IMPLEMENTATION OF THE RENEWABLE ENERGY CERTIFICATE (REC) FRAMEWORK IN INDIA

SHORT-TERM SOLUTIONS

SHAKTI
SUSTAINABLE ENERGY
FOUNDATION

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ABBREVIATIONS

AD	Accelerated Depreciation
APPC	Average Power Purchase cost
CCGT	Combined Cycle Gas Turbine
CERC	Central Electricity Regulatory Commission
CGP	Captive Generating Plant
CUF	Capacity Utilization Factor
C-WET	Centre for Wind Energy Technology
EA 2003	Electricity Act 2003
EU	European Union
FiT	Feed in Tariff
GBI	Generation Based Incentive
GHG	Green House Gas
GoI	Government of India
IEGC	Indian Electricity Grid Code
IPPC	Incremental Power Purchase Cost
IREDA	Indian Renewable Energy Development Agency
ISTS	Inter State Transmission System
JCC	Japan Customs-cleared Crude
JNNSM	Jawaharlal Nehru National Solar Mission
LBNL	Lawrence Berkeley National Laboratory
MNRE	Ministry of New & Renewable Energy
MW	Megawatt
NAPCC	National Action Plan on Climate Change
NCEF	National Clean Energy Fund
PoC	Point of Connection
PPA	Power Purchase Agreement
RE	Renewable Energy
REC	Renewable Energy Certificate
RET	Renewable Energy Technology
RLDC	Regional Load Dispatch Centre
ROE	Return on Equity
RPO	Renewable Purchase Obligation
SERC	State Electricity Regulatory Commission
SLDC	State Load Dispatch Centre
STU	State Transmission Utility
UI	Unscheduled Interchange

1. BACKGROUND AND CONTEXT OF THE STUDY

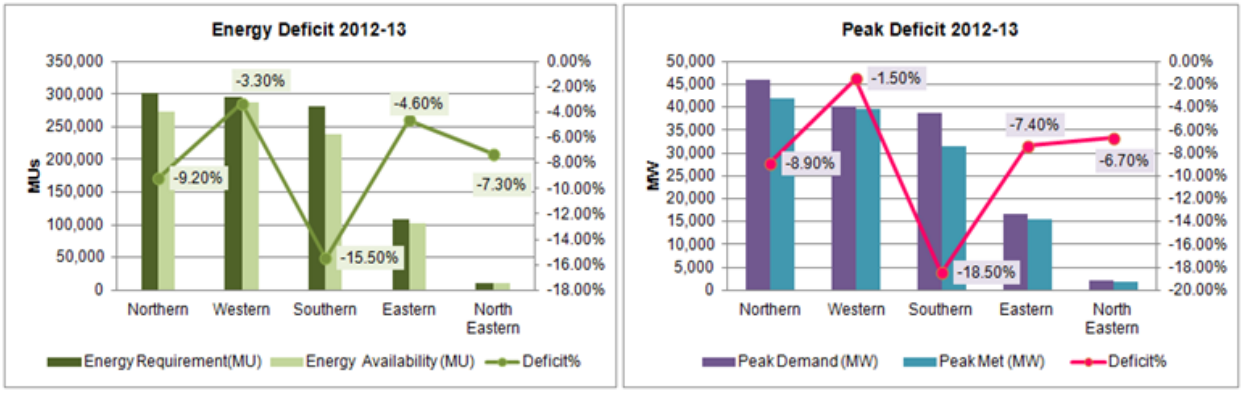
1.1. INTRODUCTION

The world today fulfils its energy requirements from a wide array of energy sources. Fossil fuels continue to remain dominant sources of energy, primarily because they are relatively inexpensive and conveniently available, are energy rich, and the global infrastructure today is well positioned to use them.

Nonetheless, given the concerns over the possible long term supply constraints of conventional oil & gas and coal supplies, the geographical distribution of these resources and increased urgency attached to assuage the Green House Gas (GHG) emissions, it is of utmost importance to explore and understand the various other viable alternatives to conventional energy.

Inspite of significant conventional power capacity addition in India in XI plan (2007-13), the gap between demand and supply continued to feature strongly, as is apparent from the charts below.

Figure 1: Energy Deficit and Peak Deficit in 2012-13



Source: CEA (Central Electricity Authority) Power Supply position

Future demand projections (as per the 18th Electric Power Survey published by the Central Electricity Authority) show a consistent growth in power demand during the XII plan.

Table 1: Demand Growth Projections from 2012 to 2017 as per 18th EPS (Billion Units)

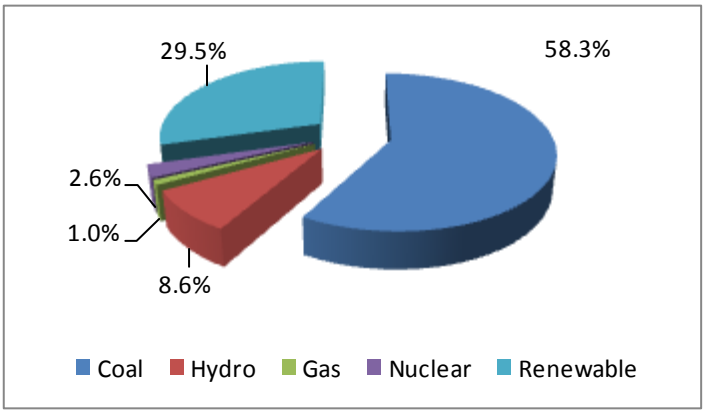
Region	2011-12	2016-17	CAGR (%)	Overall Growth (%)
Northern Region	276	415	8.5%	50.2%
Western Region	272	390	7.5%	43.5%
Southern Region	253	364	7.5%	43.9%
Eastern Region	106	163	9.0%	53.9%
North Eastern Region	11	16	7.7%	44.7%
All India	918	1349	8.0%	46.9%

Source: 18th Electric Power Survey, Central Electricity Authority

In order to meet the above projected energy demand, the Government of India (GoI) has announced a conventional power capacity addition target of 75,785 MW in the XII plan, of which 62,695 MW[1] is coal based capacity.

Figure 2 indicates the technology-wise break-up of the XII plan capacity addition.

Figure 2: Capacity contribution by various technologies to XII plan capacity addition



Source: CEA

The coal based capacity envisaged for the XII plan will require an additional 344 MT of coal besides the existing requirement from the existing generating stations (~512 MT), taking the total coal requirement to a level of 856 MT by the end of XII plan.

This is a very significant challenge. Our research indicates that production of domestic coal has been insufficient even for existing plants, and incrementally cannot cater to more than 5-6 GW per year. Even with blending (which is constrained by technical factors), a large part of the capacity is likely to be stranded, even if built. In all, about 17 GW of coal based capacity constructed or under construction face the prospect of being stranded. In addition, about 10 GW of gas based capacity also faces stranding. New capacity based on coal (other than those in the construction pipeline) is unlikely to materialize on the desired scale.

The gap between requirements and likely achievements (or availability after fuel constraints being reflected) sets the stage for other available options. Renewable energy (RE) has the ability to fill a significant part of the anticipated shortfall.

Today India is fast becoming one of the world's most attractive markets for Renewable Energy (RE) investments. India's rise has been due to the effective policy and regulatory support for development of Renewable Energy Technologies (RETs). Various policy measures such as Jawaharlal Nehru National Solar Mission (JNNSM), Feed-in-Tariffs, Accelerated Depreciation (AD), Generation Based Incentives (GBI), Renewable Purchase Obligations (RPO) and Renewable Energy Certificates (RECs) have helped in the rapid growth of RE in the country.

[1] The 62,695 MW coal based capacity for the XII plan considered in this report is based on figures announced by the Government of India. This excludes several other plants which are already at advanced stage of planning and are likely to be commissioned within the XII plan period.

As a result, the country's RE sector has registered a significant growth in the last four years. Year-on-year RE capacity addition has increased from 200MW – 300MW from early 2000s to 2,000MW-3,000MW or more in the last four years.

However, a significant part of the total RE potential is yet to be utilized. A comparison of wind energy potential at the national/state level indicated through various studies is shown below:

Table 2: National/State Level wind Energy potential

Study /Source	Potential Indicated
MNRE (CWET) – National	102 GW at 80m hub height
LBNL - National	219GW revised subsequently to 2006 GW – 3121 GW at 80 to 120m hub heights
TERI – Gujarat	304GW (non-crop land) and 858GW (only crop land)
WISE – Tamil Nadu	69GW (80m hub height) 113GW (100m hub height) 169GW (120m hub height)

According to MNRE statistics, only 19,051.45 MW of wind energy capacity has been commissioned till 31.03.2013. Hence, it indicates a large potential available for development. Similarly in solar, the current capacity of 1,686.44 MW (as on 31.03.2013) is only a small fraction of the overall potential in the country.

Even as various studies have indicated significant renewable energy potential and also investor interest, the constraints to renewable energy development are significant. These include *supply side constraints* relating to land acquisition, obtaining clearances, access to infrastructure, manufacturing capabilities, logistics, and also commercial constraints that limit the realisable potential. Issues related to availability of balancing energy, commercial arrangements for settlement, etc also serve as limiting factors. Potential *demand side constraints* are largely related to the need for electricity and the desire and ability to pay for the renewable energy generation.

Supply side aspects can be addressed principally through policy and regulation while demand pull can be provided through mechanisms such as RPO and providing adequate support to states to comply with RPO targets[2].

1.2. STUDY CONTEXT

The Electricity Act, 2003 (the Act) has brought about a substantial change in the way India approaches the expansion of RE in the electricity supply mix in the country. As compared to a framework driven by fiscal incentives and subsidies for generation projects, the Act emphasises market expansion by renewables by creating a quota for RE in the electricity procurement mix in the areas of the distribution licensees. Section 86 (1) (e) of the Act requires the State Commission to fix the RPO in this regard.

[2] Refer Annexure 1 for Solar and Non-solar RPO targets

Subsequent to the EA 2003, the *National Action Plan on Climate Change (NAPCC) aims to derive 15% of India's energy requirements from renewable energy sources (non-solar) by the year 2020, and the National Tariff Policy requires SERCs to set solar RPO (SPO) targets starting from 0.25% by 2012-13 to 3% by 2022.* Subsequently, most of the states have come up with RPO regulations for both solar and non-solar technologies. Hence, incentives for generation are not only driven from supply side, but also from demand side for large scale market creation through RPO/SPO.

