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Falling Short: An Evaluation of the Indian Renewable Certificate Market

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Executive Summary

In 2008, India's National Action Policy on Climate Change (NAPCC) set a target, called the Renewable Purchase Obligation (RPO), to produce 15% of the country's electricity with renewable energy sources by 2020. Further, under the Jawaharlal Nehru National Solar Mission (JNNSM), the Indian government aims to develop 20,000 MW of solar energy by 2022. To help reach these targets in a cost-effective manner, India recently launched a market-based mechanism called Renewable Energy Certificates (RECs). However, in the one year of trading so far, participation in the REC markets has been low: RECs have failed to attract investment. In this paper, we evaluate the effectiveness of Indian REC markets against eight government objectives and offer suggestions for improving their design.

Key Findings

Our analysis of the market design and performance of the Indian REC market indicates that this program is not likely to achieve government objectives (Table ES 1). Though the design of the REC mechanism appears adequate, the performance of the market has been far from satisfactory.

Table ES 1: Evaluation Criteria for Indian REC market and findings

Government Objectives / Evaluation Criteria	Findings
Encourage cost reduction in renewable energy projects by promoting market forces and competition	**Unlikely to achieve** Participation in the REC markets has been too low to drive any cost reduction
Provide incentives to drive capital investment in renewable energy projects	**Unlikely to achieve** Time frame of RECs is much shorter than the investment horizon; investors discount RECs due to perceived uncertainty and risk over project life
Provide a mechanism to limit boom and bust cycles	**Not clear yet** Cannot test as the renewable energy market has not yet overheated; current participation and incentive levels suggest that the REC mechanism is insufficient to dampen cycles
Weave together various state-level incentive and policy regimes within a national structure	**Unlikely to achieve** Does not incentivize states to work towards reaching national goals
Provide incentives incremental to other relevant policies	**Not clear yet** REC cash flows are supplementary to other policies and can work in conjunction with state policies, but have not to date
Allow for technologically differentiated incentives to support new and diverse sources of energy	**Not clear yet** Design allows for differentiation; however support for new renewable sources has been weak to date
Accomplish the above at a reasonable additional transaction cost	**Not clear yet** Direct transaction cost is low to date; it is unclear how costs will evolve as market matures
Accomplish the above with a reasonable additional cost due to higher perceived or real risks to developer	**Unlikely to achieve** Risk perception of using RECs has been high, failing to drive any investment

Policy Implications and Recommendations

We believe it is too early to make firm recommendations for the REC system, particularly since the largest contributor to the relative ineffectiveness of the REC market is the uneven participation and regulatory policy of the Indian states, a factor which lies partially outside the scope of REC market design. However, we note certain design flaws that are likely to contribute to a continued weak REC market:

Overdependence on state level policy and compliance

- The system is dependent on stronger and more credible RPO goals from Indian states than have been observed to date.
- Stricter compliance laws and enforcement of RPO goals will increase confidence in the nation's commitment to these goals, and can help develop and support long-term stable REC markets.
- Incentives for the enforcement agencies and states could encourage state agencies to support RPO goals.

The lack of reliable long-term price signals

- The lack of long-term price signals, contracts, and other commitments greatly increases the risk to potential investors for their energy sales beyond year one.
- Creating secondary markets can reduce some of the long-term price risks that investors perceive in RECs by providing some future price certainty.
- States' commitment to long-term targets along with yearly targets would encourage developers to invest in RECs and, in the long run, would also limit boom and bust cycles.

Contents

1. Introduction

In 2008, India's National Action Policy on Climate Change (NAPCC) set ambitious renewable energy targets, called the Renewable Purchase Obligations (RPO), which require that India produce 15% of its electricity with renewable energy sources by 2020. Further, under the Jawaharlal Nehru National Solar Mission (JNNSM), the government aims to develop 20,000 MW of solar energy by 2022.

Though India has more than enough renewable energy potential to reach these targets,[1] availability of renewable energy sources is widely dispersed, and the capacity to meet these targets varies widely from state to state. In some states, the potential for renewable energy is insignificant (e.g. Delhi), whereas some states have excess renewable sources — wind energy is abundant in Karnataka and Tamil Nadu, solar energy is concentrated in the northwest region of the country, and small-hydro potential in the country is concentrated in states of Himachal and Uttarakhand. In states with abundant renewable sources, local distribution licensees avoid paying excessive costs for renewable energy by sticking to the RPO level mandated by local state commissions, even though their additional renewable energy could be sold as relatively low cost renewable energy in other jurisdictions.

In order to spur investments in renewable energy development and improve the efficiency of reaching national targets, in March 2011, the Indian government launched the Renewable Energy Certificates (REC) (in addition to the existing feed-in-tariffs provided by the states). RECs have been widely touted as the solution to drive investment in renewable energy generation (Business Line 2010, Economic Times 2010).

However, the actual performance of REC market trading shows that the number of certificates issued in the first year of operations is less than 4.0% of the technical REC demand potential, indicating that the full potential of REC markets is far from being realized. Further, according to financial institutions, investors cannot rely upon revenues from the REC mechanism beyond the first few years of projects that have up to 20-year lives. As a result, the REC mechanism has had virtually no impact on bringing new renewable energy projects on line.

1 Renewable Energy Potential of India is estimated at 84,776 MW, including Wind (45,195 MW), Small Hydro (15,000 MW), Biomass Power (16,881 MW), Cogeneration (5,000 MW), and Waste to Energy (2,700 MW) (IREDA 2009).

In this paper, we examine the design, implementation, and performance of the REC market in India and explore why RECs have not yet had the projected effects. As we will see, in India's federal structure, one major issue is a disconnect between the creation of policies at the center — for example, by the Central Electricity Regulator (CERC) — and their implementation by the states via the State Electricity Regulators (SERC). In the case of the REC market, for various reasons, many states have not supported the policies set out by the national government.

Methodology

Previous studies have put forth the case for REC markets in India (Sonee et. al 2011, Goyal and Jha 2011) and discussed the advantages to having a market based system (Singh 2009). However, few studies (Singh 2010) have probed the effectiveness of design and assessed the performance of the year-old REC markets. In this work, we evaluate the effectiveness of Indian REC markets, where *effectiveness* is assessed in terms of meeting national objectives.

