



## Renewable energy certificate markets in India—A review



Gireesh Shrimali\*, Sumala Tirumalachetty

CPI-ISB Energy and Environment Program, Indian School of Business, Hyderabad 500032, India.

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### ABSTRACT

In India, the National Action Policy on Climate Change (NAPCC)<sup>1</sup> has set a target of 15% of electricity via renewable energy sources by 2020. To reach these ambitious targets, in March 2011, the Government of India launched the renewable energy certificates (REC) – a market based mechanism – to drive renewable energy development and spur further investments. However, a look into the actual performance of REC market trading during the first year of operation shows that, though volume of trading steadily increased, the number of accredited certificates issued was less than 2.5% of the technical REC demand potential, indicating that the full potential of the REC markets was far from being realized.

We critically examine the design and implementation of the REC market in India as well as its effectiveness in meeting the desired objectives in the context of international best practices. Our analysis of REC market best practices reveals that, though forward markets, banking and price bounds are recommended for stable markets, best-of-class methods for determining the optimal length of banking, the level of floor and forbearance prices, and the values of credit/vintage multipliers are not fully established. We then establish that the main issues with the Indian REC markets appear to be demand uncertainty resulting from lack of long term targets, absence of clarity on compliance, and near-absence of long-term price signals to investors. Finally, we present an analysis of other important features of the Indian REC market in the context of well-functioning REC markets, such as credit-multipliers/set-asides, vintage multipliers, and voluntary markets.

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### Contents

|   |     |
|---|-----|
| 1. Introduction . . . . .   | 703 |
| 1.1. Motivation . . . . .   | 703 |
| 1.2. Prior work . . . . .   | 704 |
| 1.3. Paper organization . . . . .   | 704 |
| 2. REC markets: Institutional framework and current performance . . . . . | 704 |
| 2.1. The institutional structure for REC markets . . . . .                | 704 |
| 2.1.1. Central agencies . . . . .   | 704 |
| 2.1.2. State agencies . . . . .   | 705 |
| 2.2. Renewable portfolio obligation: The driver of REC markets . . . . .  | 705 |
| 2.2.1. Obligated entities . . . . .                                       | 705 |
| 2.3. Estimated REC demand based on RPO targets . . . . .                  | 706 |

\* Corresponding author. Tel.: +91 40 2318 7155; fax: +91 40 2300 7035.

E-mail addresses: [gireesh\\_shrimali@isb.edu](mailto:gireesh_shrimali@isb.edu), [gireesh\\_shrimali@yahoo.com](mailto:gireesh_shrimali@yahoo.com) (G. Shrimali).

<sup>1</sup> List of abbreviations: Australia Securities Exchange (ASX); Average Purchase Pooled Cost (APPC); Central Electrical Authority (CEA); Central Electricity Regulatory Commissions (CERC); Chicago Climate Futures Exchange® (CCFE); Feed-in-Tariffs (FIT); Forum of Regulators (FOR); Generation Based Incentives (GBI); Indian Energy Exchange (IEX); Jawaharlal Nehru National Solar Mission (JNNSM); National Action Policy on Climate Change (NAPCC); National Load Dispatch Center (NLDC); Power Exchange of India Limited (PXIL); Renewable Energy Certificates (REC); Renewable Portfolio Obligation (RPO); Renewable Portfolio Standard (RPS); State Electricity Regulatory Commissions (SERC); State Load Dispatch Center (SLDC).

|                      |   |     |
|----------------------|---|-----|
| 2.4.                 | Status of REC markets after one year of operation. . . . .                      | 706 |
| 2.4.1.               | Trading. . . . .  | 706 |
| 3.                   | REC market design: Addressing long-term stability. . . . .                      | 707 |
| 3.1.                 | Enforcement of RPO is key to establishing a robust REC market . . . . .         | 707 |
| 3.1.1.               | Penalties outside India. . . . .  | 708 |
| 3.1.2.               | Penalties and compliance in India . . . . .                                     | 708 |
| 3.2.                 | Long term targets . . . . .   | 708 |
| 3.3.                 | Long term price-signals. . . . .  | 709 |
| 3.3.1.               | The role of secondary markets in providing long-term price signals . . . . .    | 709 |
| 3.3.2.               | The role of banking in providing long-term price signals . . . . .              | 710 |
| 3.3.3.               | Price bounds: Ceiling and floor prices . . . . .                                | 711 |
| 4.                   | REC markets design: Additional features for a well-functioning market . . . . . | 712 |
| 4.1.                 | Set asides and credit-multipliers . . . . .                                     | 712 |
| 4.1.1.               | Tiers and credit-multipliers. . . . .   | 712 |
| 4.1.2.               | International experience with Tiers and multipliers . . . . .                   | 712 |
| 4.1.3.               | The Indian context. . . . .   | 713 |
| 4.2.                 | Vintage multipliers . . . . .   | 713 |
| 4.3.                 | Voluntary markets. . . . .  | 713 |
| 5.                   | Summary and conclusions . . . . .   | 713 |
| Appendix A.          | Source specific RPOs. . . . .   | 714 |
| Appendix B.          | Design features of REC markets in select countries. . . . .                     | 714 |
| References . . . . . |   | 715 |

