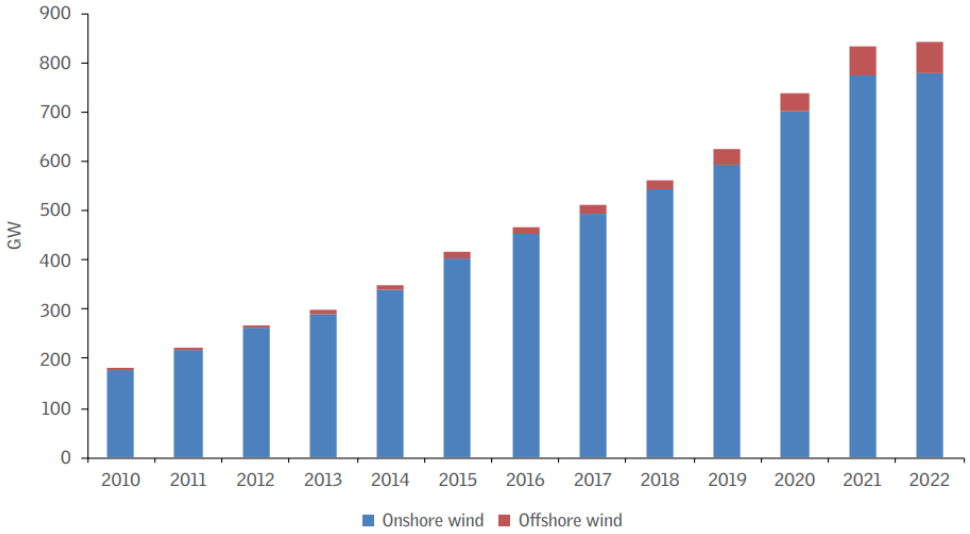
CSE

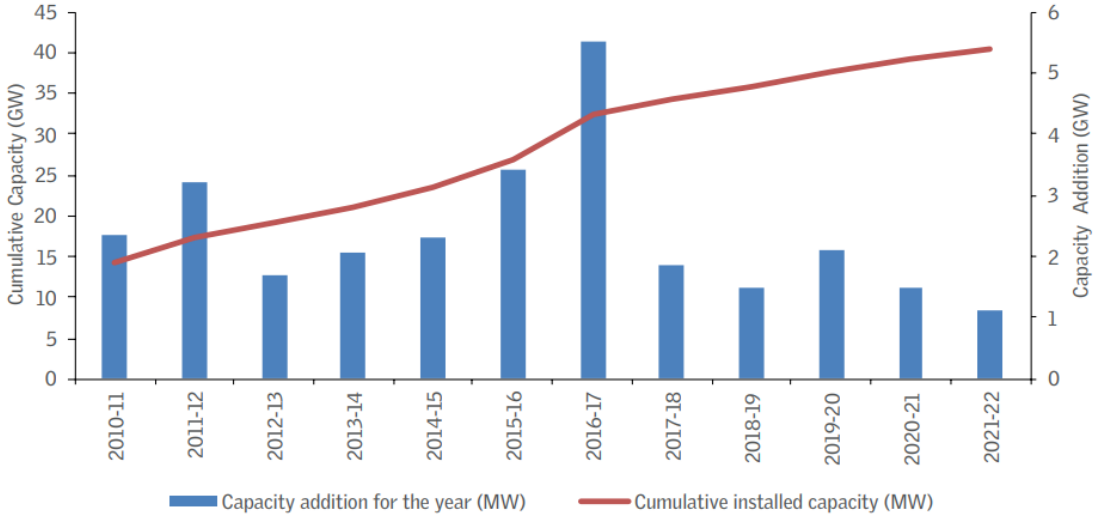
WEBINARS

REPOWERING WIND ENERGY IN TAMIL NADU

Date: FRIDAY, FEBRUARY 24, 2023 | Time: 3.00-4.00 PM (IST) | Platform: ZOOM

