Indian Wind Power

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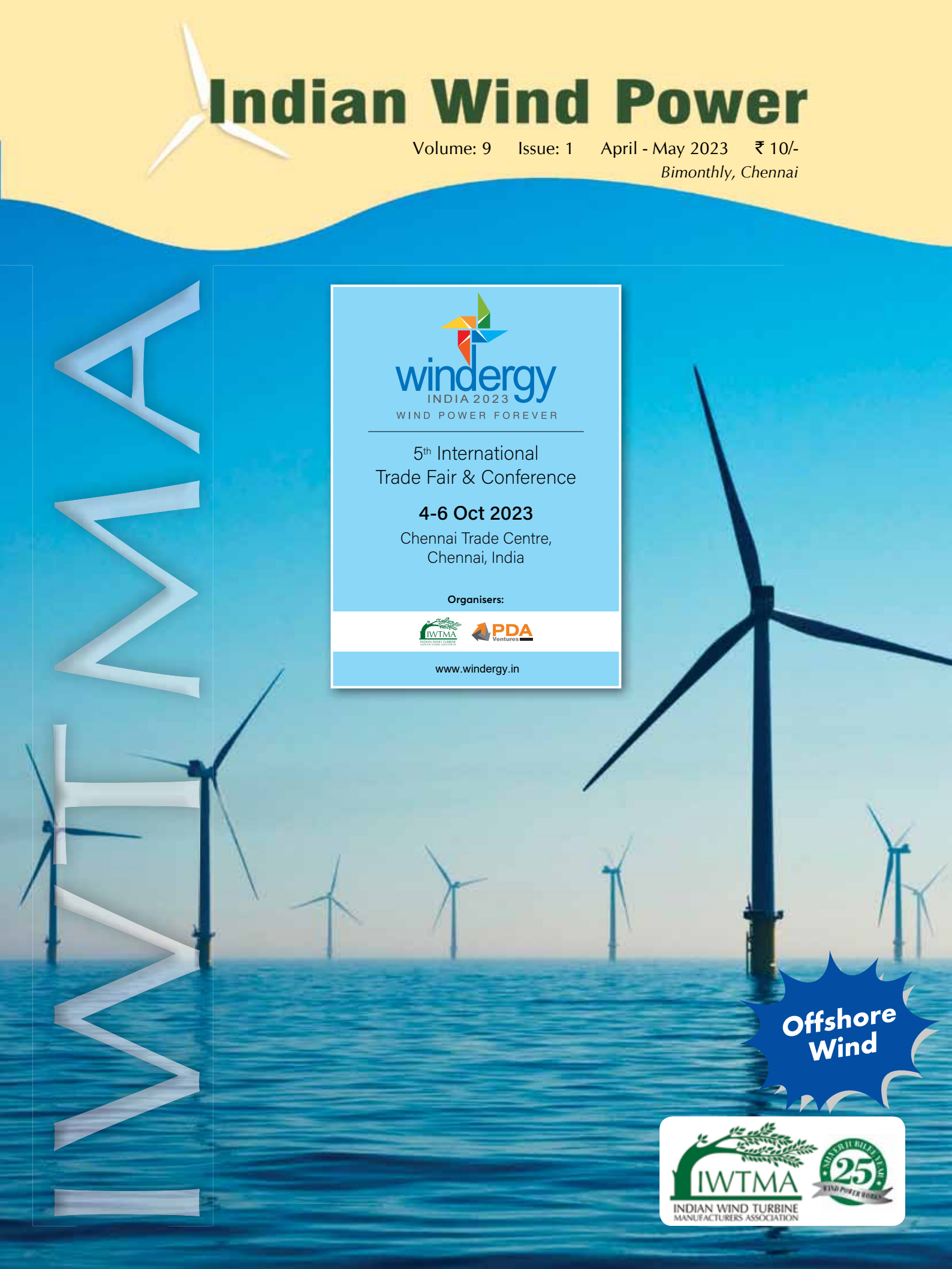

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IWTMA
INDIAN WIND TURBINE MANUFACTURERS ASSOCIATION

Indian Wind Power

A Bi-monthly Magazine of Indian Wind Turbine Manufacturers Association

Volume: 9 Issue: 1 April - May 2023

Contents

Indian Wind Turbine Manufacturers Association

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(For Internal Circulation only)

From the Desk of the Secretary General – IWTMA

Dear Readers,

Greetings from IWTMA!

We are happy to share with our readers that your magazine "Indian Wind Power" has entered into 10th year of publication. We thank all our authors, advertisers, readers and well-wishers for their continuous support in bringing out the publication.

It is a matter of pride that the celebration of Global Wind Day on 15th June 2023 will herald a new milestone 1 Terawatt wind globally (Source: GWEC). India will also celebrate Global Wind Day on 15th June 2023 at New Delhi, participated by Hon'ble Minister for Power and New & Renewable Energy, Shri R K Singh and Minister of State, Shri Bhagwanth Khuba, MOP, MNRE, NIWE and other stakeholders from the Centre and State Government. The industry is also conducting Pre-events to Global Wind Day in Wind States such as Rajasthan, Maharashtra, Karnataka, and Tamil Nadu.

IWTMA has always laid emphasis on the best of technologies, localization, job creation and with concern on climate change and work with the country goals of 2030 and Net-Zero by 2070 in the Energy Transition. We commit our continued pursuit for a Clean Green India.

Wind industry is upbeat with the issuance of 10 GW bid per year for wind alone from FY 23-24 to FY 27-28 totaling 50 GW and installation and commissioning of projects by 2030. The industry is confident that with the introduction of closed bidding, uniform pooled tariff across the wind states will bring a PAN India growth in all the wind states. The Government is also looking at maximizing generation through Wind Solar Hybrid and RTC Power which will make RE power more firm and of comfort to the SLDC and DISCOMs.

The Government is taking a path-breaking step in mandating RPO and penalty for non-compliance through "Energy Conservation Act". The industry continues its appeal to the Government on liberalizing C&I transactions both in intra and interstate and opportunity for MSME industry to take part in the wind industry for projects below 25 MW.

The targets of the Government fit in well with India taking part in the G20 Presidency and this is an opportune movement as to how India can become a Global voice and reinforce our global positioning. This aligns well with the vision of the Hon'ble Prime Minister in paving the way for all-inclusive and sustainable global growth.

With regards,

D.V. Giri
Secretary General

The Initial Challenges of Wind Power

◄ *Nedwind 225 kW Turbine installed in Sept 1995 still running well for 28 years*

Dr. Karunamoorthy Neethimani
Wind Energy Veteran

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 experienced persons of Indian Wind Power Industry about the journey of wind power in India. Dr. Karunamoorthy Neethimani, presently Managing Director at Windplus Private Limited with over 27 years of experience with wind power at Windia (Nedwind), Vestas, AWT and Powerica is sharing his experiences of initial years of wind power journey in this article.

Today with over 42000 MW of the wind power in India at present it is a long journey of over 30 years with various difficulties faced by all in the wind power field. Today we have come a long way since then and a number of manual works are being replaced with highly technical machinery and computerised information technology environment. We have reached to this stage bit by bit.

- During the earlier decades (say for example 1995), wind turbines with only two blades (makes include DAS Lagerwey - 250 kW, Nedwind - 500 kW & American wind turbines - 250 kW etc.,) were also available. In that, approximately 10 MW of Nedwind turbines and 20 MW of DAS Lagerwey & American Wind Turbine together were installed in India during that period. The two blade wind turbines did not become popular because of the less Plant Load Factor & more down time, along with its need for class-I wind site.
- Also, during that period, there was only one manufacturer called "Aban Kenetech" who produced three blades WTG of capacity 410 kW that rotates in anti-clock wise direction. Around 30 MW of those type of WTG were installed at the time. However, since this reverse technology was not proven, it couldn't survive in the market.
- Government substations only had internal transmission line with low kV ratings of 11 & 22 kV (where each feeder accommodates 5 to 10 MW respectively).
- On the Logistics side, no Right of Way (ROW) challenges existed while bringing the heavy and oversized turbine parts, as the locals were supporting it, unlike current scenario.
- The laying and terminations of the WTG power and communication cables needed to be done from bottom of the tower to the nacelle manually, because cables will come separately. So, it required a lot of man power to carry the cables and took lot of time for laying and terminating between tower and nacelle.
- Overseas engineers had to stay at the site for installation of WTGs, as they were only aware of the technical know-how of the project. Nothing was possible without the intervention of international experts from countries like Denmark and Germany.
- For installation of WTGs there was a lack of advanced technologies back then, which means no telescopic boom, etc., were available. Therefore, mobilization and demobilization were difficult using lattice crane, which in turn affected the installation deadline.
- Civil foundation work was a challenging task as huge manpower was required for it. As there were no batching plant, no TMs (transit mixtures), no alignment tools and also in need for huge man power, the process become tedious and sometimes late.
- Between the years 1995 - 2000, not much variants of standard sizes were available. The minimum size available for WTG machine was 225 kW, while the maximum size available was 600 kW. For example, if one wanted to establish a 3 MW wind capacity (standard prevailing WTG model), they would need 13 machines, each requiring its own location and foundation if they are using 225 kW WTG.
- During that time, the highways were insufficient to meet the logistic demands of the WTG and its associated components. Hence, transporting the materials was a challenge, which led to the establishment of national highways from the nearest port to meet the logistical needs of the wind industry. This, in turn, required the production of customized heavy vehicles to fulfil the purpose.
- At many places the turbine companies had to lay their own roads to take the material to the installation sites and clear the

Das Lagerway 250 KW turbine installed in 1995 and still running well

way at many places for heavy and oversized machinery.

Grid Integration challenges was there in the earlier days. Mix of electricity into existing electricity transmission from various resources was required at that injection point in the grid. This posed a challenge for the State Load Dispatch Centres (SLDCs) to evacuate wind energy generation. Additionally, there were no forecasting tools available to schedule energy generation in line with supply and demand.

- Building of metering room was necessary for each wind mill for recording the generation. Readings had to be taken every day at particular time and more man power was required as software like SCADA was not available at that time. The metering room had to be served as security room for the safety of WTGs.
- Tariff was different from one state to the other, as each state had its own wind policies and respective tariff orders.
- There was no concept called stakeholders like IPPs, OEMs and developers which are currently in practice. OEMs used to do the turnkey job starting from the site selection, developing, constructing and delivering the projects i.e. - from concept to commissioning.
- Power purchase agreement was perfect and payments from Discoms were prompt, unlike current scenario.
- Despite the disadvantages in technology front, investors were attracted by the appealing policies that received support from state regulatory authorities and local stakeholders. In numerous instances, government officials and company representatives went out of their way to provide assistance for the project.

Today industry has matured but needs advance technology for 3+ MW and offshore turbines.

Snippets

Study Finds Virtual Power Plants Could Provide Resource Adequacy and Save Utilities Billions

According to a new study in the US, incorporating virtual power plants into resource adequacy plans could save utilities billions of dollars in capacity investments. Brattle Group conducted the study on behalf of Google to explore the cost and ability of virtual power plants - aggregated distributed energy resources, like residential solar, batteries and electric vehicles — to serve resource adequacy needs in lieu of conventional options. The study compared the net cost of providing 400 MW of resource adequacy from three resource types: a natural gas peaker, a transmission-connected utility-scale battery and a VPP composed of residential demand flexibility technologies.

Source: Smart Energy International, 5 May 2023

DISCOMs' Liability to Power Generators Rises to Rs. 449 Billion

Distribution companies (DISCOMs) owed power generators Rs. 448.62 billion (~$5.49 billion) in overdue payments for the monthly billing cycle at the end of April. The dues are higher compared to Rs. 422.13 billion (~$5.16 billion) owed at the end of March. Similarly, the total outstanding owed to power generators stood at Rs. 711.35 billion (~$8.7 billion), higher than Rs. 679.73 billion (~$8.3 billion) at the end of March. The DISCOMs are allowed to pay the outstanding in up to 48 instalments.

Source: Mercom India, 4 May 2023

Government Revises Framework to Provide Cheap Power Lot 1st to Consumers

Power Ministry has revised the framework for electricity supply to provide the cheapest power lot first to consumers. It aims to lower electricity generation cost, thereby lowering prices for consumers. The merit order for cheapest generating resources across India to meet the system demand will now be finalised a day in advance as against 1.5 hours in the existing system. As per the revised mechanism, the cheapest generating resources (power) across the country will be despatched (supplied) first to meet the system demand.

Source: Financial Express, 26 April 2023

COP28 Chair Urges Tripling of Renewables Capacity by 2030

Berlin, Sultan Al Jaber, the President of this year's UN climate talks hosted by the United Arab Emirates, on May 2 called on participants to drastically ramp up their use of renewable energy. "We will accelerate delivery in sectors like renewables that must triple capacity by 2030 and double it again by 2040," Mr. Al Jaber said in a speech at the opening of the Petersberg Climate Dialogue — a meeting of climate diplomats in Berlin. Mr. Al Jaber's call marked a public endorsement of a target laid out by the International Energy Agency. At the same time, Sultan Al Jaber did not call for a complete end to the use of fossil fuels.

Source: Financial Express, 02 May 2023

Suzlon Bags 69.3MW Wind Energy Project from Juniper Green Energy

Suzlon has bagged an order to develop 69.3 MW wind power project from Juniper Green Energy for the project located at Surendra Nagar district in Gujarat and is expected to be commissioned in 2024.

Source: Moneycontrol.com, 05 May 2023

Geotechnical Insight for Risk Management of Offshore Wind Projects

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Introduction

Net Zero is currently one of the most discussed topics around the world, and renewable energy and in particular offshore wind farms are seen as a key part of achieving the Net Zero target. While offshore windfarms are not new to the renewable industry, the scale and complexity of offshore seabed conditions in which windfarms are being developed have changed drastically over the last couple of decades.

These factors invariably increase risks inherent with offshore windfarms development and are linked to foundations and cables, which need to be designed to perform within the soil and rock conditions on site.

Vindeby Offshore Wind Farm, the first offshore wind farm in the world, erected in 1991 off the coast on the Danish island of Lolland, had 11 wind turbine generators (WTGs) with a total capacity of only 5 MW, in water depths ranging from 3m to 6m. Hornsea One commissioned in 2020 and located off the Yorkshire coast in the southern North Sea, has 174 WTGs with a total capacity of 1281 MW in water depths ranging from 24m to 37m. These facts highlight how far offshore windfarms have come in terms of capacity and complexity. In an associated trend, the risk elements associated with wind farms have also increased several folds. While the first foundations were simple gravity foundations (concrete foundations), newer fixed windfarm foundations are typically monopiles, jackets, suction buckets or drilled & grouted piles. The seabed sites for early windfarms were less complex in terms of geological and geotechnical conditions (typically sands or clays) but sites for recent and future windfarms are complex and have high variability (varying layers of sand and clays, silty soils, rock, etc.). These factors invariably increase risks inherent with offshore windfarms development and are linked to foundations and cables, which need to be designed to perform within the soil and rock conditions on site.

Geotechnics in Offshore Windfarm Projects

Geotechnics play a key role in all stages of offshore windfarm development; conceptual design, FEED, details design and installation. Project risk can be linked directly to geotechnical knowledge of the project site as shown in Figure 1. Geotechnical consultants play a vital role in six key stages in offshore windfarm projects, as shown in Figure 2. In each of these stages, input

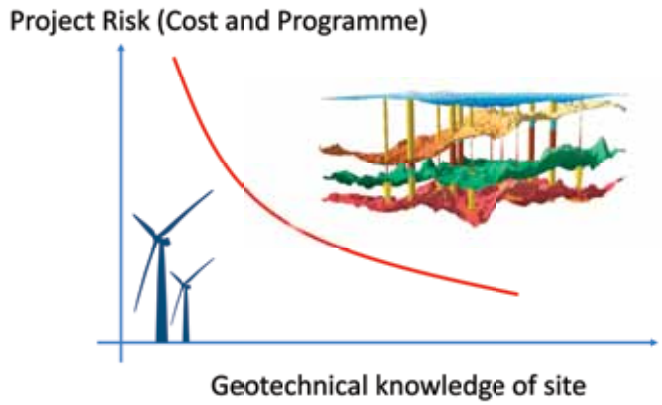

Figure 1: Project risk is directly linked to geotechnical knowledge of the site

from a geotechnical consultant is critical in identifying and managing ground risks to offshore wind projects. The following sections highlight some technical insight into how each stage needs in-depth geotechnical knowledge for risk managing the project effectively.

Stage 1, 2 & 3: Desktop study, Surveys & Geotechnical Testing

Stages 1, 2 and 3 are associated with desk top studies, geotechnical and geophysical survey implementation and geotechnical testing. Desk top studies provide an early indication as to the likely seabed conditions to be expected at the project site. During site surveys, seabed soils would be subjected

Figure 2: Key stages in an offshore windfarm project where geotechnical consultant's input is critical

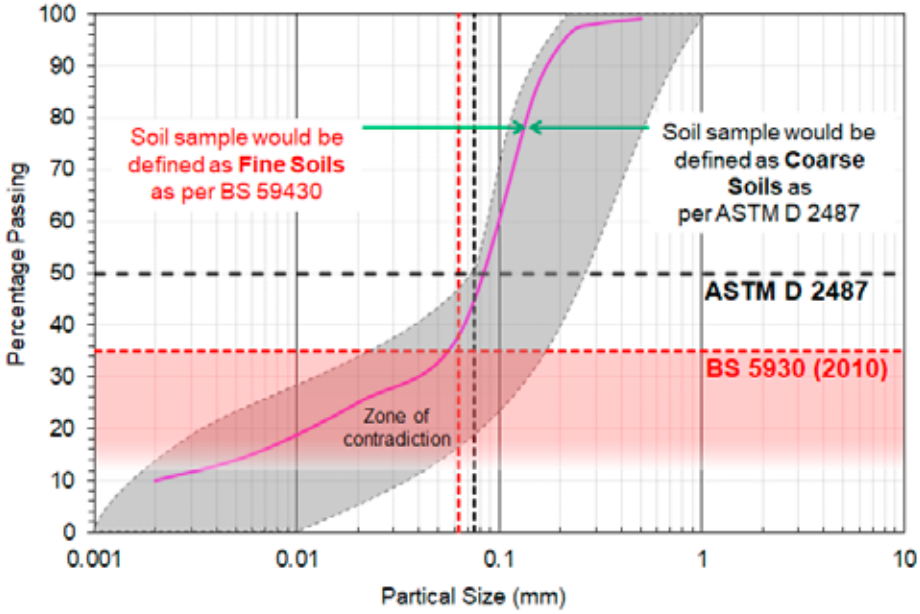

Figure 3: Particle size distribution of a soil sample and how one soil sample could be classed differently by different standards. ©Dr Thusyanthan

to in-situ testing and seabed soil samples would be further characterised by laboratory testing. The number of intrusive geotechnical tests required to characterise the offshore windfarm site would depend on several factors such as geology, accuracy and resolution of the available geophysical survey data, geo-hazards etc., and hence it cannot be generalised. In general, soil conditions cannot be assumed to be uniform across a site unless proven with geotechnical and geophysical data. Therefore, knowing the seabed soil stratigraphy at two locations does not necessarily enable one to interpret the soil stratigraphy between those two locations. Since intrusive geotechnical testing has a high impact on project schedule and cost, it is often the case that the number of test locations is optimised to save cost and time. However, expert level geotechnical knowledge is needed to ensure that sufficient geotechnical testing is undertaken to avoid major risk later in the project.

