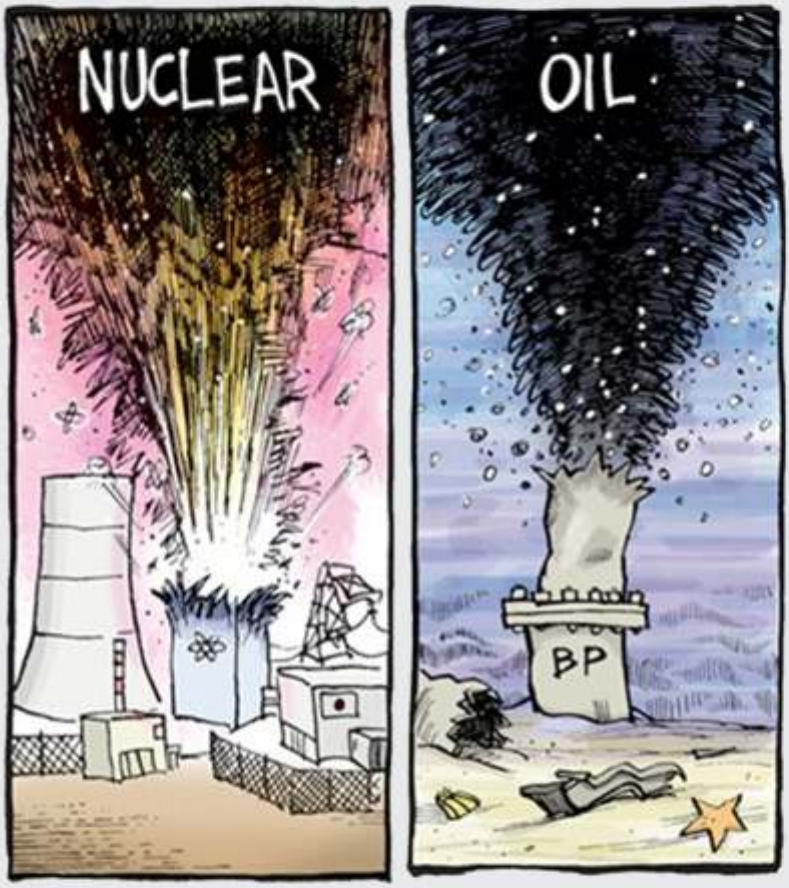
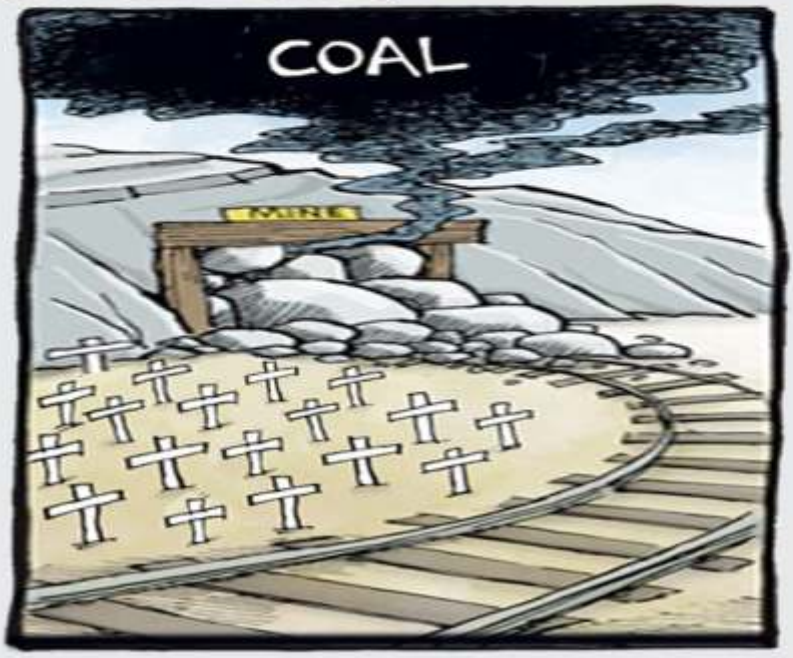
UNIFI Capital

WINDS OF CHANGE





The case of Singrauli

Singrauli, a hitherto non-descript stretch in Madhya Pradesh, is often referred to as the energy capital of India. Once covered with unnavigable forests, the region today is dotted with coal mines and coal fired thermal power plants which together contribute to 10% of India's installed power capacity. The mines in the region produce about 83mn tons of coal per annum, leading the region to be more popularly known as *Urjanchal* (land of energy). Urjanchal is also privy to aluminium smelting plants, chemical industries, cement plants, stone crushers and several other industries.