To provide an alternative route (in addition to direct purchase of power from RE sources) for compliance of RPO, Central Electricity Regulatory Commission (CERC), in January 2010, introduced REC regulations to create a pan-India market for renewables through REC trading mechanism. This mechanism also aimed to help Obligated Entities especially RE resource deficit states, and captive consumers to fulfil their RPO obligation. REC trading mechanism has been in operation for more than two years.

The formulation of RPO/SPO has created a new market framework for RE; the REC market in particular. The REC market, while providing a novel platform for propagating RE projects, faces several transition challenges which emanates from the relatively higher cost of power procurement from renewables, variability of generation requiring significant operational flexibility in utilities, transmission availability and costs. Some power-starved states as well as utilities are willing to buy power instead of purchasing RECs. Financial institutions are also hesitant in lending to projects based on RECs. There have also been cases where the REC mechanism has given way to extra/ supernormal profits to certain generators. Thus, in the current format, applicability of this mechanism is a matter that requires attention.

Thus, there is a need to understand which one (or a combination) of the frameworks is best suited to the Indian RE sector, for its overall growth.

Shakti Sustainable Energy Foundation has appointed Mercados Energy Markets India Private Limited ("**Mercados**") to analyze the barriers to implementation of the REC framework in specific, while analyzing the various frameworks, and to suggest the way forward.

1.3. SCOPE OF WORK

To address the barriers to implementation of the REC framework, Mercados is required to undertake the following activities:

1. Identifying and weighing pros and cons of co-existence of multiple routes of renewable energy trading and renewable purchase obligation (RPO) compliance, including preferential tariff, renewable energy certificates (RECs), open access, direct purchase etc.
2. Comparing REC mechanism and preferential tariff as viable options from the point of view of various stakeholders (developers, buyers regulators, others).
3. Analyzing and making recommendations on the following REC design aspects (including implementation and operational aspects of feasible alternatives):
    a. Eligibility: Generator only and PPA at a price not exceeding APPC; captive power producers (CPPs); distribution companies (Discoms); Off-grid generators; Others
    b. Trading platforms: Power exchange only; forward markets; secondary markets, hedging, aggregators; other service providers and other options

c. Provider of last resort

d. Pricing of RECs: Relevance of floor and forbearance price; Basis of determining floor and forbearance price (if required) in view of rising trend of APPC and reduction of RE tariff; Long-term visibility of REC price bands; Balancing between and safeguard against supernormal profits and negative cash flow.

4. Suggesting ways to tailor REC markets in order to encourage participation of voluntary buyers.
5. Drawing international experiences and examples (especially US and relevant European countries)
6. Discussions with key stakeholders in India on all above aspects
7. Recommend suggestions and way forward on all above aspects.
8. Illustrating the proposed alternatives/mechanisms with the help of case studies.

Mercados has worked closely with Forum of Regulators (FoR) secretariat on identifying various issues and recommend the way forward. These issues may need varying amount of time to be addressed depending upon the level of stakeholder consultation/engagement required, and complexity of institutional & commercial issues to be addressed.

This report identifies and proposes possible solutions to issues, in the existing REC framework, which can be addressed in the short term. The Medium/Long Term issues require detailed stakeholder consultation and hence will be taken into consideration in due course of time.

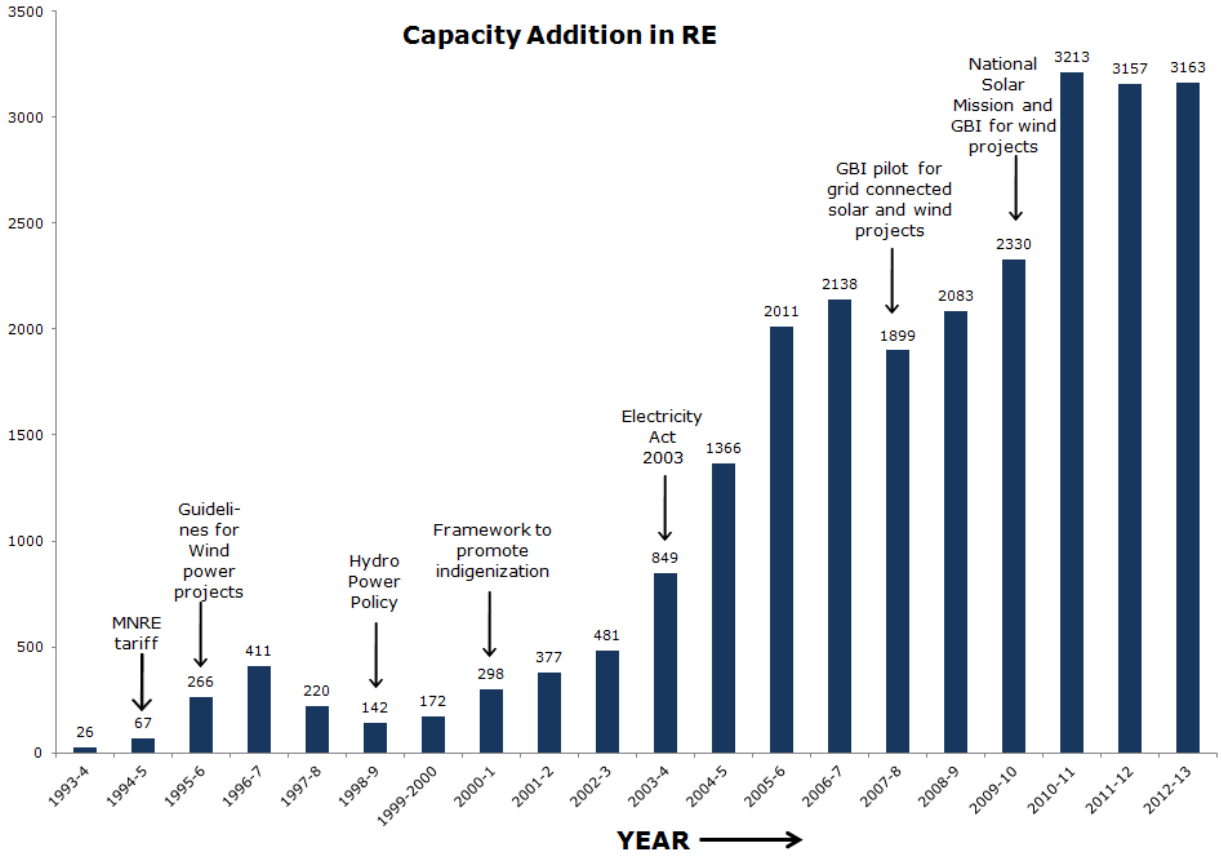
2. ASSESSMENT OF RENEWABLE ENERGY DEPLOYMENT

2.1. HISTORICAL GROWTH TRENDS

In order to meet the demand supply gap and reduce reliance on conventional fossil fuel based power generation, GoI, has introduced several policies to provide a supply push to increase renewable energy capacity addition.

The following chart shows the historical growth of RE (including wind, biomass, co-gen and SHP) since 1993-94 till 2012-13.

Figure 3: Historical Growth in Grid Based Renewable Energy in India (in MW)



As can be seen from the table below, the renewable energy sector has been growing at a healthy rate. RE capacity addition during the X plan itself was nearly twice the cumulative capacity added till IX Five year plan. As it is evident from the table below, ***the total capacity addition in the XI plan surpassed the target set for XI plan.*** The cumulative achievement till 31st March 2013 is also given in the following table.

Table 3: MNRE capacity addition target and achievement

Capacity Addition (MW)						
Resource	**Potential (MW)**	**Upto IX plan - Achievement**	**During X plan – Achievement**	**Target for XI Plan**	**Achievement during XI plan**	**Cumulative achievement up to 31.03.2013**
Wind Power	48,500	1,667	5,427	9,000	9,085	19,051
SHP	15,000	1,438	538	1,400	1,324	3,632
Bio-Power*	23,700	390	795	1,780	1,985	3,698
Solar Power	20-30MW/Km^2	2	1	50	481	1,686
Total		**3,497**	**6,761**	**12,230**	**12,871**	**28,068**

**Bio-power includes biomass power, bagasse cogeneration, urban & industrial waste to energy*

Source: MNRE Annual Report 2010-11, MNRE

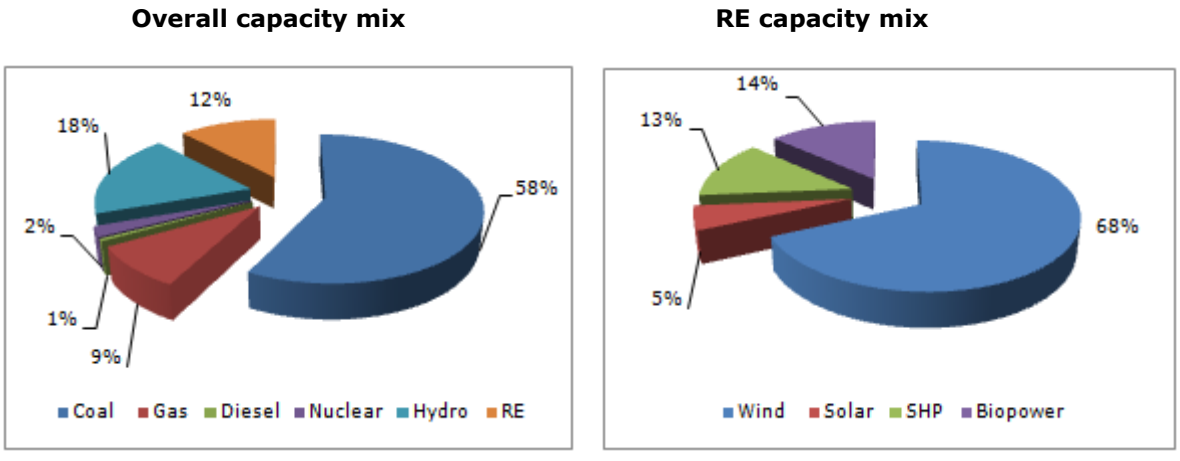
The above growth trend indicates the scope for large scale RE development. However, in electricity generation terms, the contribution has been relatively low at about 4%-5% for 2011-12.[3]

2.2. CURRENT STATUS OF RE DEVELOPMENT

Total installed capacity of power generation projects in India was 2, 25,133 MW (as on 31.05.2013), of which 68% is contributed by thermal power generation (which includes coal, gas, and diesel).

