RENEWABLE ENERGY

ROUNDTABLE REPORT 2

WIND REPOWERING

NEED FOR A KICKSTART

WIND REPOWERING

Overview

India ranks fourth in the world in terms of installed wind power, with a capacity of 38.4 GW (as of November 2020).

The country has a target of installing 60 GW of wind energy by 2022 and about 150 GW by 2030. This will require the addition of more than 10 GW new capacity per year for the next 10 years. In the current scenario, onshore wind installations can be stepped up by repowering the best wind sites, currently occupied by wind turbines of less than 1 MW, with higher capacity and higher utilization turbines.

The National Institute of Wind Energy (NIWE), an autonomous R&D institution under the Ministry of New and Renewable Energy (MNRE), established to serve as a technical focal point for the orderly development of wind power deployment in the country, is currently assessing the wind potential at 150 m hub height. Close to 1,000 GW of capacity is available at 25 per cent capacity utilization factor (CUF) and 58–98 GW of capacity at 35 per cent and above CUF, spanning over seven–eight states. In addition to green-field projects, repowering of the old projects will play a significant role in realizing this potential.

The roundtable

Centre for Science and Environment (CSE) is one of India's leading environmental research, advocacy and capacity-building organizations. Our RE programme has been working extensively to help shape policies at the national and local government level that lead to deployment of renewable energy technologies, build public awareness to strengthen energy access, and facilitate optimum use of natural resources.

India's progress in the RE sector has been remarkable, but the focus has been solar energy, at the cost of wind energy. Repowering offers an opportunity to enhance both the capacity as well as the CUF at the best wind sites. A Repowering Policy was announced in 2016, yet progress on this front is negligible.

CSE organized the 'second RE roundtable' on 2 December 2020. It emphasized the need for repowering in the wind sector for optimized utilization of the natural resource (i.e., wind). CSE's analysis is listed in a factsheet. Expert representation from the government, consultancies, developers, wind manufacturers and wind generators, along with a rich and varied viewership made the roundtable discussion interesting and informative.

Mr Samrat Sengupta

Director, Climate Change and Renewable Energy, CSE

Samrat is a development and operations management professional with 24 years of experience in sustainable energy and climate change cross-sectoral domains. His specific interests include renewable energy power projects, low carbon development and mainstreaming climate change in developmental planning. He has worked with power producers (solar, onshore and offshore wind, and hydro), management and engineering consulting houses, international trade associations for renewable energy promotion, national and international civil society organizations, and government research institutions. Samrat holds an MBA with a specialization in energy management from the Indian Institute of Social Welfare and Business Management (IISW and BM), Calcutta. He has also represented Indian and South Asian civil society in various multilateral forums like the UNFCCC, IPCC and G8.

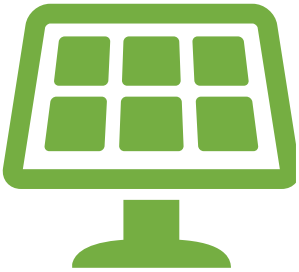
Mr Sengupta moderated the Roundtable.

Dr K. Balaraman

Director General, National Institute of Wind Energy (NIWE)

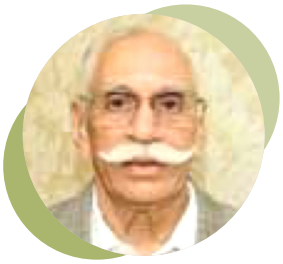
Dr Balaraman is an expert in renewable energy integration and power system planning and operation, having extensive knowledge of handling large grid systems and complex industrial networks. Dr Balaraman is specialized in renewable integration and power system planning. Besides India, his international experience includes England, Saudi Arabia, Qatar, Kuwait, UAE, Nigeria, Sri Lanka, Indonesia, Fiji, Angola, Bhutan, Bangladesh, Mongolia, Maldives, Denmark, Spain, US and other countries. He has carried out grid integration of RE with the portfolio of more than 35 GW of wind generation and 5 GW of solar generation.