A 2009 Ministry of New and Renewable Energy (MNRE) paper, *Development of Conceptual Framework for Renewable Energy Certificate Mechanism for India*, identifies "further promotion and development of renewable energy resources" and "effective implementation of inter-state transactions" as the primary objectives for Indian renewable energy policy and the REC system.[2] This paper goes on to list a few more secondary objectives for the REC system. While many of these secondary objectives are clarifications to the first two objectives, others point to the desire to support a range of renewable energy technologies and a desire to keep the transaction costs and risks associated with the REC system to a minimum.[3]

Thus, for the purposes of our analysis, we have identified four high-level objectives of the Indian REC system:

1. Promote and develop renewable energy resources
2. Facilitate inter-state transactions
3. Support diverse renewable energy technologies
4. Minimize transactions costs and risks associated with the system

For our effectiveness analysis, we have taken these four objectives and reformulated them by identifying more

2 MNRE 2009, see pages 6-7.

3 See Appendix C for an explanation of our mapping of the MNRE paper's objectives into these four categories.

specifically what the REC system would need to do to meet the four objectives above. This reformulation leads us to eight criteria against which we will evaluate the REC system.

MNRE Objectives	Effectiveness Criteria (CPI 2012)
1. Promote and develop RE resources	1. Encourage cost reduction in renewable projects by promoting market forces and competition 2. Provide incentives to drive capital investment into RE projects 3. Provide a mechanism to limit excess build and boom and bust cycles
2. Facilitate interstate transactions in RE	4. Weave together various state level incentive and policy regimes within a national structure 5. Provide incentives incremental to other relevant policies (state level or national)
3. Support diverse RE technologies	6. Allow for technologically differentiated incentives to support new and diverse technologies
4. Reduce transaction costs/risks associated with system	7. Accomplish the above at a reasonable additional transaction cost 8. Accomplish the above with a reasonable additional cost due to higher perceived or real risks to developer

In Table 1 below, we take these eight criteria one step further, identifying the implications for each.

In Section 3 we will return to these eight criteria and their implications to evaluate the effectiveness of the REC system to date. For each of these criteria we will assess both the conceptual design of the REC system including, where appropriate, how it measures up against international experience, and the performance of the system so far, when faced with the realities of Indian renewable markets and policy. Before embarking on that analysis, in Section 2 we will briefly describe the REC market and then highlight the major issues that have come to light during the first year of operation of the REC market. These issues will form an important part of our effectiveness analysis.

Table 1: Evaluation Criteria for Indian REC Markets and Implications

	Criteria	Implication
1	Encourage cost reduction in renewable energy projects by promoting market forces and competition	Must encourage a market large enough to spawn multiple competitors and lead to excess potential supply
2	Provide incentives to drive capital investment into renewable energy projects	Must develop a price signal that can encourage long-term investments at a level, timing and duration consistent with investment time horizons
3	Provide a mechanism to limit excess build and boom and bust cycles	Price signals must react to market build sufficiently to deter investment beyond targets
4	Weave together various state-level incentive and policy regimes within a national structure	System should serve as a clearinghouse for state policies and their price signals and markets
5	Provide incentives incremental to other relevant policies (state level or national)	Incentives and signals should be consistent and incremental to other policies or programs
6	Allow for technologically differentiated incentives to support new and diverse technologies	Where necessary for technology development, system should lead to differentiated price signals for different technologies
7	Accomplish the above at a reasonable additional transaction cost	The system should be reasonably clear, accessible, and simple to limit costs and encourage participation
8	Accomplish the above with a reasonable additional cost due to higher perceived or real risks to developers	Volatility and uncertainty should be limited to what is needed to address objectives, by limiting excess build and encouraging competition

2. A brief overview of the Indian Renewable Energy Credit market

2.1 Description

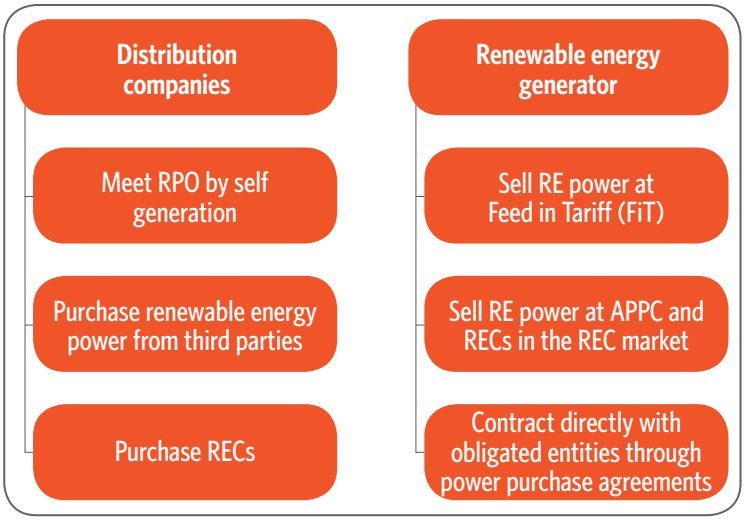
The basic elements of the Indian Renewable Energy Credit (REC) market design are similar to international REC markets: Distribution companies and other obligated entities must meet RPO targets. This creates the demand side of the market. REC certificates are issued to renewable energy generators. This provides the supply side of the market.

The Electricity Act of 2003 empowers State Electricity Regulatory Commissions (SERCs) to establish policies and rules for development of renewable energy. The Indian government has made declaration of RPO targets mandatory and has put forth guidelines for these targets. Accordingly, SERCs determine the RPO targets (a solar RPO and a non-solar RPO), assign obligated entities in their respective states, and establish state agencies responsible for enforcement of these targets. Obligated entities usually include licensee distribution companies,[4] captive consumers, and open-access users.[5] These can meet the RPO targets through self generation of renewable energy power, by buying directly from other renewable energy generators, or through REC certificates.

Renewable energy generators have the option to sell electricity at the existing feed-in-tariff (FiT) rates (determined by the state), contract directly with distribution companies or other obligated entities, or participate in the national REC markets (see Figure 1). In the latter case, renewable energy producers feed their electricity into the grid at the average purchase pooled cost (APPC) and apply for RECs through the National Load Dispatch Center (NLDC), a central agency which issues RECs and maintains REC registry. Based on reports from the State Load Dispatch Center (SLDC), a state agency which verifies the actual power fed into the grid, NLDC issues RECs. In general, one certificate is issued for every MWh of electricity produced and these certificates are valid for a period of one year, as determined by CERC.