Renewables contribute about 12% (~28,068 MW), as shown in the figure below. Out of total RE capacity, wind power contributes almost 73% of the total RE capacity in the country.

Figure 4: Installed Capacity Mix



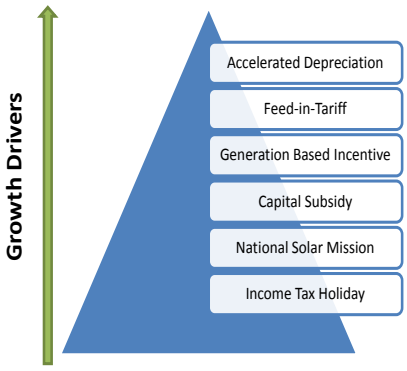
Source: CEA (As on 28.02.2013)

[3] CEA; Monthly Generation Report (Renewable Energy Sources) 2012-13 (August 12)

2.3. DRIVERS OF GROWTH

The growth of RE in India has been catalysed by several Acts, policies and institutional measures that have been implemented over the past few years especially post EA 2003.

Figure 5 : Growth Drivers



The following are major drivers of growth of renewable energy in India.

Accelerated Depreciation (AD): The Government of India allowed renewable energy based power producers to claim accelerated depreciation at the rate of up to 80% in the first year on a written-down value (WDV) basis under Section 32, Rule 5 of the Income Tax Act. This was the most significant driver of renewable energy capacity addition in the past. However, this has resulted, to some extent, in mushrooming of players with the purpose of off-setting income from other business to claim tax benefits rather than actual production of electricity. However, AD for wind power projects has been withdrawn recently to attract attention from more serious players for development of renewable energy.

Generation based incentives (GBI): The Government of India along with IREDA as the nodal agency, had introduced a scheme for grid interactive wind power projects which provided an incentive of Rs 0.50 per kWh, with cap of Rs.15 lakhs per MW per year, totalling Rs.62.5 lakhs per MW to be availed for a minimum of four years and maximum of 10 years. The scheme was however limited to a capacity of first 4,000 MW commissioned through GBI on or before 31.03.2013. As on 4.5.2012, out of 4,000MW, total capacity registered under GBI is approx. 1,605 MW (Source: IREDA). Recently the Central Government withdrew GBI benefit for wind projects. This has significantly slowed down wind energy capacity addition.

Subsidy in equipment imports: Some technologies like small hydro, biomass and solar PV (off-grid) systems are provided support through capital subsidy based on installed capacity. For example, MNRE provides a capital subsidy of 30% for off-grid and decentralized solar photovoltaic (PV) applications.

National Solar Mission: The Mission has set an overall target of installing 20,000 MW of solar power by 2022 in 3 phases - first phase up to 2012-13, second phase from 2013 to 2017 and the third phase from 2017 to 2022. The mission targets a capacity 1,000 MW of grid-connected solar power generation by 2013 and 4,000MW by 2017. It is further envisioned that the solar capacity addition could reach 10,000 MW by 2017 and 20,000MW by 2022. JNNSM targets, including grid connected, off-grid application and for solar collectors, are provided in the table below.

Table 4: JNNSM Targets

S.No.	Application Segment	Targets		
		Phase-1 (2010-13)	Phase-2 (2013-17)	Phase-3 (2017-22)
1	Utility grid power, including roof top	1,000-2,000 MW	4,000-10,000 MW	20,000 MW
2	Off grid solar applications	200 MW	1,000 MW	2,000 MW
3	Solar collectors	7 million m^2	15 million m^2	20 million m^2

Income Tax Holiday: Section 80-IA of the Income Tax Act offers a 10-year consecutive tax holiday period within a block of first 15 years during the life cycle of all infrastructure projects which also includes renewable energy power generation projects.

Feed-in-Tariff: Central and State Electricity Regulatory Commissions have notified wind, biomass and small hydro specific feed -in-tariff for electricity generated from such RETs. Also, state specific tariffs for solar (in states such as Rajasthan, Gujarat, MP, and Karnataka) have been announced. Such preferential tariffs have provided attractive returns to investors leading them to set up projects in various states.

All the above policy measures that have been largely driven by fiscal incentives and subsidies have resulted in growth of RE supply. However, such measures, in isolation, may not help in large scale development of RE.

2.4. RE CAPACITY ADDITION TARGETS

According to the Working Group Report on New and Renewable Energy for the XII plan, the GoI is also considering very aggressive plans to add about 6,000MW (on average) of RE capacity on an annual basis during the plan period.

Table 5: MNRE capacity addition plans

Resource	2012-13	2013-14	2014-15	2015-16	2016-17	Total 12th Plan
Wind	2,500	2,750	3,000	3,250	3,500	15,000
Solar	1,000	1,000	2,000	2,500	3,500	10,000
Biomass	350	625	825	950	1,300	4,050
SHP	350	400	400	450	500	2,100
Waste to Energy	40	60	100	100	200	500
Tidal/Geothermal	1	2	3	4	4	14
Total	**4,241**	**4,837**	**6,328**	**7,254**	**9,004**	**31,664**

Source: Working Group Report on New and Renewable Energy for the 12th plan

To be able to fulfil such capacity addition targets, it is important to create, in addition to supply side push, demand pull as well which will result in better pricing of power from RE.

Hence, market creation remains the overwhelming emphasis of the policy makers. In this regard, RECs will act as an important instrument in enabling Obligated Entities (especially resource deficient states, and captive consumers) in fulfilling their RPO targets.

In spite of favourable policies and regulations, there are few barriers that need to be overcome to sustain the growth of RE sector and be able to achieve capacity addition targets. These barriers are discussed in the next chapter.

3. BARRIERS IN RE DEPLOYMENT – SUPPLY SIDE & DEMAND SIDE BARRIERS

The need for enacting policies to support growth and development of renewable energy is often attributed to a variety of barriers that prevent investments in such technologies. These barriers lead to renewable energy being subject to an economic, regulatory, or institutional disadvantage relative to other forms of energy supply. The barriers include, but are not limited to, transmission constraints for evacuation of renewable power, large gestation period for getting approvals & clearances, concentration of supply in few pockets, infirm and seasonal nature of the resource, higher initial capital costs, imperfect resource assessment, imperfect markets, technology prejudice, poor credit health of the utilities, financing risks, and a variety of regulatory and institutional factors.

Various forms of renewable energy demonstrate different characteristics, which make it imperative to design the policy, regulatory and commercial framework around these characteristics. The technical approaches to support RETs also need to be aligned to the nature of the resource, and the barriers encountered in the deployment of these resources.

3.1. SUPPLY SIDE BARRIERS

The following table identifies some of the supply barriers that affect the large scale deployment of the key RETs in India.

Table 6: Supply side barriers affecting large scale deployment of renewable energy

Parameter	Wind	Solar	SHP	Biomass
Manufacturing Capability	X	X	X	X
Transmission Constraints	XXX	X	X	-
Infirm Nature	XXX	X	X	-
Seasonal	X	-	X	-
Access to site	X	-	X	-
Logistics	X	-	-	-
Clearances	X	-	-	-
Resource quality & reliability	X	X	X	XXX
Cost of Power delivered	-	XX	-	X
Improper resource utilization	XX	-	-	X

Note – "XXX" denotes a very significant barrier; "X" indicates lesser barriers. Depending on the developments on technology and policy, these barriers evolve over time.

Analysis of some of the above aspects reveals the following:

Manufacturing Capability

The local manufacturing capabilities for renewable energy are evolving rapidly. The wind turbine generator (WTG) technology has evolved very rapidly. State-of-the art technologies are now available in the country for the manufacture of wind turbines. All the major global players in this field have their presence in the country. The unit size of machines has gone up from 55-100kW in the 1980s to 2MW. Wind turbines are being manufactured by 17 manufacturers (Source: CWET) in the country. The technology is moving towards better aerodynamic design; use of lighter and larger blades; higher towers; direct drive; and variable speed gearless operation using advanced power electronics. There is continuous development happening on technology for local conditions as increasingly the developers are demanding the same. *Hence manufacturing per-se is not anticipated to be a serious constraint*.

Over the past few years the solar PV industry has also gained momentum. Buoyed by favourable policy environment ushered by the JNNSM and favourable policies in states like Gujarat, the solar PV industry is developing rapidly. This development brings enormous prospects for domestic industry for manufacturing, assembly, construction and management. The latter is important since solar PV, as an emerging VRE will require attention to manage the technical challenges arising from variability and generation characteristics including harmonics. Manufacturing will also have to pursue cost reduction and quality management actively to meet the standards of performance and also compete with imports. *The industry has to gear up to these technological challenges, which are not insurmountable*.

Development Constraints (*Land Acquisition, Clearances, Access Logistics, Transmission, Human Resources, etc*)

The issues related to development constraints are more severe for wind as compared to solar. *There are significant issues related to land acquisition, consents and clearances (particularly where forest clearances are involved), access logistics, etc.* Even as India has an apparently large wind potential, the quality of wind varies considerably across the country and across areas in various states. The relatively superior sites (e.g., in Karnataka) are in forest areas. Apart from clearances, access to these sites for large capacity trailers and cranes is difficult. This places considerable limitations on the scale of development in such areas. Remote areas also have relatively poor grid access, limiting development. These aspects have been analysed in several reports, and have not been specifically addressed as a part of our work (which principally focuses on issues related to REC framework). We have however consulted various entities involved in project development, and the interactions reveal that the issues can be addressed progressively if there is a steady development pipeline. In other words, *the constraints can slow down the growth trajectory, but does not present an intractable challenge*.

Financing and Credit related issues

The renewable energy sector has been witnessing considerable financing interest, and lenders and investors (developers, private equity) have been favourably considering the sector. *The principal issues contended are those of creditworthiness of utility off-takers.*

In this context it is important to take note of the framework for sale of RE, which affects project revenues and cash flows. At the moment the following are in vogue:

I. Home state sale under Feed In Tariffs (FIT)

II. Open Access and Captive Sale (typically in the home state)

III. Combination of revenues from sale of power and Renewable Energy Certificates (REC).

The REC mechanism is new, but is fast gaining popularity. However it also faces some important challenges that need to be understood. Some of these issues are discussed in subsequent section in this report. It needs to be noted that the three methods indicated above largely retain the energy produced in the host state. However newer approaches are emerging that could cause the power generated to flow out of the host state as well. Typical examples include:

I. Sale through competitive power markets, including power exchanges

II. Sale under PPAs to other states where physically the energy is also delivered to the procuring state

Infirm & seasonal nature

Renewable power is characterized by extreme variations in output within a short period of time. At modest penetration levels, the variability (both short term & long term) of wind is dwarfed by the normal variations of the load. Electric power systems are inherently variable in terms of both demand and supply, but they are designed to cope effectively with these variations through their configuration, control systems and interconnection. Variation is not an issue for power system reserves used for balancing as long as variation in supply is much smaller than variation in demand i.e. at lower penetration levels.