He has an MTech in power systems and a PhD in electrical science from the University of California, Berkley. He is also active in the academic world and advises many educational institutions and universities.



WIND REPOWERING

Mr D.V. Giri



Secretary-General, Indian Wind Turbine Manufacturers Association

Mr Giri is a postgraduate in management from the Xavier Labour Research Institute, Jamshedpur. He has over 50 years of experience in steel, glass fibre, tyre and wind industries. Mr Giri worked with Pioneer Wincon as a CEO. Currently, he is the Secretary-General of the Indian Wind Turbine Manufacturers Association, New Delhi.

Mr Parag Sharma

Found and CEO, O2 Power Private Limited

Mr Sharma is a prominent business personality in the Indian renewable power sector. He has more than 22 years of experience in the power sector and a track record of executing renewable energy projects in India. He served as the Chief Operating Officer of a leading renewable firm and developed more than 8 GW of capacity over eight years. He has indepth execution experience in both solar and wind power, and has also built self-engineering, procurement and construction capabilities. Mr Sharma has worked in KPMG, PwC and ABB. He holds a BSc in electrical engineering from AMU, MBA from IIT Delhi and LLB from Delhi University.

Mr K.R. Nair

President, Indian Wind Power Association (Northern Regional Council)

Mr Nair has been associated with the wind energy industry of India for the last 25 years in various positions and capacities. Presently, he is the President of Indian Wind Power Association (Northern Regional Council), based in New Delhi; mostly interacting with the Central government, regulatory authorities, industry associations, etc., on policy and other regulatory issues pertaining to wind power development in the country. He is also a director in the board of Emergya Wind Turbines (Pvt) Ltd, Chennai, a subsidiary of Emergya Wind Technologies BV, Netherlands.

Mr Balawant Joshi

Managing Director, Idam Infrastructure Advisory Pvt Ltd

Mr Joshi is a director of Origin Renewables Private Limited, a distributed renewable energy company and Aurus Lending Solutions Private Limited. He is also an adjunct fellow at Center for Strategic and International Studies. He is an energy and infrastructure expert with nearly 30 years of experience, among which 20 years have been dedicated to renewable energy. His experience spans across the value chain, i.e., generation, transmission, distribution and supply. He has been extensively involved in restructuring and reforms of utilities and has dealt with various issues ranging from financial restructuring, regulation, financial due diligence, assessment and development of IT processes, etc.

Shri Joshi is an electrical engineer with a postgraduation in both finance and software technology.

Mr Alok Kumar

Director and Country Manager India Energy Advisory, DNV GL

Alok Kumar is DNV GL's Country Manager India for Energy Advisory since 2014 and is responsible for advisory business in the power sector, including renewable energy, in South Asian Countries. He has more than 15 years of experience in this sector.

Alok has been a member of various forums, including PMG Group for the FOWIND Project (an EU-funded offshore project in India), a committee constituted by NIWE for preparation and finalization of Environment Impact Assessment Guidelines for the development of offshore wind farms, and the working group for deliberating the various IEC standards, 2015 for necessary adoption by BIS.

Alok received his bachelor's degree in aerospace from IIT Kharagpur and master's degree in aerodynamics from IIT Kanpur. He has completed an executive education programme on 'digital business models' from the University of California, Berkley and 'leading digital transformation programmes' from INSEAD Business School.

Ms Pratha Jhawar

Deputy Programme Manager, Renewable Energy, CSE

Pratha is a renewable energy and climate change researcher and analyst, currently associated with Centre for Science and Environment. She has more than eight years of experience in areas ranging from engineering, development, management, policy research and advocacy. Her work on various projects has had a significant impact on the adoption of decentralized renewable energy systems in India.

Earlier, she worked with Bharat Heavy Electricals Limited (BHEL), Bangalore for more than four years in the capacity of a product engineer for solar photovoltaics. She is a Chevening scholar for an MSc in environmental technology from Imperial College London and BTech in electronics engineering from Indian Institute of Technology, Banaras Hindu University (IIT-BHU), Varanasi.