Stage 4: Site Characterisation - Insight into Soil Classification

There are three classifications systems that are in practice today. These are ASTM D-2487, BS 5930 and ISO 14688. BS 5930 (2020) states that, where a soil (omitting any boulders or cobbles) "sticks together when wet and remoulds" it is described as a fine soil ("CLAY" or "SILT" dependent on its plasticity) and when soil does not stick together and remould, it is described as a coarse soil ("SAND" or "GRAVEL" dependent on its particle size grading). BS 5930 (2010) stated that fine soil often contains about 35% or more of fine material, however this statement was removed in the 2015 and 2020 version of BS5930 because soils with even less than 35% fine material can sticks together when wet and remould.

As per ASTM D2487, if more than 50% of the soil is retained on No. 200 sieve (0.075mm), the soil is classed as a coarse-grained soil and if 50% or more passes the No. 200 sieve, the soil is classed as a fine-grained soil. Note that the particle size boundary between fine soils and coarse soils is different in these standards, in BS 5930 it is 0.063mm whereas in ASTM D2487 it is 0.075mm.

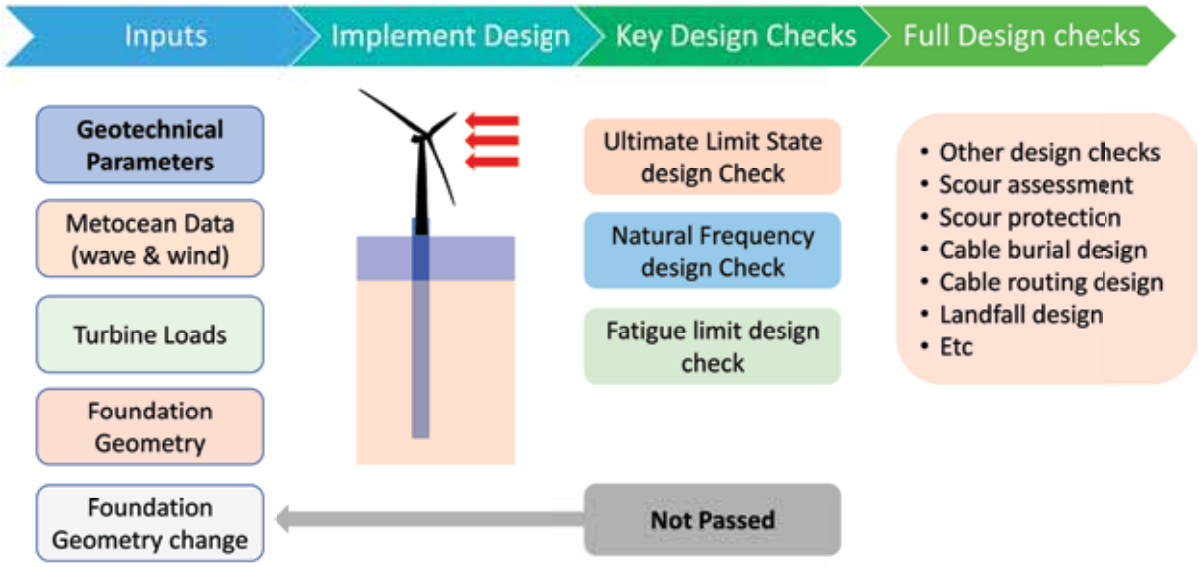

Figure 4: Offshore Turbine Foundation Design Process. ©2023 Dr Thusyanthan

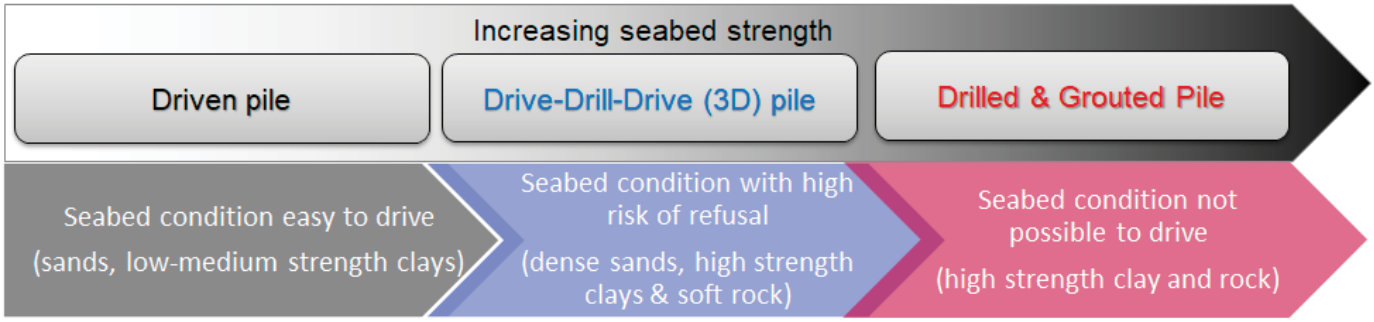

Figure 5: Recommended Pile Installation Methods Based On Seabed Condition. ©2023 Dr. Thusyanthan

It is evident that BS 5930 and ASTM D2487 do not define the classification of fine soils (CLAY and SILT) and coarse soils (SAND and GRAVEL) in the same way. This leads to potential uncertainty in that the same material can be classified as coarse or fine soils depending on the standards followed. This in turn can lead to engineers mis-predicting soil behaviour in design. The issue is highlighted in Figure 3 with an example of soil particle size distribution which would be classed as coarse soils (SAND) as per ASTM D2487 but it would be classified as fine soils (CLAY or SILT) as per BS 5930. The same issue would exist for soils whose particle size distribution is within the "zone of contradiction". Soils in these regions are predominantly SILTS which can have CLAY or SAND type behaviour. Design engineers are often unaware that the classification standards followed in the project can have a major impact on the resulting soil classification. It is always advisable that design evaluations and soil behaviour is based on properties measured and not solely based on soil classification.

Stage 5:
Ground Risks – Geohazards

Windfarms can cover hundreds of square kilometres of seabed, hence ensuring that WTGs and cables are not exposed to geohazards both during their installation and operational lifetime is vital. Below are the most common geohazards that need to be considered during design and installation:

- Seafloor Slope
- Landslides and earthquakes
- Faults
- Pockmarks
- Presence of boulders
- Shallow gas
- Channel System (palaeochannels)
- Environmentally Sensitive Areas
- Manmade Hazards (e.g. Unexploded Ordnance (UXO))

These geohazards need to be identified early in the project timeline and all identified risks need to be managed using appropriate risk mitigation mechanisms…

These geohazards need to be identified early in the project timeline and all identified risks need to be managed using

appropriate risk mitigation mechanisms. This may include a modified or more stringent design, micrositing WTGs locations or re-routing the cable routes, change of installation procedure, etc. It is acknowledged that some risks can never be fully eliminated, and residual risks may need to be managed through design or mitigated by some commercial mechanisms (such as insurance etc.).

Stage 5: Design

Offshore foundation design has several stages but it is shown in a simplistic way in figure 5. Geotechnical parameters are key for foundation design and project needs to ensure that geotechnical survey and laboratory tests are undertaken with care to obtain reliable data for design.

Stage 6: Installation – Pile Foundation

A foundation design that follows the optimum installation methodology leads to efficient foundation design and optimised installations costs. Pile installation methods in seabeds can be driven, drive-drill-drive or drilled & grouted. Seabed soil conditions determine which method is the most cost effective and have the lowest risk in a particular project as summarised in Figure 5. Selecting the appropriate installation method will lead to cost effective installation of the campaign. Driven piles are common and cost effective in seabed conditions comprising sands and low to medium strength clays. In seabed conditions, where driving refusal risk is high (in dense sands or high strength clays or soft rock) drive-drill-drive methodology is more suitable. In high strength clay and rocky conditions, driving could lead to pile fatigue damage and refusal. In this situation, a drilled & grouted pile installation would lead to an efficient solution.

Conclusion

Ground risk in offshore windfarm projects are always linked to the geotechnical knowledge of the project site. As we increase geotechnical knowledge of the project site the risk also reduces. If ground risks are allowed to pass on in project stages, its impact and consequences on project cost and programme can be very high at later stages. Thus, ground risks should be identified as soon as possible and mitigated through site investigation, ground modelling and design.

Geotechnics play a key role in providing safe and efficient design solutions for foundations and cables in offshore wind projects. Ground risks in the project can be identified and mitigated by the early engagement of a specialist geotechnical consultant. In-depth knowledge of site surveys, geotechnical testing, seabed classification, foundation designs and seabed interventions are paramount for successfully derisking offshore wind projects.

Snippets

CEA Releases Draft Power Demand Forecast Guidelines

The Central Electricity Authority (CEA) has released draft guidelines for utilities to prepare uniform power demand forecasts to improve infrastructure planning. CEA said the forecast should be prepared for the medium-term and long-term. The medium-term forecast should be more than one year and up to five years, while the long-term forecast should be for at least the next 10 years.

Source: PTI, 12 April 2023

Kerala DISCOM Proposes a Premium Green Energy Tariff of Rs. 2.54/kWh

The Kerala State Electricity Board (KSEB) has proposed introducing a green energy tariff of Rs. 2.543/kWh for consumers who wish to switch to green energy. In its communication to the State Electricity Commission, the board has proposed a premium tariff of Rs 2.543 per Kilowatt-hour for the supply of clean energy to power consumers in Kerala.

Source: Saur Energy International. 09 May 2023

SECI gets 'Miniratna Category-I' status

Solar Energy Corporation of India Limited (SECI) has been accorded the status of Miniratna Category-I Central Public Sector Enterprise (CPSE) on 10th April, 2023 by the Ministry of New and Renewable Energy, Government of India. Incorporated in the year 2011, SECI is the primary implementing agency of the Ministry of New and Renewable Energy, Government of India for renewable energy schemes/projects towards fulfilment of India's international commitments. Till date, SECI has awarded Renewable Energy (RE) project capacities of over 56 GW. SECI is also active in setting up of projects through its own investments as well as for other public sector entities as Project Management Consultant (PMC).

Source: PIB, 12 April 2023

Government Issues Guidelines to Promote Development of Pumped Storage Projects

The government has released the final guidelines on 10 April, 2023, to promote development of pumped storage projects in the country. The guidelines have been formulated with inputs received from stakeholders by the Ministry of Power. The state governments may allot project sites to developers through various ways, like competitive bidding, tariff-based competitive bidding process and on nomination basis to central public sector units (CPSUs) and state public sector units (PSUs). Pumped hydro projects are estimated to store up to 9,000 GWh of electricity worldwide.

Source: Projects Today, 10 April 2023

NTPC Green Energy to Raise Funds via IPO, Targets 60 GW RE by 2032

NTPC Green Energy Ltd. (NGEL), a subsidiary of NTPC, is planning to raise funds through an initial public offering (IPO) during the current fiscal year. SBI Capital Markets will act as an advisor for the listing of NGEL. NTPC aims to achieve a target of 60 GW of renewable energy by 2032.

Source: Solar Quarter, 14 April 2023

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A Boost to Wind Energy - Green Hydrogen Technology - Advantages and Market Study

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Green hydrogen technology has recently emerged as a promising solution to decarbonize various industries, including transportation, power generation and industrial processes. Hydrogen is the lightest element and has the highest energy density, making it an excellent fuel for various applications. However, traditional hydrogen production methods, which rely on fossil fuels, are associated with significant greenhouse gas emissions. Green hydrogen production, on the other hand, uses renewable energy sources, making it a sustainable and eco-friendly alternative.

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Green Hydrogen Production

The process of green hydrogen production involves the electrolysis of water, which splits it into hydrogen and oxygen. This process requires electricity, which can be generated from renewable energy sources such as wind, solar, or hydropower. The hydrogen produced through this process is then compressed and stored for use as a fuel.

Processes Involved in the Production of Green Hydrogen

1. **Electrolysis:** The first step in producing green hydrogen is to perform electrolysis. This involves passing an electric current through water, splitting it into hydrogen and oxygen. This process is typically carried out using an electrolyzer, which consists of an anode and a cathode separated by a membrane. The anode is connected to the positive terminal of a power supply, while the cathode is connected to the negative terminal.
2. **Water Source:** The water source can come from various sources such as surface water or groundwater.
3. **Renewable Energy:** To ensure that the hydrogen produced is truly green; the electricity used in the electrolysis process must come from renewable energy sources, such as solar or wind power. This is because if electricity comes from non-renewable sources, such as coal or natural gas, the process would still produce carbon emissions, negating the green benefits.
4. **Separation:** Once the hydrogen and oxygen have been separated, they must be kept separate to prevent combustion. This can be achieved using a separator membrane, which allows only hydrogen ions to pass through, while blocking the oxygen ions.
5. **Compression:** After separation, the hydrogen gas must be compressed to make it more practical for storage and transport. This is typically done using a compressor, which pressurizes the gas and reduces its volume.
6. **Storage:** The compressed hydrogen gas is stored in high-pressure tanks or pipelines until it is ready to be used.
7. **Transport:** Once the hydrogen has been produced and stored, it can be transported to its final destination. This can be done using pipelines, trucks, or even trains.
8. **Utilization:** Green hydrogen can be used in a variety of ways, including as a fuel for vehicles, as a feedstock for industrial processes, and as a source of heat and electricity.

Overall, the process of producing green hydrogen is a complex one that involves a combination of technologies and careful management of resources. However, as the demand for clean energy continues to grow, green hydrogen is likely to play an increasingly important role in meeting our energy needs.

Advantages of Green Hydrogen

One of the significant advantages of green hydrogen technology is that it is entirely emissions free. The only byproduct of green hydrogen production is oxygen, making it a sustainable alternative that helps to reduce greenhouse gas emissions. According to the

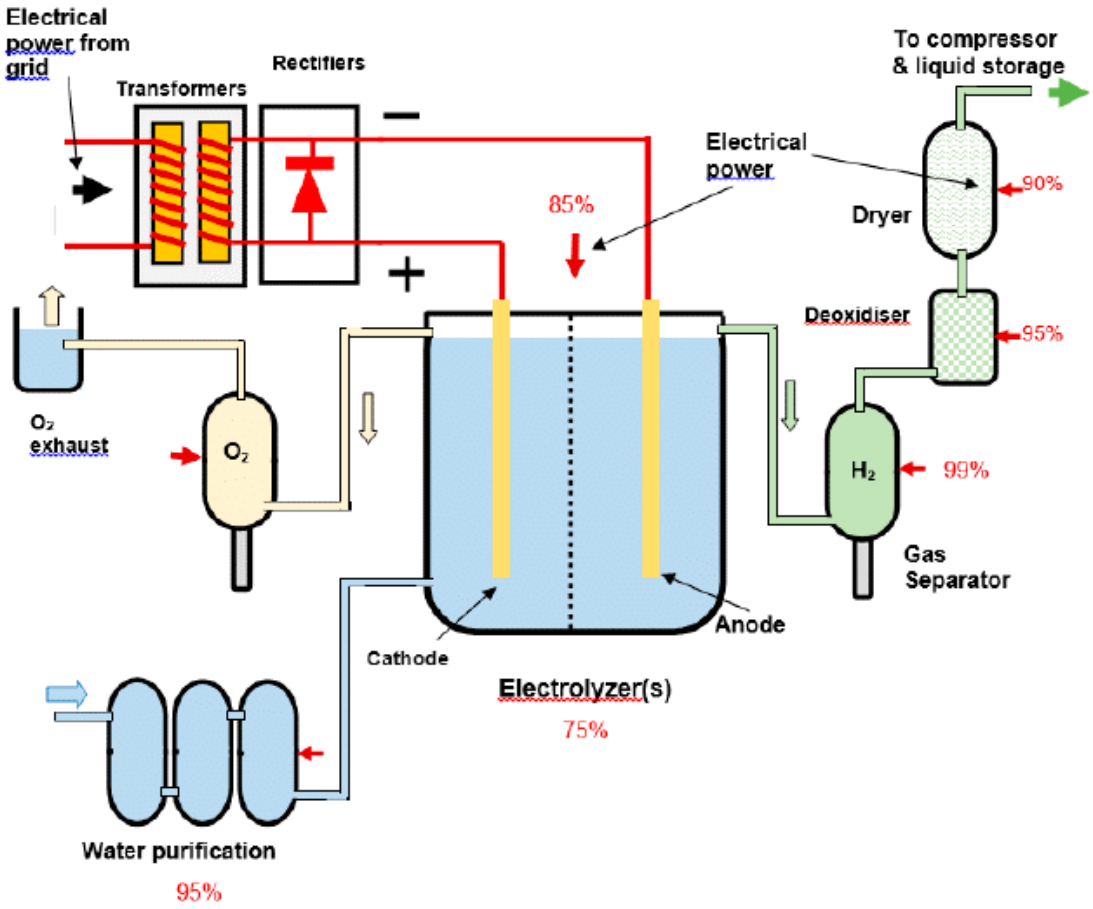

Figure 1: Producing Green Hydrogen *(Source: ResearchGate)*

International Energy Agency (IEA), green hydrogen could play a significant role in reducing global greenhouse gas emissions, particularly in hard-to-abate sectors such as heavy-duty transportation, aviation and shipping.