Singrauli's curse | It is no surprise that Urjanchal is also categorized as one of India's critically polluted areas. Ash ponds, mining over burdens and discharge points from thermal power plants are a common site here. Various studies conducted by Government and independent agencies have found levels of fluoride, mercury & lead at levels that are drastically higher than permissible limits. Let's look at Mercury levels for instance; the average concentration of mercury in human blood for residents in this area was noted at 34.30 parts per billion (ppb), far exceeding the 5.8 ppb safe standard set by the United States Environment Protection Agency. More than 84 per cent of the blood samples were found to contain mercury above the safe level.

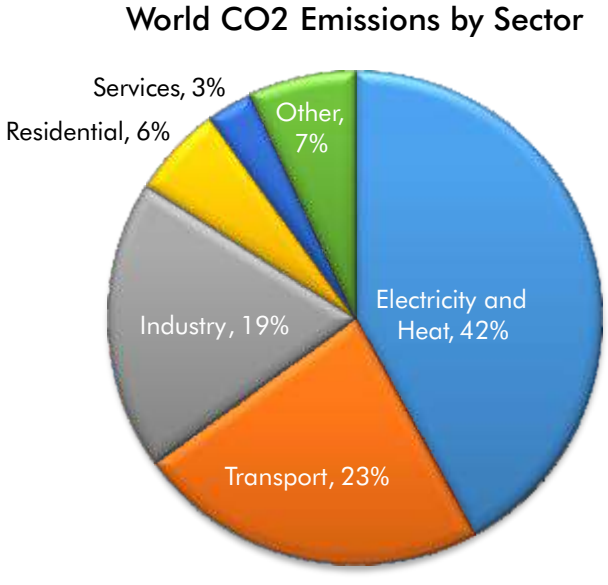
The continuing level of environmental degradation was so alarming that in 2009 the Environment Ministry imposed a moratorium on clearances in the district's coalfields. The moratorium was lifted in 2011 after Uttar Pradesh and Madhya Pradesh developed action plans for improving environmental quality, but Singrauli's Comprehensive Environmental Pollution Index continued to remain critically high.

Urjanchal wasn't always a carbon black hole. In the early 80's, it was a region dotted with dense forests & rich bio-diversity. And then, development, as we know it, took over. The contest to change the use of the region's forest land began way back with the operation of the first set of coal mining projects. The existing operations of Northern Coalfields Ltd, a subsidiary of Coal India in the Singrauli region has already converted several forest areas into overburden hills towering over the resettled village in the area. Environmental degradation apart, the cost of social displacement has been irreparable with thousands having to give up their land, for what is beneath.

Singrauli is not a stand-alone story. It is a reflection of what any coal fired plant does to an environment and society albeit of different scales. It is the cost of development as we know it today, backed by our ravenous thirst for power. And power, we cannot do without. Should the trade-off be this environmentally or socially catastrophic?

Wind Energy, a panacea

Carbon Dioxide emissions in the atmosphere have been increasing significantly over the past century and use of electricity and Heat represents by far the largest source of this.