Wind power capacity addition in India vs. Global

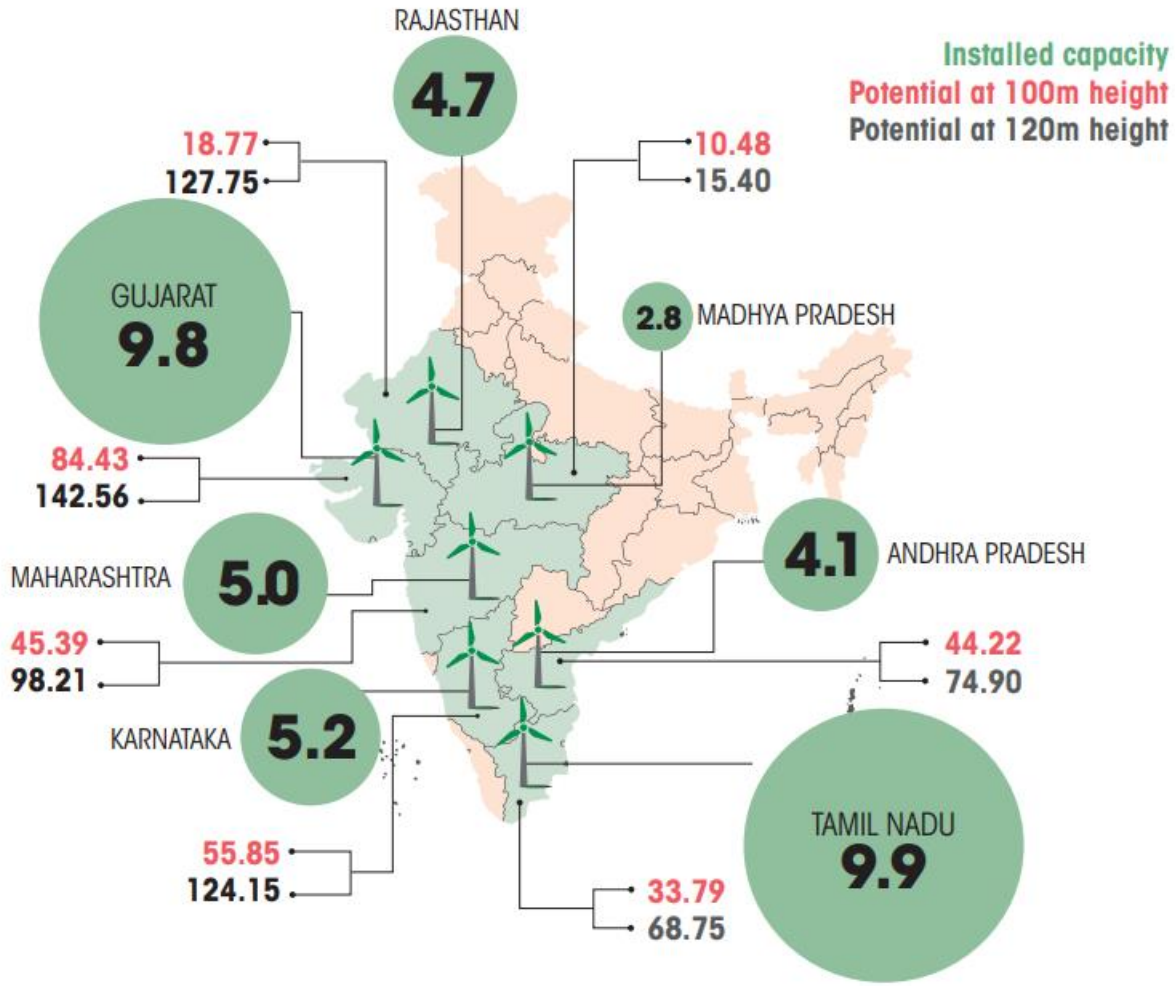




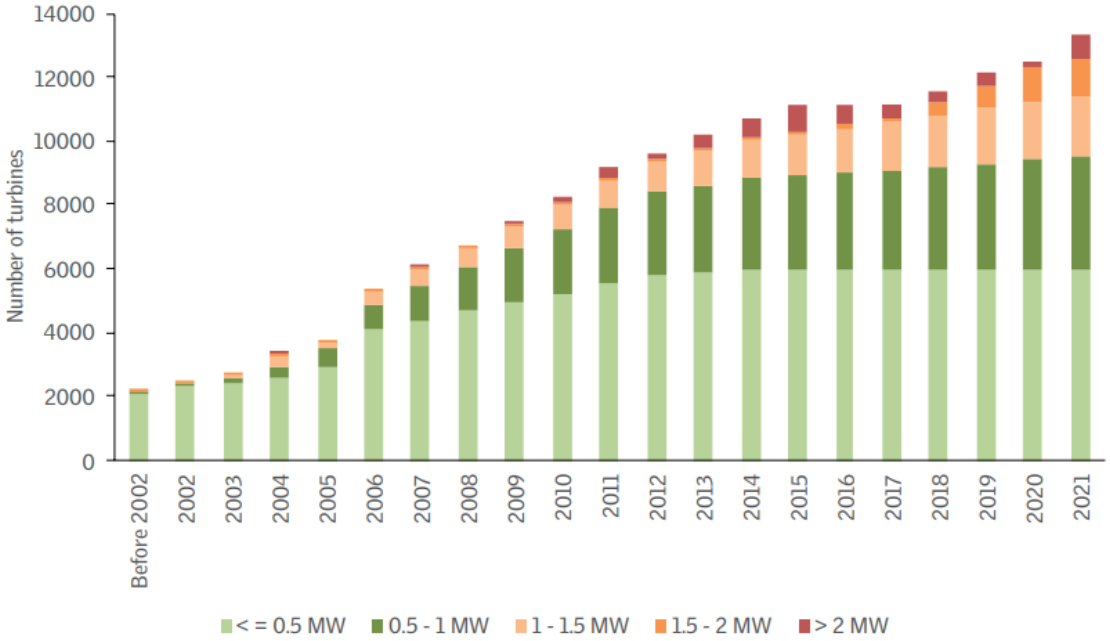
Wind Energy is being increasingly used to generate electricity and its application is likely to increase in the future.