Another significant advantage of green hydrogen technology is that it can help to overcome the intermittency of renewable energy sources. Wind and solar power generation are dependent on weather conditions, making it challenging to rely on them as a primary source of energy. By producing green hydrogen during periods of excess renewable energy generation, excess power can be stored and used when energy demand exceeds supply.

Green hydrogen technology also has a range of applications. It can be used as a fuel for vehicles, including cars, buses and trucks. According to a report by the Hydrogen Council, hydrogen-powered vehicles could account for up to 20% of the global passenger car market by 2030. Green hydrogen can also be used in industrial processes, such as steel and cement production, which traditionally rely on fossil fuels. Additionally, green hydrogen can be used as a feedstock in the chemical industry, including the production of ammonia.

Market Study for Green Hydrogen

Green hydrogen is emerging as a key clean energy source and its demand is expected to grow significantly in the coming years. The market for green hydrogen is expected to reach $2.5 trillion by 2050, according to a report by the Hydrogen Council. Green hydrogen is produced by using renewable energy sources such as wind and solar power to electrolyze water and separate hydrogen from oxygen.

Several countries are currently investing in green hydrogen technology. The European Union has set a target to become carbon-neutral by 2050 and hydrogen is expected to play a significant role in achieving this goal. The EU has identified green hydrogen as a key technology to help decarbonize hard-to-abate sectors such as heavy-duty transportation and industrial processes. In July 2020, the European Commission unveiled a €750 billion recovery plan, which includes a significant investment in green hydrogen technology.

Germany is also investing heavily in green hydrogen technology. The German government has set a target to become carbon-neutral by 2050 and has identified hydrogen as a key technology to help achieve this goal. In June 2020, the German government announced a €9 billion national hydrogen strategy, which includes an investment in green hydrogen production.

Australia is also well-positioned to become a global leader in green hydrogen production. The country has abundant renewable energy resources including wind and solar, making it an ideal location for green hydrogen production. In November 2020, the Australian government announced an A$1.9 billion

investment in new and emerging technologies, including green hydrogen.

Several companies are also investing in green hydrogen technology. In December 2020, BP announced a partnership with Orsted to develop a green hydrogen production facility in Germany.

The market for green hydrogen is being driven by several factors. The growing demand for clean energy sources to reduce greenhouse gas emissions is one of the primary drivers of the green hydrogen market. The transportation sector is a major contributor to greenhouse gas emissions and the use of green hydrogen in transportation can significantly reduce emissions.

The power generation sector is another key contributor to greenhouse gas emissions and the use of green hydrogen in power generation can help reduce emissions. Green hydrogen can be used in fuel cells to generate electricity, and it can also be used as a fuel in gas turbines.

The industrial sector is another major contributor to greenhouse gas emissions and the use of green hydrogen in industrial processes can help reduce emissions. Green hydrogen can be used in the production of chemicals and fertilizers, and it can also be used in steel production to replace coal.

The market for green hydrogen is expected to grow significantly in the coming years, driven by government initiatives and private sector investments. Several countries have announced plans to promote the production and use of green hydrogen. For example, the European Union has announced a target of producing 40 GW of green hydrogen by 2030, while Japan has announced a target of producing 300,000 tons of green hydrogen by 2030.

The private sector is also investing heavily in the green hydrogen market. Several major energy companies such as Shell, Total and BP have announced plans to invest in green hydrogen production. These companies are expected to play a significant role in the development of the green hydrogen market.

The green hydrogen market is also being driven by technological advancements. Research and development in green hydrogen technology are leading to the development of more efficient and cost-effective processes for the production and use of green hydrogen. For example, the use of electrolyzers with higher efficiency and lower costs is expected to reduce the cost of green hydrogen production.

The green hydrogen market is segmented based on production method, end-use sector and region. Based on the production method, the market is segmented into electrolysis, biomass gasification and others. The electrolysis segment is expected to dominate the market, as it is the most widely used method for the production of green hydrogen.

Based on the end-use sector, the market is segmented into transportation, power generation and industrial processes. The transportation sector is expected to be the largest end-use sector for green hydrogen, driven by the growing demand for clean transportation fuels. The power generation sector is also expected to be a significant end-use sector for green hydrogen, driven by the growing demand for clean energy sources.

Based on region, the market is segmented into North America, Europe, Asia-Pacific and Rest of the World. Europe is expected to be the largest market for green hydrogen, driven by the European Union's target to produce 40 GW of green hydrogen by 2030. Asia-Pacific is also expected to be a significant market for green hydrogen, driven by the growing demand for clean energy sources in countries such as China, Japan and South Korea.

The key players in the green hydrogen market include Air Liquide, Linde, Air Products and Chemicals, Siemens and Hydrogenics. These companies are investing in the development of green hydrogen production technologies and building partnerships to promote the use of green hydrogen.

In conclusion, the green hydrogen market is expected to grow significantly in the coming years, driven by government initiatives, private sector investments, and technological advancements.

India's National Green Hydrogen Mission

India is one of the world's largest and fastest-growing economies and its energy demand is expected to grow significantly in the coming years. To meet this demand while reducing greenhouse gas emissions, the Indian government has launched the National Green Hydrogen Mission (NGHM). The NGHM aims to promote the production and use of green hydrogen as a clean and sustainable energy source.

The NGHM was announced in the 2021-22 Union Budget, and its objective is to establish a framework for the development of green hydrogen in India. The mission aims to promote research and development in green hydrogen technology, build a domestic manufacturing ecosystem and create a market for green hydrogen. The NGHM has set a target of producing 1 GW of green hydrogen by 2022, 4 GW by 2025, and 17 GW by 2030. The mission also aims to make India a global hub for green hydrogen production and export. The NGHM will be implemented by various government ministries and agencies, including the Ministry of New and Renewable Energy, the Ministry of Power, the Ministry of Science and Technology, and the Ministry of Heavy Industries and Public Enterprises. The mission will also involve collaboration with the private sector, academia and research institutions.

To achieve its objectives, the NGHM will focus on several key areas. These include:

a. **Research and development:** The NGHM aims to promote research and development in green hydrogen technology to make it more efficient and cost-effective. The mission will establish research and development centers, provide funding for research projects, and collaborate with international institutions to share knowledge and expertise.

b. **Domestic manufacturing:** The NGHM aims to build a domestic manufacturing ecosystem for green hydrogen technology. This will involve setting up manufacturing facilities, providing incentives for domestic manufacturers and promoting technology transfer and collaboration.

c. **Capacity building:** The NGHM aims to build a skilled workforce in green hydrogen technology by providing training and education programs. This will involve collaboration with

academic institutions, research institutions and industry associations.

d. **Market creation:** The NGHM aims to create a market for green hydrogen by promoting its use in various sectors. This will involve developing regulatory frameworks, providing incentives for users, and creating awareness about the benefits of green hydrogen.

The NGHM has the potential to transform India's energy landscape by promoting the use of green hydrogen. The use of green hydrogen can help reduce greenhouse gas emissions and improve air quality, thereby contributing to India's sustainable development goals. The NGHM has received positive feedback from various stakeholders, including the private sector and international organizations. The Confederation of Indian Industry (CII) has welcomed the NGHM and has stated that it will help accelerate the development of green hydrogen in India. The International Energy Agency (IEA) has also praised India's efforts to promote green hydrogen and has stated that India has the potential to become a global leader in green hydrogen production.

In conclusion, the National Green Hydrogen Mission is an important initiative by the Indian government to promote the use of green hydrogen as a clean and sustainable energy source. The mission aims to establish a framework for the development of green hydrogen in India and create a market for it. The NGHM has set ambitious targets for green hydrogen production, and if implemented successfully, it has the potential to transform India's energy landscape and contribute to its sustainable development goals.

Other Technologies competing with Green Hydrogen Technology

Despite the numerous benefits of green hydrogen technology, it is still in the early stages of development. The technology is currently more expensive than traditional hydrogen production methods, which is a significant barrier to its widespread adoption. However, as the cost of renewable energy continues to fall, and technology advances, the cost of producing green hydrogen is expected to decrease. While green hydrogen is gaining momentum as a clean energy source, there are also other competing technologies that are being developed and deployed in the market.

1. **Battery storage:** Battery storage technology has been rapidly improving in recent years, making it a strong competitor to green hydrogen. Batteries can store energy generated from renewable sources, such as solar and wind, and can be used to power homes, businesses and electric vehicles. Battery storage is particularly well-suited for smaller scale applications, where hydrogen production and storage may not be practical.
2. **Bioenergy:** Bioenergy is another technology that competes with green hydrogen. Bioenergy involves using biomass, such as wood, crops and waste, to generate energy. This energy can be used to produce electricity, heat and fuel. Bioenergy can also be used to produce biogas, which can be used as a cleaner alternative to natural gas.
3. **Carbon capture and storage (CCS):** Carbon capture and storage technology is used to capture carbon dioxide emissions from industrial processes and store them underground. This technology can be used to reduce greenhouse gas emissions from industries such as cement and steel production. CCS technology can also be used in conjunction with hydrogen production, capturing and storing the carbon dioxide emissions from the process.
4. **Nuclear power:** Nuclear power is a well-established technology that has been used for decades to generate electricity. Nuclear power does not produce greenhouse gas emissions and is a low-cost source of electricity. However, there are concerns over the safety and disposal of nuclear waste, as well as the potential for accidents.
5. **Geothermal energy:** Geothermal energy is generated from heat that is naturally produced by the earth. This energy can be used to produce electricity and heat buildings. Geothermal energy is a reliable and renewable source of energy, but it is limited to areas with significant geothermal activity.

While these technologies compete with green hydrogen, they also have their own unique advantages and disadvantages. The choice of technology will depend on the specific application and local conditions. In some cases, a combination of technologies may be used to provide a reliable and clean source of energy. Ultimately, the goal is to reduce greenhouse gas emissions and transition to a cleaner, more sustainable energy future. The production of gren hydrogen will give a big boost to wind and solar energy.

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Clean Energy Transition in India: Towards a Brighter Future

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India could potentially create 3.4 million jobs by adding 98 GW of new wind capacity and 213 GW of solar capacity to reach the 500 GW non-fossil-fuel generation capacity by 2030.

India is the third-largest energy producer in the world and one of the top energy consumers. To build a pathway to clean energy transition, the country has made remarkable strides by putting in place a number of measures that support renewable energy production and research.

In its recent Union Budget, India allocated INR 19,500 crore for domestic solar cells and module manufacturing. Similarly, INR 1050 crore was allocated to the wind-power sector for expansion. In addition, India has always focussed on international collaborations, such as the one with the International Renewable Energy Agency (IRENA) in early 2022 to scale up clean energy technologies and assist India's long-term energy planning initiatives. India's future energy transition targets include achieving and installing 450 GW of renewable energy by 2030 and providing 24-hour access to electricity for all.

The Roadblocks

Though India has made extraordinary efforts to develop solar and wind power, fossil fuels are still the mainstay of the electricity industry, making it difficult to take the road to clean energy transition. As of March 2023 the total installed coal, Lignite, gas, and diesel thermal power capacities in India were 205.24 GW, 6.62 GW, 24.82 GW, and 0.59 GW, respectively, which account for ~57% of the total share. The share of renewables stood at ~30%, with the rest coming from hydroelectric (~11.3%) and nuclear (~1.65%).

Further, for a country like India — where fossil fuels power the economy — they are a lifeline for the local communities in many states. According to a recent survey, the coal industry employs around forty lakh Indians directly or indirectly, and another five lakh Indians depend on it for their pensions, highlighting the fact that coal continues to be the foundation of the Indian economy and the power sector.

Despite seeing an improvement in rural electrification in recent years — from 83.4% in 2015 to 98.5% in 2020 (according to the World Bank) — for communities in the rural areas of India, erratic power supply, routine outages for several hours, and high operation and maintenance costs of transmission network and supply remain big bottlenecks.

The Roadmap

While India has taken several initiatives to improve energy access by increasing the integration of renewables, the focus now must be on providing affordable and reliable power. Grid stability and resilience in power systems can be enhanced through a hybrid renewable energy model which includes solar and wind, and opens the floor for investment opportunities in distributed energy resources such as rooftop solar and offshore wind.

At the same time, to overcome the unpredictable nature of policies, a long-term energy strategy is needed. The National Energy Policy drafted by NITI Aayog in 2017 is a suitable framework and can guide the policy decisions of central and state governments. The policy enables the fulfilment of the Government's bold ambitions for India's energy sector development, by making access to energy affordable for all through the extension of financial support to ensure merit consumption within the vulnerable sections of society; and ensuring improved energy security through both diversification of the sources of imports and increased domestic production of energy. Another objective of this policy is to ensure sustainability and economic growth through deep decarbonisation.

For monitoring, assessing and enforcing energy policies, high-quality and timely energy data are crucial. To fill policy gaps and establish new laws, data on consumption by various industries, captive power plants, open-access energy procurement, etc., will be especially helpful. Thus, state services with access to such data and authorities acquiring the data must prioritise data structuring. Sharing data in the public domain would also help monitor progress.

The process of energy transformation offers substantial business potential. According to a recent report, India could potentially create 3.4 million jobs by adding 98 GW of new wind capacity and 213 GW of solar capacity to reach the 500 GW non-fossil-fuel generation capacity by 2030.

The clean energy transition is a revolutionary idea, which should be ingrained in policy, planning, and implementation for the country to effectively achieve its energy goals.

(This was originally published as a CSTEP blog.)

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*Data till 31st December 2021

An Analysis of Offshore Wind Production

...why it is worth it to explore offshore. The answer is efficiency. Offshore wind turbines produce an average of 3.6 MW whereas onshore wind turbines average 2.5 MW.

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The renewable energy sector is expected to become the most prominent source of energy at 44% of the United States' total energy generation by 2050 with 43% of the total energy expected to be produced from wind energy sources[C]. In the battle to achieve net-zero carbon emissions (mainly from CO_2), the potential of wind energy has sparked interest in the public and the increased production of wind energy has occurred. A continued trend shows wind energy generation to undergo a steep increase from 2020 to 2050 (113 GWh to 404 GWh)[B]. Moving along with clean sources of energy and shifting away from non-renewable sources will aid in reducing national vulnerability to price spikes and supply disruptions with long-term pricing, because of this wind energy is anticipated to save consumers $280 billion by 2050[A]. The primary method of obtaining energy through wind is by using wind turbines. Most commonly wind turbines are strategically placed on land masses where they can be optimized to produce as much energy as possible. There has been a recent surge in offshore wind energy production. Wind turbines are built in seas where wind speeds are much higher and thus produce more energy. The offshore wind market had increased by twenty-four percent in 2021 and is expected to slowly rise throughout the near future. The major fault of offshore wind technology comes from the high costs of construction and maintenance due to having to be built in a body of water. To keep this industry thriving we must understand the costs, research and other aspects necessary to continually operate wind turbines for years to come.

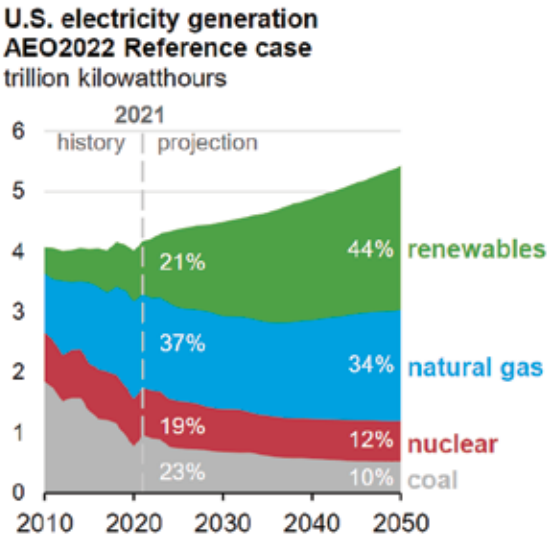

Figure 1: The United States' Current Energy Generation Types with a Future Projection[C]

Foundation

Offshore wind structures show great potential for producing an extraordinary amount of renewable energy for industrial applications. One of the forefront challenges is the decision of what foundation to use to maximize production. Depending on the water depth, wind turbines of different kinds are needed. Fixed-bottom wind turbines include monopile foundations are suitable for water depths less than 15 m, gravity-based foundations constructed for water depths up to 30 m, and jacket-type foundations for depths from 30-60 m[E]. A visualization of a few common offshore wind foundation structures is shown in Figure 2.

The majority of existing offshore wind farms has been built in shallow water utilizing these foundations. It has been economically determined that for water depths greater than 60 m, a floating foundation design, specifically semi-submersible platforms, tension leg platforms, and spar-buoy mechanism, is

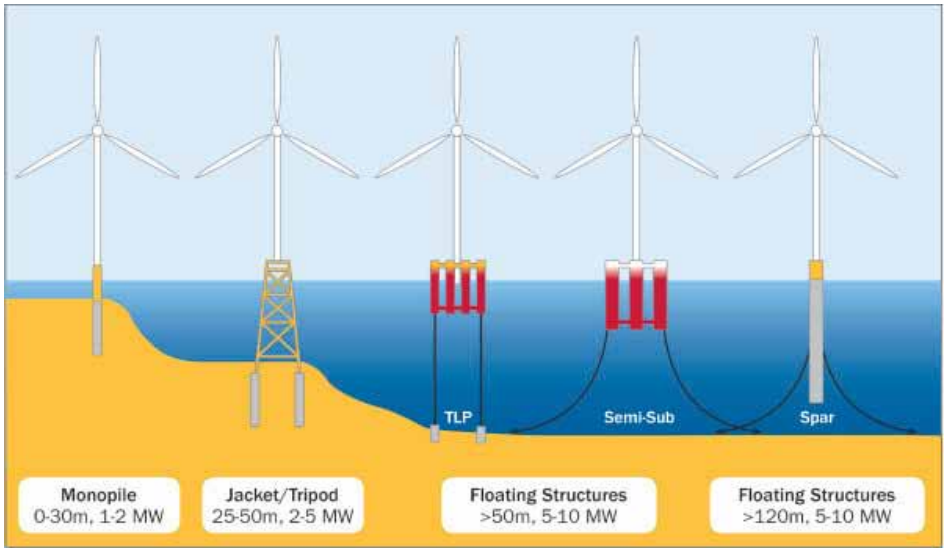

Figure 2: Selecting the Proper Foundation with Structural Illustrations[H]

necessary but these platforms have been studied very little and are less developed. In addition, floating foundations are considerably more expensive than their fixed-bottom counterparts[E]. Floating foundations' inherent advantages such as increases in the reach of wind farms as these foundations can be installed in depths of greater than 200 m which utilizes 58% more resources than traditional foundations, ease of maintenance as these foundations can be towed back to ports, and due to the distance offshore, wildlife risk is minimized[F]. Another major economic benefit of floating foundations is that there is no need for large dynamic positioned jack-up installation vessels. These vessels are expensive to maintain each day to ensure continuous operation. Tugboats that are used for the installation of floating foundations are 80% cheaper to maintain than these larger vessels[I]. With the much cheaper installation rates, the installation time does not necessarily increase. Installation time will vary based on factors such as the number of offshore operations, meteorological and oceanographic condition limitations, and the complexity of the installation process specifically related machinery required. Installation time is a key component of cost in wind projects and plays a crucial role in the development process from prototype to commercial use[I].