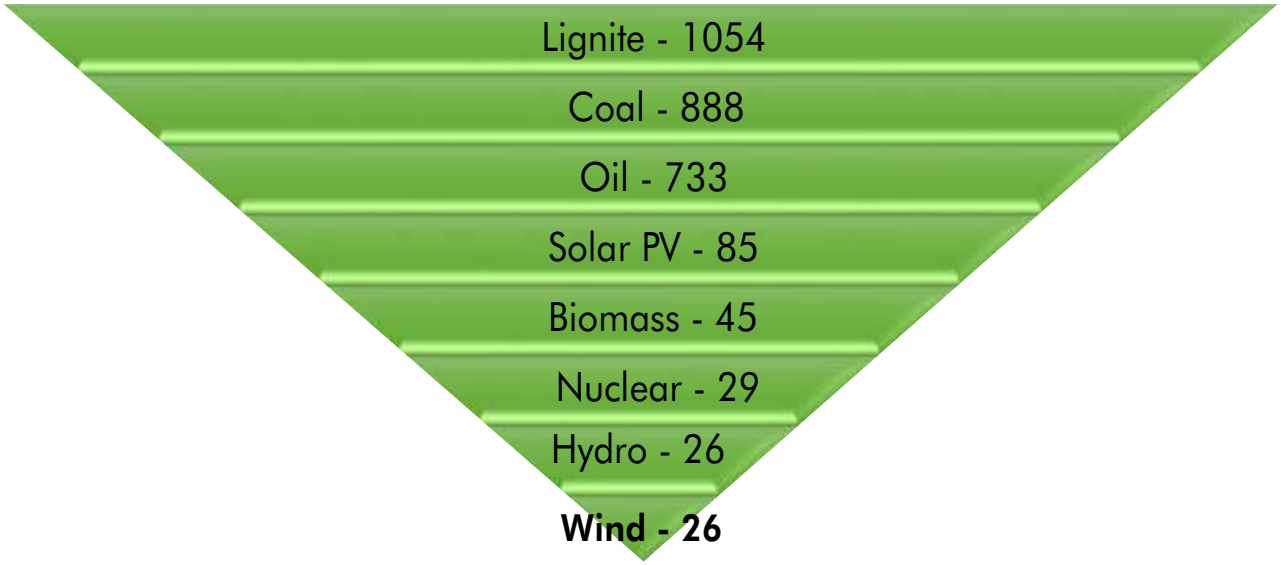
Source: International Energy Agency

Thankfully, there is enough kinetic energy in our midst, which can be profitably tapped into, without resorting to any of the above emissions or discharges. Wind energy as a concept has been around for years now. However, what was a concept and not a self-sustaining economic proposition at the beginning for a life cycle, has now matured into a self-sustaining technology that not only holds its ground against thermal power, but has now triumphed the latter economically as well.

As per a report from World nuclear association, it is estimated that mean life cycle GHG emissions (construction, operation and decommission) using wind power is lesser by 41x than using a lignite based energy generation.

The reasons are not difficult to understand; it completely eradicates the need to combust a fossil fuel, the only input required to churn a wind turbine is completely drawn and determined from the immediate environment, the process has been mechanically perfected over the years and importantly, is now commercially viable without drawing from government or fiscal subsidies.

Technology and Respective Mean Tonnes of CO2 Produced in their life Cycle (in CO2/GWH)