India has added only a small wind power capacity—about 1.50 GW annually—over the past five years.

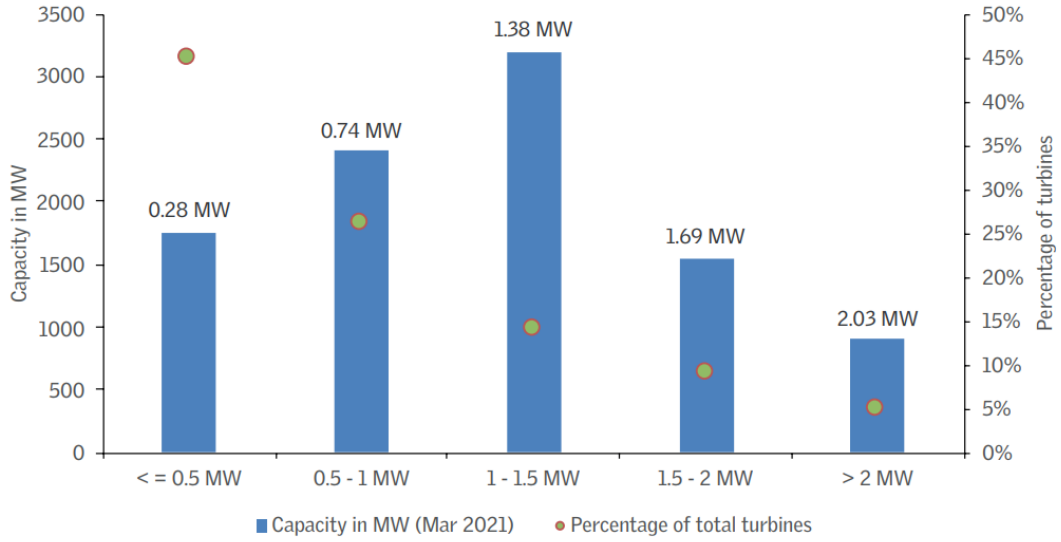
Installed capacity and wind potential in seven windy states



The need for repowering



Source: Indian Wind Power Directory, 2021



Note: Average capacity of each turbine range is mentioned above the bars

Source: CSE analysis

Approximately 3,000 turbines, each of less than 1 MW capacity, and with a cumulative installed capacity of 800 MW, have completed their design life.

Wind turbines in Tamil Nadu have an average capacity of 750 kW. As of March 2021, over 13,000 odd wind turbine generators (45 per cent) were of 500 kW or less in capacity, and another 26 per cent were between 500 kW–1 MW capacities. Together, these smaller turbines account for slightly over half of the total installed capacity.

Why is repowering not taking off?