Data shows that the investment in foundations accounts for 20–30% of the cost of a typical offshore wind farm. Economic comparison and analysis between different power production technologies can be done by measuring the levelized cost of energy (LCOE):

Equation: Levelized Cost of Energy[I]

$$LCOE = \frac{\textit{Sum of lifetime discounted generation costs}}{\textit{Sum of discounted lifetime electricity output}}$$

Generation cost includes all capital and operating expenses that occur over the lifecycle of the turbine. Electricity output is the net metered output at the offshore substation after all losses. LCOE gives a value with units $/MWh and therefore gives a quantitative value of cost per energy produced per hour. LCOE analysis of existing offshore wind farms indicates that spar-buoy foundations (122 $/MWh) show the lowest LCOE while semi-submersible foundations (130 $/MWh) show the highest with tension leg platforms (126 $/MWh) falling in between[I]. The LCOE for offshore wind farms is significantly higher than an onshore wind turbine (32 $/MWh)[A]. This poses the question of why it is worth it to explore offshore. The answer is efficiency. Offshore wind turbines produce an average of 3.6 MW whereas onshore wind turbines average 2.5 MW. Furthermore, from data across Great Britain in 2020, 1,500 onshore wind farms (typically 5-150 wind turbines) produced 34.7 TWh of energy whereas 35 offshore wind farms (2,200 wind turbines total) produced 40.7 TWh[J]. This difference is astonishing, as 2% of the farms produced more energy.

Factors Affecting the Development of Offshore Wind Industry

To realize the promise of offshore wind, various technological, operational, environmental, and regulatory barriers must be overcome. At least for the earliest projects, offshore wind project costs and associated evacuation infrastructure expenses may not be competitive with solar and onshore wind tariffs. With its successful expertise in supporting and mainstreaming the adoption of new renewable technologies, the governments of various countries can play a key role through a variety of measures such as establishing proof of concept, extending incentives and fiscal benefits, and so on.

Yan Xu, Kun Yang and Guohao Zhao have listed the following 14 factors affecting the development of China's offshore wind power industry.

1. Policy formulation

a. ***Development Planning:*** Refers to the plans and arrangements made by governments at all levels and relevant institutions for China's offshore wind power industry. Including industrial layout, technology research and development, key project construction, safeguard measures, etc.

b. ***On-grid Tariff:*** Refers to the measured price when the power grid purchases the power of the power generation enterprise and the electricity quantity is connected to the main grid. The benchmark on-grid tariff of offshore wind power in China is now the guide price, and the newly approved on-grid tariff is determined through competition.

c. ***Economic Incentive Policy:*** Refers to a series of economic policies and measures implemented by the government to promote and guarantee the development of offshore wind power. It mainly includes financial subsidies, investment credit concessions, tax concessions for value-added tax (VAT) and income tax reduction and exemption, etc.

d. ***Environmental Protection Policy:*** It refers to a series of economic policies and measures implemented by the government to realize ecological civilization and sustainable development. It has a certain impact on the energy consumption structure.

e. ***Operating Mechanism:*** This refers to the general name of some international and domestic systems and activities closely related to the development of offshore wind power. It mainly includes clean development mechanism (CDM), carbon emission trading mechanism, renewable energy quota trading mechanism and its supporting green certificate trading mechanism, etc.

2. Technical Management Level

a. ***Operations Management:*** The general term for the management of the planning, organization, implementation and control of the whole operation process of offshore wind power projects. Including site selection in the early stage of power generation project, equipment selection, operation after production, etc.

b. ***Offshore Wind Power Technology:*** Refers to the related technologies of offshore wind power industrialization, involving piling and installing wind turbines, wind resources storage and other links.

3. Resource and Environment Level

a. ***Supply of Offshore Wind Resources:*** Refers to the available energy of offshore wind resources for offshore wind power generation.

b. ***Site Selection:*** Refers to the site selection of offshore wind farms, which needs to consider wind resources, power generation costs, technical difficulties and other issues.

c. ***Power Generation Cost:*** Refers to the cost generated in the process of electric energy production, which is mainly composed of fixed assets investment cost and management operation cost.

d. ***R&D Investment:*** Refers to the input cost of research and development of offshore wind power-related technologies. It reflects the core competitiveness of offshore wind power industry and is influenced by macro-economy.

4. Market Supply and Demand Level

a. ***Industrial Chain:*** It consists of wind resources supply, related wind turbines, power generation equipment supply, power generation enterprises and downstream power grid enterprises.

b. ***Energy Market Mechanism:*** Refers to the mechanism by which China's energy resources are allocated through market competition. It mainly consists of supply, demand mechanism, price formation mechanism, competition mechanism and risk mechanism.

c. ***Investment and Financing Mechanism:*** Refers to the investment and financing mechanism for offshore wind power industry or enterprise. Offshore wind power involves many factors, large investment scale and high investment risk.

Conclusion

The Global Offshore Wind Market is projected at a compound annual growth rate of 12.3%. Offshore wind farms have the same advantages as land-based wind farms in providing renewable energy; not consuming any water, providing domestic energy source, creating jobs and not emitting environmental pollutants or greenhouse gases. In addition, offshore wind speeds have a tendency to be faster than on land (~3 m/s vs ~8 m/s) resulting in offshore productions generating more energy. To put this in prospective, small increases in wind speed yield large increases in energy production, for example, a turbine in a 15-mph wind can generate twice as much energy as a turbine in a 12-mph wind. Another inherited advantage of offshore wind is that offshore wind speeds tend to be steadier than on land. A steadier supply of wind means a more reliable source of energy. The downside of this new technology is the economics. Offshore wind farms are expensive due to difficulty in building and maintaining as compared to the onshore wind farms. Wave action and even very high winds, particularly during heavy storms or hurricanes, can damage wind turbines. The production and installation of power cables under the seafloor to transmit electricity back to land are also a huge expense. Lasty, a major consideration in economic analysis is depth of the sea and soil type of the seabed can which make a large difference in capital cost for installation of offshore wind turbines. It is very hard to build robust and secure wind farms in water deeper than around ~60 m, or over half a football field's length. Although, coastal waters off the east coast of the U.S. are relatively shallow, almost all of the potential wind energy resources off the west coast are in waters exceeding this depth. Floating wind turbines are beginning to overcome this challenge. Typical semi-submersible offshore foundations, which have the ability to operate in >200 m depth, cost upwards of 130 $/MWh while onshore wind turbine cost approximately 32 $/MWh. Because of this, efficiency of offshore farms must exceed onshore operations exponentially. From data in the UK from 2020, this statement is factual as just 2% of offshore wind farms exceed all onshore farms outputs.

The wind power industry is affected by a number of variables. These variables hold more value in offshore wind as compared to onshore wind as to match onshore economically, efficiency maximization is crucial. Some of the key factors the offshore wind power industry is affected by are, such as economic development, policy situation, technological innovation, resource environment and market supply and demand. The inevitable climate disaster is upon us and new renewable ways to produce energy is a top priority. Offshore wind farms show incredible promise for producing energy at rates never seen before by

other renewable methods. Continued research into maximizing the efficiency and costs of offshore wind farms may very much revolutionize our planet.

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SnippetS

Adani Power Begins Electricity Supply from Godda Plant to Bangladesh

Adani Power Limited (APL), a part of the diversified Adani Group, has commissioned the first 800 MW ultra-super-critical thermal power generation unit at Godda in Jharkhand. The plant has started with supplying 748 MW of power to Bangladesh significantly improving the situation in the neighbouring country as it will replace expensive power generated from liquid fuel, bringing down the average cost of power purchased.

Source: PTI News, 10 April 2023

Japan to Fund Private Sector RE Projects

Japan is looking to initiate financing for private sector-led renewable energy projects in India, fuelled by the strong wave of investment focus in renewable energy in the country. The Japan International Cooperation Agency (JICA) has provided lines of credit to Indian Renewable Energy Development Agency (IREDA) and India Infrastructure Finance Company (IIFCL) for renewable energy capacity of 8 GW.

Source: Projects Today, 18 May 2023

Green Data Centres is Fresh Buzzword for Businesses

Data centre firms are raising their focus on sustainability by creativity with design, creating ways to use renewable sources of power and making infrastructural changes to ensure better waste management and efficient energy consumption. Some of these companies like Bharti Airtel's data centre business under Nxtra Digital, for example, is investing to develop proprietary efficient energy consumption solutions, which can be adopted at scale across its data. According to projections, power consumption of data centres in India is expected to reach nearly 5 gigawatts over next six to seven years, making sustainability critical.

Source: Industry Outlook Team, 15 April 2023

EU Launches First Tender Under Renewable Energy Financing Mechanism

The European Commission has approved the inaugural cross-border tender to promote renewable energy-related collaboration among member states to expedite the achievement of clean energy targets. The tender is being carried out as part of the renewable energy financing mechanism and is a result of Luxembourg and Finland's pledge to collaborate under this initiative. Beginning April 18, 2023, interested parties can submit their proposals via the funding and tender portal. Grants will be awarded to project developers who establish new renewable energy projects utilizing solar photovoltaic technology. Luxembourg has decided to contribute €40 million (~$44 million) voluntarily, while Finland will host the competing projects that will vie for support.

Source: Mercom India.com, April 14, 2023

Siemens Gamesa to Supply Wind Turbines for Arcelormittal Andhra Pradesh Project

Siemens Gamesa has signed the deal to supply 46 SG 3.6-145 wind turbines to AM Green Energy Private Ltd (AMGEPL), a joint venture of ArcelorMittal S.A. and ArcelorMittal Nippon Steel India Ltd (AM/NS India). The clean electricity produced will be used by one of ArcelorMittal's steel plants in India, providing a much-needed boost to the industry's decarbonisation efforts in the country. The wind project will form part of a 989-MW wind-solar hybrid renewable energy project by AMGEPL in Kurnool district of Andhra Pradesh.

Source: IANS, 13 April 2023

An Investment of about Rs.14.54 lakh Crore required during 2022-27 for Power

The 20th Electric Power Survey (EPS) Report, published by Central Electricity Authority (CEA) in November 2022, covers electricity demand projection for the year 2021-22 to 2031-32 as well as perspective electricity demand projection for the year 2036-37 and 2041-42 for the country.

The estimated energy requirement and peak demand of the country State/UT-wise from the year 2022-23 to 2026-27 is also given there.

The steps taken/being taken by the government to meet the demand of electricity and investment in it are as follows:

i. In order to meet the growing demand of electricity, there is need for fresh generation capacity addition. As per draft National Electricity Plan for the period 2022-27 which is under approval, an investment of about Rs.14.54 lakh crore would be required to install additional generation capacity of about 210 GW during 2022-27 along with battery storage of 8680MW/ 34720 MWh.

ii. Thermal Power Plants of 25,440 MW of capacity are at various stages of construction in the country.

iii. Hydroelectric projects (above 25 MW) totalling to 17803.5 MW are under implementation.

iv. Nuclear Power Plants of 8,700 MW of capacity are under construction and 7000 MW of Nuclear power plants have been accorded Sanction.

v. The capacity of National Grid is being expanded on a continuous basis commensurate with the growth in electricity generation and electricity demand. It is planned to add about 17,500 ckm of transmission lines and 80,000 MVA of transformation capacity per year (220 kV and above voltage level) on all India basis. The present inter-regional capacity of the National Grid is 1,12,250 MW and is likely to go upto about 1,50,000 MW by 2030.

vi. Government has set a target to achieve 50 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030. As of February 2023, India's total utility scale installed solar capacity is around 64.4 GW. As on February 2023, India's total installed wind capacity is around 42 GW. As on February 2023, total installed non-fossil based capacity is around 176 GW out of total capacity of 412 GW. The likely installed capacity of non-fossil fuel of the country by the end of year 2029-30 will be around 500 GW.

The estimated energy requirement of the country from the year 2022-23 to 2026-27 (in MU)

Particulars	2022-23	2023-24	2024-25	2025-26	2026-27
All India	1512918	1600214	1694634	1796627	1907835

The estimated peak demand of the country from the year 2022-23 to 2026-27(in MW)

Particulars	2022-23	2023-24	2024-25	2025-26	2026-27
All India	216966	230144	244565	260118	277201

Source: PIB Delhi, 28 March 2023

Snippets

Government Invites Bids from Merchant Bankers for IREDA IPO

Government of India has announced plans to list shares of Indian Renewable Energy Development Agency Limited (IREDA) on the stock exchanges, as well as raise fresh equity share capital through a prospectus-based initial public offer (IPO) in the domestic market. This entails the partial sale of the government's stake in IREDA, with a dilution of up to 25%. The percentage of paid-up equity to be divested or issued as part of the IPO will be determined based on IREDA's post-issue capital calculated in accordance with the rules.

Source: Solar Quarter, 28 April 2023

ZF Wind Power Places 15 MW Test Rig Order at R&D Test Systems

ZF Wind Power has ordered a 15 MW end-of-line test rig from R&D Test Systems which will support the testing of two powertrains a day. In the first quarter of 2024, the first serial-produced 15 MW powertrain for the offshore wind market will leave the ZF Wind Power factory in Lommel, Belgium.

Source: Offshore Wind, 25 April 2023

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Or write to naveen.chakradhar@hexagon.com

HEXAGON

Flexible Resources Initiative (FRI) of the US-India Clean Energy Finance Task Force

Least Cost Pathway for Power Sector Investments for the states of Gujarat, Karnataka, Maharashtra and Rajasthan through 2030

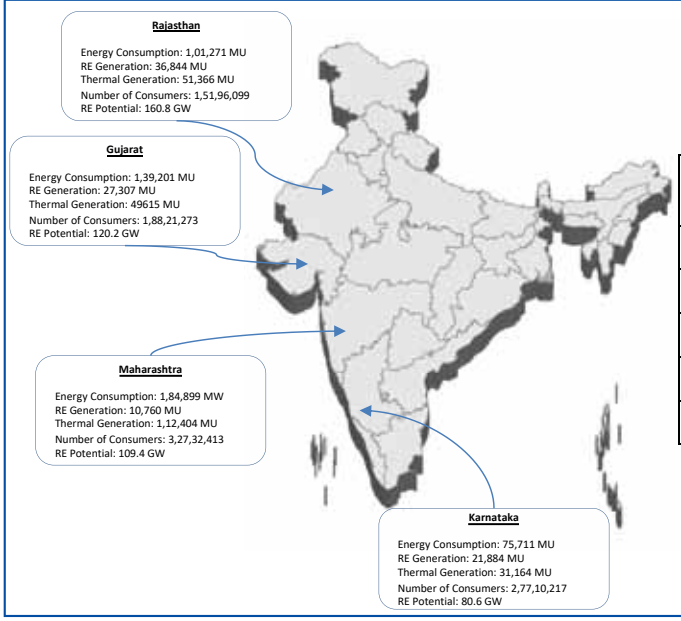
India has set an ambitious clean energy target for the power sector, namely 175 GW of renewable energy (RE) installed capacity by 2022. In 2021, Prime Minister Modi increased this ambition by announcing a target of 500 GW of installed non-fossil capacity by 2030. India has made rapid progress towards achieving these goals. Between 2015 and 2021, India's renewable energy capacity more than doubled from 40 GW to 100 GW, supplying nearly 10% of the total electricity generated in the fiscal year 2021 (CEA, 2021). Over the last decade, India has been successful in achieving some of the lowest RE costs in the world. Between 2010 and 2020, it saw the largest reduction of 85% in country-level solar levelized cost of energy (LCOE), while the average solar tariff in 2020 was 34% lower than the global weighted average. India also had the lowest country-level installed cost for solar and wind in 2020.

With increasing renewable energy penetration, it is important to analyse optimal flexibility requirements to ensure grid stability and reliability. In this context and in collaboration with Lawrence Berkeley National Laboratory (LBNL), Idam Infra has conducted a study to analyse Least Cost Pathway for Power Sector Investments for four states namely Gujarat, Karnataka, Maharashtra and Rajasthan.

Using PLEXOS – an industry-leading energy modelling software – Idam has analysed optimal fuel mix for the four states and identified optimal and least-cost pathways for meeting 2030 requirements. Our studies find that these four states can meet ~36% or 181 GW of India's non-fossil fuel commitment of 500 GWs by 2030. Further, no new thermal capacity addition may be necessary. Adequate storage (pump storage and/or battery) and other flexible resources like load shift will help maintain grid stability and reliability even during high stress periods.