Separate certificates are issued for solar and non-solar generators. RECs thus issued can then be traded in only two exchanges recognized by CERC. Since March 2011, REC certificates have been traded in Power Exchange of India (PXI) and Indian Energy Exchange (IEX). One trading session happens each month. Floor and ceiling prices[6] have been determined by the central agency to provide a minimum price guarantee for renewable energy generators and certificates are traded within this price range.

Figure 1: Options available for distribution companies and renewable energy generators



2.2 Issues

Several issues have surfaced in the development and (despite the short-life, in) the operation of the REC markets, and in some cases partial solutions have been implemented. Some of these issues are with the RPO, and some with the design of the REC markets itself. These issues, as outlined below, form the basis for much of the low effectiveness of the REC mechanism as will be discussed in Section 3.

1. **Low participation by renewable energy generators** – By March 2012, when the first compliance period ended, only 12.5% (2513 MW) of the estimated installed renewable energy capacity was accredited. Participation from solar developers has been particularly low – no solar RECs were traded in the first

4 State owned distribution companies operate 95% of the power distribution.

5 Many electricity intensive industries like Cement, Steel, Ferro Alloys, Paper & Pulp are operating their own power plants run by either thermal generation or generation from other resources including renewable energy. In 2007-08 nearly 15% of the installed capacity in the country was in captive power plants.

6 Floor price is the lower price limit for RECs and guarantee a minimum return to REC sellers. Ceiling price is the upper price limit for RECs . Solar/Non Solar RECs have a floor price of Rs 9300/1500 (USD 186/30) and a ceiling price of Rs 13400/3300 (USD 268/66) respectively.

Case of Maharashtra

The case of Maharashtra is a notable example, demonstrating difficulties in achieving RPO compliance, given that it did try to enforce the RPO targets before the REC regime (Nath 2008). Chasing an RPO target of 4%, the actual share of renewable energy was 0.78% and 1.09%, in 2004-05 and 2005-06, respectively. Further, in 2007-08, only one of the four distribution companies — Tata Power Co. — was able to meet its RPO target via generation from its own windmills. The other private distribution companies – Reliance and BEST – have not been able to procure renewable energy because of the lack of suppliers in their distribution areas and the high cost for sourcing them from outside. In fact, RPO compliance targets led to high land prices which made new renewable energy projects financially unviable, leading to both stalled growth and high demand for existing renewable generators, with price of renewable energy shooting up due to lack of supply.

year of operation. During the same period, only 1.1 million non-solar RECs were issued, implying that only 4% of the total estimated non-solar RPO obligation (~36,357 GWh in 2011-12) could be met using the certificates available through the REC market. Instead, the majority of renewable energy generators chose to avoid the REC market entirely and opt for FiT – a proven mechanism, which not only have been around since the early 2000s but also provide long-duration contracts of 20-25 years.

2. **Low compliance by REC purchasers (obligated entities at the state and distribution company level)** – After the introduction of REC markets, current market expectations on states' enforcement of RPO goals have varied. The only market sizing available is performed by REConnect, a market research firm. Based on current actions, REConnect estimates that very few states – Chattisgarh, Madhya Pradesh, Jharkhand and Orissa, representing ~9% of renewable generation – are expected to enforce RPO obligations in 2011-2012 . The low compliance is mainly driven by:

    a. **Lack of guidelines for penalties** — Specific guidelines and laws for RPO enforcement are still not in place, though state notifications and regulations have called for penalties at the forbearance price (the maximum price set for the REC certificates), as well as additional penalties on defaulters.

    b. **No enforcement of penalties** — In the pre-REC market period (when FiT alone were provided for renewable energy developers), though rules existed for penalties in case of non-compliance with RPO targets, enforcement did not see the light of the day. The SERCs have been empowered to allow distribution companies and any other obligated entities to carry forward compliance requirements to the next year or to relax the targets (FOR 2009, GERC 2010, CSERC 2011). Some states e.g Maharashtra (see MERC 2010), Gujarat (see GERC 2010) have relaxed the RPO obligation in the past due to various reasons, including lack of available renewable energy in the state. This is a loophole in the design, which the distribution companies can exploit, and adds to the uncertainty of the demand in the market.

However, based on other actions, such as past enforcement initiatives, many more states may end up enforcing RPO obligation, raising the expected compliance to ~54%. In any case, the first compliance period ended in March 2012 and the degree of enforcement by SERCs will be seen in action.

3. **Financial condition of State Electricity Boards (SEB) is often poor and affects trading** — State electricity boards (SEBs) and government distribution companies own nearly 95% of the distribution network (KPMG 2010). According to the latest report released by Power Finance Corp. Ltd., aggregate SEB losses in 2009-10 were USD 12.7 billion (Shunglu et al. 2011). Further, SEB losses are projected to reach USD 23.2 billion by 2014-15 from current levels (The Economic Times 2011).[7] The financial conditions of the SEBs raise questions about their ability to meet RPO targets, participate in REC markets, and promote renewable energy development. These questions have discouraged renewable energy developers from participating in REC markets. .

4. **Absence of state-level, long-term RPO targets** — The absence of long-term RPO targets at the state level in India undermines credible price signals to investors. The targets set by the states are not

7 Exchange rate of 1 USD = 50 INR has been used throughout this paper.

representative of the national renewable energy development goals. Though the Indian government has declared long-term national renewable energy targets and though CERC has made declaration of RPO targets mandatory, out of the 26 states that have RPO targets in place, only 10 have specified quota obligations for more than three years (See Appendix A for a list of RPO targets by state). By August 2012, 54% of the projects registered for RECs are from these 10 states. This is a clear indication of greater participation in REC markets from states with long-term targets. Long-term policies and targets for developers to estimate REC demand and drive long-term, stable investment in the sector.