However, at higher penetration levels, the infirm nature of renewable energy resource calls for adequate quick response back-up power to be available without which, power system integrity cannot be maintained. Such nature of wind and solar can disturb the day ahead economics and affect the power system operation in the grid in terms of voltage control, congestion management, transmission efficiency etc. With increase in variable energy penetration, maintaining grid stability will be a significant challenge which needs to be addressed. *Some of the possible solutions for managing the greater integration of variable resources may pertain to better forecasting & planning procedures, planning for and charging for integration of variable resources, sharing of cycling costs, scheduling and dispatch of renewable sources, creation of larger control areas, establishment of developed Ancillary Services market, imbalance settlement mechanism, creation of robust transmission infrastructure in resource rich areas and redesign of system operations.*

Cost of power delivered

Initially, high cost of renewable power was considered as a deterrent to the development of renewable energy. Over time the cost of RE has become competitive (and at instances cheaper) than some of the conventional alternatives. This is true for wind, small hydro and biomass. Even for solar, with growth in installed capacity and market development, the prices have come down significantly. With phase II of competitive bidding under JNNSM and impending competitive bidding in RE, the *tariffs are further expected to come down and should not be a barrier in future.*

Resource forecasting and utilization

Forecasting serves two purposes – (1) allows wind generators to take operational decisions which are aligned to market prices of energy, (2) allows the system operator to better plan ancillary services required to balance generation from VRE sources. The VRE generators are often compensated based on feed-in-tariff rates and hence there is little inducement for the generators to gain from better prices in the market. The second requirement is however critical for better grid integration. *The host states, as exemplified in states like Tamil Nadu and Rajasthan, often have to bear the brunt of high UI charges/ Load shedding / operation of high cost pumped storage based generators to manage variability of RE– especially when poor quality forecasts are used*.

Also, most of the wind resource assessment has used meteorological masts up to 50 m height. These heights are suitable for sub MW range turbines. As a first step in realizing wind potential, improved wind assessment needs to be carried out at heights more than 100m which would act as the basis for determination of suitable turbine size and design for optimum resource utilization.

In summary, the supply side issues are primarily linked to the certainty of the off-take pipeline, commercial arrangements and creditworthiness of off-takers. These are aspects to be addressed principally through policy and regulation.

However, addressing supply side barriers alone may not help us in achieving the RE growth targets and address various issues in creating a sustainable market for Renewable Energy. These efforts need to move along with efforts towards addressing demand side related issues discussed below.

3.2. DEMAND SIDE BARRIERS

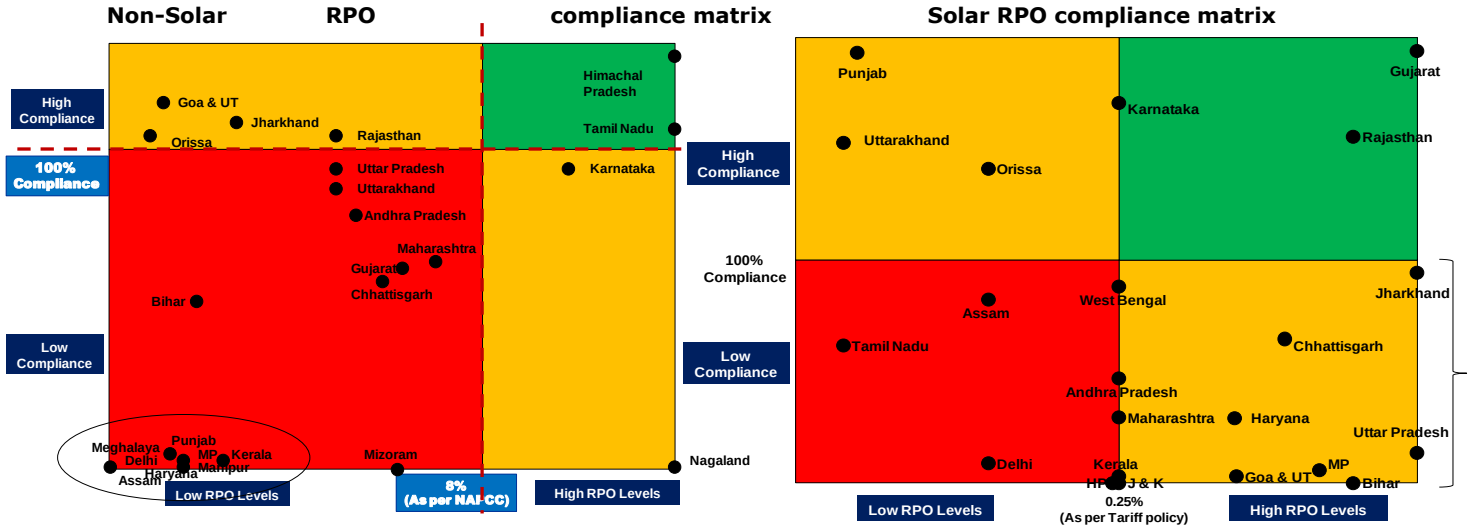
The most critical demand side barrier in the development of Renewable Energy is the enforcement of RPO.

The formulation of RPO/Solar Purchase Obligation (SPO) has created a new market framework for RE. However, RPO targets set by states do not have uniform trajectory and are not in conformity with NAPCC or Tariff Policy targets[4]*. The new market faces several transition challenges emanating from uneven distribution of resource in the country, relatively higher cost of renewables, variability of generation requiring great operational flexibility in utilities, transmission availability and costs.* Because of such issues, majority of states are not complying with their RPO targets, both for solar and non-solar obligations. States like Arunanchal Pradesh and Sikkim have not come up with their RPO regulations. The following compliance matrix illustrates the compliance level for both solar and non-solar.[5]

[4] State-wise total RPO target and solar RPO target are provided in Annexure 1

[5] Non solar RPO compliance matrix is based on latest approved ARR petitions. Solar RPO target compliance matrix is based information sourced from NVVN, MNRE, SNAs and publically available information.

Figure 6: RPO compliance matrix (for FY 2012-13)



Source: AF Mercados EMI Analysis

The above chart reinforces the fact that a large number of states have set RPO targets lower than National guideline target and the compliance level is lesser than the RPO target for most of the states. The lack of a framework for monitoring the RPO compliance on an on-going basis and lack of a mechanism for enforcement of penalties has resulted in states not complying with their targets.

Also, lack of incentive mechanism for states to comply with RPO targets is also hindering the growth of RE. In light of poor financial health of state utilities; resource rich states do not have any incentive to fulfil their own RPO and help resource deficient states in fulfilling their RPO compliance. Also, resource deficient states do not have any incentive to fulfil their RPO.

The table below identifies incentive needs for both resource rich and resource deficient states.

Table 7: Incentive needs for Resource rich state

Cost Elements	FiT Route	APPC Route
Energy Cost (FiT)	Yes	-
APPC cost	-	Yes
REC Cost	-	Yes
Transmission cost	Yes	Yes
Transmission losses	Yes	Yes
Balancing power cost	Yes	Yes

Resource rich states need to be incentivised:

- For fulfilling its own RPO (FiT route), and
- Helping resource poor states to fulfil their RPO target (APPC route).

Table 8: Incentive needs for Resource deficient state

Cost Elements	FiT Route	IPPC[6] Route
Energy Cost (FiT)	Yes	-
APPC cost	-	-
REC Cost	-	Yes
IPPC	-	Yes
Transmission cost	Yes	Yes (Supply state)
Transmission losses	Yes	Yes (Supply state)
Balancing power cost	Yes	-

Resource deficient states need to be incentivised to fulfil their own RPO targets.

The REC market presently contributes about 0.5% of India's overall electricity basket and about 10% of RE based electricity generation. However, as the penetration of RE increases, RPO compliance, in general, will face a greater challenge which needs to be overcome. REC market provides an alternative mode of RPO compliance and can help growth of RE provided certain issues – structural, commercial and economic – are addressed timely.

[6] IPPC refers to Incremental Power Purchase Cost. This is the cost of buying every incremental unit of power from generators.

4. CURRENT STATUS OF RENEWABLE ENERGY CERTIFICATE (REC) MARKET

The concept of Renewable Energy Certificate (REC) was introduced to:

I. Address the mismatch between availability of renewable energy sources and the requirement of obligated entities to meet their renewable purchase obligations in a cost effective manner.

II. Utilize the RE potential on a large scale

III. Undertake the procurement of RE in the most cost-effective manner

IV. Widen the base of the buyers and sellers of RE

V. Obviate inter-state transmission needs in form of a certificate

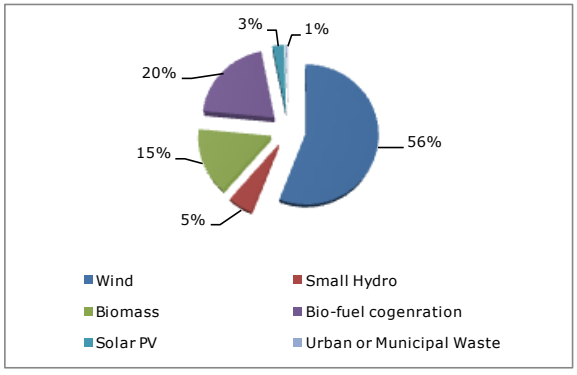
VI. Make procurement of green energy/attributes simple

REC mechanism aims at promoting additional investment in RE projects and to provide an alternative mode to the RE generators for recovery of their costs.