The objective of these studies is to find the least-cost and operationally feasible resource mix for Gujarat to meet its load reliably through 2030, in sync with the national grid, and by considering key flexible resources such as energy storage and demand response solutions including agricultural load shift as

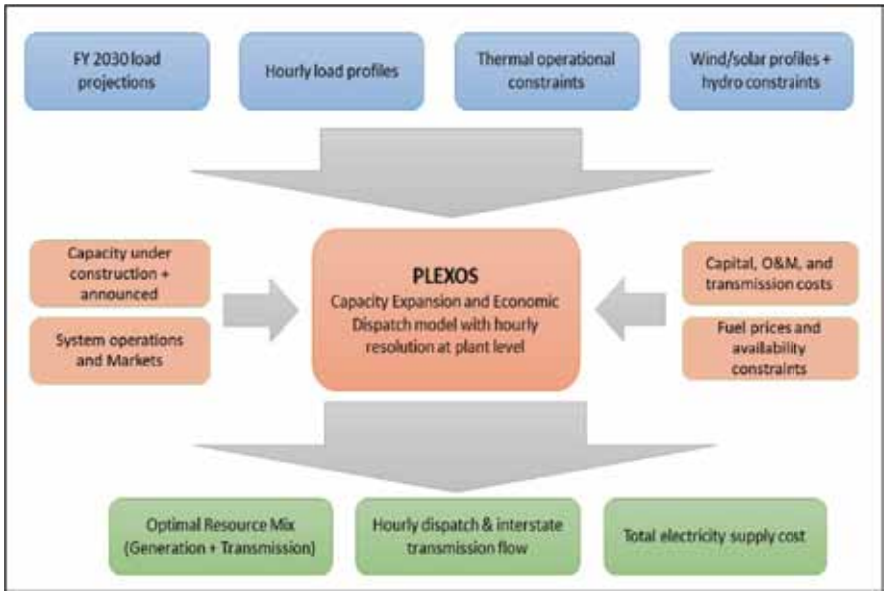
Overview of States



FY 22-23	Total (all four states)	% Share in Country
Energy Consumption (MU)	5,01,082	33%
RE Generation (MU)*	96,760	61%
Thermal Generation (MU)*	2,44,549	22%
Number of Consumers**	9,44,60,002	29%
RE Potential (GW)	471	45%

** Data Available - April 22 to February 23*
*** Data Available till March 2021*

Modelling Methodology



Modelling Methodology

Scenarios		
Current Policy Scenario Pathway for States to meet 500 GW of solar and wind nationally by 2030 considering present rate of installation of RE in the State	**Primary Least Cost Scenario** Least cost pathway for States to meet 500 GW of solar and wind nationally by 2030	**Sensitivities Case** High RE installation Scenario.
Demand forecast & AG Load shift	**Harnessing VRE Potential**	**Cost parameters & assumptions**

• Electric Power Survey (EPS) based demand and energy projections.
• Considered load shift of 5000 MW in Karnataka, Maharashtra and Gujarat.
• Ag. Shift has not been considered in Rajasthan *(Primary least cost case)*.
	• Considered MNRE targets by 2022 and MNRE potential for solar and wind generation
	• Max. yearly built up constraint for solar and wind generation.
		• **Capital cost considered (Rs Cr/MW)**
		  • Solar : 4.20 in 2020 to 2.94 by2030
		  • Wind: 6.62 in 2020 to 5.96 by 2030
		  • Battery: 6.30 in 2020 to 3.77 by 2030

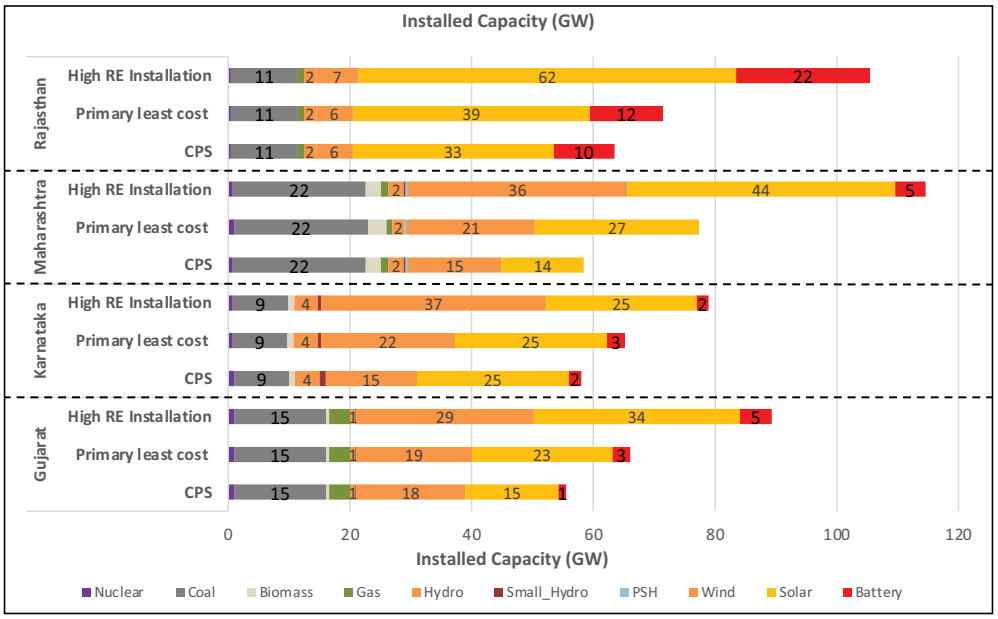
Salient Assumptions

State	Gujarat	Karnataka	Maharashtra	Rajasthan
Ag-Shift (MW)	5000	5000	5000	No
Coal Capacity Considered (MW)	15095	9172	20527	10525
Pumped Storage Hydro Capacity	No	No	Yes (Bhira, Ghatghar)	No

Demand Projections

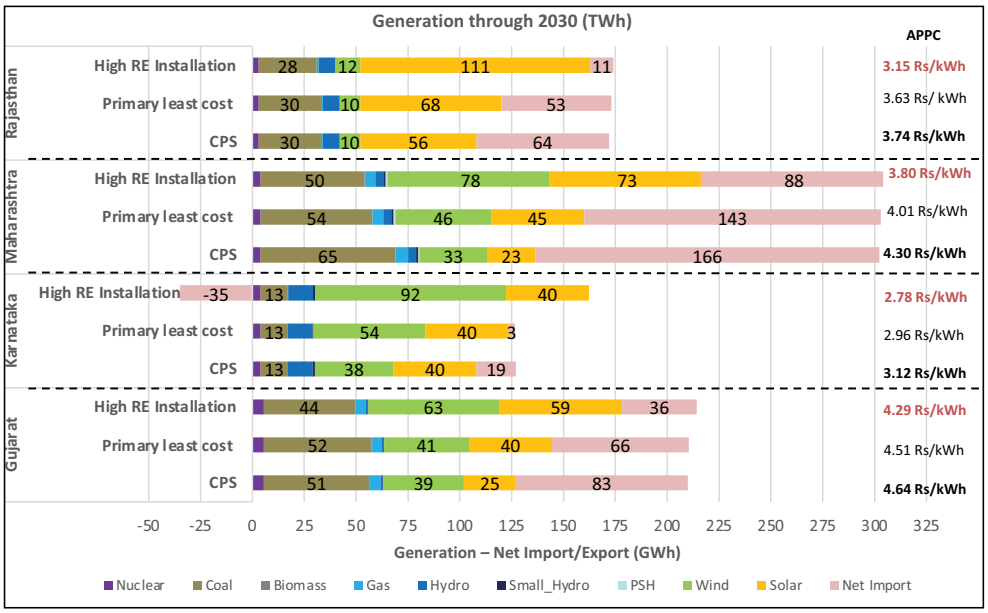
State	Gujarat	Karnataka	Maharashtra	Rajasthan
Tariff (TWhr)	185	121	207	150
EPS (TWhr)	213	128	303	173
Difference (EPS/Tariff)	15.14%	5.78%	46.38%	15.33%

Investment Scenarios till 2030 - Comparison of Installed Capacity



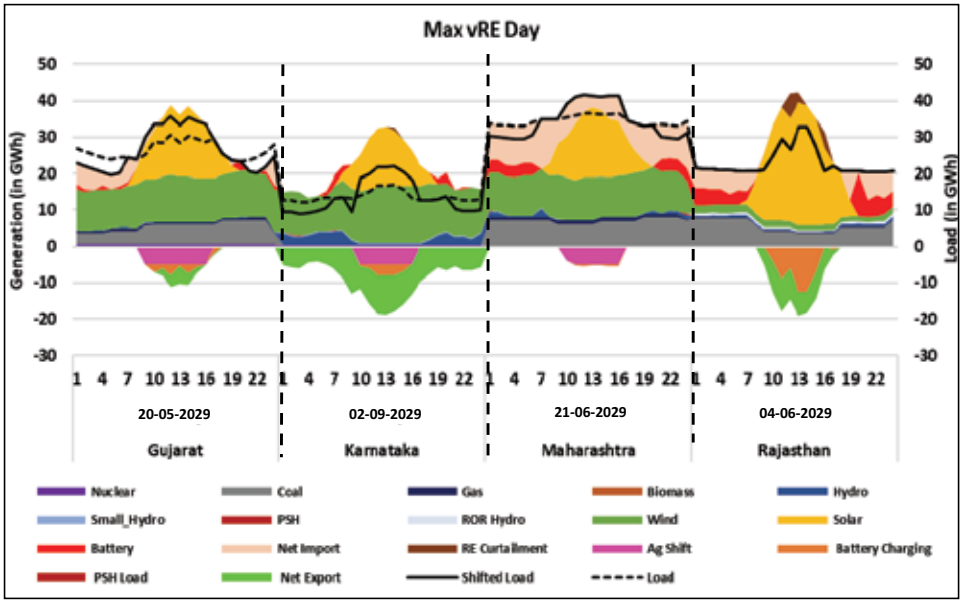
- **No new thermal additions** through 2030 in any of the 4 states
- **Need of energy storage** with increased variable RE capacity
- **Aligning state policies & ecosystem** to further accelerate deployment of RE capacity addition per year to harness maximum possible RE potential.

Investment Pathway till 2030 - Comparison of Generation



- **With increase in generation from cheaper RE, dependability on import of power decreases and cost of power procurement decreases.**
- CO_2 emission intensity decreases from FY23 to FY 30 as:
  - Rajasthan from * 0.54 to 0.26 kg/kWh (53% decrease)
  - Maharashtra from *0.67 to 0.35 kg/kWh (48% decrease)
  - Karnataka from *0.23 to 0.11 kg/kWh (53% decrease)
  - Gujarat from *0.63 to 0.37 kg/kWh (41% decrease)

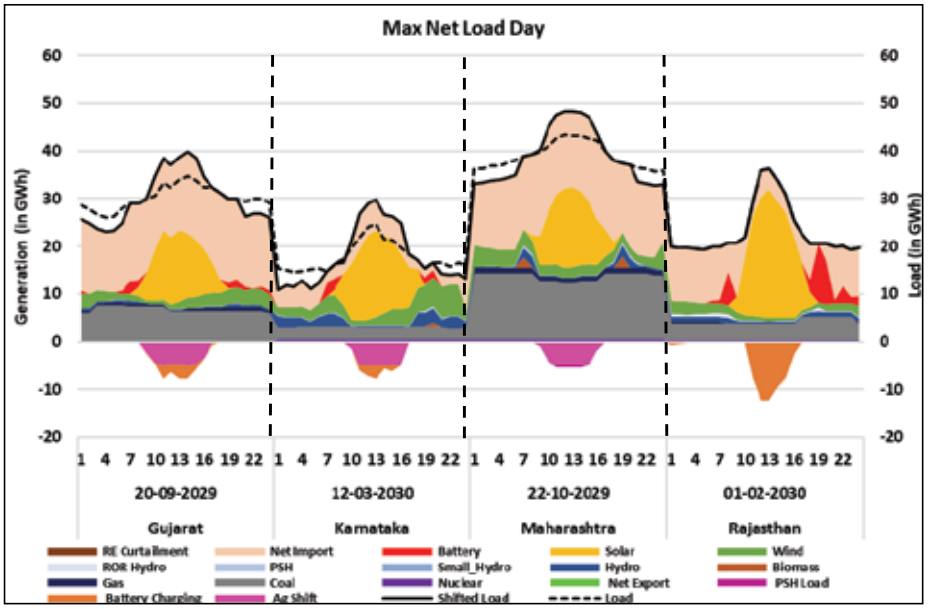
Max vRE day: Dependable Grid during High Stress Periods



Max vRE Day:

- System is stable even without much thermal generation support
- Rajasthan and Karnataka has some RE curtailment on high RE days.
- RE contribution at instantaneous peak load on Max vRE day for Gujarat is ~91%, for Karnataka is ~183%, for Maharashtra is 47%, and for Rajasthan it is 105%.

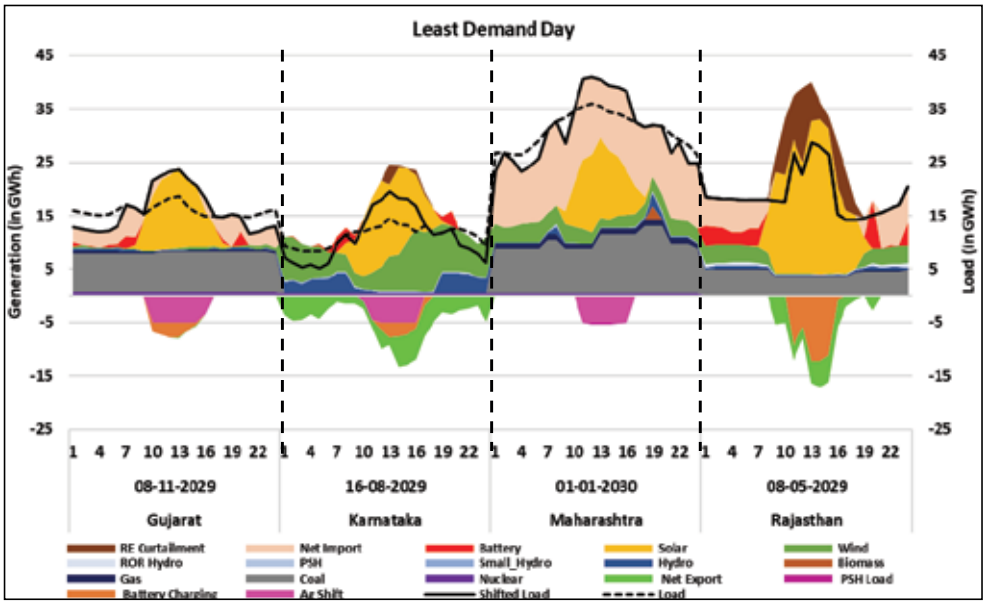
Max Net Load Day: Seasonality of RE Generation



Max Net Load Day:

- Thermal generation is low in Karnataka and Rajasthan.
- Maharashtra would require significant thermal generation.
- RE contribution at instantaneous peak load on Max net load day for Gujarat is ~45%, for Karnataka is 81%, for Maharashtra is ~43%, and for Rajasthan it is 77%.

Least Demand Day: Seasonality of Load



Least Demand Day:

- Because of low demand, Rajasthan and Karnataka has RE
- Even during lowest demand, Maharashtra imports power, suggesting that the State should particularly focus on increasing its share.
- RE contribution at instantaneous lowest load on least demand day for Gujarat is ~41%, Karnataka it is 73%, for Maharashtra is ~10%, for Rajasthan is 85%.

Summary of State Level Studies

	Gujarat	Karnataka	Maharashtra	Rajasthan
Total RE optimal capacity by 2030 (Solar+Wind)	42 GW (23+19)	46 GW (25+22)	48 GW (27+21)	45 GW (39+6)
Storage Requirement	3 GW	3 GW	0.9 GW	12 GW
RE generation as % Total generation (*excluding import) in 2030	56%	75%	57%	65%
RE as % Total energy in 2030	38%	73%	30%	45%
Net Importer or Exporter by 2030	Net importer	Net importer	Net importer	Net importer
Average Power Purchase Cost (FY 23)	4.60 Rs./kWh	3.66 Rs./kWh	4.06 Rs./kWh	3.95 Rs./kWh
Average Power Purchase Cost (FY 30)	4.51 Rs./kWh	2.96 Rs./kWh	4.01 Rs./kWh	3.63 Rs./kWh

well as flexibility provided by thermal generators and hydro resources. The study uses the latest RE and battery cost data, an industry-standard power system modelling platform (PLEXOS), and exhaustive analytical methods (optimal capacity expansion and power plant-level hourly grid dispatch simulations). In all the 4 states, as share of RE increases, the system would need more flexible solutions to address increased intermittency.

What did we find?

- PLC cases in these four states can meet ~36 % (~181 GW) of India's non fossil fuel target of 500 GW by 2030.
- No thermal capacity addition in the least cost pathway of any of the states
- With adequate storage (battery &/or PSH) and other flexible resources (load shift), grid operations would be stable even during high stress periods.
- Need policy/regulatory interventions (resource adequacy framework, storage regulations, capacity markets, wider/ deeper energy markets)

Key Findings

The Least Cost Capacity Expansion is pointing to the following results:

- With adequate storage (Battery &/or PSH) and establishment of other flexible resources (load shift), the grid operations would be stable & dependable even during high stress periods.
- No coal investment is cost effective through 2030 in any of the States.
- However, import of cheaper coal power from states like Chhattisgarh, Madhya Pradesh and Jharkhand
- Complementary FRs working in tandem maintains grid dependability.

- Share of RE in total energy - Guj 38%, Kar 73%, MH 30%, Raj 45%
- If seasonal storage is developed, Karnataka can become net zero faster than other states.
- CO_2 emissions intensity decrease considerably for all States from FY 23 to FY 30.

Key Policy Recommendations

Specific Resource Availability

- Karnataka exhausts its present known solar potential (24.7 GW) before 2030
- Other States also exhaust substantial portion of their known RE potential by 2030
- The States need to reassess their RE potential as present RE potential assessment was carried out nearly a decade ago.

Resource Adequacy Framework

- Need for accurate demand forecast - Guidelines for state load forecasts and planning reserve margin studies.
- States such as Karnataka and Rajasthan show almost nil thermal generation during high RE seasons
- Need to sell thermal/ extra RE generation during these periods.
- This would require a proper resource planning and adequacy framework.
- RA Framework is required to drive planning and procurement strategies and avoid potential future stranded assets.
- Integration of resource adequacy requirement into discom-level planning and procurement.
- Market reforms to enable capacity procurement to avoid under/over-contracting and stranded assets.

Development of Transmission both Intra and Inter-State.

- States with high RE also show higher RE curtailment, especially during high RE seasons.
- Both inter and intra-state transmission should be augmented.
- Development of transmission infrastructure to handle capacity expansion and increasing export/import.

Promotion of Flexible Resources.

- Regulatory framework for energy storage.
- Promotion of flexible resources such as demand side management including Ag and industrial load shift.
- Results show that Rajasthan would suffer high RE curtailment during high solar season, partly because of limited demand management tools like agricultural shift. This could be avoided by adopting demand management approaches like shifting night-time load to solar hours.

Focus on Demand Side Management and Other FRs

- Results show that Rajasthan would suffer high RE curtailment during high solar season, partly because of limited demand management tools like agricultural shift.
- This could be avoided by adopting demand management approaches like shifting night-time load to solar hours.

