Energy Policy 123 (2018) 325–336

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

India's sustainable development goals – Glide path for India's power sector

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ARTICLE INFO

Keywords:
Energy and environment
Renewable energy
Electricity policy
Power sector reforms
Low-carbon economy

ABSTRACT

India has adopted the 2030 Agenda during the United Nations Summit held in September 2015. Energy is intimately connected with 74% of the 169 targets related to the 17 Sustainable Development Goals (SDGs) to be achieved by 2030. Subsequently, India has also submitted its Nationally Determined Contributions (NDCs) for the period 2021–2030 to the United Nations Framework Convention on Climate Change (UNFCCC). While the Government of India (GOI) has ambitious plans for enhancing the installed capacity of RE sources, 75% of its electricity is currently generated by coal-fired power plants. As India's electricity requirements grow to meet the aspirations of 1.3 Bi people, it needs a policy framework that integrates all low-carbon energy technologies with coal in such a manner that the reliability, security, and affordability of electric supply are balanced with sustainable development. India also needs to develop innovative strategies to clean up the country's coal sector while enhancing the integration of renewable energy into the National Power Grid. In this context, certain recommendations are proposed in this article for timely implementation by GOI to facilitate the achievement of India's targets with respect to SDG 7 and the NDCs in an efficient and effective manner.

1. Introduction

The global consciousness for the protection of environment in the early seventies prompted Government of India (GOI) to amend the Constitution of India in 1976, to mandate that protection and improvement of natural environment is the Duty of the State (Article 48 A - Directive Principles of State Policy) and the Fundamental Duty (Article 51 A (g)) of every citizen (MLJ, 2016a). In 1991, the Hon Supreme Court of India even made the environment a part of the Fundamental Rights of every Citizen by declaring that, "*Right to live is a fundamental right under Art. 21 of the Constitution and includes the right of enjoyment of pollution free water and air for full enjoyment of life* (Subhash Kumar versus State of India and Others, 1991).

The 2030 Agenda for Sustainable Development (2030 Agenda) finalized by the United Nations includes 17 Sustainable Development Goals (SDGs) and 169 associated targets to measure the progress towards achievement of the 2030 Agenda. The SDGs are integrated and indivisible and balance the economic, social, and environmental dimensions of sustainable development (United Nations, 2015). India has adopted the 2030 Agenda during the United Nations Summit held in September 2015 (United Nations, 2017). Unlike the Millennium Development Goals, which preceded the SDGs, provision of energy services has found an important place amongst the SDGs (United Nations, 2015). Specifically, SDG 7 is to: '*Ensure access to affordable, reliable, sustainable, and modern energy for all.*'

The World Bank has documented the inter-connections between energy and 125 out of the 169 targets (74%) related to the 17 SDGs. Therefore, '*planning for universal access to modern energy services should be an integral part of national planning efforts to achieve the SDGs*' (World Bank, 2017). Subsequent to the adoption of the 2030 Agenda, India ratified the Paris Agreement on 2 October 2016 and has submitted inter alia the following NDCs to the UNFCCC for the period 2021–2030 (MOEFandCC, 2017a; UNFCCC, 2015).

- Reduce Green House Gas (GHG) emissions intensity of India's Gross Domestic Product (GDP) by 33–35% by 2030 from the 2005 level;
- Enhance generation capacity of non-fossil fuel based sources to 40% of all sources by 2030 with the help of transfer of technology and low-cost international finance including from Green Climate Fund;
- Create an additional carbon sink of 2.5–3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030.

Affordable, reliable and modern energy services are crucial to achieving all of the SDGs. Therefore, SDG 7 is central to every major challenge that India has to overcome today and in the near future. In this context, the key purpose of this article is to examine India's strategy and ongoing action plans to achieve SDG 7 as well as the NDCs by 2030, assess any gaps in the path towards achievement of these National goals, and suggest measures to bridge these gaps. Specifically, there is a need to develop an orderly transition to a low-carbon economy, so that

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https://doi.org/10.1016/j.enpol.2018.08.050
Received 3 May 2018; Received in revised form 18 August 2018; Accepted 21 August 2018

India can achieve its SDGs and NDCs in an efficient, effective and sustainable manner.

This article has six more sections. Section 2 gives a brief overview of India's electricity (power) sector. Section 3 summarizes India's key actions to address climate change. Section 4 discusses the key challenges to be overcome for India to achieve its NDCs and the SDG targets related to energy. Since India's power sector is highly dependent on coal, Section 5 indicates the key clean coal technologies adopted by India to enhance environmental compliance of its Coal-fired Power Plants (CPPs). Section 6 indicates the key policies to be implemented by India to enhance its carbon sink. Section 7 concludes with overall policy recommendations.

2. India's electricity sector

India is the third largest electricity generator in the World behind China and USA, but its per capita electricity consumption of 1117 kWh in 2017 was less than one-fourth that of China, and one-third of the World average (BP, 2018a; World Bank, 2018). During the Financial Year 2017–18 (FY 18), coal, gas, hydro, nuclear, and Renewable Energy (RE) sources (including, wind, solar, bio-energy, small hydro) contributed: 75%, 4%, 10%, 3%, and 8%, respectively of the 1309 TWh of total electricity generated by utilities in India (CEA, 2018a). Non-utilities (captive power plants that produce electricity largely for consumption in their own industrial plant(s) and release the surplus to the grid) generated 19.7 TWh in FY 17 on top of the 1242 TWh generated by utilities in that year (MOSPI, 2018). During FY 18, the share of CPPs in the total electricity generated in India varied between 70% (during the monsoon months of July and August 2017 when large hydropower plants contributed 14.7% of the total electricity generated) and 80% (during the post-monsoon months of January and February 2018) with an annual average of just over 75% (see Fig. 1).