## 1. Introduction

### 1.1. Motivation

In India, the renewable energy sector is undergoing changes rapidly – renewable energy has begun to play a significant role in the energy security of the nation as conventional energy sources (e.g., coal) have become scarcer and more expensive to import. Further, India has set ambitious renewable energy targets. The NAPCC, which in addition to India's response to climate change also tackles diverse issues such as energy security and industrial competitiveness, has set a target of 15% of electricity via renewable energy sources by 2020, with a starting target of 5% in 2010, increasing by 1% every year [45]. Under the Jawaharlal Nehru National Solar Mission (JNNSM), the government aims to develop 20,000 MW of solar energy by 2022 [43].

India is the only country with a separate ministry for renewable energy—called the Ministry of New and Renewable Energy (MNRE). Regulations supporting the development of renewable energy in India are the Electricity Act of 2003 and the National Electricity Policy of 2005. The Electricity Act of 2003 stipulates purchase of a certain percentage of the power procurement by distribution utilities from renewable energy sources. Under this act, implementation of the renewable portfolio obligation (RPO) is to be guided by the regulatory provisions issued by the respective State Electricity Regulatory Commissions (SERCs). The National Electricity Policy of 2005 also mandates that the share of electricity from non-conventional sources has to be increased progressively. Several other incentives in the form of generation based incentives (GBI), feed-in-tariffs (FIT), depreciation benefits and tax incentives have also been introduced.

Due to a supportive policy environment coupled with abundant resources, India has seen tremendous growth in renewable energy deployment, with wind energy surpassing 16 GW of installed capacity by 2011 (CPI 2012). However, the actual generation of electricity from renewable sources has been only 5.5% of the total electricity generation as of August, 2012 [11], as opposed to the annual target of 7% [45]. Though this is a marked improvement than the share of less than 4% just four years ago [12], renewable energy in India is lagging behind the targets, and it needs a comprehensive and focused effort to catch up.

Though India has a huge renewable energy potential,<sup>2</sup> availability of renewable energy sources is widely dispersed. In some states the potential for renewable energy is insignificant (e.g., Delhi), whereas some states have abundant renewable sources [35,56]: wind energy is abundant in Gujarat, Karnataka, Maharashtra, Tamil Nadu, and Jammu and Kashmir; solar energy is concentrated in the northwest region of the country—in Gujarat, Rajasthan, Ladakh, Maharashtra, and Madhya Pradesh; and the small hydro potential in the country is concentrated in hilly states of Himachal Pradesh, Uttarakhand, Jammu and Kashmir, Arunachal Pradesh, and Chattisgarh.

However, since renewable energy is typically more expensive than fossil-fuel based energy at a levelized cost basis [38], and since the intermittent nature of renewable sources results in higher integration costs [29], inclusion of renewable energy results in increased financial burden on local distribution companies, many of which are in poor financial health to begin with [60]. Thus, even though there are opportunities for harnessing renewable energy in states with abundant renewable resources, financial burden discourages corresponding distribution companies from purchasing renewable power beyond the RPO level mandated by the state-level regulatory authorities.

To address this mismatch and to achieve the targets set, MNRE launched the renewable energy certificates (RECs) trading mechanism in March, 2011. States with low renewable potential can now support renewable energy and meet their RPO by purchasing RECs. For states with high renewable potential, this would reduce the burden on state utilities to purchase renewable energy beyond the RPO fixed by the SERCs. This would help to minimize cost of power procurement, and lead to efficient resource utilization across the country. The REC market mechanism was widely touted as the solution to drive investment into renewable generation [7,61].

However, a look into the actual performance of REC market trading till March, 2012 – i.e., over the first year of operation – shows that, though volume of trading increased in the last few

<sup>2</sup> As of March 2011, the renewable Energy Potential of India is estimated at 89,760 MW, including wind (49,132 MW), small hydro (15,385 MW), biomass power (17,538 MW), and cogeneration (5000 MW) [44].

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