Land Allotment and Development for RE

- Results show that a total 181 GW RE could come up by 2030 in 4 states.
- This would require huge land and thus States need to identify land and develop innovative land use policies that would enable higher RE installation.

Courtesy: Idam Infrastructure Advisory Private Limited and Lawrence Berkeley National Laboratory (LBNL)

SNIPPETS

Power tariffs in India are one of the lowest in the world: Mr. RK Singh

Despite countries, especially Europe, witnessing a steep increase in electricity prices due to the Russia-Ukraine war, India managed to offer stable power tariffs to its consumers, Union Minister for power and renewable energy Mr. R. K. Singh has told Moneycontrol in an interview. Now power tariff in Spain is €50 per megawatt hour (MWh), that is almost Rs. 50 per unit! The entire developed world went through the crisis of very high power cost, which led to hefty hikes in power tariffs. But, we didn't let the global increase in input costs affect us at all. The power cost of our consumers remained levelised. So, our prices will remain stable, the tariffs will remain stable and the supplies will also be available to meet the growing demand," he said.

Source: Moneycontrol.com, 15 April 2023

$150 Billion in Announced Capital Investment for the Industry

American Clean Power Association's (ACP) just-released Clean Energy Investing in America report reveals more than $150 billion in capital investment announced for utility-scale clean energy projects and manufacturing facilities since the passage of the Inflation Reduction Act (IRA) last August. That figure surpasses the overall investment into U.S. clean power projects commissioned between 2017- 2021. Alongside the massive investment, the report details more than $4.4 billion in savings for over 24 million utility customers. While the industry continues to expand, substantial barriers to development remain, leaving projects at risk. Without permitting reform, many of these projects may face costly delays, or worse.

Source: American Clean Power Association, 17 April 2023

Government Planning to Launch Interest Subvention Scheme To Support Clean Energy Sector

Government is working on an interest subvention scheme for the energy sector to support new clean energy and energy efficiency technologies, said Power Secretary Mr. Alok Kumar recently in his speech at the third Energy Transition Working Group (ETWG) meeting under India's G20 Presidency. He added that initial support in terms of VGF and priority lending is required to scale up a new technology and government is also working towards universal access to clean energy. ETWG is working on identifying the priorities and estimates of low cost financing and presenting it to the leadership of G20.

Source: ET Energy World, 9th May 2023

India's G20 Presidency is an opportunity for offshore wind countries, businesses, and financial institutions to work together for clean energy transition ambitions

Shri Bhupinder Singh Bhalla
Secretary, MNRE

As part of the third Energy Transition Working Group (ETWG) meeting under India's G20 Presidency, the Ministry of New and Renewable Energy (MNRE), Government of India, in collaboration with the Global Wind Energy Council (GWEC) and National Institute of Wind Energy (NIWE) convened a high-level event "Harnessing Offshore Wind for Accelerating Energy Transition: The Way Forward" on 16th May, 2023 in Mumbai. The event brought saw a gathering of government representatives, financial institutions and senior domestic and international industry representatives. The event emerged as a platform for the exchange of urgent priorities for bolstering offshore wind deployment in India and globally — permits and clearances, supply chain resilience, low-cost financing, capacity building and business volumes to boost market attractiveness.

Mr Bhupinder Singh Bhalla, Secretary, Ministry of New and Renewable Energy (MNRE), Government of India, attributed offshore wind as a solution to air pollution and climate change mitigation. He emphasized the jobs creations opportunity through the flourishment of the offshore wind value chain. He outlined India's strides in harnessing offshore wind given its role in balancing the grid. He further added that India's G20 Presidency is an opportunity for offshore wind countries, businesses, and financial institutions to work together and build on mutual strengths to support national, regional, and global offshore wind and clean energy transition ambitions.

Mr Alok Kumar, ETWG Chair and Secretary, Ministry of Power, Government of India emphasized the ever-growing role of offshore wind in India's power mix. He outlined how India's offshore potential is almost comparable to hydro and nuclear capacities that India may add in the future. In addition, he suggested how having an offshore wind horizon, beyond 2030, emerges as an opportunity for the country and a mission mode approach may give even further force to the country's aspirations that may lead to the development of a robust value chain and attract more enthusiastic participation of the industry.

Mr Dinesh Dayanand Jagdale, Joint Secretary, Ministry of New and Renewable Energy (MNRE), Government of India, outlined the country's progress on various facets of offshore wind - including proposed business models, upcoming plans of rolling out tender, international collaborations, and extensive engagements between government and the industry to facilitate a robust enabling environment.

Mr Sumant Sinha, Chairperson of GWEC India collaboration between government and industry and partnership between Indian and international offshore wind companies, as well as power generators and original equipment manufacturers, and finally the role of multilateral development banks. He also pressed for long-term PPAs and necessary infrastructure. He also added on supply chain resilience- availability of customized equipment, ships, cables, and trained people among others.

There were two high-level panel discussions moderated by Ms Rebecca Williams, Global Head of Offshore Wind, GWEC and Mr Chintan Shah, former Director of IREDA, respectively. The session titled "Role of Global Offshore Wind Sector in Reaching Net Zero Targets" focussed on deliberations around global offshore wind experience, international best practices, supply chain priorities, and expectations of the industry from the emerging Indian offshore wind market.

The panel discussion on "Financing and Capacity Building for Offshore" presented a comprehensive view of available instruments to feed the need for the development of an offshore wind ecosystem. Senior representatives of ADB, World Bank, Corio Generation, Aon, NTPC REL Limited, NIWE, ReNew, IREDA, Center of Excellence on Offshore Wind and Renewable Energy, IEA, O2 Power and SGRE among others spoke in these panels.

In his concluding remarks, Mr Dinesh Dayanand Jagdale, Joint Secretary, MNRE, summarized the enriching discourse as part of the event and thanked distinguished speakers and esteemed participants for their enthusiastic participation.

Courtesy: PIB, New Delhi, 17 MAY 2023

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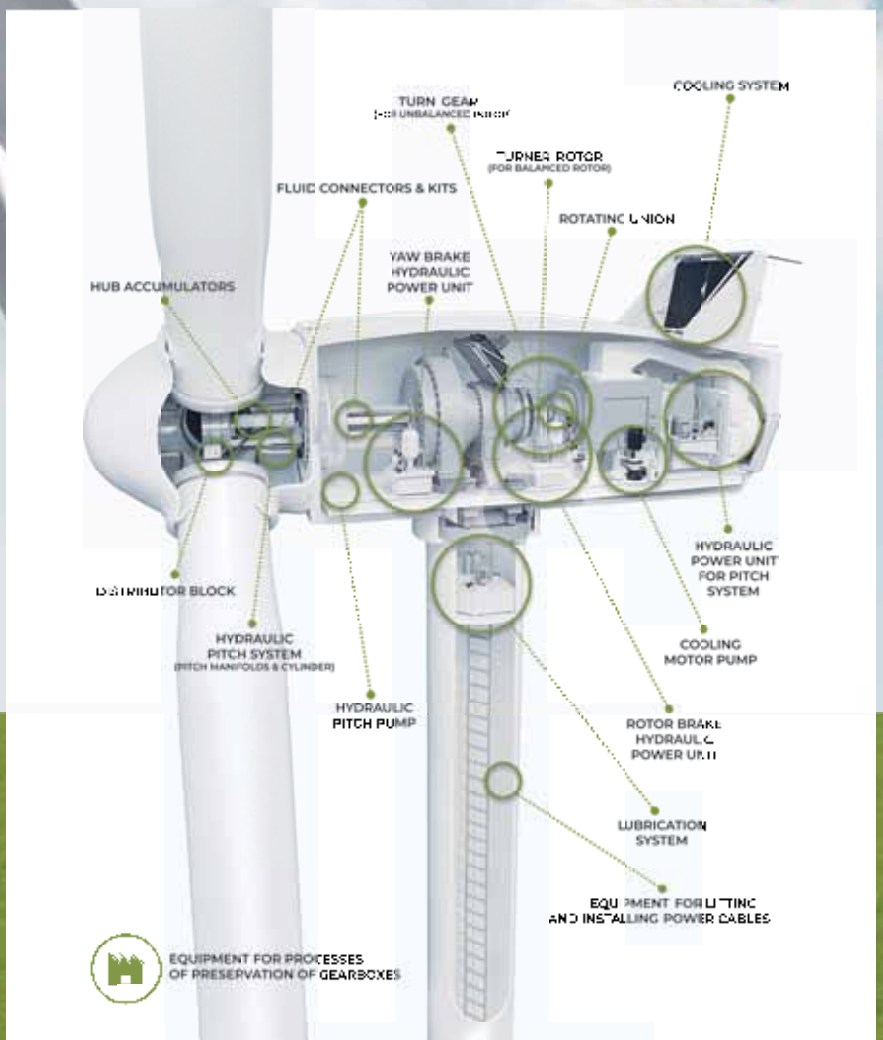

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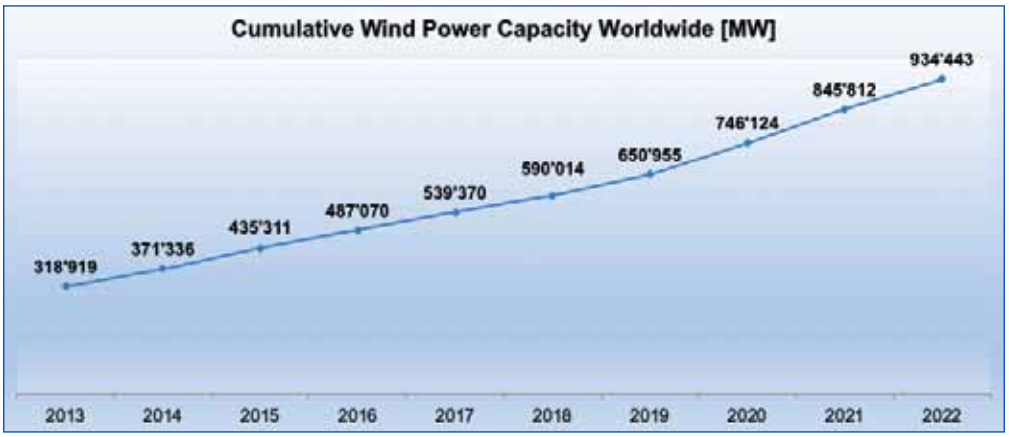
World Wind Power Installations 2022 Stay Below Expectations

- ***Delays across the globe result in the lowest growth since 2019***
- ***88,6 Gigawatt of additional capacity added in 2022, equaling a growth rate of 10,5%, after 13,4% in 2021***
- ***Global wind power capacity stands at 934 Gigawatt – 1000 Gigawatt expected to be exceeded in 2023***

Stefan Gsänger
Secretary General
World Wind Energy Association (WWEA),
Bonn, Germany

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 Gigawatt, after close to 100 GW in 2021 and 95 Gigawatt in 2020.

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 by the World Wind Energy Association.



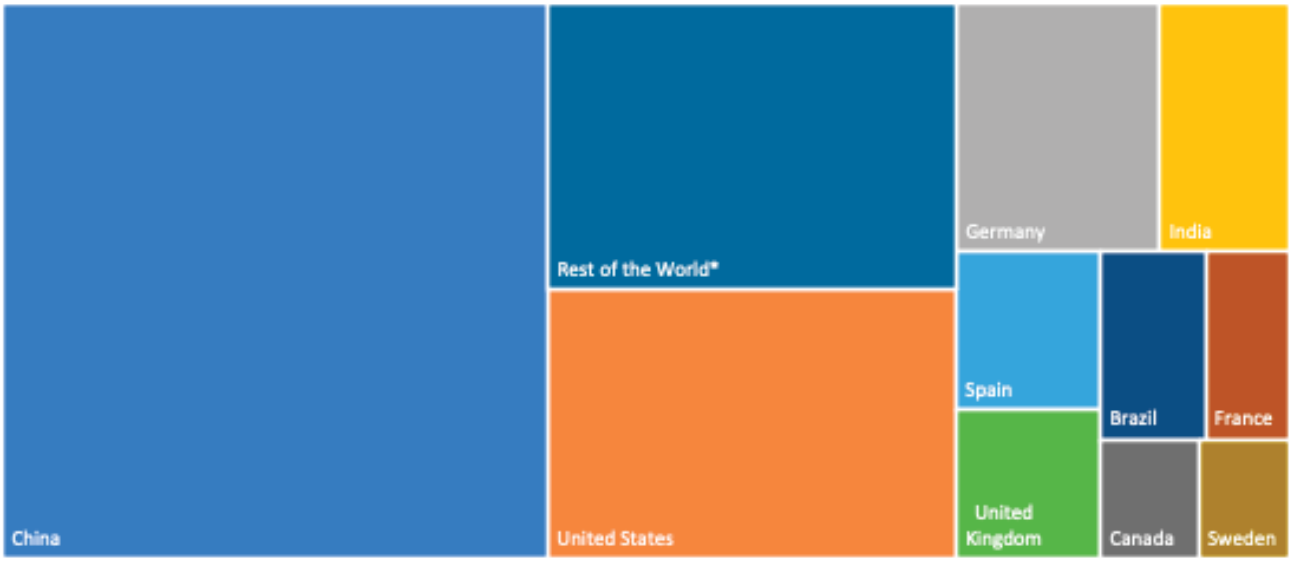
Top Five Markets

China, as the world market number one, saw strong growth although substantially less than in 2021. A weak wind power year can also be observed in remaining of the top five wind markets, in the USA, Germany, India and Spain. In contrast, Brazil has shown excellent performance with 4 GW of new capacity, making it clearly the third largest market for new wind turbines. In the foreseeable future, the country will become one of the five largest wind power markets.

Europe

Europe has a new leader in terms of new installations: Finland added 2,4 GW in 2022, followed by the United Kingdom and Germany which have shown very similar growth, each adding 2,3 GW. Sweden added 2 GW, Spain 1,7 GW, followed by France and Poland, which both installed 1,5 GW.

Wind Power Capacity by Country End 2022



Americas

The American continent saw rather weak developments aside from the USA (8,8 GW new capacity), with Canada adding 1 GW, while Brazil has become the undisputed lead market in South America.

Africa

Wind power plays still only a marginal role in most African countries although major wind farms can today be found half a dozen African countries. Major investment in new turbines happened in the leading wind power country, South Africa, which added 0,4 GW amid a serious power crisis, as well as in Morocco.

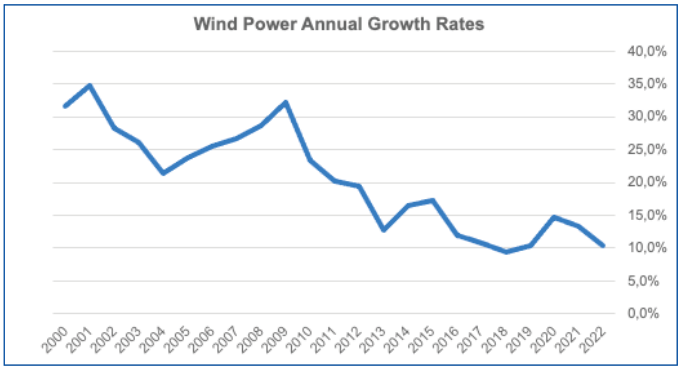
Asia

In Asia, China continues to play a role on its own with 49 Gigawatt of new capacity added, substantially less than in 2021 and also below the expectations which experts raised during 2022. However, the country still represents 55% of the market volume for new turbines and 42% of the global wind power capacity. Stronger growth is expected in 2023.

India added 2,2 Gigawatt, which brings the total capacity well above 40 GW. In order to meet the government's targets, the country will need to accelerate its deployment rates substantially and adjust regulatory frameworks – such step has just been announced.

Some Asian countries including Vietnam and Pakistan saw robust growth rates, while Japan and South Korea underperformed in 2022.

Growth Rates



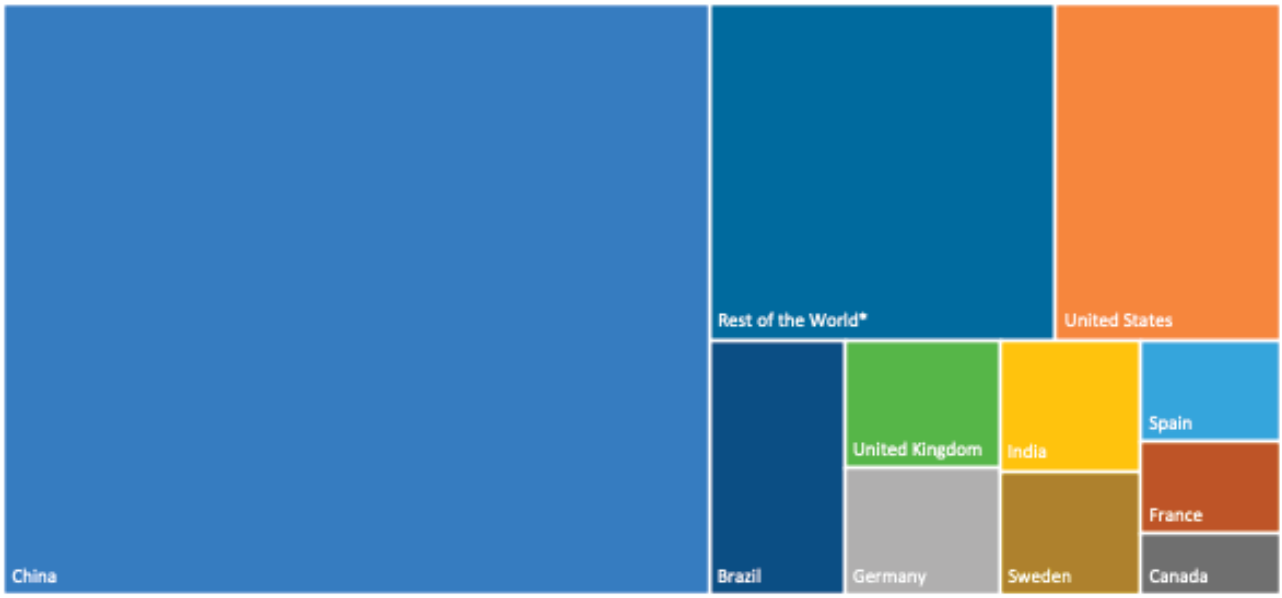
The growth rate of the global wind sector has reached 10,5%, one of the lowest rates ever since modern wind power utilisation started 40 years ago. The most dynamic markets with the biggest growth rates of the year 2022 where Finland with 74%, Poland with 21%, Brazil with 19% and Sweden with 17%.

