. The Manual was further revised in 1994 and 2013 taking into account the technological advancements and institutional changes. The regional electrical grids were synchronously interconnected in December 2013 to form a single unified grid, one of the largest synchronous electrical grids in the world. India envisages having more than 50% of the installed power generation capacity through non-fossil fuel based sources by the year 2030, most of which will be Solar and Wind power. Keeping in view the system needs like anticipated large scale renewable generation capacity addition, growth of load, increasing fault level, right of way issues, and technological advancements, the Manual on Transmission Planning Criteria has been revised again in 2023.

*Contributed by **O. P. Taneja**, Renewable Energy Consultant*

China Drives Global Wind Turbine Orders to New Record in 2022

Global wind turbine order intake hit new highs in 2022, with 44 GW procured in Q4 and 134.6 GW for the year, both records. Dominated by activity in China, annual investment reached an estimated $74.2 billion, according to new analysis from Wood Mackenzie. This activity was driven by developers positioning to comply with China's 14th 5-year plan, which highlights green energy development in the Asian nation. While China made an outsized impact on global order capacity, order intake outside of China dropped 15% YoY to 41 GW, approximately 9 GW off the four-year average for full-year order capacity from 2018 to 2021.

Source: Woodmac, 8 March 2023

India Plans 18 GW of Pumped Hydro Storage by 2032

India's Ministry of Power has issued draft guidelines to procure power from pumped hydro storage projects to better integrate renewable energy capacity in the grid.

According to a document released by the ministry of power, the country envisages setting up 18 GW of pumped hydro storage capacity. The projects shall be used to meet peak power demand using renewable power. India has 8 pumped hydro storage projects of around 4.7 GW but these are not actively operated in the pumped storage mode. Four other projects of 2.8 GW are under construction while 26 others with 26.6 GW have been allocated to states. The government estimates 108 GW of pumped storage potential in the country.

Source: CleanTechnica, 10 March 2023

Power Ministry Notifies 40 per cent Renewable Generation Obligation

The Union Ministry of Power has notified Renewable Generation Obligation (RGO) for new coal-fired thermal power plants that commence operation on or after April 1, 2023. The renewable purchase obligations for the plants were increased to a minimum of 40 per cent of its coal power capacity from 25 per cent after stakeholder consultations on the draft notification issued earlier in November 2022.

In order to meet the mandate, coal power plants may either produce renewable energy within their own premises or enter into agreements with other entities to procure and supply an equivalent amount of renewable energy. The notification identified 81 coal power plants to replace 58,000 million units of energy from coal with renewable energy generation by 2025-26. The scheme was said to conserve 34.7 million tonnes of coal and reduce carbon emissions by 60.2 million tonnes.

Source: Downtoearth, 7 March 2023

IREDA Achieves Record-breaking Loan Disbursement and Sanction in FY 2022-23

Indian Renewable Energy Development Agency Ltd. (IREDA) has crossed highest annual loan sanction of Rs. 23,921 Crores (FY 2021-22) and disbursement of Rs. 16,071 Crores. It has touched loan sanction of Rs. 32,578 Crores (as on 27th March 2023).

Source: Solar Quarter, 28th March 2023

Prospects and Limitations of Repowering

Rajan Deb
Managing Director
Consolidated Energy
Consultants Limited, Bhopal

1. It is necessary and beneficial to ensure repowering of old and inefficient Wind Electric Generators (WEG) and windfarms through modern high capacity generating WEGs.

   There are however quite a few constraints in repowering old turbines and projects. The major problems likely to be faced are:

   a) Location of nearby WEGs – to ensure adequate separating distance

   b) Capability of existing grid connection to facilitate connectivity of larger MW capacity WEG.

   c) Present operating status and residual life available – to justify financial investment.

   d) Present usage of power – for captive/third party sale/ sale to discom.

2. It is therefore necessary to conduct area-wise diagnostic study to ascertain present status and develop a workable methodology to replace the old WEGs. This study conducted in specific area – would provide a clear picture of possibilities and constraint for repowering.

   Several such area-wise studies would indicate the actual quantum of repowering opportunity throughout the country besides providing the present status of operating WEGs.

   This study can be conducted – state wise and specific windy zone wise to appropriately indicate the overall possibility of Re-powering.

3. The above mentioned diagnostic study would also facilitate – decision making process of connecting Re-powered Projects to State or National Grid.

   Besides technical issue to ensure suitable grid connectivity – availability of National Grid – would facilitate sale of energy generated at profitable rate to justify investment.