> About 10,000 MW of capacity consists of turbines smaller than 1 MW. Repowering them could increase generation by almost two-three times
>
> **K. Balaraman**

> Based on today's capital costs and available sites, the reasonable tariff for greenfield wind energy projects is about Rs 3.2-3.25 per kWh. Adding a cost of decommissioning and the residual value of the power purchase agreement, the tariff for a repowering project will be of an order of Rs 4 per kWh or above
>
> **Parag Sharma**

Agenda and discussion

India's wind power sector has a unique growth story. It took off in the early 1980s. Experimental installation of wind turbines started to come in Gujarat and Tamil Nadu, riding on the presence of some 'best wind sites', termed Class 1, that have high wind speed and density. An Indian wind energy programme was initiated in 1983-84 and facilitated wind power installations. The sector was stimulated by short gestation periods and better commercial viability of projects. Still, progress remained slow for the first two decades, as the sector was in a nascent stage.

During this period, the government tried to incentivize the sector through a variety of inducements, which included income tax holidays, accelerated depreciation (AD), concessional excise and customs duty, provision of borrowing at low interest rates, etc. State governments provided preferential feed-in tariff for purchasing wind energy and many more incentives.

Of all these, the incentive that had the most impact was AD. Introduced in 1992, the AD Scheme was particularly attractive to investors who has large taxable incomes. Wind projects no longer needed to rely on traditional funding sources such as banks; instead, they could access a large number of private investors. The tremendous growth of wind energy in Tamil Nadu was driven by AD benefits.

Historically, the growth in wind energy capacity has followed a pattern, with individual states dominating for a few years before the focus shifts to another state. In the first phase, before 2004-05, a majority of the capacity addition took place in Tamil Nadu. In March 2005, the state's share in the country's total wind energy capacity was around 56 per cent. Subsequently, Gujarat, Karnataka and Maharashtra began making sizable investments in wind energy. Rajasthan was the next state to show rapid growth, beginning in 2009-10, followed by Andhra Pradesh, where installations increased sharply post 2012-13. During 2014-16, Madhya Pradesh was the clear leader.

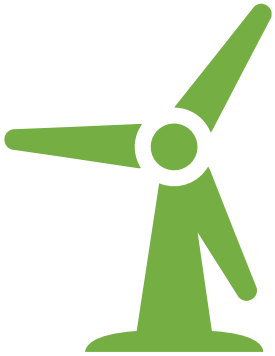
Taking a cue from the success of solar, where continuously lower tariffs were discovered, in 2017, India's wind energy market moved from tax-credit driven investment to a tariff-based bidding process by mainstream independent power producers (IPPs). This has been a major change. Its positive impact was seen in form of the lowest tariffs in the wind power sector of Rs 2.43 per unit in December 2017. But the effect was short-lived and the challenges compounded.

IPPs in the wind sector now face the same issues which solar power has been facing. There are other, unique, challenges as well in the wind power sector. Non-availability of land for new projects is a major bottleneck. Yet wind is expected to compete with all other power sources including solar, despite technical differences. Wind is expected to match solar prices, which will only happen if a site has a high wind potential. Only two states—Gujarat and Tamil Nadu—have such sites, where projects can achieve preferred tariffs. But these states are not ready to give up land for wind projects to be developed under the Interstate Transmission System (ISTS) model, where energy can be exported through the grid. Further, Class 1 wind sites have almost been exhausted. New installations since April 2017 have been less than 6 GW.

India has a target of installing 60 GW of wind energy by 2022 and about 150 GW by 2030. This will require addition of more than 10 GW new capacity per year for the next 10 years. However, annual wind installation in India has crossed the 5 GW mark only once (in 2016-17) and it has been less than 2 GW in all other years. Given this scenario, there are two possible ways to step up wind installations:

» Offshore, which requires wind turbine installation at sea, along the coasts. But it is still a very costly affair. Europe is all geared up to venture into offshore to meet their clean energy transition targets under the Paris Agreement of 2015.