The biggest progress in the global ranking of all countries can be found in Finland which jumped from 25th to 18th position, and Poland which climbed from 17 to 14. Turkey improved by one place and took over the 11th position from Italy.

Assessment of Market Performance

The wind power market performance in 2022 is disappointing for WWEA. With more than two years of covid recovery programs

Wind Power Capacity Added in 2022 by Country



Country/Region	2022	New Capacity 2022	Growth 2022/2021	2021	2020
China	395'630	48'960	14,1%	346'670	290'750
United States	144'184	8'837	6,5%	135'347	122'328
Germany	66'242	2'318	3,6%	63'924	62'708
India	41'983	2'183	5,5%	39'800	38'625
Spain	29'813	1'670	5,9%	28'143	27'294
United Kingdom	28'087	2'339	9,1%	25'748	24'458
Brazil	25'631	4'064	18,8%	21'567	18'010
France	20'600	1'516	7,9%	19'084	17'949
Canada	15'310	1'006	7,0%	14'304	13'627
Sweden	14'227	2'054	16,9%	12'173	10'068
Turkey	11'950	0'850	7,7%	11'100	9'305
Italy	11'848	0'526	4,6%	11'322	10'850
Australia	10'134	1'411	11,0%	9'126	7'296
Poland	8'617	1'517	21,4%	7'100	6'614
Netherlands	8'500	0'654	8,3%	7'846	6'784
Mexico	7'312	0'050	0,7%	7'262	6'789
Denmark	7178	0'000	0,0%	7178	6'235
Finland	5'677	2'421	74,4%	3'256	2'586
Portugal	5'671	0'043	0,8%	5'628	5'502
Belgium	5'305	0'303	6,1%	5'002	4'719
Norway	5'087	0'432	9,3%	4'655	3'980
Japan	4'802	0'228	5,0%	4'574	4'372
Greece	4'783	0'331	7,4%	4'452	4'113
Ireland	4'685	0'280	6,4%	4'405	4'355
Vietnam	3'966	0'735	15,2%	3'444	2'829
Chile	3'810	0'366	15,6%	3'297	3'120
Austria	3'573	0'276	8,6%	3'291	2'818
South Africa	3'560	0'397	10,2%	3'231	0'513
Argentina	3'309	0'018	4,6%	3'163	2'495
Romania	3'077	0'048	1,6%	3'029	3'029
Rest of the World*	29'892	2'797	12,0%	26'692	22'003

(All figures are in MW.)

and six years after the Paris climate accord, the wind sector was confident that the wind power industry has the basis for steady growth – although there are still serious policy gaps such as unbalanced auction systems, too lengthy and too bureaucratic permitting and licensing processes as well as lack of appropriate grid infrastructure.

Unfortunately, as the results show, the frameworks are not yet sufficient to allow the wind power sector to invest on the required scale. The war against Ukraine which led to huge energy market turbulences added more momentum to improve the investment frameworks for wind energy, but this has not yet turned sufficiently into practical action.

Long-term Prospects are Bright

WWEA has therefore called on governments to improve policies for wind power. The wind sector needs stable and predictable remuneration schemes as well as smoother and faster permitting processes. Regulatory frameworks must also cater for strong engagement of local citizens and communities and support benefit sharing in order to strengthen the social support for wind power.

With strong and comprehensive frameworks in place, wind power can fulfill its task and become the main pillar of a future energy supply which provides equally affordable energy access to all human beings, which secures stability and peace on our planet and which does not worsen the climate crisis. Considering the global trend towards electrification also in the traffic and heating/cooling sectors, huge opportunities are lying ahead and the wind sector is ready to make use of them, for the benefit of mankind.

Reference: WWEA Annual Report 2022)

MoP Initiates Bidding Process for ISTS under NERES-XVI Scheme

The Ministry of Power has issued a Request for Proposal (RFP) document for the selection of a bidder as a Transmission Service Provider for the establishment of an Inter-State Transmission System (ISTS) under the North Eastern Region Expansion Scheme-XVI (NERES-XVI). The bidding process will be conducted through Tariff-Based Competitive Bidding (TBCB) and the selected bidder will be responsible for building, owning, operating and transferring the ISTS.

Source: SolarQuarter, 20 April 2023

AMI and weatherproofing guide $36.4bn investment plans for US grid modernisation

According to Wood Mackenzie, 25 investor-owned utilities in the US have filed for $36.4 billion of investment into grid modernisation with 80% focussing on grid hardening, distribution automation and advanced metering infrastructure.

Source: Smart Energy International, 21 April 2023

Discoms to Submit Report on Electricity Subsidy to Centre Every Quarter

Through an amendment to the Draft Electricity Rules, 2005, the power ministry has proposed a quarterly report should be submitted by state electricity regulatory commissions (SERCs) for the discoms in their jurisdiction providing a report on the electricity subsidy. It said the report should contain details on whether or not the demand for subsidy was raised by the distribution licencee based on accurate accounts of the energy consumed by the subsidised category and consumer category wise per unit subsidy declared by the state government. The report should also contain details of actual payment of subsidy in accordance with Section 65 of the Act and the gap in subsidy due and paid as other relevant details.

Source: Business Standard, 22 April 2023

Fish Farm Inside A Turbine's Foundation

Mingyang Smart Energy, China is making an offshore wind turbine foundation that features a net cage for fish farming. The jacket foundation – a lattice-truss fixed wind turbine foundation with four tubular legs connected by diagonal struts – with the fish net cage is going to be installed at the 500 MW Mingyang Qingzhou 4 offshore wind farm in the South China Sea, China's first wind farm to feature both hydrogen production and aquaculture farming. The fish will be kept in the net cage in the open sea, but they'll be confined, making it easier to feed, observe and harvest them. Up to 150,000 fish will be raised in 5,000 cubic meters of water in its net cage.

Source: Electrek, 18 April 2023

India Extends Transmission Fee Waiver for Green Hydrogen Plants

India has extended transmission fee waiver for renewable power to hydrogen manufacturing plants commissioned before January 2031, as it aims to become the world's cheapest producer of the fuel. The move is expected to cut the cost of green hydrogen by a fifth. It will make more green hydrogen manufacturing projects eligible for the 25-year waiver of transmission charges, previously available for projects set up before July 2025.

Source: Reuters, 10 April 2023

Suzlon Bags Order for 39 MW Wind Energy Project from First Energy

Suzlon will install 13 wind turbine generators (WTGs) for Thermax Group company First Energy with hybrid lattice tubular (HLT) tower and a rated capacity of 3 MW each. The project, to be located at Thalaikattupuram, Tuticorin in Tamil Nadu, is expected to be commissioned in 2024. This order is part of a 100-MW wind-solar hybrid project.

Source: PTI, 27 April 2023

Bidding Calendar for FY 2023-24

Ministry of New & Renewable Energy (MNRE) Government of India has issued the REIAs-wise Bidding Calendar for FY 2023-24 on 24th April 2023 requesting the Renewable Energy Implementing Agencies (REIAs) [SECI, NTPC, NHPC & SJVN] to co-ordinate with other REIAs for floating of tenders and opening of bids to avoid concurrent bids. In continuation to the Bidding Trajectory for Renewable Energy (RE) Power Projects issued on 31st March, 2023.

Renewable Energy Implementing Agency-wise Bidding Calendar for FY 2023-24

(All figures are in GW)

Bidding Trajectory for FY 2023-24

Bidding Agency		Apr, 2023	May, 2023	Jun, 2023	Jul, 2023	Aug, 2023	Sep, 2023	Oct, 2023	Nov, 2023	Dec, 2023	Jan, 2024	Feb, 2024	Mar, 2024	Total		
SECI	Solar, Hybrid, RTC etc.	2		1.5	3		3	2			1			12.5	15	SECI
	Wind		2.5											2.5		
NTPC	Solar, Hybrid, RTC etc.		3			3			3			3.5		12.5	15	NTPC
	Wind				2.5									2.5		
NHPC	Solar, Hybrid, RTC etc.			3			1:5			1.5			1.5	7.5	10	NHPC
	Wind									2.5				2.5		
SJVN	Solar, Hybñd, RTC etc.		3			2			1			1.5		7.5	10	SJVN
	Wind												2.5	2.5		
Monthly TOTAL		2	8.5	4.5	5.5	5	4.5	2	4	4	1	5	4	5O		
Quarterly TOTAL		15			15			10			10				SOLAR + Total	40
		Q1			Q2			Q3			Q4				WIND Total	10

Solar+: Solar/Hybrid/RTC/Others

Snippets

Adani Group Aims to Raise about $800 Million for Financing Green Energy Projects

Adani Group is mulling to raise nearly USD 800 million for new green energy projects and is in discussions with global banks, including SMBC, DBS Bank Ltd, Mitsubishi UFJ Financial Group and Standard Chartered Plc. The size of the fundraise could range from about USD 700 million to some USD 800 million and the plan and size can vary as it is not finalised.

Source: Livemint, 27 April 2023

MNRE Designates SJVN as RE Implementing Agency

Ministry of New and Renewable Energy has designated SJVN as Renewable Energy Implementing Agency (REIA) to Aid India's RE Targets. The Ministry of New and Renewable Energy (MNRE) has designated SJVN Ltd, a Miniratna, Category-I PSU, as a Renewable Energy Implementing Agency (REIA). SJVN had requested this categorization from the ministry. The ministry said that SJVN will need to co-ordinate with other REIAs — SECI, NTPC and NHPC- for floating of tenders and opening of bids to avoid concurrent bids for similar projects.

Source: MNRE, 24 April 2023

6.7 Million Smart Meters, the Largest Order in India

Indian smart metering company IntelliSmart Infrastructure has been awarded a contract by electric utility Pashchimanchal Vidyut Vitran Nigam Limited (PVVNL) to install 6.7 million prepaid smart meters in 14 districts of West Uttar Pradesh, the largest project of its kind in India.

Source: SmartEnergy.com, 28 April 2023

CERC Extends Deadline for Power Generators to Submit Details on Generation and Transmission

The Central Electricity Regulatory Commission (CERC) has announced that it has extended the deadline for power generators to submit their details by one month. As per the latest order, the deadline has been moved from April 15 to May 15, 2023.

Source: CERC 13 April 2023

Regulatory Update on Wind Power

Ministry of Power issued Draft Electricity (Amendment) Rule 2023

Ministry of Power, Government of India has issued Draft Electricity (Amendment) Rule 2023 and has invited comments from stakeholders till April 14 on the Draft Electricity (Rights of Consumers) Amendment Rules, 2023, which seeks to "bring transparency and give more control to the consumers" when dealing with power distribution companies (discoms).

Source: The Federal, 3 April 2023

Ministry of Power Issues Guidelines to Promote Development of Pumped Storage Projects

The Ministry of Power has issued Guidelines to promote development of Pump Storage Projects (PSP) in the country on 10th April 2023. Highlights are as follows:

- Estimated potential of on-river pumped storage potential is 103 GW in India.
- At present, projects (4745.60 MW) are presently in operation, 4 projects (2780 MW) are under construction, and 27 projects (29930 MW) have been allotted by States which are under different stages of development.
- As per CEA, the country would require 26.7 GW of Pumped Storage Projects and 47.2 GW of BESS (5 hour) to integrate the RE capacity envisaged till 2032.
- PSPS provide the necessary scale of storage and have a long service life of more than 40-50 years.

Measures already taken by Government to promote Pump Storage Project Sites (PSPs)

- CPSUs facilitate states in the development of PSP sites by providing financial and project execution capabilities.
- Energy Storage Obligation trajectory has been notified by MoP in order to create demand for energy storage.
- 100% waiver on ISTS charges to all the PSPs where construction work has been awarded by 30th June'2025.
- Budgetary support for Enabling Infrastructure i.e., roads/bridges for Hydropower projects on case-to-case basis after appraisal/ approval of each project by PIB/CCEA. The limit of this budgetary support for such roads and bridges would be.
- Rs. 1.5 crore per MW for projects up to 200 MW and
- Rs. 1.0 crore per MW for projects above 200 MW.
- Timelines reduced from 900 days to 720 days for formulation and from 150 days to 75 days for concurrence of Detailed Project Reports for Pumped Storage Projects

Guidelines for Promotion of PSP

- The home state to have first right of refusal up to 80% of the project capacity and tariff to be fixed by appropriate commission under Section 62 of Electricity Act on projects allocated through nomination basis or competitive bidding.
- In case of project allotted through TBCB, Survey & Investigation (S&I), DPR preparation and all preconstruction activities to be done by SPV formed under CPSU/State PSU.
- The successful bidder will be transferred SPV, and tariff will be adopted under section 63 of Electricity Act on basis of -
- composite tariff (including the cost of input power) in case input power is arranged by the developer.
- Tariff for storage on per MWH basis if input power is arranged by procurer of the storage capacity.
- The allotment of project site will be cancelled if developers fail to start construction work within a period of 2 years from the date of allotment of the project.
- PSPS and other storage projects shall be allowed to participate in all market segments of the power exchange; earlier restricted to HP-DAM
- Financial institutions like PFC, REC, and IREDA shall treat PSPS at par with other RE projects while extending long term loans of 20-25 years tenure. The debt equity ratio of PSP projects can be up to 80:20.
- Electricity Duty (ED) and Cross Subsidy Surcharge (CSS) shall not be applicable on pumping power for charging of PSP. ED and CSS may only be levied on the final consumption of electricity.
- No water cess shall be levied on PSPS

Source: Ministry of Power, 10th April 2023

TANGEDCO Approves Green Energy Tariffs for the Energy Consumers

To promote renewable energy, Tangedco sought the introduction of the green energy tariff in its tariff petition last year. TNERC in its order allowed Tangedco to introduce the green tariff for HT services permitting it to charge a tariff of 10 per cent over the respective tariff.

Source: Tangedco, 25 April 2023

RERC Proposes Amendments to Boost RE Adoption and Green Practices

The Rajasthan Electricity Regulatory Commission (RERC) has released a draft amendment to the "Rajasthan Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2020." The proposed amendments aim to promote renewable energy projects with storage, facilitate solar power supply to electric vehicle charging stations, encourage non-fossil fuel-based waste-to-energy plants. These amendments seek to make renewable projects more attractive to end-users by allowing annual energy banking. Additionally, in alignment with the Green Energy Open Access Rules 2022, the RERC has introduced the concept of Green Energy Tariff, Green Certificate, and Ratings, thereby promoting environmentally friendly practices.

Source: Solar Quarter, 10th May 2023

CERC Can't Go Beyond Express Terms Of Contract; APTEL Can't Discover New "Change In Law" Which Parties Never Contemplated : Supreme Court

The Supreme Court has ruled that in a case where the matter is governed by express terms of the contract, the Central Electricity Regulatory Commission cannot, even donning the garb of a regulatory body, go beyond the express terms of the contract. The court further held that the Appellate Tribunal for Electricity cannot discover a new 'change in law' which the parties have not contemplated as +5change in law under the contract, and the Tribunal cannot rewrite the contract and create a new bargain between the parties.

Source: Live Law, 9 May 2023

CERC Issued New Price Capping For Trading of Power on Exchange

The CERC has asked them to enable members to quote prices up to Rs. 10 per unit for all contracts. The earlier cap for the segment was up to Rs. 12 per unit. In May 2022, the CERC had directed the power exchanges to cap prices at Rs. 12 per unit, as the prices went up to Rs. 20 per unit.

Source: CERC, 31 March 2023

KERC Allowed Monthly Wheeling and Banking in Renewable Energy

The Karnataka Electricity Regulatory Commission (KERC), under the new format for banking agreement, has now allowed monthly energy banking for renewable energy generators to ensure better grid stability and energy demand management. The state previously had an annual energy banking settlement mechanism. The new format also includes wheeling agreements for renewable energy projects under its green energy open access regulations.

Banking

The company must provide a list of consumers and the amount of power to be wheeled to them 15 days before commencement.

At the end of each month, the company must allocate all energy generated to its customers under WBA. Any residual energy will be billed to the ESCOM per the applicable tariff. RE-generating stations would be entitled to RECs for such energy remaining unutilized at the end of the month.

Source: KERC, 12 April 2023

Determination of Green Tariff

Ministry of Power, Government of India had notified Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 on 6th June, 2022.

Ministry of Power has taken note of the fact that only few States have determined the Green Tariffs, and the tariffs had been set at a rate much higher than the Average Power Purchase Cost of renewable energy procured by the Discoms.

MoP vide its letter dated 13th May, 2023 has again written to SERC/ JERC for Determination of Green Tariff under Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 and Implementation of the Rules. Further it has stated that it is clarified that in no case the Green Tariff should be higher than Average Power Purchase Cost of RE + Surcharge @ 20% of ACoS + (say) a reasonable margin of 25 paisa.

Gujarat Extends Wind-Solar Hybrid Policy

The Government of Gujarat has further extended the operative period of the Gujarat Wind Power Policy-2016 upto 30th September 2023 or till a new Wind Power Policy/a new Policy is announced, whichever is earlier, incorporating the amended GRs referred at serial no.2 to 6. All other provisions of the Gujarat Wind Power Policy-2016 and amendments thereof shall remain the same

Source: GERC, 17 April 2023

*Compiled by: **Om Taneja**, Renewable Energy Consultant*

Innovation, Cost of Storage to Decide Future of Renewable Energy in India: Tarun Kapoor

"The future of (renewable) energy is totally dependent on innovations and storage cost coming down, less space (for energy storage), utilize high energy density, and materials (used to produce energy storage), which are available safe for us," said Advisor to Prime Minister of India, Mr. Tarun Kapoor addressing at a conference 'India Energy Storage Week' at New Delhi. Referring to recent tenders on energy generation bundled with storage, he pointed out that the energy price was some Rs 11 per unit (including Rs 2.5 per unit cost of solar energy in addition to charges for storage). He stressed that it is important that materials like Lithium to produce batteries are available in India. So if we have to transition into the space where it will be, mostly renewable energy, we will have to find some place to store energy for our grids or Power Systems, he said.

Source: PTI, 03 April 2023

CERC Approved to Trade Power on HP-DAM in PXIL

The Central Electricity Regulatory Commission (CERC), in its order on a petition filed by the Power Exchange India Limited (PXIL) approved its demand for the introduction of the High Price Day Ahead Market (HP-DAM).