5. **Floor prices and caps have reduced one form of uncertainty, but may have created others** — The CERC has created floor prices to guarantee a minimum rate of return to investors and reduce perceived risk. To determine floor (and ceiling) prices, the CERC has looked at the following parameters across states: (a) the FiT (determined by the states); (b) the APPC; and (c) the basic minimum requirements for ensuring project viability including expenses to cover loan repayment and interest charges, operations and maintenance, and fuel. The floor price has been determined keeping in view the basic minimum requirements for ensuring the viability of renewable energy projects set up to meet the renewable energy targets. The ceiling price has been derived based on the highest difference between prevailing FiT and the average power purchase cost of 2009-10 for the respective states. However, the parameters, as well as the method used in CERC's calculation of the price band, are questionable on many accounts, due to:

    a. **Circularity in determination of price bands** — Though the calculations seem to assume that the parameters are independent and reflect the cost variations and project economics across states, the independence assumption is violated in practice: the state-level preferential (or feed-in) tariffs have been determined by the SERCs based on guidelines from the CERC, which are in turn used by the CERC to determine the floor and forbearance prices. Further, it is not clear what causes the variation in preferential tariffs and whether that variation is truly state-dependent, as desired.[8]

    b. **Unclear rationale for estimating floor price** — The use of the minimum requirement for project viability for the determination of the floor price raises the question of not only what needs to be included in the calculations (e.g., should CAPEX be included?) but also how different this exercise should be from determining a feed-in tariff since the RECs support a market-based mechanism.

    c. **Ceiling price not based on cost cap** — The cost cap, which limits the total cost of the RECs and their eventual impact on rate payers, seems to be the dominant method for setting ceiling prices worldwide. It is hard to see the rationale for moving away from this proven methodology and estimating ceiling prices based on FiT.

8 Details on determination of floor price and forbearance prices are provided in CERC (2011).

3. Effectiveness Analysis

In this section we examine the ***status of the India REC mechanism and markets*** against the objectives identified in Section 1. In Table 2 we set out our summary findings for each of the eight evaluation criteria; we include a score for both design and performance and refer back to the relevant issue identified in Section 2. In sections 3.1-3.8 we discuss our findings for each evaluation criteria in more detail.

We evaluate the design as well as performance of REC markets in India against each of these objectives using a three-point, ordered scale (Table 2). A score of 2 on the design implies the system has provisions in place to achieve the objective, a score of 1 means that though some focus exists, it is inadequate, while a score of 0 implies there is no focus in the design. The performance ratings are also defined in a similar manner (see Figure 2). We note that the performance assessment is based on a short period (one year), and periodic evaluation of the performance of the REC markets would be pertinent as these markets mature over time.

Figure 2: Design and Performance Ratings

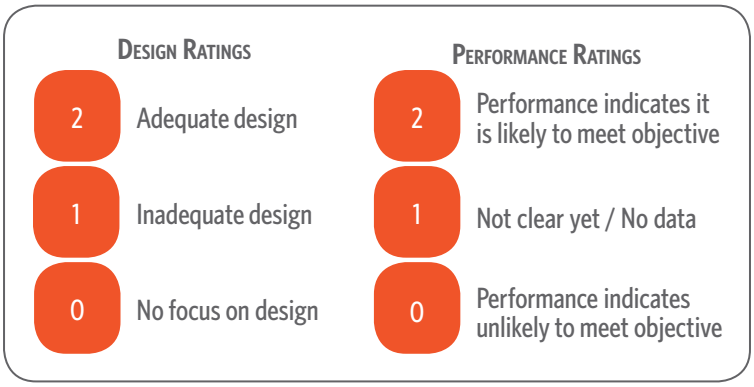


Table 2. Summary of CPI Effectiveness Analysis of the Indian REC market (Total score is calculated as a simple sum, which assumes that criteria are equally weighted)

CRITERIA	FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
		DESIGN	EXECUTION	
Encourage cost reduction in renewable energy projects by promoting market forces and competition	**Unlikely to achieve** Participation in the REC markets has been too low to drive any cost reduction	1	0	1, 2a, 2b, 3
Provide incentives to drive capital investment in renewable energy projects	**Unlikely to achieve** Time frame of RECs is much shorter than the investment horizon; investors discount RECs due to perceived uncertainty and risk over project life	1	0	3, 5
Provide a mechanism to limit excess build and boom and bust cycles	**Not clear yet** Cannot test as the renewable energy market has not yet overheated; current participation and incentive levels suggest that the REC mechanism is insufficient to dampen cycles	1	1	1, 2, 4, 5
Weave together various state-level incentive and policy regimes within a national structure	**Unlikely to achieve** Does not incentivize states to work towards reaching national goals	1	0	2, 4
Provide incentives incremental to other relevant policies (state level or national)	**Not clear yet** REC cash flows are supplementary to other policies and can work in conjunction with state policies, but have not to date	2	1	1, 2, 5

CRITERIA	FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
		DESIGN	EXECUTION	
Allow for technologically differentiated incentives to support new and diverse technologies	**Not clear yet** Design allows for differentiation; however, support for new renewable energy sources other than solar is weak.	2	0	
Accomplish the above at a reasonable additional transaction cost	**Not clear yet** Direct transaction cost is low to date; it is unclear how costs will evolve as market matures	2	1	
Accomplish the above with a reasonable additional cost due to higher perceived or real risks to developers	**Unlikely to achieve** Risk perception of using RECs has been high, failing to drive any investment	1	1	2a, 2b, 4, 5
	Total Score	11/16	4/16	

3.1 Encourage cost reduction in renewable energy projects by promoting market forces and competition

FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
	DESIGN	EXECUTION	
Unlikely to achieve Participation in the REC markets has been too low to drive any cost reduction	1	0	1, 2a, 2b, 3

One of the main objectives of any market-based mechanism is to create a large enough market to spawn competition and lead to excess potential supply that would drive cost reductions. A market mechanism should foster a multitude of competitors and then push down costs by paying for only the lowest cost to proceed. These competitors will further lower costs in order to maintain or improve their position in the market.

The problem in the Indian REC market is that only a fraction of suppliers have even applied for the RECs, and there is little evidence that the REC market has either encouraged more developers or encouraged these competitors to build more or lower-cost projects (Section 2 - Issue 1). The market does not, as yet, seem to have created, or been relevant to, competition in renewable energy. While the design of a REC market could potentially encourage competition and drive down prices, the Indian REC markets have failed to develop enough to achieve these goals.