» Repowering, which mean decommissioning old small technology turbines and replacing them with high capacity turbines that have higher utilization factors. Germany, Denmark etc. have embarked on repowering since the turn of the century.



Why do we require repowering?

Wind turbines are designed for a 20 year period. They require decomissioning on completion of their designed life, otherwise they pose a safety risk. However, several wind farms in India continue to operate beyond their 20 year life period, as they are still profitable to the owners. All turbines installed before March 2000, with a combined capacity of about 1.1 GW, have already completed 20 years. They all have turbines with an individual capacity of less than 1 MW.

These older wind turbines are located at some of India's best sites in terms of availability of wind (Class I sites). But they have very low CUF of 10-15 per cent, compared to more than 30 per cent plant load factor (PLF) of modern wind turbines. If repowered, the project capacity and PLF of the turbines can go up by two-three times and this can translate into annual energy production rising by at least five times. If solar power is also added to these calculations, leading to hybrid renewable energy projects, annual energy production can go up by more than six times.

Beyond this, wind farms with a combined capacity of 1.67 GW, commissioned before March 2002, will complete their 20 year designed life soon. These can be immediately repowered to 5 GW with modern wind turbines. Another 2 GW capacity commissioned between 2002 and 2005 will complete its designed life of 20 years in the next two-five years. There is an opportunity for continuous sizeable volume of repowering on a rolling basis. This will require a long-term conducive policy to ensure that older turbines are retired suitably and regularly, and available resources are utilized optimally. Most repowering opportunities are available in Tamil Nadu.

MNRE announced a policy for 'Repowering of Wind Projects' in August 2016. The policy allows repowering of wind turbine generators (WTG) of 1 MW and less. It offers an additional interest rate rebate of 0.25 per cent on the loans financed through the Indian Renewable Energy Development Agency (IREDA). But there has been no activity in this regard. In response to an RTI filed by Centre for Science at Environment (CSE), IREDA revealed that not a single project has availed the additional interest rate rebate offered for wind repowering.

The panellists deliberated on the need for repowering as a means for optimized use of land and wind resources. Apart from energy gains, the low acoustic noise of modern turbines and better visual aspects are clearly plus points. However, 'safety' and 'performance' were agreed upon as the two determining criteria vis- -vis the fate of turbine repowering in India.

> Green-field projects and repowered projects differ significantly and cannot be clubbed together
>
> **Balawant Joshi**

Major issues and possible solutions

Major issues that are hindering the progress in this regard were highlighted as:

» **Commercial:** Tariff mechanism and cost of decommissioning
» **Technical:** Spacing, turbine models and evacuation infrastructure
» **Legal:** Fragmented land ownership, PPAs signed for longer periods

Based on an understanding of the issues, the reflection in the direction of possibilities underlines the need for efforts from all stakeholders and includes:

» Mandating the disconnection of turbines that have crossed their designed life
» Collaboration with turn-key suppliers, who can provide not only the technology but a complete package that can make repowering possible
» Making repowering attractive for developers by introducing incentives in terms of generation-based incentives or on the lines of US Production Tax Credit
» Customizing the lessons of success from other countries or other sectors for kickstarting the Indian wind repowering sector

> Land is a finite source, hence repowering is a must
>
> **D. V. Giri**

The way forward

There is a clear technical and resource utilization justification for repowering. Repowering has the potential to increase energy generation by more than six times by using modern wind turbines and throwing in solar power into the mix, thus making the best use of natural resources as well as the power evacuation system. To make optimum use of the best sites available for repowering, it is necessary to design new wind turbines. Given the current repowering market size of around 5 GW and the similar size of the market available on a rolling basis, it requires a long-term policy and roadmap for investment in and design of large-sized wind turbine models and infrastructure improvements. The government should undertake a massive augmentation of transmission facilities. This should encompass repowering projects to meet the target of 140 GW of wind capacity by 2030. It is important to acknowledge that repowering projects are very different from solar and green-field wind and require a fresh thought process immersed in a tailor-made philosophy and not in easily available templates.