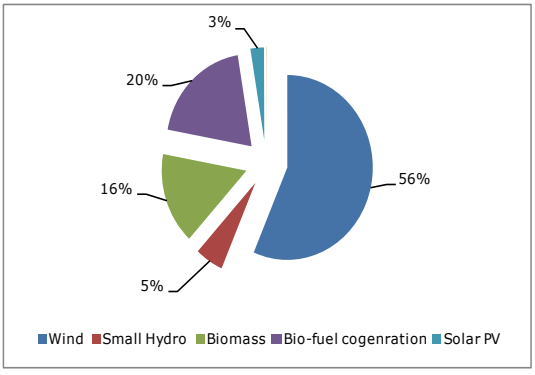
Experiences of REC transactions in the past two years have provided valuable insights into its operations. Several important milestones have been reached in the trading sessions for non-solar and solar RECs. A total of 3,873 MW of renewable energy generators have been accredited for REC out of which 3,505 MW of capacity has got registered as on 9th April 2013. Table 9 below provides a technology-wise break-up of capacity accredited and registered under REC mechanism till 9th April 2013.

Figure 7: Capacity Break-up of accredited and registered projects under REC scheme

Accredited Capacity Break-up



Registered Capacity Break-up



After the introduction of REC mechanism on 14th January 2010, nearly 6,300MW of RE capacity has been commissioned. Out of this, as of June 2013, 2,470.12MW (~39%) of the above ***new capacity*** which got commissioned after 14th January 2010 were registered under the scheme as shown in the table below:

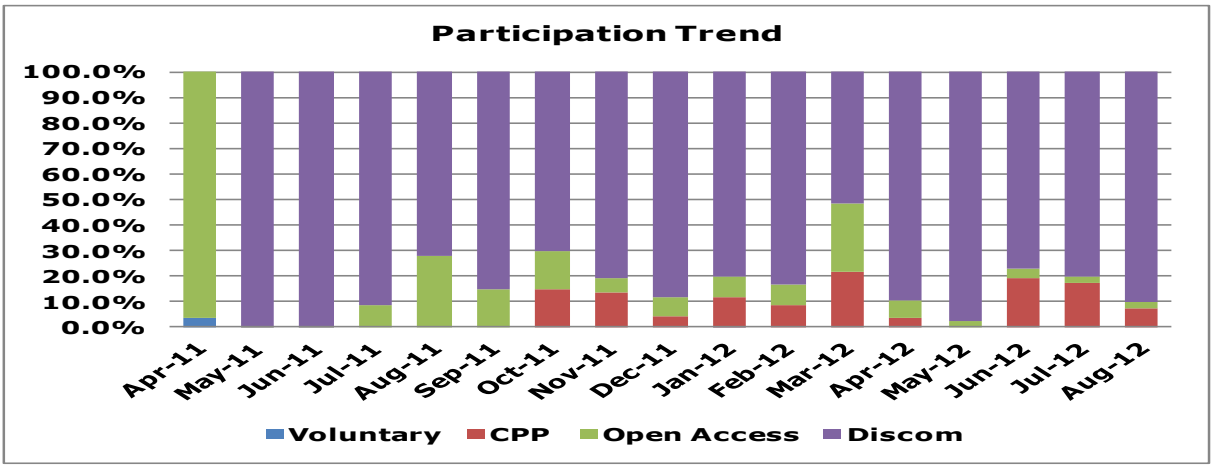
Table 9: Status of REC registered projects

Registered RE Projects commissioned up to 14.01.2010 and after 14.01.1010-under REC Mechanism							
S.No.	Energy Source	OLD (Commissioned up to 14.01.2010)		NEW (Commissioned after 14.01.2010)		Total	
		No. of Projects Registered	Capacity	No. of Projects Registered	Capacity	No. of Projects Registered	Capacity
1	Wind	117	281.08	413	1753.16	530	2034.24
2	Bio-fuel cogeneration	46	532.68	24	150.62	70	683.30
3	Small Hydro	5	47.50	17	140.00	22	187.50
4	Biomass	29	293.60	30	273.25	59	566.85
5	Solar PV			70	151.43	70	151.43
6	Others			1	1.67	1	1.67
	Total	**197**	**1154.86**	**555**	**2470.12**	**752**	**3624.98**

Source: NLDC as of June 2013

Also, **in terms of volume, demand for RECs has largely been from distribution companies as shown in the figure below; however few captive consumers are also participating. Most of the participating DISCOMS are private; government DISCOMS are still largely absent from the market.**

Figure 8: Participation trend (IEX) in REC market

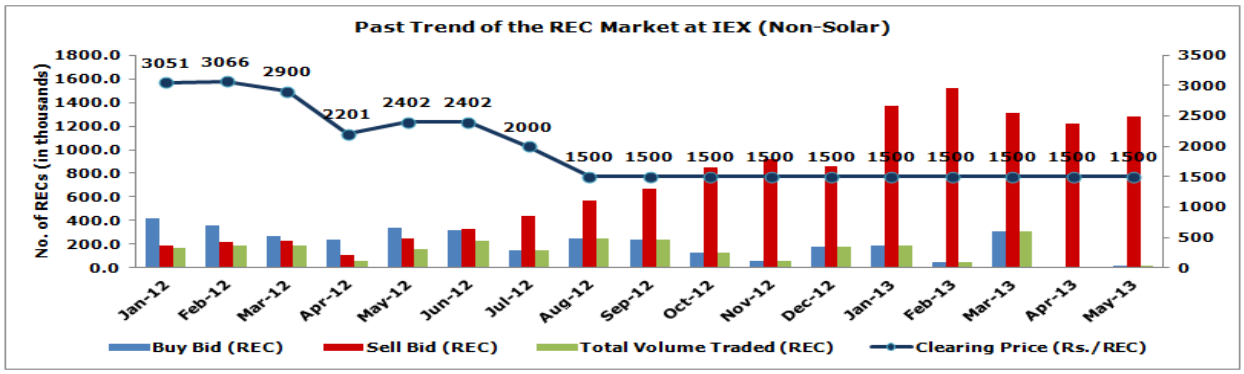


Even as the registrations are substantial and the initial volume growth has been encouraging, there are several important issues that need to be addressed.

One principal concern is on the REC prices that have come down considerably in the past few months as shown below. This raises questions about the economics of the project based on REC route and demand for REC for RPO compliance. Non solar RECs have traded at Floor price in the last few trading sessions and solar REC prices have also come down.

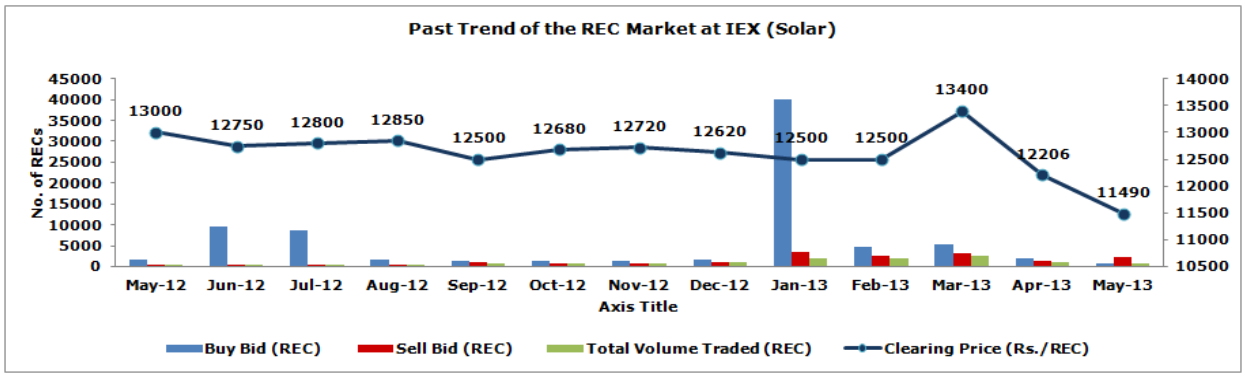
The graph below shows the pricing trends of both solar and non-solar.

Figure 9: Non solar REC Price & volume trend



Source: As on 31st May 2013, IEX

Figure 10: Solar REC Price & volume trend



Source: As on 31st May 2013, IEX

Gradual decline in REC prices is an indicator of lack of any compliance. Also, even when there is demand for RECs, the buyers are not willing to pay higher price, which is resulting in uncleared volume of RECs as shown in the table below.

Table 10: REC Trading summary

Month, Year	REC Issued	REC Redeemed
December, 2011	88,055	111,621
January, 2012	102,348	171,524
February, 2012	200,736	206,188
March, 2012	203,819	199,737
April, 2012	122,369	71,226
May, 2012	230,697	168,685
June, 2012	259,125	236,827
July, 2012	382,712	158,399
August, 2012	474,784	274,272
September, 2012	569,567	265,606
October, 2012	615,890	224,491
November, 2012	394,088	133,571
December, 2012	383,383	274,852
January, 2013	307,544	195,645
February, 2013	316,799	155,186
March, 2013	271,240	431,054
April, 2013	261,743	46,676
May, 2013	253,316	54,671

Source: recregistry.in

Contributing to the increase in inventory is the perception that the REC route of compliance is considered costlier than buying power directly from a RE generator as prices move away from floor price.

The root causes of the concerns relating to RPO and REC framework needs to be analyzed and appropriate actions need to be taken. The following section analyses some of the issues associated with REC framework which can be addressed in the Short Term. Issues to be addressed in Medium/Long term will be taken up in a phased manner as premature intervention may distort REC market.

5. ISSUES AND POSSIBLE SOLUTIONS – SHORT TERM

CERC had notified the Renewable Energy Certificate Regulations in January, 2010. The concept of renewable energy certificate was introduced which intended to address the mismatch between availability of renewable energy sources and the requirement of obligated entities to meet their Renewable Purchase Obligations. REC mechanism aims at promoting additional investment in the renewable energy projects and to provide an alternative mode to the RE generators for recovery of their costs.

Subsequently, CERC amended clause 5 of Principal Regulations in September, 2010 to provide clarity on applicability of the regulations and bring in certain essential checks and balances in the REC related process.

However, because of the issues discussed in the previous section and concerns raised by various stakeholders (discussed in section 5), there is a need to make further changes to the existing framework.

It needs to be noted that several of the issues are not in the domain of the Central Commission. The principal responsibility of determining the level of renewable energy in the distribution licensee's area, and enforcement of the same lies with the State Commissions, consequent to Section 86 (1) (e) of the Electricity Act, 2003, which requires the State Commission to "*promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licence*". The Central Commission, as a consequence of its roles for market development under section 66 of the Electricity Act, 2003 has created a market framework through the REC mechanism that would help compliance of the obligations set by the State Commissions across the country. It is proposed to strengthen the REC framework and remove the design issues and address ambiguities that may affect implementation, to the extent feasible and required. However the final implementation is in the ambit of State Commissions which must require the obligated entities in their jurisdiction to comply. Without meaningful obligations being established and the same being enforced, design changes per-se will not achieve desired results.