4. In some locations – a small rated old WEG can be replaced by a larger WEG with longer rotor dia- but in many other locations – a larger rotor dia WEG may adverse effect the performance of near-by other WEGs. In such cases a lower rating WEG with higher hub-height would be a better option. Through such intervention – the overall MW capacity may not increase but the generation shall increase substantially.

   The proposed diagnostic study would provide a clear picture of the possibilities in totality.

5. The best commercial option for Re-powering would be those WEGs which were installed for captive consumption.

   There shall be least problem in terms of commercial/sale transactions.

   The next best option shall be those WEGs installed for open access sale.

6. The most pertinent issue – however- would be to ensure – sale of energy and receipt of timely payment against the new investment.

   Rationalization of open access changes shall be a welcome step.

7. To provide short-term financial assistance/interest subsidy – shall not attract investment unless and until reasonable selling rate and timely payment is assured.

8. Re-powering exercise should be considered purely as a commercially viable business proposition – to attract Private sector investment.

Snippets

India Seeks Investment by LIC, Pension Fund in Green Bonds: Sources

The government is considering mandating the Life Insurance Corp of India (LIC) and Employees' Provident Fund Organisation (EPFO) to invest 1% of their assets under management in bonds issued by Power Finance Corp (PFC), REC Ltd and Indian Renewable Energy Development Agency (IREDA), the state-run power lending firms to finance green projects. The Finance Ministry was looking at steps to push climate financing.

Source: Reuters, 9 February 2023

Lithium Reserves Found in Jammu and Kashmir

The government has said that lithium reserves have been found for the first time in the country in Reasi district of Jammu and Kashmir. Lithium is a non-ferrous metal and is one of the key components in EV batteries. Earlier government was taking several proactive measures to secure minerals, including lithium, from Australia and Argentina. Currently, India is import-dependent for many minerals like lithium, nickel and cobalt.

Source: PTI, 10 February 2023

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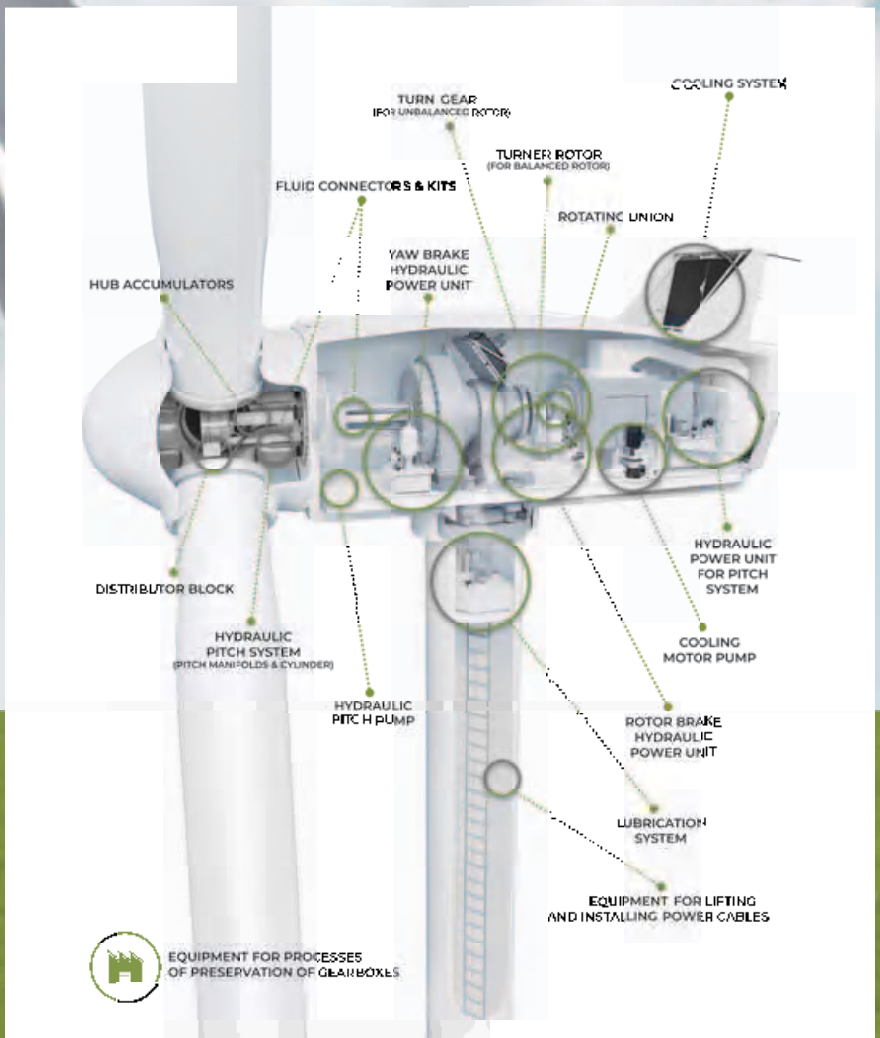