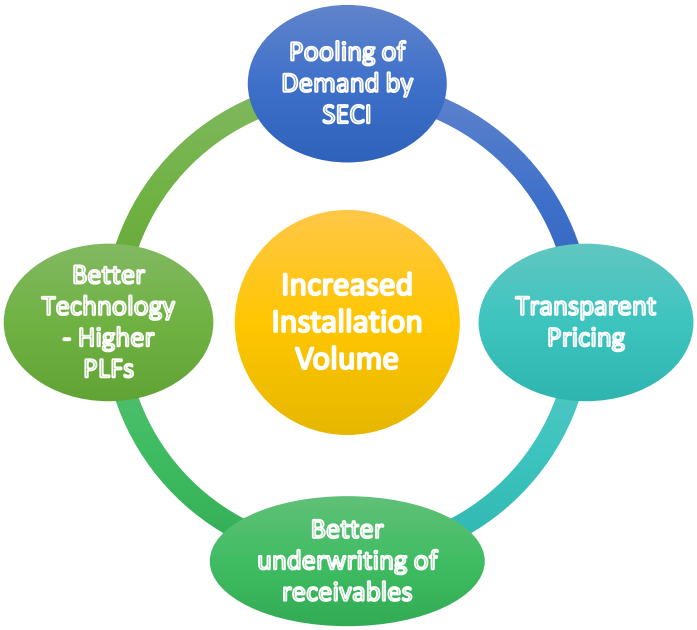


Source: World Nuclear Association

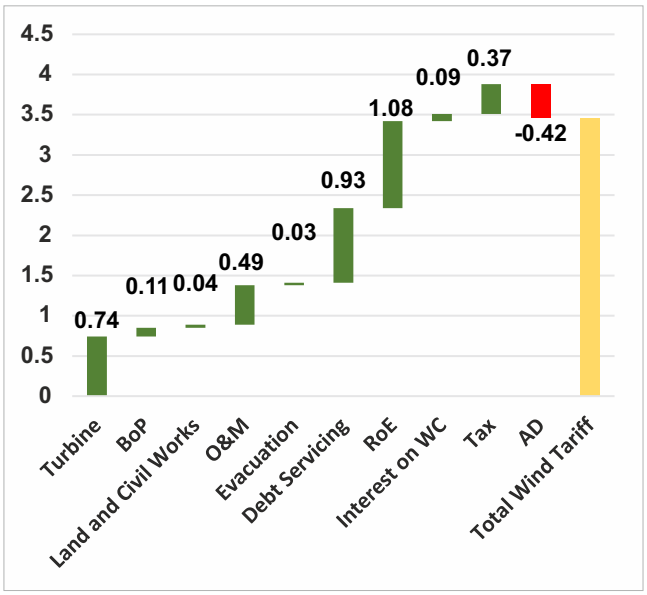
Increasing Contribution of Wind Energy to India's overall energy requirement

India woke up to the importance of Wind Energy in a small way in the mid 1990's. State Governments, led by renewable purchase obligations did their bit to set up wind capacities. However, the economics of the industry was anything but economical. Developers were given tariffs that were large multiples of thermal power costs, in addition to heavily incentivized tax sops in their bid to promote wind farms. While corporates took advantage of the tax breaks and IRR's looked good on paper, it did little to address India's need for a non-polluting source of power. Besides, wind tariffs' were a long multiple of thermal tariffs and State DISCOMs' were financially burdened to pay for good karma that they could ill afford. A safe and non-pollution source of power wasn't moving the needle, and the reasons weren't hard to note – wind needed to be profitable and make economic sense on a standalone basis. Thankfully, this development came by in the last financial year, due to a number of reasons.

Key Contributors of Wind Energy Demand Going Forward



Breakup of Components of Current Wind Tariff – Rs. 3.46/unit



Pooling of demand | A scale not witnessed in India before

Large scale utility wind farms in India never took off in a scale due to a variety of reasons. The emergence of small farms (a) neither moved the needle of India's energy mix, nor (b) gave manufacturers the scale to bring economies of scale to the industry.

Step in SECI | Solar Energy Corporation of India (SECI), the nodal agency of solar power auctions in India, entered the wind sector in February 2017 with auctioning 1050MW of wind power. Entry of SECI into wind has resulted in significant changes in the size of the market and its consequent pricing.