01 Fragmented ownership structure of wind farms

02 Loss of captive status if captive generators opt for repowering

03 Evacuation infrastructure upgradation

04 Challenges in micro-siting

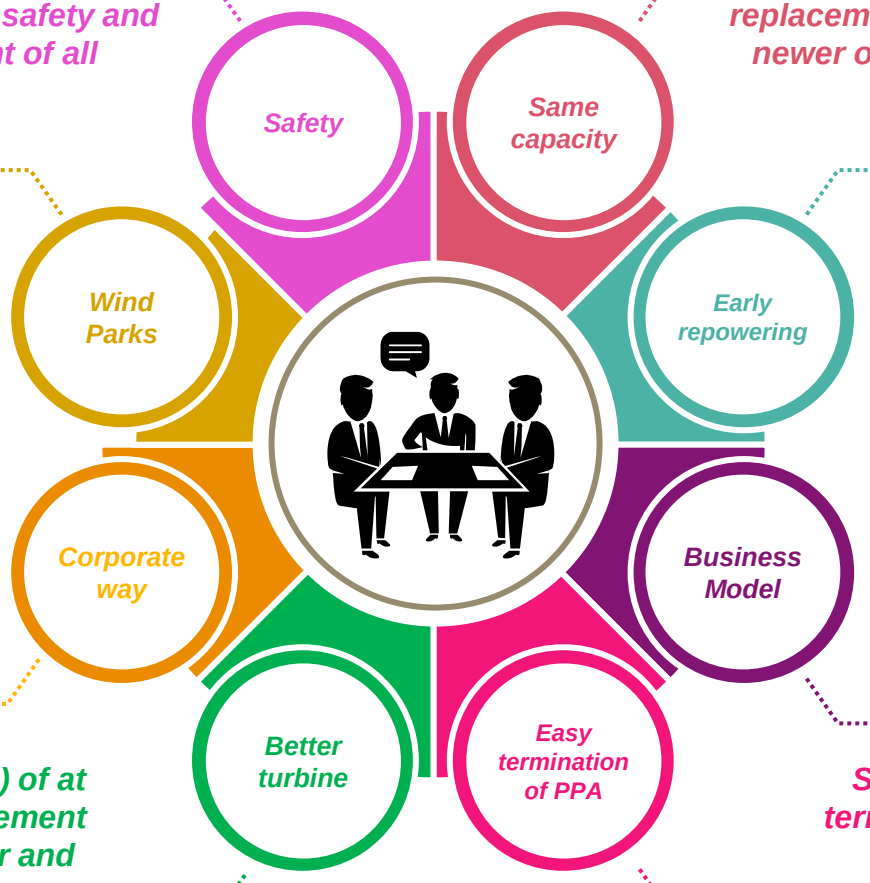
05 Valuation of existing assets

06 Lack of financial interest by owners

07 Loss of generation during construction

08 Transport challenges of longer blades and taller towers

Recommendations for repowering



mandatory to conduct a safety and performance assessment of all turbines

replacement of older turbines with newer ones of the same capacity

government can identify a few Wind Parks/Wind-Solar Hybrid Park for repowering and should develop/ enhance transmission infrastructure

In Maharashtra and Karnataka it is possible to take up repowering early in the life cycle of the projects without impacting the contracts and adding complexities

Creating a group of corporates can be a viable option. This will help to replace their older turbines with newer ones and establish confidence in the sector

can be initiated through an original equipment manufacturer (OEM) driven business model

Direct Drive Wind Turbine (Gearless) of at least 1 MW would be a better replacement since not only are their sizes smaller and weight lesser, but the efficiency is also higher

States must facilitate easy termination of PPAs without penalties

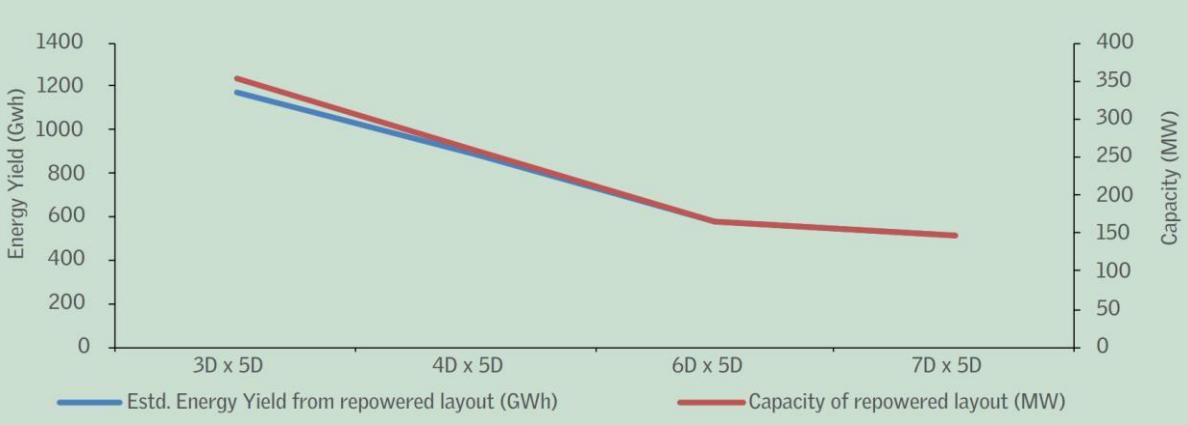
Case of Micro-siting at Vankusawade Wind Park