The failure of REC markets to develop appears to be driven as much by the low demand for RECs as by the renewable project developers' preference for other mechanisms. The lack of clarity on penalties and absence of enforcement of RPO compliance has led to uncertain demand for RECs from the distribution companies that should be the purchasers of the certificates (Issues 2a and 2b). Though some focus exists in the design to encourage participation, stricter compliance laws and enforcement measures are needed to ensure demand for RECs exists and thus drive participation in the REC markets by developers. Further, the poor financial condition (Issue 3) of some of the state electricity boards may be discouraging developers from selling RECs to some potential buyers as they worry about counterparty risk.

3.2 Provide incentives to drive capital investment in renewable energy projects

FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
	DESIGN	EXECUTION	
Unlikely to achieve Time frame of RECs is much shorter than the investment horizon; investors discount RECs due to perceived uncertainty and risk over project life	1	0	3, 5

Renewable energy projects are capital-intensive investments that, once built, provide relatively steady streams of energy, and therefore cash, over a reasonably long life with low variable costs. The certainty of these cash flows should encourage equity investors to accept lower returns and allow them to borrow more money against the projects to further lower costs. The more certain both production and price, and thus cash flows, are, the less risk and therefore the lower cost.

As seen in 2.2.4, only 10 of the 26 states have declared RPOs beyond three years. The lack of long-term targets is exacerbated by uncertainty around the REC mechanism itself. With many states failing to declare longer-term RPO targets, and with the finances of the SEBs (Issue 3) raising questions about the veracity of some of the targets that have been set, uncertainty about future REC demand and thus REC prices is high. As a result, investors have not viewed REC cash flows as being reliable enough to incorporate in investment decisions.

Further, as designed, the REC market issues certificates valid only for one year. If investors were to rely upon RECs for a significant portion of their cash flows, uncertainty for the last 19 years of a 20-year project would be extremely high. This uncertainty would either significantly increase the financial return required by the project or encourage investors to seek alternative arrangements.

The CERC attempted to address these issues via declaration of price ranges and has declared floor and ceiling prices for five years. Floor prices, in particular, guarantee a minimum rate of return to investors; however the current methodology adopted has several issues (Issue 5) and clear methodology for setting floor prices is yet to emerge. In particular, it is not clear as to how long these prices have to be set in terms of providing long-term investor guidance – since setting long-term floor prices essentially amount to setting long-term FiT, a difficult exercise for policymakers to perform, given lack of long-term credible information on the cost of technologies.

Introducing secondary markets for RECs to enable trading of RECs after the initial auction or transaction, along with the development of instruments, such as forward and futures contracts, bilateral trades, etc would enhance their value as practical financial instruments that could be used to support debt or equity investment cases. It can be argued that a liquid REC market, along with the presence of forward contracts with (or without) appropriate market conditions, the floor price would automatically emerge from the system.

Other regions have used secondary markets and/or banking instead of attempting the very hard task of setting long-term floor prices. However, though secondary market instruments can offer advantages, they also present risks. One key risk is that ineligible projects may be sold in the REC market given that secondary trades are hard to verify independently. Though this issue might be of less concern in some of the developed countries, it a key concern in India where the legal system is not robust and the experience with open markets is relatively new.

> Much can be learned from the U.S. and Australia where secondary markets for RECs have existed successfully. In the U.S., the Chicago Climate Futures Exchange® (CCFE) has futures contracts on RECs for the states of New Jersey, Connecticut, and Massachusetts as well as for voluntary participants. The Australia Securities Exchange (ASX) also issues REC futures contracts – a minimum of 1000 certificates with a contract term of five years. Similarly, much can be learned from the European Emission Trading Scheme, where secondary markets are well established – for example, futures accounted for 85% of transaction volume in 2009 (World Bank 2010).

3.3 Provide a mechanism to limit boom and bust cycles

FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
	DESIGN	EXECUTION	
Not clear yet Cannot test as the renewable energy market has not yet overheated; current participation and incentive levels suggest that the REC mechanism is insufficient to dampen cycles	1	1	1, 2, 4, 5

Boom and bust cycles can stretch years or decades. In theory, REC prices should fall when the market is oversaturated, reducing incentives and slowing growth in renewable energy deployment, but rise when insufficient renewable energy projects are being built, stimulating demand. Together, prices should dampen the boom and bust cycle.

However, given the lack of a forward price signal for RECs, and that current prices will have no impact on the economics of projects that will not be complete for a year or more, it is unclear what the effect of REC markets would be in containing boom and bust cycles. It's likely that the price floor and ceiling would limit the dampening effect. Further, the low level of participation would certainly limit the impact the mechanism could have on renewable energy projects outside the REC market.

As for current observations, the market is just beginning to build momentum, so it is neither overly extended nor unusually slow, but, many, if not most, of the components – in the form of state RPOs – are not yet fully developed. With only one year of data, it would be difficult to make any claim as to the effectiveness of the REC system in limiting growth of renewable energy when the market is out of control, or in stimulating the market when it is slow. Therefore, it is premature to make any judgment as to the dampening effect of the REC system.

It is interesting to note, however, that some states have reduced RPO targets after the introduction of RECs. Nine states have issued notifications reducing RPO targets from 2011 due to fear of placing excessive burdens on distribution companies. With these actions, estimated national RPO obligation fell from 5.6% in 2009-10 to 4% in 2010-11, which is below the national target of 5%. Such swings in policy could either set the stage for boom and bust cycles or be part of the dampening effect.

Progressive and consistent long-term targets and policies can avoid boom and bust cycles. In Germany, for instance, more than a decade of consistent policy support for renewable power under the feed-in law (StrEG) and its successor (EEG) has been an important driver for increasing renewable electricity generation – between 1990 and 2003, wind power has grown at a compounded annual growth rate of 59.8% (Wüstenhagen and Bilharz 2006). As another example, Australia sets targets and obligations for 10 years at a time and has successfully reached them.

On the other hand, inconsistent policies can lead to boom and bust cycles. In the U.S., expiration of Production Tax Credits (PTCs) in 2000 and 2002 led to 93% and 73% reduction in new wind installations respectively. In 2011, new wind power installations in Japan dropped 70 percent year-over-year from 2010, following the shut-down of a direct subsidy to wind developers that covered one-third of wind energy project financing.

