

Key determinants of wind energy growth in India: Analysis of policy and non-policy factors

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ABSTRACT

Wind energy has been considered as an important resource to meet the energy needs of India in a sustainable manner, with over 30 GW installed capacity as on December 2017. However, the wind sector has witnessed a temporal and spatial asymmetrical growth in India over the last decade, attributed to policy inconsistency. We analyzed wind growth in six resource rich states of India from 2003 to 2016, using panel data regression, considering 16 exploratory variables categorized under policy, geographic, economic, social, technical and commercial heads. Contrary to expectation, both policy variables FIT and RPO came out as insignificant factors. The existing wind capacity and its share in the total generation capacity came out as significant drivers. Commercial factors like industrial tariff and utility's performance got reflected as other determinants. Stark variations were observed in state-wise analysis, with wind growth in some states responding to infrastructure factors like road network. Scaling up wind deployment in resource rich Indian states would require policy instruments contextualized to their economic profile, energy resources and power market.

1. Introduction

Climate change due to global warming has been identified as one of the biggest threat ever faced by the humankind. This has largely been attributed to emission of greenhouse gases, GHG, on account of use of fossil-based energy sources like coal and other petroleum products (IEA, 2016). India, the second most populous country globally, is working assiduously towards meeting the energy needs of its growing economy in a sustainable manner. Counted among top five GHG emitters globally (WRI, 2016; GHG Inventory, Government of India, 2010), the Indian government is accelerating the pace of adding renewable energy in its coal dominated power generation sector. It has committed to meet forty percent of the power requirements from non-fossil sources by the year 2030 as part of its nationally determined commitments submitted to the United Nations Framework Convention on Climate Change, UNFCCC.²

Electricity, being a concurrent subject under the Indian Constitution (similar to the United States), national level policies are used in conjunction with state specific regulations to promote renewable technologies including wind energy. The federal policy instruments include fiscal benefits in form of accelerated depreciation and tax concessions. With respect to the state policies, the local government indicates medium to long-term capacity addition targets based on resource assessment and market demand, while the respective state electricity regulatory commission, SERC, determines the feed-in-tariff and sets

purchase obligations for the utilities (Thapar et al., 2016).

The total installed power capacity in India at the March 2018 of year 2017 was over 340 gigawatts, GW, with ten per cent contributed by the wind sector at 34 GW (MNRE, April 2018). Six of the Indian states, located along the southern-western coastal belt, endowed with good wind potential, make up for over ninety percent of this capacity; refer Table 1 and Fig. 6. Fig. 1

The impact of policies on wind sector can be clearly realized in terms of varying quantum of annual increments, as depicted in Graph 1. A sudden boom was witnessed in 2009 due to introduction of generation-based incentives (GBI), while a steep reduction in 2012 was attributed to withdrawal of depreciation and GBI benefits. However, it can be observed that even with a similar kind of policy support instruments both at the national as well as state levels, there has been a significant variation in the level of annual wind capacity addition across these states, as illustrated in Graphs 2, 3 and 4. This may be attributed to state-specific factors like level of FIT, RPO mandates, state energy demand, economic growth, differential between wind FIT and consumer tariffs, grid penetration of wind power, wind resource endowment, technological improvements in turbines and infrastructure variables like land availability and road network.

This research paper identifies key policy and non-policy determinants impacting wind development in Indian states using panel data regression for the period 2003–2016. Statistical analysis has been

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² India's INDC, Paris CoP, UNFCCC, 2015.

Table 1
State wise installed wind capacity^a.

State	Capacity (in MW)
Tamil Nadu	7861
Maharashtra	4771
Gujarat	5341
Rajasthan	4282
Karnataka	3751
Madhya Pradesh	2498

^a As on March 2018, data from MNRE.

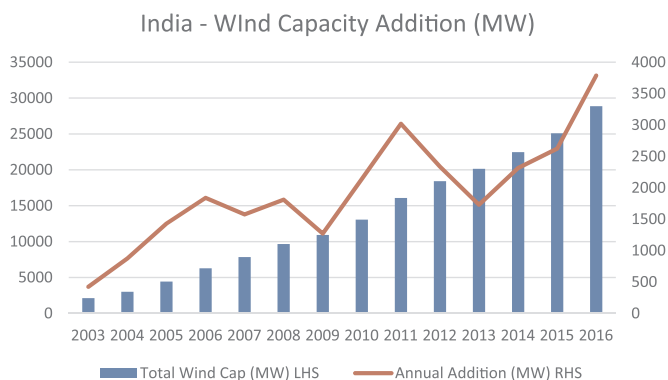
conducted on sixteen exploratory variables grouped into policy, geographic, economic, social, energy, commercial and technical categories. Scaling up wind capacity to meet country's climate pledges would require a different set of policy instruments taking into consideration the aforementioned state-level micro factors.