Source: CERC, 11 April 2023

CERC Instruct Power Exchanges to Cap Transaction Fees at INR 2 Paisa/Unit

The Central Electricity Regulatory Commission (CERC) has allowed the three power exchanges in the country to charge a transaction fee up to the ceiling of 2 paise/kWh on either side of the transactions.

Source: ET Energy World, 6 April 2023

CERC Issued New Price Capping for Trading of Power on Exchange

The Central Electricity Regulatory Commission (CERC) has reduced the price cap on power purchase from exchanges. It has directed the exchanges to redesign their bidding software from April 4 till further orders. The CERC has asked them to enable members to quote prices up to Rs. 10 per unit for all contracts. In May 2022, the CERC had directed the power exchanges to cap prices at Rs. 12 per unit, as the prices went up to Rs. 20 per unit. The CERC also cut the price cap at high price day ahead market (HP-DAM) in the integrated day ahead market (I-DAM) segment at the India Energy Exchange, which was introduced in February this year, with a price ceiling of Rs. 50 per unit. Noting that there has not been any trade in the HP-DAM segment, the CERC cut the price cap to Rs. 20 per unit.

Source: The Hindu.com, April 03, 2023

Masdar and IRENA to Collaborate on Setting a Roadmap to Triple Global Renewable Energy Capacity By 2023

Abu Dhabi Future Energy Company PJSC – Masdar, one of the world's leading clean energy companies, has signed an agreement with the International Renewable Energy Agency (IRENA) to cooperate on a major international knowledge project setting out the means to triple global renewable energy capacity by 2030. IRENA and Masdar signed a MoU on the side-lines of the first-of-its-kind UAE Climate Tech Forum to collaborate on a project for COP28 that will outline global targets for renewable energy by 2030. MoU expected to generate knowledge that provides a global baseline for renewable energy

Source: IRENA, 11 May 2023

India Seeks Exemptions for MSMEs from EU's Carbon Tax: Sources

From October, domestic companies from seven carbon-intensive sectors -- including steel, cement, fertilise, aluminium and hydrocarbon products would have to seek compliance certificates from the EU authorities to comply with the CBAM norms. India is pressing the European Union for a mutual recognition agreement for its carbon certificates and exempt MSMEs in certain sectors to insulate the domestic industry from the burden of the EU's carbon tax, which would kick in from October this year, a government official said. The EU is introducing the Carbon Border Adjustment Mechanism (CBAM) from October 1 this year. CBAM would translate into a 20-35 per cent tax on select imports into the EU starting January 2026.

Source: PTI, 10 May 2023

BPCL to Invest Rs 600 Crore in 240 MW Renewable Power Capacity Project

Bharat Petroleum Corporation (BPCL) is planning to set up 240 MW of renewable power capacity at a cost of Rs 600 crore this fiscal. BPCL is looking to establish solar and wind power facilities in Uttar Pradesh, Madhya Pradesh and Maharashtra.

Source: SolarQuarter, 20th April 2023

NLC India Tenders for Engaging Coordinating Agency for 1400 MW Solar and Wind Power Plant in Tamil Nadu

NLC India Limited has released an open tender for engaging a qualified coordinating agency (QCA) for their 1400 MW solar and wind power plant (REPP) located at various places in Tamil Nadu. The purpose of this engagement is to comply with the Tamil Nadu Electricity Regulatory Commission's (TNERC) regulations on forecasting, scheduling, deviation settlement, and related matters for wind and solar generation. The contract duration is set for 24 months.

Source: Solar Quarter, 16 May 2023

Indian Government Urges Compliance with Green Tariff Determination and Renewable Energy Rules

The Indian government has urged state electricity regulatory commissions (SERCs) to adhere to the guidelines outlined in the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022. The rules were introduced to promote the use RE and accelerate the country's RE programs but only a few states have determined the Green Tariffs, and in some cases, these tariffs have been set higher than the average power purchase cost of renewable energy. To incentivize the adoption of renewable energy, the government has clarified that the Green Tariff should not exceed the average power purchase cost of RE, along with a surcharge of 20% of the average cost of supply and a reasonable margin of 25 paisa. This ensures that tariffs are in line with the regulations.

Source: Solar Quarter, 16 May 2023

Wind Turbine Technology Advancement

P.R. Gopan
Country Head -
Product & International Solutions
Envision Wind Power
Technologies India Private Limited

Wind installation globally is expected to reach 1TW in 2023 (took last 4 decade's) but next 1TW (=1K GW) may happen in less than a decade by 2030 due to reasons, such as, increased energy demand to meet economic growth trajectory, replace fossil fuels for energy security, more focus on climate crisis and to achieve Net Zero Targets, apart from onshore wind, more offshore projects and also, wind is a matured sector-reliable & cost-competitive.

In India the share of solar and wind power energy in the generation capacity mix is approximately 26% as of April'23. As per CEA (Central Electricity Authority) renewable energy-based capacity of ~180 GW (solar and wind) is required by 2030. In the energy mix, energy generation from wind is extremely a significant factor and with a growing focus on renewables worldwide, certainly, wind power is a better choice and to realise more sustainable sources of power generation. To maximize power harness from wind resource and to ensure future industry growth, wind turbine technology must continue to evolve, building on earlier successes to further improve performance, reliability, while lowering the cost of wind energy. Innovation in design and manufacturing of wind power generation components continues to be critical to achieving our national goals

India has the 4th largest installed capacity of renewable energy globally with +42GW onshore wind power capacity operational by April'23. Wind has emerged as an integral part of the solution to meet the nation's energy needs.

Advanced Wind Turbines, Key to Efficiency

The driving force behind this has been the smart wind turbines that produce electrical energy have become more powerful in terms of power production, more efficiency and more cost competitiveness. The latest modern wind turbines of today are considerably and continually improving from the earlier models. The technology advancements have happened in many different areas — rotors, controls, blades, Tower, power electronics and gearboxes —as the technology matures and becomes more and more sophisticated, advancements are on the horizon that will extend wind project lifespan whilst simultaneously lowering operational costs.

The Increasing Demand for Renewable Energy

India with over 1.4 billion population; is the seventh largest in geography and ranks third among high energy consuming countries in the world. For economic empowerment, holistic growth and prosperity, the Hon'ble Prime Minister of India has set a vision of making India a 5 trillion-USD economy in near future; hence, demand for energy will increase exorbitantly. In India and globally, demand for renewable energy is growing. For India, it is an opportune time with the right ecosystem to enhance manufacturing hub for global mkt and enhance competitiveness by leveraging technology solutions by infusion of efficient equipment

Recognizing importance of self-reliance and to minimise dependence on energy imports, Indian government, has set a target to install 500 GW of renewable energy capacity by 2030 and achieve NetZero emissions by 2070. After India assumed the presidency of the G20 forum. India's G20 presidency will play a crucial role to lead climate change actions, green energy focus while ensuring energy access, security & transition.

India has the 4th largest installed capacity of renewable energy globally with +42GW onshore wind power capacity operational by April'23. Wind has emerged as an integral part of the solution to meet the nation's energy needs. In India, wind industry has evolved significantly over the last 3 decades and has contributed towards renewable energy development. India is blessed with immense wind energy potential for onshore turbine and with further opportunities to add generation capacity with offshore turbine in vast coastal region of Gujarat & Tamil Nadu.

In India, from early days, onshore wind turbine equipment commissioned is with matured wind turbine technology, always at par with the best in the world. Today, India has a strong manufacturing base of approximately 15GW per annum in wind power and different wind turbine models of international quality suitable for India's climatic conditions. Original Equipment Manufacturers (OEMs) in India after introducing new turbine configuration try to achieve maximum percentage of turbine components localized to offer reduced project Levelized Cost of Energy (LCoE) and to meet project delivery timelines.

Site Specific Turbine Models

Considering Indian climatic conditions, turbine manufactures are implementing ways to improve efficiency and output of turbines. Towards this, selection of turbine for operational period of 25 years and beyond with optimal bigger rotor diameter, site specific tower height, optimal Mega Watt rating of turbine, turbine suitability study for the site conditions including seismic, cyclone and atmospheric temperature are done. Assessment, using advanced CFD based simulation tools is helping industry to have realistic estimate upfront on Annual Energy Production (AEP)/Plant Load Factor (PLF) with good micro-siting possibilities for different type of terrain (flat, semi and complex terrain) and with better wake modelling capabilities. Reduced wake losses have advantage on improved turbine reliability through reduced turbine loads. This in-turn reduces O&M cost. Advanced SCADA system and in-built CMS (Condition Monitoring System) in wind turbine help to manage the machine performance and help to improve machine availability with predictive maintenance.

Blade

Rotor blades are critical to achieve lowest LCoE and performance of turbine for the operational life of the turbine; hence, innovative blade design approach is in practice to increase energy capture. Majorly, blades are manufactured with glass fibre with polyester or epoxy base as a cost-effective solution and also done with carbon fibre to have them longer, lighter and stiffer. Apart from better aerodynamics, blades are designed to address other requirements- low noise during operation, reliable anti-dust paint , leading-edge protection coating, effective lightning protection system, blade add-on's to improve performance and reduced blade soiling losses. Recently, focus is, use of recyclable materials, automation of blade manufacturing for attaining consistency in quality and optimize through-put and having split/segmented blade for ease of transportation.

Tower Technology & Competitiveness

Different tower construction type has been used for wind turbines, such as, full lattice structure, tubular steel, concrete, hybrid (lattice & concrete bottom portion with top tubular steel). Tubular steel towers, till 140m hub height are most widely utilized for wind turbines- with soft-soft tower design approach and with smart controller logic, to have optimized reduced weight and to meet project operational life. Considering the steel price variability, logistic and installations challenges, optimised hybrid tower and segmented tower technology options can also be an attractive proposition. Going beyond 140m tower height is a good option to improve energy generation and in India the use of hybrid concrete tower has economic viability, if the windfarm size are 200+ MW. Hybrid Lattice tower, though has eyesore and higher OpEx cost but still a preferred option by developers to have reduced upfront project CapEx.

Foundation

Traditionally, for onshore wind turbine, commonly used is site specific optimized design with slab type gravity foundation. However, further optimal design with wall/rib type foundation is a possibility, if consistency in quality can be ensured. Further a high-rise pedestal foundation can be investigated to have optimal tower weight and to address logistics challenges, if tower bottom section diameter goes beyond 4.5m.

Increased turbine size risk mitigation

Wind turbine sizes keep scaling in terms of rotor diameter, tower height and MW ratings. Hence, the risk associated to technology, bankability and reliability is a concern to windfarm developers and lenders. For that, turbine OEM's try to meet contractual obligations under the equipment warranty and defects during operational life under comprehensive O&M contract. However, apart from these, mainly, OEM's proactively do risk mitigation upfront during design phase supported by stringent testing and validation at component, sub system, turbine level and certification meeting IEC requirements.

India Emerges as "Next-China" for Wind Supply Chain

China dominates the global supply chain across the renewables- due to high domestic demand, strong efficient manufacturing setup, raw materials availability, improved product quality and adherence to deliveries. However, India is emerging as the largest hub for turbine assembly and key components production and gaining an increasingly prominent role in the global wind supply chain. India has right ecosystem to strengthen its position in wind turbine supply chain, mainly due to various reasons- Government's vision of green growth, set high growth trajectory and policy reforms to achieve cumulative 140 GW of wind capacity by 2030, western OEM's as a strategy, consider India as their manufacturing hub to meet India market requirements and export to other markets , low manufacturing costs and local engineering skills, to meet local content requirements by OEM's, moreover, India's favourable trade relationships with many key wind markets strengthens the case for new investments.

Snippets

India, China Propose 'Multiple Pathways' on Cutting Use of Fossil Fuels: Sources

India, backed by China, is trying to build a consensus within the G20 group to let countries choose a roadmap to cut carbon emissions instead of setting a deadline to end the use of fossil fuels. India, the current G20 president, is keen on introducing the phrase 'multiple energy pathways' in a communique to be released at a group summit in September and has been supported by countries including China and South Africa.

Source: Reuters, 02 May 2023

Climate Talks See Pushes for Global Renewable Energy Target

Germany called for governments around the world to work on setting up for renewable energy that would "ring in the end of the fossil fuel age" and help prevent dangerous global warming. Speaking at the start of a two-day meeting in Berlin attended by dozens of top climate envoys, German Foreign Minister Annalena Baerbock noted that the world needs to sharply cut greenhouse gas emissions in order to limit global warming to 1.5 degrees Celsius.

Source: AP, 02 May 2023

Members Meeting of Indian Wind Turbine Manufacturers Association (IWTMA)

A Members Meeting of Indian Wind Turbine Manufacturers Association (IWTMA) was conducted on Thursday, 11th May 2023 at Hotel Royal Le Meridien, Chennai to conduct various business. An Extra-ordinary General Meeting (EGM) of Indian Wind Turbine Manufacturers Association (IWTMA) was also conducted at the same venue to discuss various matters. The meeting was attended by all the members. The photograph of the Meeting is given below.

Snippets

New Algorithm Uses Smart Meter Data to Improve Power Grid Reliability

A new algorithm to improve power grid situational analysis drawing on residential smart meter data has been developed by Arizona State University researchers. While currently situational awareness technology uses two software modules to measure power grid parameters, one to verify topology information and the other to determine system state, the new and more complex algorithm identifies all the necessary parameters at once along with improvements claimed in the accuracy and speed at which the parameters are determined.

Source: Smart Energy International, May 9, 2023

China's First Deep-Sea Floating Wind Power Platform-Installed

Offshore construction activity on Haiyou Guanlan, China's one-of-its-kind deep sea and floating wind power platform, has finally been completed. It will likely generate about 22 million kWh each year as it boasts 7.25 MW.

Source: Marine Insight, 10 May 2023

Suzlon Received 50.4 MW Wind Power Project For Sembcorp's Green Infra

Suzlon Group has received a project for developing a 50.4 MW wind power project for Sembcorp's renewables subsidiary Green Infra Wind Energy Ltd in Karnataka. This order is part of the bid won under REMCL's 50 MW wind tender by Sembcorp. Suzlon will install 24 wind turbine generators with a Hybrid Lattice Tubular tower at rated capacity of 2.1 MW each. The project is expected to be commissioned by 2024.

Source: Livemint.com, 12 April 2023

REC lists its USD 750 Mn Green Bonds at GIFT IFSC Stock Exchanges

REC Limited has undertaken an exclusive listing of its recently issued Green bonds of USD 750 million raised under its Global Medium Term Programme of USD 7 billion at GIFT IFSC Stock Exchanges in a primary listing ceremony held in GIFT IFSC, Gandhinagar. The proceeds of the bonds will be applied to finance, in whole or in part, the eligible green projects.

Source: PIB, Delhi, 03 May 2023

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Windergy India 2023

Enabling India's transition to Clean Energy

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

Renewable Energy Sources (excluding large hydro) currently account for 30.08% (125 GW) of India's overall installed power capacity of 416 GW. Wind Energy holds the major portion of 34.06% of total RE capacity among renewable and continued as the major supplier of clean energy. Currently, at an installed capacity of 42.6 GW, India's wind energy market is one of the fastest-growing markets worldwide.

With favourable government policies and technological advancements, India's wind power generation capacity has grown in recent years, paving the way for the country's transition to clean energy with a target of 140 GW of wind installed capacity by 2030. The Indian government's plan of achieving 30 GW of offshore wind energy capacity by 2030 will boost the wind sector further.

The sector has already made significant progress in terms of capacity expansion and manufacturing capabilities with a manufacturing capacity of 15 GW per annum. It significantly contributes to the Prime Minister's clarion call of 'Atmanirbhar Bharat' with over 70% localization, which is supported by over 4000 MSME providing various components.

Wind Energy's canvas extends to tertiary business in addition to having a positive impact on the socio-economic fabric of the nine wind states by providing employment to rural youth.

To convert the sectoral potential to business opportunities, Windergy India, as the country's sole comprehensive international trade fair and conference for the wind energy sector, is organised by the Indian Wind Turbine Manufacturers Association (IWTMA) and PDA Ventures Pvt. Ltd. The event will be held from 4-6 October 2023 in Chennai, Tamil Nadu, which is an ideal location as it is at the forefront of the entire eco-value chain.

Windergy India 2023, in its fifth edition, seeks to emphasize the pivotal role of wind energy in achieving the net-zero emission objectives, as well as accelerate progress in capacity expansion, manufacturing capabilities, and other areas.

The upcoming event will once again combine a 3-day trade fair with a 2-day conference featuring keynote speeches, thought-provoking panel discussions, special addresses, and technology presentations by senior bureaucrats, industry leaders, academics, and subject-matter experts. This exclusive platform aims to facilitate interactions and engagements with policymakers, regulatory authorities, and domestic and international technology, solution, and service providers from the wind energy sector.

Supported by the Ministry of Power, Ministry of New and Renewable Energy, and various associations and organisations including the Argentina Wind Energy Association, Indian Wind Power Association, World Forum Offshore Wind, Skill Council for Green Jobs, World Wind Energy Association, Vasudha Foundation, Asia Wind Energy Association, Wind Independent Power Producer Association (WIPPA), Solar Energy Corporation of India (SECI), India Energy Storage Alliance (IESA), Indian Wind Energy Association (INWEA), REAR, National Institute of Wind Energy (NIWE), Association of Renewable Energy Agencies of States, and National Small Industries Corporation (NSIC), the event aims to bring together wind energy professionals from India and around the world.

The conference will focus on accelerating decarbonisation through wind energy, the business and financial economics of wind, hybrid and storage solutions, technology and innovation, the Inflation Reduction Act (IRA) and Net-Zero initiatives, manufacturing and supply chain/export aspects, grid-planning integration with regulatory frameworks, the southern region's specific considerations, offshore development in India and Tamil Nadu's unique context.

Windergy India 2023 will feature approximately 150 exhibitors from various sectors such as aluminum materials, coating, component manufacturing, composites, drones, electrical components, fiber optic attenuators, filtration, gripping solutions, hydraulics, industrial automation, industrial equipment, independent power producers (IPPs), laser projection systems, lifts, cranes, logistics, lubrication, mechanical power transmission products, original equipment manufacturers (OEMs), offshore engineering, service providers, software, technical consultants, and media.

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