3.4 Weave together various state level incentive and policy regimes within a national structure

FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
	DESIGN	EXECUTION	
Unlikely to achieve Does not incentivize states to work towards reaching national goals	1	0	2, 4

The REC mechanism was designed to enable states lacking adequate renewable energy resources to meet their targets by procuring excess renewable energy from states with abundant, lower-cost resources. While the mechanism shows promise in theory, in practice the performance has been poor. In fact, in some cases the REC mechanism may actually have been detrimental, as some states have reduced their RPO goals, or removed other forms of renewable energy support in response to the REC mechanism. In other cases, investors have stuck with local support measures, restricting opportunities for REC trading.

States have reduced RPO goals: Since the REC trading mechanism was launched, nine states have reduced their RPO targets fearing that compliance would burden the distribution companies. Madhya Pradesh has reduced its RPO to less than 1% from the previous 10%. Andhra Pradesh postponed the obligation of targets until 2014. These actions resulted in a decrease of nearly 15% of the overall national RPO targets. Frequent changes in targets would result in changing the potential size of REC markets, and may send confusing signals to investors.

States have withdrawn support via FiT: In India, FiT and RECs co-exist for the same technology. The choice between the two is with the developer. Though more in depth analysis is needed to understand the preferences of renewable energy developers between FiT and RECs, some states have withdrawn support via FiT for certain technologies in the belief that the REC mechanism should be enough to support project development — FiT for wind in Tamil Nadu and small hydro in Himachal Pradesh are representative examples. Over the years, FiT — a proven mechanism that provides revenue certainty up to 20-25 years — have been effective in deploying renewable energy in these states. Thus, moving to RECs might have an unintended negative effect resulting in the effective removal of support in some states.

3.5 Provide incentives incremental to other relevant policies

FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
	DESIGN	EXECUTION	
Not clear yet REC cash flows are supplementary to other policies and can work in conjunction with state policies, but have not to date	2	1	1, 2, 5

The REC market exists in a world with multiple state renewable policies — RPOs and other Indian government policies. Indeed, one of the hoped for benefits of the REC system is that it could provide an incentive that would bring together and help rationalize these various policies. Additionally, the REC market in India must function alongside other programs that are offered as substitutes in lieu of RECs.

Complementary Policies: Policies in this category are offered independent of the incentives obtained via RECs. These include:

- Accelerated depreciation (AD) benefits — i.e., the balance book value of a renewable energy project that developers can depreciate in the first year. This is 20% for wind projects and 80% for solar projects.
- Generation-based incentives (GBI) of Rs 0.50/kWh (USD 0.01/kWh) for wind developers who don't wish to use AD benefits.
- Concessional rates for excise (0% as opposed to 8%) and customs duty (0-5% as opposed to 7.5-10%) for all renewable sources of energy.

Substitute Policies: As mentioned earlier, renewable energy developers can choose to sell the electricity either at the FiT or at the average pooled purchase cost

(APPC) price and opt for RECs which can be traded in the REC markets. Thus, if they choose the REC option, their total remuneration equals the sum of APPC and REC prices. Table 3 provides the existing FiT and price that can be obtained via RECs (APPC + REC floor/ ceiling price) across some of the states in the country.

Note that the effective floor price (APPC + REC floor price – (4)) is higher than the feed in tariff in several states (Andhra Pradesh, Chattisgarh, Gujarat, Rajasthan, Tamil Nadu, Uttar Pradesh). For example, in Tamil Nadu the benefit for wind generators via FiT is Rs. 3.4/kWh (USD 6.8 cents/ kWh), while the benefit via RECs (at the floor price) is Rs 4.88/kWh (USD 9.76 cents / kWh). Thus in this case, RECs guarantee a minimum gain of Rs 1.48/kWh (USD 2.96 cents/kWh) over the existing feed in tariffs. Given that the REC floor price has been set so as to provide a price higher than the FiT prices, in several states there is an added incentive to opt for RECs over FiT. Thus in design, REC provides incentives in addition to and at higher prices than other policies in place. In spite of this incremental incentive, RECs are still not seen as an attractive proposition mainly due to the uncertainty in demand and lack of clarity in enforcement.

Table 3: Feed in Tariff and APPC rates

STATE	PREVAILING FEED-IN-TARIFF (RS/KWH)			PRICES WITH REC	
	Wind	Biomass	Small Hydro	APPC + Floor Price (2011-12)	APPC + Ceiling Price (2011-12)
	(1)	(2)	(3)	(4)	(5)
Andhra Pradesh	3.5	3.95	2.19	4	5.98
Chhattisgarh		3.11		3.55	5.53
Gujarat	3.56	3.08		4.48	6.46
Haryana	4.26	4.32	3.4	4.27	6.25
Karnataka	3.7	3.86	3.4	4.16	6.14
Kerala	3.64	3.64	2.94	3.49	5.47
Madhya Pradesh	4.35	3.43	5.37	3.59	5.57
Maharashtra	4.55	4.98	3.0	4.12	6.1
Punjab	4.68	4.96	3.69	4.21	6.19
Rajasthan	3.49	3.72		3.98	5.96
Tamil Nadu	3.4	4.8		4.88	6.86
Uttar Pradesh	3.21		3.28	4.12	6.1
Uttaranchal	3.9		3.50	3.84	5.82
West Bengal	4.0	4.0	3.64	3.93	5.91

3.6 Allow for technologically differentiated incentives to support new and diverse renewable energy sources

Renewable energy generation includes various sources – wind, solar, biomass, wave, tidal, geothermal etc. While the markets for some of these technologies (e.g., wind) are fairly developed, some are still in nascent stages (e.g., solar), waiting for technologies to develop and costs to go down. If all sources were treated alike, the lowest-cost technology would be developed first and generators from the more mature technologies could make substantial profits, however, there would likely be inadequate support for promising new technologies.

The focus in the design of the REC market for solar energy is adequate. Given the higher up-front costs and the less mature state of solar technologies in the nation, separate treatment for solar projects is essential to encourage these projects — in particular, to support the JNNSM, which has set a target of 20GW by 2022 (MNRE 2010). The REC mechanism has allowed for separate RPOs and issuance of separate certificates for solar and non-solar projects (with higher floor prices for solar certificates). Given that credit-multipliers (see Box below) have not worked in practice, use of these set-asides seems appropriate in India.