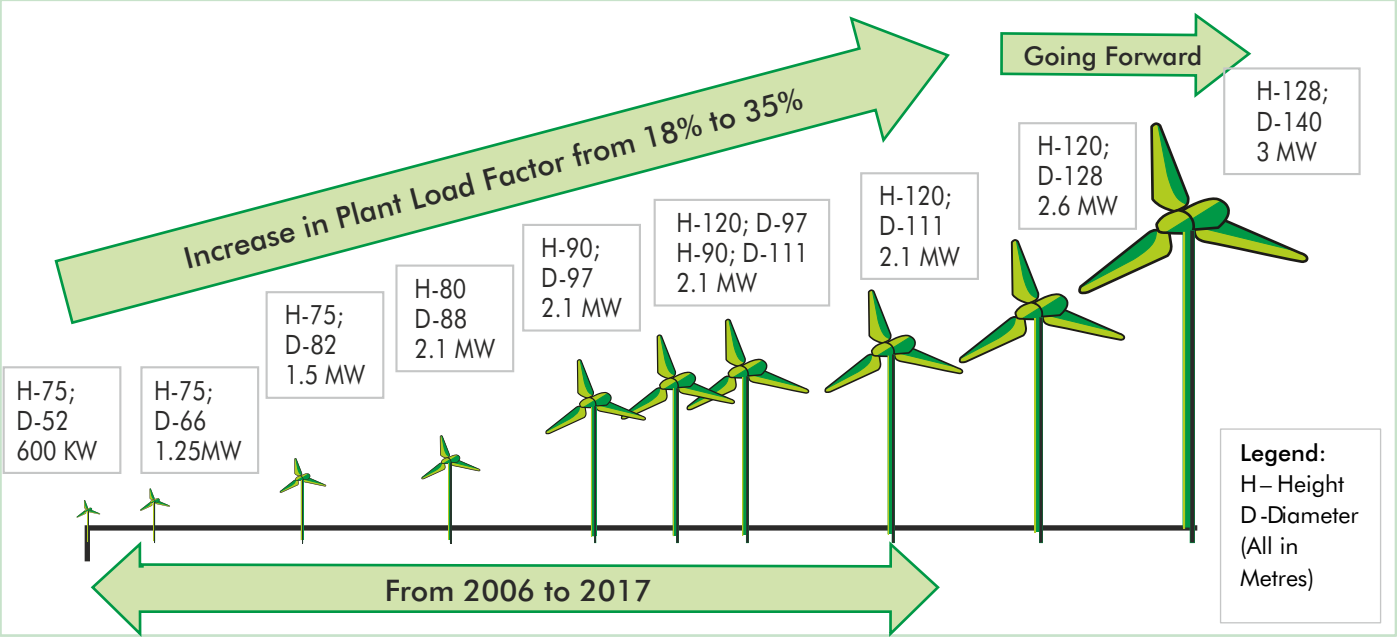
Market Size: Indian demand for wind power used to be predominantly distributed among the 7 windy states (AP, Karnataka, Tamil Nadu, Maharashtra, Gujarat, MP and Rajasthan). But now, SECI, with the help of Power Trading Corporation, has enabled in generating distributed demand of power, not limited to the consumption by any particular State, there by significantly changing the dynamics of power demand. This has directly increased the demand for wind power by 30-50%; from 4000MW to 6000MW.

Pricing: Wind power across the States used to be determined under the Feed-in-Tariff (FiT) regime, wherein pricing was determined on the back of certain commercial assumptions. The lack of market based pricing was not the best of economic practices, besides being un-timely and ad-hoc. However, under the new regime, SECI has introduced reverse auctions, pushing the onus of tariff determination to the wind farm developers, in conjunction with turbine manufacturers. Further, SECI has underwritten the delivery of power as well as payables in a manner that vastly reduces the working capital requirements of the developer. As a result of economies of scale, better payment cycles and market competition, turbine manufacturers have pushed the cost of wind tariff down, there by completely changing the dynamics of the wind industry in India. For Example: Gujarat used to have a FiT based tariff of Rs. 4.3/unit which saw an overnight reduction of 20% to Rs. 3.46/unit.

This is a landmark development in the history of the Indian power sector, as for the first time, wind energy has become formally cheaper than thermal power. As a result, there is little doubt that over the next few years, the incremental demand for wind power in India would be absolute and cascading.