The issues related to existing REC framework can be classified under the following broad heads:

1. **Issues relating to design of the framework**, and removing some basic difficulties or problems that have been identified based on the implementation experience;

2. **Issues relating to implementation of the framework** that have resulted in lack of visibility of the future prospects in the eyes of the market participants – both buyers and sellers.

Within above categories of issues, several aspects have been identified that needs to be considered for review and dealt with appropriately.

Some of the issues identified are of great significance and would need to proceed along a logical path of progression. Addressing such issues would require very extensive consultation with State Commissions and the state level stakeholders.

Timing would be of essence in many such issues. Introduction of such changes prematurely may affect the REC markets adversely, and may also create distortions that would be difficult to undo subsequently.

Accordingly, the issues can be classified under the following heads:

(a) Issues requiring amendment in the ***short term***

(b) Issues requiring further consultation and potential amendment in the ***medium and long term***

Issues which are identified as short-term include issues related to APPC definition, Eligibility for RECs for captive generating plants (CGPs) availing Electricity Duty waiver, self consumption by RE generator other than CGP, eligibility for RECs for OEs, seasonal PPA for co-generation plants, CGP eligibility if it loses captive status, shelf life of REC, time period for REC issuance, non-uniform RPO levels, and REC issuance date.

These issues are mainly definitional and procedural in nature and can be implemented with limited stakeholder consultation as this only involves addressing infirmities and ambiguities in the existing regulations. Therefore, such issues are proposed to be addressed first to start the process. Thus, this report discusses only the short term issues related to the REC framework.

It needs to be noted that the CERC has already extended the life of the REC issued from one year to two years through its orders dated 11.02.2013 to partly address issues relating to expiration of RECs on account of low demand in the market. This is aimed at improving the confidence in the REC market without which it would have been affected further. However, there are a larger set of issues that would need to be addressed to bring about harmonious operation of the market and address the issues that beset it.

This following sub-section identifies the issues for near term resolution and discusses possible solutions.

5.1 Design Aspects

I. **APPC definition:**

a. Issue

The cash flow for the projects under the REC Scheme depends on the REC price discovered in the power exchange and the APPC rate allowed to them by the local DISCOM in a state. However, some state utilities are not procuring electricity component (for fulfillment of RPO obligation) at APPC because of the stipulation in CERC Regulation that the electricity

component is to be purchased at a price "not exceeding APPC". They have excluded short-term purchase of power for the determination of weighted average pooled price. In the event of purchasing electricity at the rate lower than the APPC rate, there could be a viability gap for the projects, especially in cases where the price discovered in the power exchange(s) is close to floor price.

b. Suggestion

To remove the ambiguity, it can be clarified that eligible entity should sell power to distribution licensee at previous year's pooled cost of power purchase. The expression "Not exceeding APPC" may be replaced by "at previous year's pooled cost of power purchase" to provide clarity in the eligibility criteria under CERC REC Regulations.

II. **Eligibility for RECs for CGPs availing waiver of Electricity Duty:**

a. Issue

One of the conditions of eligibility for issuance of REC on self consumption of electricity by a Captive Generating Plant (CGP) is "waiver of electricity duty". The electricity duty is a State Government specific subject and many states have exempted levy of electricity duty on captive consumption of CGP irrespective of fuel used. Such concession is given by the state as a policy decision to promote captive power plants in order to reduce gap between the demand and supply in their state. However, such benefits provided by the State Government have no effect on the revenue of licensees in any manner. It becomes a limiting factor for CGPs in such states for participation in the REC framework.

b. Suggestion

This eligibility criterion can be removed as such benefit provided by the State Government has no significant effect on the revenue of licensees in any manner.

III. **Self consumption by a renewable energy generator other than CGP:**

a. Issue

The REC Regulations stipulate that a CPP based on renewable energy sources shall be eligible for the entire energy generated from such plant including self consumption for participating in the REC scheme subject to the condition that such CPP has not availed or does not propose to avail certain benefits such as concessional/promotional transmission or wheeling charges, banking facility benefit and waiver of electricity duty. The Regulations are however silent on eligibility of issuance of REC in case of self consumption of a renewable energy generator other than CPP. Thus the eligibility conditions for availing RECs by CGP are different from the eligibility conditions required by other RE generators and these conditions cannot be made applicable to other RE generators. It is apparent from the above that a CGP should be treated differently from the other RE generators in so far as the eligibility for registration and issue of RECs are concerned.

b. Suggestion

The regulation may need to clarify the same by stipulating that a renewable energy generator that does not meet the requirement of being CGP shall be eligible for participating in the REC scheme provided it meets eligibility criteria for a renewable energy generator other than a CGP, even if a part of the energy generated is for self consumption since such generators are

no different from others generating for third party sale. The issue in this context is not the REC regulations, but the provisions of the EA 2003 regarding captive generation. The REC regulations need to be in alignment with the same and clarify the REC issuance rules in this regard.

IV. **REC eligibility for entities other than generators:**

a. Issue

Presently there is no incentive for distribution utilities to procure RE beyond RPO levels in conformance with the national objective of promotion of RE. But it is felt that the burden on consumers needs to be reduced through an alternative mechanism.

b. Suggestion

One of the mechanisms of mitigating this burden could be through entitlement of RECs to distribution utilities for purchasing RE power in excess of the specified RPO. Obligated entities may be eligible for RECs, upon approval by the appropriate commission, only for procuring renewable power beyond, say, 125% of the RPO target set by the Appropriate Commission. The distribution licensees may be required to identify such renewable energy generators and undertake the process of accreditation and registration and obtain the approval of the Commission for such purchases. Upon approval, Central Agency shall allow for vesting of the certificates of such renewable energy generators with the distribution licensee and such distribution licensee shall be free to sell the certificates in the market.

V. **Seasonal PPA in case of bagasse based cogeneration:**

a. Issue

Bagasse based co-generation power plants have been established for meeting mainly the self load requirement of sugar mills and selling of surplus quantum, if any. As per CERC's REC Regulations, an eligible RE Project for its capacity under REC Mechanism should not be having PPA at preferential tariff, and would also need to specify the MW capacity that would be registered for REC issuance. Accordingly, the capacity tied up under preferential tariff, even for a certain period in a year, is ineligible under REC Mechanism. The cogeneration plants have registered the plants for REC scheme to avail RECs only on self load; which is highly dependent on "Cane Crushing". Hence, in absence of "Cane Crushing" during off-peak season, the self-consumption quantum (REC Eligible quantum) also becomes negligible. Hence, capacity available for PPA based sales to the utility as per tariffs determined by the State Commission varies between seasons and between years, depending on the nature of the self consumption requirements of such co-generation units. However, these seasonal variations should not be allowed to impact the eligibility of RECs on actual self-consumption by such co-generation plants. In such cases, linkage to installed capacity presents an impediment under the present regulations.

b. Suggestion

To obviate this, biomass/bagasse based cogeneration projects may be made eligible for the issuance of certificates for the entire quantum of self consumption irrespective of capacity tied up under tariff.

VI. **Eligibility of a CGP for issuance of REC on self consumption, if it loses the status of CGP:**

a. Issue

According to Rule 3 of the Electricity Rules, 2005, no power plant shall qualify as a 'Captive Generating Plant' unless 26% of the ownership is held by the captive user(s) and not less than 51% of the aggregate capacity generated in such plant, determined on annual basis, is consumed for the captive use. However, it is observed that the CGP status of a generating plant is not static in accordance with the Electricity Rules, 2005 and it may vary from year to year depending on the amount of captive consumption. A captive plant which fails to achieve 51% of captive consumption in a year, its entire generation of electricity including captive consumption shall be deemed to have been supplied to the licensees or open access consumers. In that case, such a plant will have to fulfill eligibility conditions laid down in CERC REC Regulation to avail the benefits of RECs and will not be subject to the conditions required to be fulfilled by a CGP.

b. Suggestion

It can be clarified that a renewable energy generator that does not meet the requirement of being captive plant according to the Electricity Rules 2005, shall be eligible for participating in the REC scheme provided it meets eligibility criteria for a renewable energy generator other than a CPP and that the quantum of electricity generation utilized by such generator for self consumption shall be deemed to be sale of electricity by a generator to an open access consumer. As mentioned earlier, such issues are consequent to the provisions of the EA 2003 regarding captive generation. The REC regulations need to be in alignment with the same and clarify the REC issuance rules in this regard.

VII. **Time period for applying for issuance of REC:**

a. Issue

Presently, the REC Regulation has provision that the eligible entities shall apply to Central Agency for REC within three months after corresponding generation from eligible RE Projects. As per the approved detailed procedure, host SLDC shall provide Energy Injection Report to the Central Agency. However, the receipt of information to Central Agency from SLDC may take more than 3 months time due to lack of coordination among SLDC, distribution licensee and RE Generator.

b. Suggestion

This time period may be extended to, say, 6 months as the issuance of RECs is a time consuming process.

VIII. **REC not allowed from generation date but from registration date:**

a. Issues

Currently, RECs are allowed from date of registration only, not from date of generation. This may result in loss of revenue for the generator if the registration of RECs is delayed due to procedural issues.

b. Suggestion

There are legitimate reasons for consideration of the issue favorably, since the utility records clearly maintain the date of commissioning of the plant and its generation history. This can be evaluated by the Central Agency through review of detailed procedures that presently permit consideration of generation for REC issuance only from the date of registration.

IX. **Varying & low RPO levels:**

a. Issues

National Action Plan for Climate Change (NAPCC) and Tariff policy has provided guidelines for setting RPO targets at national level. NAPCC specifies that RPO target should increase from 5% in 2009-10 to 15% by 2020 while Tariff policy specifies that SPO should be 0.25% by 2013 and should reach 3% by 2022. However, states have set varying levels of RPO which is not in conformance with NAPCC or Tariff Policy. The primary reason for such non-confirmation is that RE power procurement, currently, is perceived costly and there are other issues pertaining to establishment of transmission infrastructure, balancing power cost and issues related to managing variable nature of renewable power.

b. Suggestion

This is a state level matter as per current legislation. Central Commission needs to pursue this through the Forum of Regulators and other appropriate forum to ensure that state targets are in accordance with guideline targets set by NAPCC and Tariff Policy.