The performance of solar REC markets has not been adequate, however, and solar RECs have not witnessed any trading in the first year of operation. Developers continue to prefer the alternative mechanism (i.e., FiT)

FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
	DESIGN	EXECUTION	
Not clear yet Design allows for differentiation, however, support for new renewable energy sources other than solar is weak.	2	0	

Credit multipliers and set asides are the two tools used to provide differentiated price signals for different technologies in India. Credit multipliers, where each technology is given a pre-specified number of RECs for every MWh of electricity produced, promote liquidity in the market. Set-asides provide a degree of certainty for the development of a specific amount of a particular technology. Setting multipliers values is a difficult task: They typically end up promoting a specific technology. The advantages and disadvantages of these systems, specifically for solar energy, have been discussed in greater detail by Wiser et al. (2010).

In the U.S., set-asides have been more popular than credit multipliers for solar support (Wiser et al. 2010). Sixteen states, including New Jersey, New York, and Washington, D.C., have solar-specific RPO targets. Experience shows that solar set-asides have successfully initiated market growth — many more projects have been developed in states with set-asides. On the other hand, Sweden doesn't distinguish between the sources of renewable energy and has used credit multipliers to support the market. Here most additional renewable energy generation has been from wind power — the most viable source — and resource diversity has been low, putting the effectiveness of credit-multipliers in question.

over REC markets. Support for new renewable energy sources is included in the non-solar category in the current design — however, as the Swedish example shows (see Box above) support for new technologies is weak in such a set-up. Stronger incentives are needed to support less mature technologies and drive innovation.

3.7 Accomplish the above at a reasonable additional transaction cost

FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
	DESIGN	EXECUTION	
Not clear yet Direct transaction cost is low to date; it is unclear how costs will evolve as market matures	2	1	

The REC mechanism should be reasonably clear, accessible, and simple to limit costs and encourage participation. Direct transaction costs, including costs for registration and redemption of certificates, should be low to attract developers to participate in the system. Currently a one-time accreditation (by state agencies, to be completed within 30 days) and registration (by central agencies, to be completed after accreditation within three months from date of application) process is necessary to trade RECs.

Direct transaction costs appear to be low for REC markets — especially when compared to similar mechanisms in other countries, such as the clean development mechanism (CDM). The various fees paid by developers to these agencies are:

- **Initial Accreditation Fee** Rs 45,000 (USD 9,000), with an annual fee of Rs 10,000 (USD 200) annual fee. Revalidation fee of Rs 15,000 (USD 300) is to be paid after five years;
- **Initial Registration Cost** of Rs 7,000 (USD 140), with an annual fee of Rs 1,000 (USD 20); and
- **Issuance Fee** of Rs 10 (USD 0.20) per REC issued (certificates can be issued on a biweekly basis).

For non-solar certificates, this comes to about 1% (at the floor price) to 2.5% (at the ceiling price) of revenue in the first year for a 1 MW plant with 22% capacity utilization factor.[9] In comparison, for projects using certified emissions reduction (CER) certificates under the CDM, transaction costs are 1-15% of revenue (Krey, 2004). Single window counters for accreditation/registration/issuance may further reduce associated transaction time and costs for redeeming RECs.

The outstanding question is how these costs will evolve as the market matures. Will sellers be required to build large compliance departments? Will trading become an important and costly element of the REC market? These questions will only be answered with time.

9 A 1 MW plant at 22% power load factor generates 1927 MWh of RE electricity or 1927 RECs, which implies direct transaction cost of Rs 71,272 ($1 425) for obtaining RECs. Whereas the revenue at floor price = Rs 2.9 million ($ 57,816) and the revenue at ceiling price = Rs. 6.4 million ($ 127,915)

3.8 Accomplish the above with a reasonable additional cost due to higher perceived or real risks to developers and investors

FINDINGS	EFFECTIVENESS SCORE		RELEVANT ISSUES (SECTION 2)
	DESIGN	EXECUTION	
Unlikely to achieve Risk perception of using RECs has been high, failing to drive any investment	1	1	2a, 2b, 4, 5

Volatility and uncertainty in REC markets should be limited to what is needed to address objectives such as limiting excess build and providing competition. Based on interviews with developers and financial institutions, we observed that the majority of the developers perceive the REC mechanism as a high-risk option. Financial institutions also have a high-risk perception of RECs and do not view RECs as instruments that are "bankable"; that is, income from these instruments cannot be relied upon for investment decisions. The situation is exacerbated by the fact that Indian developers and banks have historically been skeptical of open markets and trading, and are more comfortable with a stable fixed source of income like FiT (India opened its markets to outside investment only two decades ago). Price ranges, introduced to guarantee a minimum return to investors, should help, but design may still be creating uncertainty and skepticism (see Issue 5).

4. Conclusions and Policy Implications

Evaluating REC market against these criteria suggests that while the design of the REC system has some merit, in the context of the Indian renewable market and related state and national policy, the performance of the market has been, and is likely to continue to be, inadequate.

We believe it is too early to make firm recommendations for the REC system, particularly since the largest contributor to the relative ineffectiveness of the REC market is the uneven participation and regulatory policy of the Indian states; a factor that lies partially outside the scope of REC market design. However, we note certain specific design flaws that are likely to contribute to a continued weak REC market:

1. Overdependence on state-level policy and compliance

- The system is dependent on stronger and more credible RPO goals from Indian states than have been observed to date.
- Stricter compliance laws and enforcement of RPO goals will increase confidence in the nation's commitment to these goals, and can help develop and support long-term, stable REC markets.
- Incentives for enforcement agencies and states could encourage state agencies to support RPO goals.

2. The lack of reliable long term price signals

- The lack of long-term price signals, contracts, or other commitments greatly increases the risk to potential investors for their energy sales beyond year one.
- Creating secondary markets would provide some future price certainty and could reduce some of the long-term price risks that investors perceive in RECs.
- States' commitment to long-term targets along with yearly targets would encourage developers to invest in RECs. This commitment would, in the long run, also limit boom and bust cycles.

A list of remedies may help improve the REC system and resolve these design flaws. As our experience with the Indian system grows, these recommendations are likely to become firmer and more detailed. That said, there are a number of policy recommendations that are clear, even in light of India's limited history with the REC market. These include:

Stricter compliance laws and enforcement measures — Without strict compliance laws and enforcement actions on obligated entities, long-term, stable markets are unlikely to develop. SERCs, which are entrusted with the responsibility of enforcing RPO goals, must make sure all the distribution companies and captive consumers meet the RPO requirements.