Improving Efficiencies - Wind is Getting Stronger

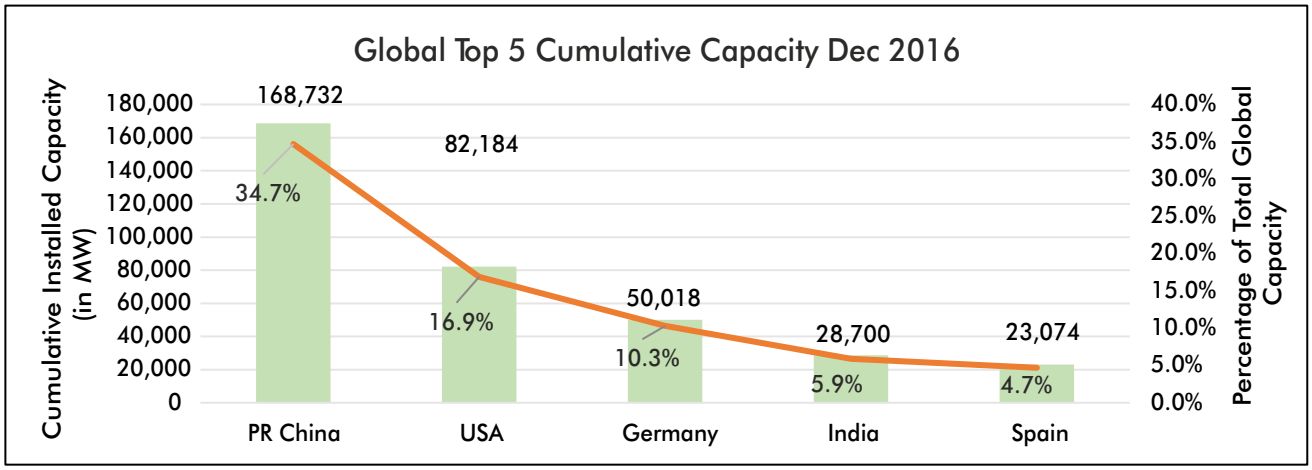
Policy initiative apart, a key mover of lowering the cost of wind power generation has been the increasing efficiencies of wind turbines. This has been achieved by increasing the vertical reach of wind towers combined with greater turbine diameters. The increase in efficiency, through shifting to bigger turbines, higher towers and longer blades, help the turbines capture a great quantum of wind mass in an absolute sense. The average size of wind turbines has increased from 600kW in 2006 to 2.1 MW in 2017 (up 3.5x), while rotor blade diameters have increased from 52 metres to 100-110 metres in the same period (up 2x). This has resulted in PLF's increasing from 18% to 35% currently, thereby improving the throughput of power by almost 2x. As per a NIWE study, the potential of wind turbines in India increases 3x at a height >100m (302GW at 100m height; 102GW at 80m).



Capacity additions to improve

The Indian wind industry is nearly thirty years old, and now holds the 4th position in the world with installations of over 31 GW (31,000mw) with almost 90% of the investment coming from the private sector. Unlike the solar energy industry, which is heavily dependent on import of silica panels, the Indian wind manufacturing sector has state-of the-art domestic manufacturing capability and a strong supply chain with 75 percent localization. Globally, wind turbines are the only area where India is deemed to be a player of quality, championing the government's Make in India campaign. India's manufacturing capacity of about 10 GW can be ramped up to 15 GW without significant investments. The industry employs about 48,000 people and is expected to create as many as 1,80,000 jobs by 2022.

India has committed installation of 60 GW of wind power by year 2022 from the current installed base of 35GW. Given the absolute economic sense that it makes, India's international commitment to reducing carbon emissions, and the Government's focus on fiscal prudence, we believe this is an achievable task.



As per the Central Electricity Authority (CEA) draft plan, the share of coal based power plants (in terms of installed power capacity) will decrease to 38% by 2027 from the current levels of 57%. While the wind will move up from 9% now to 16% in the same period.

India - Installed Capacity (MW)	FY 2017	FY 2022E	FY 2027E
Wind	30,967	60,001	1,00,001
Total	3,35,568	4,73,364	6,34,249
Wind as % of installed capacity	9%	13%	16%

The National Institute for Wind Energy estimate for India's wind power potential is 302 GW at 100 meters. The major wind power states are Tamil Nadu, Gujarat, Karnataka, Maharashtra and Rajasthan. Given our current base of just 32 GW, and the fall in tariffs, there is a long way to in terms of new installations.

Wind power potential in India at 100m AGL (MW)				
State	Rank I: Waste Land	Rank II: Cultivable land	Rank III: Forest land	Total
Gujarat	52,288	32,038	106	84,431
Karnataka	15,202	39,803	852	55,857
Maharashtra	31,155	13,747	492	45,394
Andhra Pradesh	22,525	20,538	1,165	44,229
Tamil Nadu	11,251	22,153	395	33,800
Rajasthan	15,415	3,343	12	18,770
Madhya Pradesh	2,216	8,259	9	10,484
Telangana	887	3,348	9	4,244
Odisha	1,666	1,267	160	3,093
Kerala	333	1,103	264	1,700
Puducherry	69	79	4	153
Chhattisgarh	3	57	16	77
Andaman & Nicobar	4	3	1	8
Lakshadeep	3	3	1	8
West Bengal	0.03	2.04	0	2
Goa	0	0	1	1
Total Potential(in MW)	1,53,017	1,45,743	3,487	3,02,251

Source: National Institute of Wind Energy (Ministry of New and Renewable Energy)