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Envision New Blades Facility at Trichy

Envision group is localizing & expanding in India with a new Blades manufacturing facility upcoming at Trichy in Tamil Nadu. With an Investment of approximately Rs. 200 Crores – this plant will generate 1200+ employment in wind sector. Presently, the plant is installed with 4 Blade production lines for Envision Make EN156-3.3 MW WTGs with annual production capacity of 1000 blades per year. The commercial production is expected to commence from April 2023 and this plant is expected to produce 500 Blades by end of December 2023.

Source: Mercom India, 17 March 2023

2.57 Lakhs EVs Registered in India in 2023 as of 15th March

A total 2,56,980 EVs have been registered in the current year till March 15. Of over 21.70 lakh electric vehicles registered in India, Uttar Pradesh topped the list with 4,65,432 EVs, followed by Maharashtra and Delhi with 2,26,134 and 2,03,263 respectively, the government said in Parliament on 21st March 2023. The Ministry of Heavy Industries has given incentives to buyers and manufacturers of electric vehicles through three schemes.

SECI Payments to Wind and Solar Power Generators in India See 51.2% YoY Increase

Solar Energy Corporation of India (SECI) payments have increased by 51.2% compared to the same period last year. The increase in payments to wind and solar power generators could be attributed to various factors, such as increased power demand during January 2023, resulting in lower electricity prices. Payments totalling Rs 8.21 billion were made to solar and wind power producers for the power purchased by SECI in January 2023, which is 11.827% more than what was paid out in December 2022. Disbursements were made in January, accounting for around 83.5% of the nodal agency's total payments for the month. SECI's payments have provided additional support to renewable generators who were already suffering from DISCOMs past payment delays. SECI even paid Rs 27.11 million to contractors and service providers, in addition to the payment of Rs. 122.86 million for the refund of excess money received.

Source: Solar Quarter, 20 March 2023

Global RE Capacity Grew by Record 10% Last Year: IRENA

Global renewable energy capacity grew by 9.6% in 2022 but needs to grow by three times the current rate to limit global warming, the International Renewable Energy Agency (IRENA) has said. IRENA's annual report on renewable energy statistics has said that the global renewable energy capacity amounted to 3,372 GW at the end of last year, some 295 GW or 9.6% higher than the previous year. Some 83% of all new power capacity last year was from renewables. "This continued record growth shows the resilience of renewable energy amidst the lingering energy crisis," IRENA's Director General Mr. Francesco La Camera has said. "But annual additions of renewable power capacity must grow three times the current level by 2030 if we want to stay on a pathway limiting global warming to 1.50C," he added. Solar and wind energy dominated the renewable capacity expansion, jointly accounting for 90% of all net renewable additions in 2022, the report said.

Source: Reuters, 22 March 2023

India's RE Capacity Reaches 168.96 GW till Feb 2023: Minister R K Singh

India's total installed renewable energy capacity has touched 168.96 GW mark by February, 2023-end. Mr. R.K. Singh, Union Minister for Power, New and Renewable Energy has said that out of the total 168.96 GW, 64.38 GW is solar power capability, 51.79 GW is hydropower, 42.02 GW is wind power, and 10.77 GW is bio-power. He further informed that another 82.62 GW of green energy capacity is being implemented and that 40.89 GW of capacity is in different stages of tendering.

Source: IBEF, 22 March 2023

Ministry of Power Notifies Grid Controller for Uniform RE Tariff for Central Pool

Ministry of Power, Government of India has notified the Grid Controller of India Limited (Grid India) as the Implementing Agency for the implementation of "Uniform Renewable Energy Tariff for Central Pool" vide order dated 17 March 2023.