Site Existing Details				Repowering with 2.7MW (130 m) Turbine							Repowering with 3.6 MW (140 m) Turbines						
Layout	Capacity of <1 MW WTG's (MW)	Area of Site (Sq km)	Estd. Energy Yield from Existing site (GWh)	Capacity of re-powered layout (MW)	Re-powering ratio	Estd. Energy Yield from re-powered layout (GWh)	% CUF (on plant basis)	Average Wake loss (in %)	Land usage Ratio (MW/ Sqkm)	Energy Yield Ratio	Capa-city of re-powe-red layout (MW)	Re-powe-ring ratio	Estd. Energy Yield from re-powered layout (GWh)	% CUF (on plant basis)	Average Wake loss (in %)	Land usage Ratio (MW/ Sqkm)	Energy Yield Ratio
3D x 5D	243	26.27	261	353.7	1.46	1173	37.88	8.12	13.46	4.48	313.2	1.29	1110	40.47%	6.25	11.92	4.24
4D x 5D	243	26.27	261	259.2	1.07	884	38.94	5.58	9.87	3.38	244.8	1.01	883	41.19%	4.45	9.32	3.37
6D x 5D	243	26.27	261	164.7	0.68	575	39.89	3.02	6.27	2.20	180	0.74	660	41.90%	2.93	6.85	2.52
7D x 5D	243	26.27	261	145.8	0.60	514	40.32	2.45	5.55	1.97	162	0.67	594	41.91%	2.67	6.17	2.27

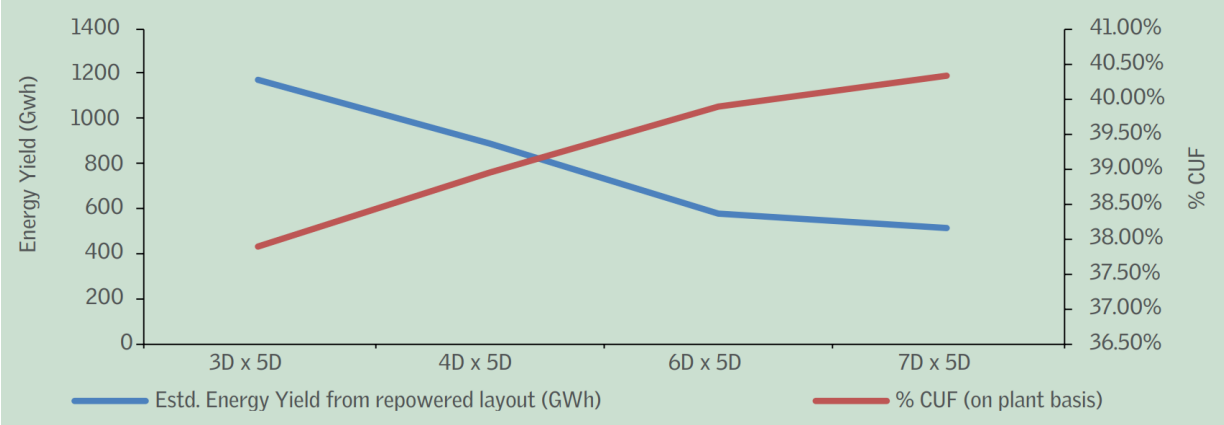
Capacity of repowered layout keeps on increasing compact arrangement
With less spacing in between, the CUF decreases
With sparsely placed turbines, there is a decrease in wake loss
A slight decrease in CUF of approximately 2 per cent at 3DX5D, the energy yield ratio increased by two times.

Source: Wind Repowering in India: Potential, Opportunities, and Challenges; USAID 2022

Case of Micro-siting at Vankusawade Wind Park



Energy yield and capacities with different layouts



Capacity utilization factor and energy yield with different layouts

Source: Wind Repowering in India: Potential, Opportunities, and Challenges; USAID 2022

Key challenges addressed by the repowering policy (2022) draft

- Well defined objective of repowering policy – maximum energy generation from given area (Max MWh/Sq.km)
- Overall project development framework – project based or site-based repowering
- Guidance on regulatory flexibility – PPA related provisions
- Guidance to states on their role in repowering – states to devise policies and decide incentive mechanism
- Business model /project development model – addresses challenges regarding fragmented land and asset ownership

Thank you

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Centre for Science and Environment