Improving policy environment

To address grid integration challenges, the government has initiated the Green Corridor programme. The objective is to improve linkage between India's regional grids with its national grid to facilitate interstate transmission. 2016 saw a number of new policies for promoting wind power including the draft wind-solar hybrid policy, guidelines for Development of Onshore Wind Projects, guidelines for prototype wind turbines, and the proposal for evaluation of small wind energy and hybrid projects. While so long, India has explored the wind generation through onshore projects, it has started taking baby steps in exploring its vast 7,600 km coast line for offshore projects. FOWIND (Facilitating Offshore Wind in India) is undertaking the first offshore wind resource measurement in the Gulf of Khambhat, off the coast of Gujarat. Another offshore platform is in the works for the coast along Tamil Nadu. The Offshore Wind Policy outlines an international competitive bidding mechanism for the sector. The first tender is likely to be announced in 2019. Another opportunity lies in harnessing solar energy along with wind – hybrid energy. This would effectively utilise transmission infrastructure and land and reduce the variability in renewable power generation thus achieving better grid stability.

Unifi's Strategy in Green Fund

A holistic approach to address the problem of environmental pollution and global warming will have significant implications for quite a few listed stocks. Non-conventional sources of energies like Wind are expected to be a significant beneficiary of changing industry dynamics. Though the industry is passing through a transition from FIT to auction based regime, we expect the factors like pooling of demand from SECI, transparent pricing mechanism, higher PLF technology and hence strong underwriting of credit will assist the sector in coming years. A combination of these factors will give fillip to increased wind installation in India and we expect wind turbine manufacturers benefit from this phase of consolidation in the industry.

Unifi Green Fund has an investment in India's largest turbine manufacturer, Suzlon. An investment in a single share of Suzlon, results in total CO2 emission savings of 6 Kg per annum. For instance, a Rs.10 Lakh investment in Suzlon will equal to CO2 emission savings of 319 tons per annum. This is equivalent to saving CO2 emissions per annum from 58 diesel buses or 4371 cars. Detailed calculations are shown in the following annexure.

Unifi's Green Fund has a close eye on developments in the sector that is resulting in opportunities across the value chain.

Annexure:

The below table computes amount of CO2 emission saved per annum by each share held in Suzlon-

Company : Suzlon	Calculation	Comments
Emission from Wind Energy		
Installed Wind Capacity (in MW)	15,500	*Cumulative installed wind capacity by Suzlon is 15,500 MW*
Amount of Coal used for Steel and Concrete used in manufacturing 1 MW of Wind Turbine (A) - (in Tonne)	291	
Carbon Dioxide Emitted from manufacturing 1 MW Wind turbine (in kgs) (B)	8,32,260	*1 Ton of Coal Emits 2.86 Tonne of CO2*
Total CO2 emission from Suzlon's Installed Capacity (in mn kgs) C = (A*B)	12,900	
CO2 Emission per Year from installed capacity (D) = C/20 (in Mn Kgs)	**645**	*Assuming Life of a wind turbine is 20 years; the total emission (C) is divided by 20 to calculateemission per year.*
Emission from Coal based thermal Power Plant		
No. of Mn units generated from Suzlon's Installed Capacity (E)	32,587	
CO2 emitted (in Kgs) per KWh from coal based thermal power plant (F)	0.97	Co2 emission per Kwh = 0.97 kgs
Total CO2 emission from coal based thermal power plant (in mn kgs) G = (E * F)	31,610	
Net Co2 emission saved (mn kgs) (G minus D)	30,965	
No. of shares (in Million)	5,128	
CO2 emission saved (kg/share)	6	

Note: The calculation for CO2 emission savings from using Wind Energy has been verified by Mr. D.V. Giri, Secretary General, Indian Wind Turbine Manufacturers Association. Unifi Capital have used it for calculating CO2 savings per annum from investing in shares of Suzlon.

Assumptions

1. That entire wind energy substitutes coal based thermal energy. However it can be used as a substitution for other sources of energy as well.
2. Plant Load Factor (PLF) for wind turbine assumed is 24%. However this would vary based on geography and turbine model.
3. Amount of raw material used in manufacturing is dependent on specific turbine model.