5.2 Implementation Aspects:

I. **Use of word "preferential" in the eligibility criteria:**

a. Issue

Currently, REC regulations specify that RE generator selling electricity at preferential tariff rate shall not be eligible for issuance of REC. It is not clear that the renewable energy procured through competitive bidding would be eligible for issuance of REC as it may be argued that power procured through competitive bidding is not at preferential tariff. This may result in RE generators selling through competitive bidding route also eligible for RECs which may lead to super-normal profits.

b. Suggestion

The word "preferential" in the eligibility criteria can be removed to avoid ambiguity.

II. **Minimum capacity requirement for REC eligibility:**

a. Issues

According to statement of reasons for CERC (Terms and Conditions for recognition and issuance of Renewable Energy Certificate for Renewable Energy Generation) Regulations, 2010, grid connected RE Technologies with minimum capacity of 250 KW and approved by MNRE would be eligible for REC. However, the principal regulations are silent on the minimum capacity for eligibility.

Also, the unit of 1 MWh generation for issuance of RECs effectively limits the market, since small generators are effectively kept out of the ambit of REC issuance on account of this.

b. Suggestion

Even as the issues discussed above could be areas for future attention, there could be administrative issues in extending the REC framework to very small generators. Hence at this time the principal regulations may be required to specify the capacity threshold for registration. As the cost of administration reduces, the threshold can be progressively lowered.

III. **Retaining RECs for own compliance or for group companies:**

a. Issues

According to detailed procedure under REC mechanism, if a CPP wants to fulfill its own RPO, the CPP shall have to procure the REC from the CERC approved Power Exchanges only. All RECs in the market are extinguished through trading on the exchanges alone. This mandatory requirement of procuring RECs through power exchanges puts an additional cost burden, in the form of transaction cost, on the project developer.

b. Suggestion

To obviate this issue, project developer generating electricity from renewable energy source can be allowed to retain the number of REC's and trade them between entities for fulfillment of his own RPO subject to verification and certification from State Agency. In such case where a renewable energy generator retains certificates for its own compliance of obligations, such certificates shall be extinguished only after surrender of such certificates as per detailed procedures issued by the Central Agency. The procedures of the Central Agency would need to be changed to accommodate this.

IV. **Direct obligation on large consumers:**

a. Issues

Industrial, commercial and other large consumers consume a very significant proportion of the total electricity consumption in India. Hence, they contribute significantly towards RPO compliance requirements on utilities.

Direct obligation on large consumers may help in meeting a large portion compliance of the total RPO across all states. Also, this may obviate many issues related to RPO compliance including financial condition of utilities, compliance capabilities and enforcement of penalties. Certain states (e.g. Tamil Nadu) have already adopted this approach. However, issues related to infrastructure and process requirements for direct compliance by large customers – either on their own or through utilities – in terms of metering and communication, open access, energy accounting, settlement, etc needs to be addressed.

b. Suggestion

Direct obligation for RPO compliance is likely to improve the compliance of RPO on the whole and also provide a fillip to the REC markets since a significant proportion of the compliance requirements can be expected to be met through the REC mechanism. It is important to ensure right kind of monitoring and compliance processes for the implementation of such direct obligations in a fair, transparent and cost effective manner. Also, responsibilities of various entities in this regard needs to be defined and articulated in an appropriate manner.

As described above, a number of critical actions are contingent on enforcement of RPO, responsibility of which lies primarily with the State Commissions. It is important to engage with State Commissions through the FOR to evolve a more robust framework in this regard that allows for strengthening of the RPO and consequently the REC framework. **It would be extremely beneficial to set up a RPO registry at the state level that identifies obligations of all obligated entities (Discoms, CPPs, OA customers, large customers with direct obligations) and the monitors the same periodically. This function can be undertaken by the State Nodal Agency or the SLDC (typically the SLDC, as a repository of all transactions of electricity in the grid would be better equipped) and overseen by the a RPO cell/nodal officer at the SERC.** The SLDC can be compensated for the costs through the charges permitted to it. These costs are unlikely to significant in the overall context of operations of the electricity sector.

As mentioned, this report has dealt with the resolution of short term issues. There are a number of additional issues that will require structural changes in the REC market design. Such medium/Long Term issues shall include market distortion due to presence of Floor and Forbearance prices, lack of long term visibility of the REC market, need for a market support mechanism for REC, promotion of voluntary investments in RECs, REC entitlement for off-grid/standalone mode, bunching of compliance at the end of a year, fungibility between solar and non-solar RECs, incentives for buyer to comply and surpass RPO, provision of first right of refusal to local DISCOMs to buy the electricity under Feed-in-Tariff and the high cost of REC based compliance as compared to alternatives. After the implementation of the short term changes as mentioned in this report, **the actions identified for mid-term/Long term implementation would need to be taken up for further review and further modifications to regulations**. At that stage learnings from global experiences, in relation with renewable obligations and renewable energy trading certificates, also need to be reflected in resolving the issues.

A comparison of REC framework in UK, USA (California), Japan, and Australia is provided in Annexure 2.

6. CONCLUSIONS

Experiences of REC transactions in the past two years have indicated that the some of the impediments faced by the mechanism are due to definitional and procedural shortcomings, discussed earlier in the report, in the existing mechanism. **RPO compliance is the biggest challenge facing the mechanism.** Government DISCOMS are mostly absent from the market; most of the participating DISCOMS, though small in number, are private. Other OEs are also not complaint with their targets as there is no monitoring mechanism in place. Lack of compliance and price uncertainty has also resulted in lenders shying away from financing REC based projects. Another reason which has resulted in increasing inventory of certificates is that REC route of compliance is considered costlier than buying power directly from a RE generator as prices move away from Floor price.

To address issues in the existing framework, the regulators and other stakeholders would need to proceed along a logical path of progression. Timing would be of essence in many such issues. Introduction of such changes prematurely may affect the REC markets adversely, and may also create distortions that would be difficult to undo subsequently.

Therefore, issues which require definitional and procedural aspects to be addressed can be taken up in short term. Issues which require state level consultation, co-ordination between various government institutions and other stakeholders, market design changes, design of robust monitoring and verification mechanism, and change in existing policy provisions can be taken up in Long Term. **Since such issues need to engage stakeholders with divergent interests, they have been deferred and will be taken up in a phased manner.**

It is to be noted that several of the issues identified in the report have to be handled in unison and not in an isolated manner.

The following interventions will be needed in short term to address various issues of the existing framework.

1. **Forum of Regulators needs to take stewardship** in harmonising setting of RPO targets by various states as per NAPCC and Tariff Policy. Also, it is important that FOR should set up a model guideline for RPO monitoring and take initiatives in bringing states on a common platform for monitoring and penal mechanism for non-compliance.

2. **Direct obligation can be imposed on large customers**. This will obviate many issues related to RPO compliance including financial condition of utilities, compliance capabilities and enforcement of penalties. A significant proportion of the compliance requirements can be expected to be met through the REC mechanism. It is important to ensure right kind of monitoring and compliance processes for the implementation of such direct obligations in a fair, transparent and cost effective manner.

3. A RPO registry under the SLDC and overseen by the SERC can be introduced for compliance accounting and monitoring.

4. **Definitions and the usage of terms can be further clarified.** For example, the definitions and the usage of terms such as "APPC" and "preferential" (in relation to the eligibility criteria), need to be further defined to remove any ambiguity regarding their usage.

5. **RECs can be issued from the date of generation instead of the date of registration**, so that the resulting loss in case of project delay is minimized.
6. **Eligibility of RECs for self consumption** by plants other than CGP should be clarified.
7. **Captive Generating Plants availing Electricity Duty waivers provided by state should be eligible for RECs,** as this does not have material impact on the revenues earned by the licensee.
8. **Seasonal variation in self consumption for bagasse based co-gen plants** should not be allowed to impact the eligibility of RECs on actual self consumption. Hence, linkage to MW capacity presents an impediment for REC eligibility for such plants where self consumption largely depends upon amount of crushing required.
9. **The time period for applying for the issuance of RECs should be extended to six months** as it takes time for SLDC to provide Energy injection report to Central Agency. Also, co-ordination between various agencies takes some time.
10. **The minimum capacity of a project** in order to be eligible to receive RECs should be defined, under the REC Regulations specifically.
11. **DISCOMs can be made eligible for RECs,** if they purchase RE power in excess of their RPO requirements to mitigate the burden of RPO compliance and provide incentive.
12. Currently, REC trades are allowed only on approved exchanges. Hence, a RE based CPP can comply its RPO through an exchange only by incurring additional transaction cost which can be avoided if it is allowed to retain RECs from its own generation and trade them between entities for compliance.

The solutions discussed previously can have significant impact on the development of REC markets in the short run. Hence, the implementation of proposed measures should involve stakeholder discussions to assess all pros and cons to ensure issues of all stakeholders are considered before phased implementation.