The installed capacity of electricity generation in India increased by 99.2 GW between April 2012 and March 2017 against a targeted expansion of 88.5 GW (CEA, 2018a). As a result, the All-India average energy deficit (gap between 'energy requirement' and 'energy supplied') was only 0.7% during FY 18, while the power deficit (gap between 'peak demand' and 'peak met') was approximately 2% during the same period (MOP, 2018a). These figures indicate a great improvement in electricity supply when compared with the All-India average energy deficit of 8.7% and power deficit of 9% as recently as in FY 13 (CEA, 2018b). However, several CPPs in India are under financial stress due to the lack of inadequate demand in the form of Power Purchase Agreements (PPAs) from State-owned Power Distribution Companies or DISCOMS (Lok Sabha, 2018a).

Electricity is in the Concurrent List of the Constitution of India. Distribution of electricity and management of associated functions are handled by DISCOMS which are largely owned by the respective State Governments. Therefore, the inherent variability in the quality of governance in each State has resulted in disparities not only in the last mile electricity distribution systems in the respective States but also in the financial health of the DISCOMS serving these States. These disparities are also evident in the large variations between the power deficits in different regions as well as between the States. For example, the State of Maharashtra with the highest power demand of 23.4 GW during FY 18 had a power deficit of only 0.2%, while the State of Uttar Pradesh which had the second highest peak demand in India (20.5 GW) had a power deficit of 10.9% during the same period (MOP, 2018c).

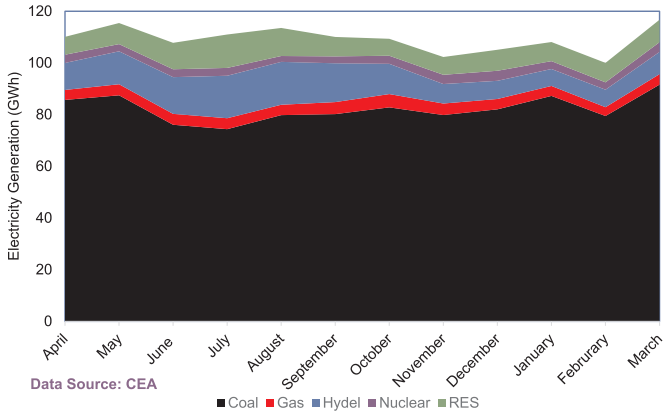

Fig. 1. The contribution of various sources to electricity generation in India during FY 18.

According to India's Ministry of Power (MOP), of the 177 million rural households in the country, only 152 million (86%) have been provided with an electrical connection as on 11 July 2018 (MOP, 2018b). On the other hand, the Ministry has also declared that India is a power 'surplus' country because the total installed electricity generation capacity in the country exceeds 344 GW against a peak demand which has never exceeded 170 GW till date (MOP, 2018c). The deficit in supply to the aforesaid 25 million rural households is primarily because of the DISCOMs' reluctance to procure power from the generating companies, either because they lack the funds required to procure adequate quantum of power to meet the unserved/under-served demand or because they want to limit their losses due to under-recoveries from these consumers, or both. Further, several DISCOMS in India resort to power cuts during peak hours rather than procuring costlier power to meet the peak demand.

Central Electricity Authority (CEA, 2018c) has projected that during the ongoing FY 19:

- India's requirement of electrical energy will increase to 1337 TWh from the FY 18 level of 1309 TWh while the peak demand will exceed 180 GW from the FY 18 level of 164 GW.
- At the All-India level, India is likely to have a peak surplus of 2.5% in terms of electrical power and a surplus of 4.6% in electrical energy; however, the Northern, and Southern regions of the country are likely to face power deficits of the order of 1.2% and 4.5%, respectively.

As per India's National Electricity Plan prepared by the CEA, the quantum of electricity required to meet India's growth aspirations is projected to increase to 1566 TWh in FY 22 and further to 2047 TWh in FY 27 (CEA, 2018b). In line with the increasing requirement of electrical energy, the peak electricity demand is projected to increase from the FY 18 level of 164 GW to 226 GW in 2022 and further to 299 GW in FY 27 (MOP, 2018a, 2018d). As of 31 March 2018, fossil fuel sources have a share of 65% in the total electrical generation capacity of electrical utilities in India, while non-fossil fuel (hydro, nuclear, and RE) sources have the balance 35% of generation capacity in India (CEA, 2018d). Further, power plants with a total generation capacity of 58 GW comprising of 48 GW thermal, 6.8 GW hydro, and 3.3 GW nuclear, are at various stages of construction. These new power plants will progressively replace old and inefficient CPPs with a combined capacity of 22.7 GW that are not in a position to comply with current environment norms (MOP, 2018d). In addition, GOI is also projecting an increase in RE capacity to 175 GW by March 2022 from the March 2018 level of 69 GW (CEA, 2018b, 2018d). Even after the generation capacity of RE sources reaches the projected level of 175 GW by FY 22, RE sources are expected to generate only 19% of the electricity produced in India in FY 22 compared to their current share of 8% (CEA, 2018a; MOP, 2018d). However, the share of RE in the total electricity generated in the Southern and Western regions of the country will be much higher than the All-India average (NREL, 2017a, 2017b).

A committee set up by India's Ministry of Power (MOP) has submitted broad recommendations for an optimal energy mix for India during 2022 and 2027 under various scenarios (MOP, 2018d). The base case studied by this committee is based on GOI's projections for RE