2. Indian power sector

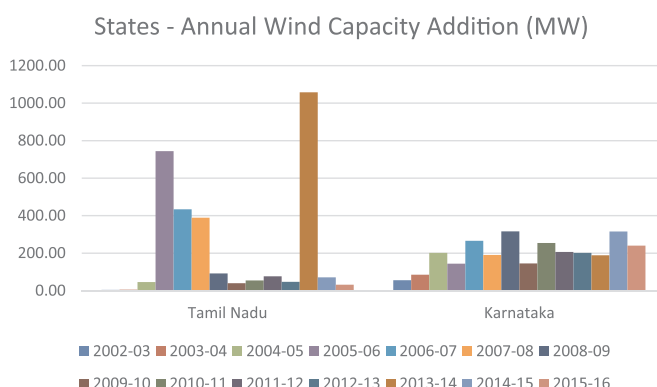
2.1. Overview

Electricity is a concurrent subject under the Indian constitution, with both the federal government and the state governments eligible to frame legislations. The Electricity Act-2003 unbundled the monolith electricity boards, delicensed the generation and distribution sectors, facilitating open access of power through power markets and energy exchanges. This reduced the entry barriers, leading to entry of private companies across the value chain of Indian power sector as can be seen from their increasing share in the total power installed capacity.

The Electricity Act brought about fundamental changes in the institutional and market structure of the Indian Power Sector. It mandated the formulation of a National Electricity Policy for long term planning of the sector as well as the National Tariff Policy, which shall enable determination of tariff through a transparent regulatory process. The government of India notified the National Electricity Policy in the year 2005 and the National Tariff Policy in the year 2006. The



Graph 1. Growth of Wind Installations in India. Graph developed using MNRE data.



Graph 2. Annual wind capacity trends- Tamil Nadu & Karnataka.

Regulatory Commission Act 1998 enabled creation of statutory agencies to regulate the power sector (ERC Act, 1998).

The Indian power sector is the third largest in the world, with the total installed capacity at 340 GW as on March 2018. Thermal based

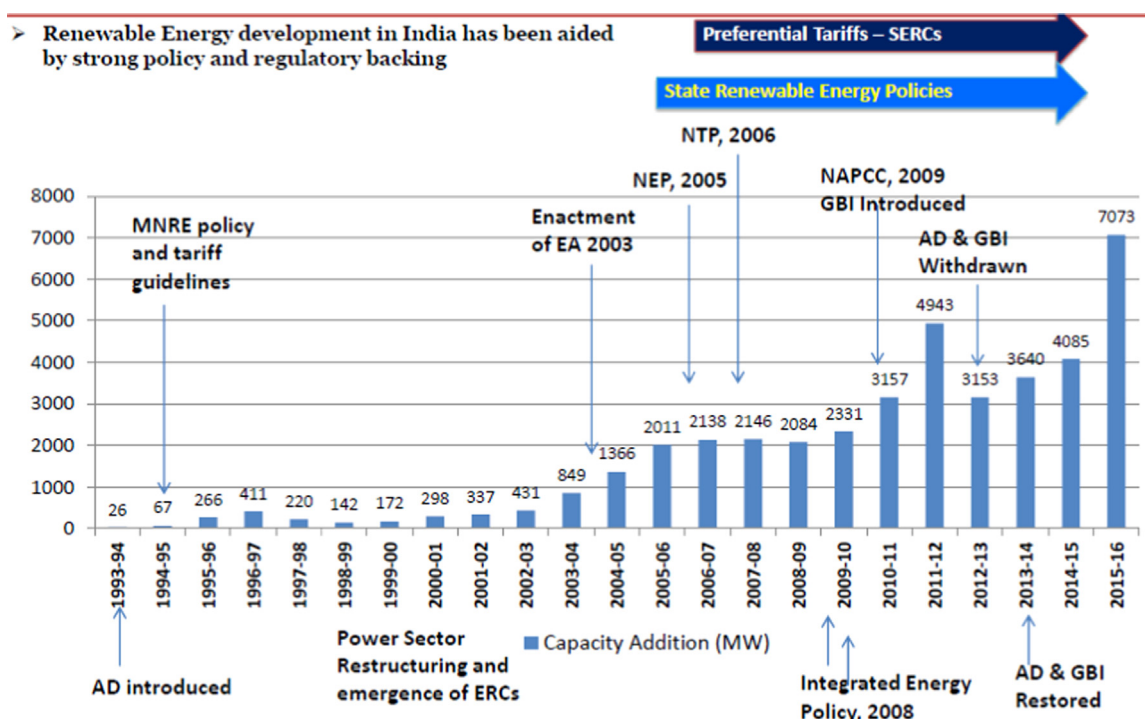


Fig. 1. Renewable energy growth in India. RE Invest Conference 2015, Ministry of New and Renewable Energy, Government of India.

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