MNRE Releases Bidding Trajectory for RE Power Projects

Ministry of New and Renewing Energy, Government of India has released the bidding trajectory for Renewable Energy power projects on 31st March 2023. According to the trajectory the bid for the Renewable Energy capacity of 50 GW per annum with at least 10 GB per annum of Wind Energy capacity are to be issued each year from FY 2023-24 to FY 2027-28. For FY 2023-24 the bids for renewable capacity of 50 GW are to be issued as per the following time line:

1. Quarter 1: April to June 23: 15 GW
2. Quarter 2: June to September 23: 15 GW
3. Quarter 3: October to December 23: 10 GW
4. Quarter 4: January to March 24: 10 GW

The bids for aforesaid trajectory may consist of vanilla Solar, vanilla Wind, Solar-Wind Hybrid, Round the Clock (RTC) Renewable Energy power, etc. with or without storage or any other combination, based on the assessment of the Renewable Energy market or as per directions of the government. The year-wise targeted bid capacity would be allocated among the REIAs by the Government.

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Windergy India 2023
5th Edition to be held in Chennai

5th International Trade Fair & Conference
4-6 October 2023
Chennai Trade Centre, Chennai, India

India is one of the fastest growing wind energy markets in the world with an installed capacity of over 41 GW. With a rapidly growing population and increasing demand for cleaner sources of energy, India's wind energy market is set to continue its strong growth trajectory.

It may be recalled that in order to reduce dependence on fossil fuel and achieve the target of net-zero emission by 2070, Prime Minister Shri Narendra Modi at COP26 (November 2021) pledged five key targets towards fulfilment of this objective. These include: (i) Increasing country's non-fossil energy capacity to 500 GW by 2030 (ii) 50 percent of country's energy requirements to come from renewable energy by 2030 (iii) Reduction of total projected carbon emissions by one billion tons from now till 2030 (iv) By 2030, India will reduce the carbon intensity of its economy by more than 45 percent (v) By the year 2070, India will achieve the target of Net-Zero.

Wind energy will play a pivotal role in achieving the above objectives and has already made impressive progress in terms of capacity addition, manufacturing capabilities and other areas. Currently, 27% of the total installed power capacity in the country comes from renewable energy, of which 37.73% is contributed by wind energy (40.13 GW). The target for wind energy is 140 GW by 2030 ~ an annual capacity addition of around 10 GW year on year.

As India's only comprehensive International Trade fair and Conference for the Wind Energy Sector, Windergy India aims to once again bring together wind industry professionals from India and overseas to reiterate the pivotal role of wind energy in achieving the target of net-zero emission objectives and to accelerate progress in terms of capacity addition, manufacturing capabilities and other areas through its annual Trade fair and conference. Indian Wind Turbine Manufacturers Association (IWTMA) and PDA Ventures have just announced the fifth edition of Windergy India 2023 to be held from 4-6 October 2023 at Chennai Trade Centre, Chennai. Tamil Nadu is in the forefront of the entire Eco Value Chain.

The last edition which took place from April 27–29, 2022, at Pragati Maidan in New Delhi, was a success in bringing together the top OEMs, component makers and service providers from countries including China, Malaysia, Denmark, the UK, Italy, Germany, France and India. Over 3000 wind industry professionals from India and overseas comprising of Academicians, Associations, Industry Leaders, International Organisations, Banks and Financial Institutions, Clean-Tech Specialists, Consultants, Corporates, DISCOMS, Environmental Groups, State/Central Governments, Green Power Providers, Independent Power Producers, Investors, Landscape architects, Energy Consultants, Lawyers, Surveyors & appraisers, Media and trade press, Municipalities, Non-Governmental Organisations, Non-profit Organisations, Think Tanks, PSUs, Power Consultants, R&D Institutions, Technology Developers, Trading Company/ Distributing Agent, Utility Providers and Venture Capitalists participated at the event in a span of three days.

The parallel conference themed 'Power of the Wind: India's Drive to Net-Zero" had deliberations by industry leaders and professionals with the presence of 300 plus delegates analysed and reflected on policies and regulatory challenges in India. Future electricity demands, efficient grid integration and offshore were all examined in-depth, in addition to technology and green finance methods.

The upcoming 5th edition will yet again be an exclusive blend of a 3-day Trade fair alongside a 2-day power packed conference with key note speeches, thought-provoking panel discussions, special addresses and technology presentations by senior bureaucrats, industry leaders, academics and other subject matter experts, providing an exclusive platform to meet, interact and engage with policymakers, regulatory authorities, international/domestic technology, solutions and service providers from the Wind Energy Sector.

For more details: https://windergy.in/
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