7. ANNEXURE

Annexure 1:

Total RPO targets as per state RPO regulations are tabulated below:

State	2012-13	2013-14	2014-15
Andhra Pradesh	5.00%	5.00%	5.00%
Arunachal Pradesh	4.20%	5.60%	7.00%
Assam	4.20%	5.60%	7.00%
Bihar	3.50%	4.00%	4.50%
Chhattisgarh	5.75%		
Delhi	3.40%	4.80%	6.20%
JERC (Goa & UT)	3.00%		
Gujarat	7.00%		
Haryana	2.05%	3.10%	
Himachal Pradesh	10.25%	10.25%	10.25%
Jammu and Kashmir	5.00%		
Jharkhand	4.00%		
Karnataka	10.25% & 7.25%	10.25% & 7.25%	10.25% & 7.25%
Kerala	3.90%	4.20%	4.50%
Madhya Pradesh	4.00%	5.50%	7.00%
Maharashtra	8.00%	9.00%	9.00%
Manipur	5.00%		
Mizoram	7.00%		
Meghalaya	1.00%		
Nagaland	8.00%		
Orissa	5.50%	6.00%	6.50%
Punjab	2.90%	3.50%	4.00%
Rajasthan	7.10%	8.20%	
Sikkim			
Tamil Nadu	9.00%	9.00%	9.00%
Tripura	2.00%		
Uttarakhand	5.05%		
Uttar Pradesh	6.00%		
West Bengal	4.25%	5.30%	

>NAPCC Target in 2012-13

Solar RPO target as per state RPO regulation is tabulated below:

State	2011-12	2012-13	2013-14	2014-15
Andra Pradesh	0.25%	0.25%	0.25%	0.25%
Assam	0.10%	0.15%	0.20%	0.25%
Bihar	0.50%	0.75%	1.00%	1.25%
Chhattisgarh	0.25%	0.50%		
Delhi	0.10%	0.15%	0.20%	0.25%
JERC (Goa & UT)	0.30%	0.40%		
Gujarat	0.50%	1.00%		
Haryana	0.00%	0.05%	0.75%	
Himachal Pradesh	0.01%	0.25%	0.25%	0.25%
Jammu and Kashmir	0.10%	0.25%		
Jharkhand	0.50%	1.00%		
Karnataka	0.25%	0.25%		
Kerala	0.25%	0.25%	0.25%	0.25%
Madhya Pradesh	0.40%	0.60%	0.80%	1.00%
Maharashtra	0.25%	0.25%	0.50%	0.50%
Manipur	0.25%	0.25%		
Mizoram	0.25%	0.25%		
Meghalaya	0.30%	0.40%		
Nagaland	0.25%	0.25%		
Orissa	0.10%	0.15%	0.20%	0.25%
Punjab	0.03%	0.07%	0.13%	0.19%
Rajasthan	0.50%	0.75%	1.00%	
Sikkim	**Not Issued**			
Tamil Nadu	0.05%			
Tripura	0.10%	0.10%		
Uttarakhand	0.03%	0.05%		
Uttar Pradesh	0.50%	1.00%		
West Bengal			0.25%	0.30%

Annexure 2:

International Comparison of REC framework - UK, USA (California), Japan, and Australia

Parameter	United Kingdom	USA (California)	Japan	Australia
General	➢ Introduced in 2002, the Government announced its intention to reform the Renewables Obligation in 2006. Banding was introduced in 2009 to provide differing levels of support to groups of technologies depending upon their relative maturity, development cost and associated risk.	➢ In US, 29 states, Puerto Rico, and Washington, D.C., have adopted separate RPS policies. ➢ Another eight states have *non-binding goals* to increase the amount of renewable energy in the electricity generation mix ➢ RECs procured in the compliance market can be either bundled with electricity or unbundled		➢ In April 2001 the Mandatory Renewable Energy Target (MRET) was introduced as an instrument aimed at reducing both greenhouse gas emissions and developing the renewable energy industry. ➢ Presently, Renewable Energy Target (RET) requires that 20 % of Australia's electricity be produced from renewable energy sources by 2020
Accreditation and Registration	➢ Central Agency (OfGEM) is responsible for both Registration and Accreditation	➢ California Energy Commission is responsible for accreditation. ➢ No separate need for registration as only accredited generators can generate REC	➢ The Minister of Economy, Trade and Industry (METI) is responsible for accreditation. ➢ No separate need for registration as only accredited generators can generate	➢ Office of the Renewable Energy Regulator (ORER) is responsible for registration and accreditation of RE power plants. ➢ ORER validates REC's as well

Parameter	United Kingdom	USA (California)	Japan	Australia
REC Prices	Market determined	Market determined	Price of NEC is determined through relative trading between retailers	Market determined
Existence of Floor & Forbearance Price	No Floor & Forbearance Price	No Floor & Forbearance Price	No Floor price, but Forbearance price set at Yen 11/kWh	No Floor & Forbearance Price
REC Denomination	Different denomination for different technologies[7]	1 REC=1MWh	1 New Energy Certificate (NEC) = 1MWh	1 REC = 1 MWh
Dealing with certificates	➢ Exchange Trading ➢ Bilateral trade	➢ Bilateral trading. Tracking is done through Western Renewable Energy Generation Information System. ➢ REC prices can vary widely by region	➢ Bilateral Trading is done in a government controlled environment[8]	➢ Internet based trading market called Green Electricity Market is present ➢ Bilateral Trade is also allowed

[7] Landfill gas – 0.25/MWH; Sewage gas, Co-firing of biomass – 0.5/MWH; Onshore wind, Hydro-electric, Co-firing of energy crops, Co-firing of biomass with CHP, EfW with CHP, Geo pressure, Standard gasification or pyrolysis, Other (not falling within a specified band) – 1/MWH; Offshore wind, Co-firing of energy crops with CHP, Dedicated biomass – 1.5/MWH; Wave, Tidal stream, Anaerobic digestion, Advanced gasification or pyrolysis, Energy crops (with or without CHP), Dedicated biomass with CHP, Solar photovoltaic, Geothermal, Tidal Impoundment (i.e. tidal lagoons and tidal barrages (<1GW)), Micro-generation – 2/MWH.

[8] Whenever new energy based electricity is generated, the generator makes a submission. The government accepts the submission and records it in the electronic account as a "New Energy Certificates". It is then possible to sell the "New Energy Certificates" that has been recorded in the account to other generators and retailers.

Parameter	United Kingdom	USA (California)	Japan	Australia
Multipliers	Two ROCs for 1MWh solar produced	Some states provide multipliers for generation for RPS compliance. For example, Colorado offers a bonus of 25% to generation located in-state.		Solar Credits REC multiplier of around 1.5 for small solar installations
Banding/ Categories of certificates	Four bands are proposed: ➢ Technologies in the Established Band will receive 0.25 ROCs/ MWh ➢ Technologies in the Reference Band will receive 1 ROC/ MWh; ➢ Technologies in the Post-Demonstration Band will receive 1.5 ROCs/MWh; ➢ Technologies in the Emerging Technologies Band will receive 2 ROCs/ MWh.	Two categories of certificates: ➢ Solar ➢ Non Solar	No solar specific targets in RPO enforcements	Two categories of certificates: ➢ Large-scale generation certificates (LRECs) - The Large-scale Renewable Energy Target (LRET) has a target of 41 000 gigawatt hours (GWh) by 2020 and only large-scale renewable energy projects are eligible. ➢ Small-scale generation certificates (SREC) - The Small-scale Renewable Energy Scheme (SRES) targets a theoretical 4000 GWh annually and is eligible only to small-scale or household installations No solar specific targets in RPO enforcements

Parameter	United Kingdom	USA (California)	Japan	Australia
Validity	2 years	➢ In New Jersey, each SREC (solar REC) is valid for 3 years. ➢ It can be used by an electricity supplier for compliance in the year it is issued or one of the subsequent two compliance years.	Two years including the year in which it was generated	1 year
Banking and Borrowing	➢ Market banking is limited up to a limit set at 25% of a suppliers Obligation in the period concerned	Deficit of 25% carried forward to next year for 3 years allowed automatically without approval of CPUC	If shortfall is up to 20%, it can be carried over to the next period	➢ If shortfall is less than 10% of the party's total liability, the shortfall will be carried forward into next year's liability ➢ If the shortfall is greater than 10% of the total liability, a penalty payment of AUD$65 per MWh, called the renewable energy shortfall charge, will be imposed by the Renewable Energy Regulator
Penalty	➢ In case of non-compliance of obligations, a fixed buyout	5 cents/ kWh, with cap of $ 25 million/yr	Non-compliance with interim and final targets is subject to penalties of up to	➢ If the shortfall is greater than 10% of the total liability, a

Parameter	United Kingdom	USA (California)	Japan	Australia
	value (at a pre-determined buyout price[9]) for the ROCs, as determined by the regulator from time to time, is to be paid by the entity under default into a buyout fund. ➢ Failure to pay buyout price due to insolvency or other reasons can be addressed through a mutualisation mechanism[10].		1 million Yen.	penalty payment of AUD$40 per MWh, called the renewable energy shortfall charge, will be imposed by the Renewable Energy Regulator. ➢ However, if the shortfall is made up within the following three years, the penalty can be refunded. ➢ There are civil penalties as well
Issuance of Certificates	Monthly/ Annually	Annually	Annually	Annually ➢ Before the end of the year after the year of generation for Large-scale generation certificates

[9] The buyout price is the additional amount that suppliers would be likely to pay for renewable electricity in excess of the market value of the electricity. The value of the buyout price is fixed to cover the difference between "market value of electricity" and the "anticipated value of the marginal projects required to meet the demands of the Obligation. This price is adjusted for inflation by linking it with Retail Price Index

[10] Mutualization is intended to maintain investor confidence in the value of ROCs by protecting the value of the buyout fund. In the case of insolvency of a supplier to pay the buyout price thus leading to a shortfall in buyout fund, all other entities (other suppliers) who have met their obligations make good the shortfall, up to a prescribed limit (Mutualization). The Mutualization process is triggered only when supplier insolvency results in a large enough shortfall in the buyout fund (calculated by Ofgem) which is equivalent to or larger than the trigger. Ofgem will notify the other suppliers of the shortfall and requests that suppliers make a payment to the buyout fund proportionate to their share of the Obligation. The buyout fund is then re-distributed in the usual way to suppliers in line with the proportion of ROCs they presented. The payments are staggered quarterly and recycled immediately to minimize the burden on consumers and suppliers. A cap exists on the size of the shortfall that can be recovered, to protect against the fund causing smaller suppliers to go into insolvency.

Parameter	United Kingdom	USA (California)	Japan	Australia
				➢ Within 12 months after installation for Small-scale generation certificates
Validity of regulations	Till 2037		Perpetual. Review is carried out once every 4 years and changes made if necessary	Till 1st Jan 2031
Extinction of Certificates	After it has been exchanged by way of sale and purchased	After is has used to show compliance with an RPS program or other voluntary program	After is has used to show compliance with an RPS program	Where a certificate is surrendered to meet the compliance the certificate ceases to be valid.
Off-grid/Private network	Available			➢ Available if distribution network is more than 1KM away OR ➢ If cost of establishing the line is more than $30,000

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About Shakti Sustainable Energy Foundation

Shakti Sustainable Energy Foundation works to strengthen the energy security of India by aiding the design and implementation of policies that encourage energy efficiency as well as renewable energy. Shakti works in sectors with the maximum potential for energy and carbon savings: Power, Transport, Energy Efficiency and Climate Policy. A Section 25 non-profit organization under the Companies Act, Shakti is governed by a national board of directors, and supported by both Indian and international philanthropies. It convenes NGOs, universities, business, think tanks, and domestic and international experts to design and implement smart energy policies in India

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