Declaration of long-term targets along with yearly targets — The absence of long-term targets raises questions about how long RECs will be available. Once developers and investors believe that REC markets are here to stay, they will value RECs as a financial instrument and will drive investment in renewable energy generation. Long-term targets and consistent polices may also limit boom and bust cycles.

Incentives for state compliance — Incentives for enforcement agencies and compliant states could push state agencies to enforce RPO goals. Revenue generated through penalty collection could be pooled in a national fund used for this purpose (similar to incentives provided by APDRP where 50% of the operational cash loss reduction achieved by SEBs was provided in the form of grants to the states which undertook reforms).

Introduction of secondary markets — The creation of secondary markets can make RECs bankable by creating stable markets. This could ease some of the risks regarding long-term REC prices for investors and also limit volatility of REC prices.

Stronger incentives for new renewable energy sources — The current framework doesn't distinguish between established renewable energy sources and new renewable energy sources. Differentiated incentives (in addition to those for solar sources) are needed to encourage new renewable energy sources.

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Appendix A. RPO targets across States

STATE	YEAR OF FIRST REGULATION	PRE-REC TARGET			POST-RPO TARGETS					
		2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Andhra Pradesh (Draft)*	2005	5.0%	5.0%	5.0%					5.0%	5.0%
Assam	2010				1.4%	2.80%	4.20%	5.6%	7.0%	
Bihar				4.0%	1.5%	2.50%	4.00%	4.5%	5.0%	
Chhattisgarh	2008	10.0%	10.0%	10.0%	5.0%	5.25%	5.75%			
Delhi (Draft)*		1.0%	1.00%	1.00%	2.0%	3.40%	4.80%	6.2%	7.6%	9.0%
Gujarat	2005	1.0%	2.0%		5.0%	6.0%	7.0%			
Haryana	2007	2.0%	5.0%	10.0%	1.5%	2.0%	3.00%			
Himachal Pradesh		20.0%	20.0%	20.0%	10.01%	10.01%	10.25%	10.25%	10.25%	10.25%
Jammu & Kashmir					1.0%	3.0%	5.00%			
Goa & UT					1.0%	2.0%	3.00%			
Jharkhand					2.0%	2.50%	3.10%			
Karnataka	2008	1.0%	1.00%	1.0%	0.25%	0.25%	7.25%	7.25%	7.25%	7.25%
Kerala	2006	5.0%	5.0%	5.0%	5.25%	5.25%	5.25%	5.25%	5.25%	5.25%
Madhya Pradesh	2008		10.0%	11.0%	0.80%	2.50%	4.0%	5.50%	7.0%	
Maharashtra	2006	4.0%	5.0%	6.0%	6.0%	7.0%	8.0%	9.0%	9.0%	9.0%
Manipur	2010				2.0%	3.0%	5.0%			
Mizoram	2010				5.0%	6.0%	7.0%			
Meghalaya	2010				0.50%	0.75%	1.0%			
Nagaland					6.0%	7.0%	8.0%			
Orissa		3.0%	3.0%	4.0%	5.0%	5.0%	5.50%	6.0%	6.50%	7.0%
Punjab	2007	1.0%	1.0%	2.0%	2.4%	2.86%	3.44%	3.94%	4.0%	
Rajasthan	2006#	4.28%	6.25%	7.5%	8.5%	9.50%				
Tamil Nadu	2006	10.0%	10.0%	13.0%	10.15%	9.05%				
Tripura	2010				1.0%	1.0%	2.0%			
Uttarakhand		5.0%	5.0%	8.0%	10.0%	11.0%				
Uttar Pradesh		7.5%	7.5%	7.5%	4.0%	5.0%	6.0%			
West Bengal	2005			4-6.8%	2.0%	3.0%	4.0%			

Appendix B. Statewise Electricity Consumption and RPO Obligation

STATE/U.TS	TOTAL - ELECTRICITY DISTRIBUTION (GWH)	CAPTIVE GENERATION (GWH)	2010-11 RPO OBLIGATION	RPO OBLIGATION (GWH)
Andhra Pradesh	73,544.0	6,707.3		-
Arunachal Pradesh	255.1	-		-
Assam	3,829.9	1,647.6	1.40%	76.7
Bihar	6,613.4	252.7	1.50%	103.0
Chhattisgarh	15,974.6	5,618.9	5.00%	1,079.7
Delhi	24,575.6	0.8	2.00%	491.5
Goa	3,835.3	61.4	1.00%	39.0
Gujarat	66,582.9	27,885.6	5.00%	4,723.4
Haryana	27,485.0	1,716.9	1.50%	438.0
Himachal Pradesh	7,555.1	99.2	10.01%	766.2
Jammu & Kashmir	6,067.1	5.5	1.00%	60.7
Jharkhand	17,140.0	5,421.9	2.00%	451.2
Karnataka	51,529.9	5,369.1	0.25%	142.2
Kerala	17,746.7	505.1	5.25%	958.2
Madhya Pradesh	35,508.2	5,033.0	0.80%	324.3
Maharashtra	102,247.2	7,386.1	6.00%	6,578.0
Manipur	297.1	-	2.00%	5.9
Meghalaya	1,344.5	127.5	0.50%	7.4
Mizoram	270.1	-	5.00%	13.5
Nagaland	275.0	-	6.00%	16.5
Orissa	17,007.0	13,898.2	5.00%	1,545.3
Punjab	44,984.6	1,198.3	2.40%	1,108.4
Rajasthan	35,608.9	7,116.4	8.50%	3,631.7
Sikkim	391.7	-		-
Tamil Nadu	79,702.4	9,170.7	10.15%	9,020.6
Tripura	598.8	-	1.00%	6.0
Uttar Pradesh	56,491.6	11,863.1	4.00%	2,734.2
Uttarakhand	7,128.6	664.7	10.00%	779.3
West Bengal	39,507.5	2,368.5	3.00%	1,256.3
A.& N. Islands	225.5	-	1.00%	2.3
Chandigarh	1,741.7	5.9	1.00%	17.5
D. & N. Haveli	4,403.8	11.3	1.00%	44.2
Daman & Diu	1,933.9	1.3	1.00%	19.4
Lakshadweep	36.3	-	1.00%	0.4
Puducherry	3,118.7	229.7	1.00%	33.5
Total All India	**869,924.5**			**36,357.4**