
Renewable energy
The next wave
Confederation of Indian Industry
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Quality In Everything We Do

Content

Acronyms

Abbreviation	Explanation
CERC	Central Electricity Regulatory Commission
CFA	Central Financial Assistance
CUF	Capacity utilization factor
FIT	Feed-in tariffs
GBI	Generation-based incentive
GW	Giga watts
INR	Indian rupee
IREDA	Indian Renewable Energy Development Agency Ltd.
kWh	Kilowatt hour
MNES	Ministry of Non-Conventional Energy Sources, which was later named as Ministry of Renewable Energy (MNRE)
MNRE	Ministry of New and Renewable Energy
MW	Megawatt
NAPCC	National Action Plan for Climate Change
PLF	Plant load factor
PPA	Power purchase agreement
R&M	Renovation and modernization
RPO	Renewable purchase obligation
SEB	State Electricity Board
SERC	State Electricity Regulatory Commission
SEZ	Special economic zone
SHP	Small hydro plant
SIPS	Special Incentive Package Scheme
SPV	Solar photovoltaic
WTG	Wind turbine and generator

Introduction

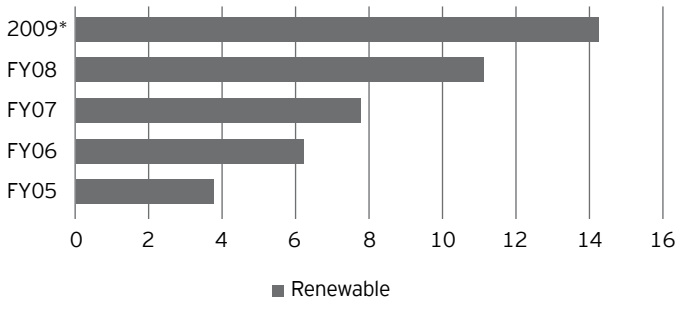
India is home to a vast supply of renewable energy resources and boasts one of the largest programs for deploying renewable energy products and systems in the world. In fact, India was the world's first country to have an exclusive ministry for renewable energy development, the Ministry of New and Renewable Energy Sources. India initiated its renewable energy program in 1981 with the establishment of the Commission for Additional Sources of Energy, which was later converted into the Ministry of Non-Conventional Energy Sources (MNES) in 1992 and renamed the Ministry of New and Renewable Energy (MNRE) in 2006.

Renewable potential

India has a commercially viable renewable potential of around 85,000 MW, which includes wind potential of 45,000MW, small hydro of 6,000 MW and 25,000 MW of biomass/bio-energy. Further, the country has the potential to generate 20 MW per sq. km. using solar photovoltaic and solar thermal energy.

The latest Ernst & Young's Renewable Energy Country Attractiveness Indices, which rank countries based on regulatory environment, fiscal support, unexploited resources, suitability to different technologies and other factors determining renewable energy growth in a country, has ranked India fourth on its All Renewable Index (ARI). India's consistent top-grade ranking in the ARI over the past few years is further testimony to the country's appeal as a renewable energy investment destination.

Growing clean energy capacity



*Note: Generation capacity as on 31 July 2009

Source: Ministry of Power, MNRE and Central Electricity Authority (CEA)

The renewable energy space in India

Factors such as energy security, the power-generation potential of various renewable sources, environmental concerns, and the availability of mature and indigenous technologies for select renewable sources are among the key imperatives for renewable energy to play a more pivotal role in India's energy mix. These factors, along with existing power shortages in the state, have prompted the government, both at the Central and State level, to recognize the importance of developing renewable energy sources and formulating policies and measures to develop the renewable energy value chain.

Untapped renewable potential

- Wind potential of 45000 MW but installed capacity of 10464 MW; nearly 35000 MW yet to be tapped
- Bagasse cogeneration potential of 5000 MW but about 23% of that has been achieved.
- Economically feasible Small hydro potential of 6000 MW but only 2461 MW realized to date.
- The solar potential of 20 MW/sqkm remains largely untapped for grid interactive solar power.

Energy security

- India is heavily dependent on conventional sources of fuel for power generation.
- More than 55% of the total intsalled capacity of power generation is coal based.
- Depleting fuel reserves, supply shortages (coal) and heavy reliance on imports (oil and natural gas) warrant measures to improve energy security by focusing on renewable energy.

Power shortage

- The country is witnessing a high peak depficit of 12-13% and a sustained energy shortage of 6-8%
- India needs to bridge the demand-supply gap in order to maintain current levels of economic growth

Environment concerns

- Although India has one of the lowest per capita pollution rates in the world, it is still one of the biggest polluters due to its large population
- India is under immense pressure to reduce emissions with new emission reduction targets coming into place
- To address its growing energy requirements, while considering the global environmental concerns, India needs to effectively harness Renewable Energy

The Electricity Act 2003 provides the overall framework for promoting and sustaining the growth of renewable energy sources in India. It contains several provisions to promote the accelerated development of power generation from non- conventional sources, such as directives to the central and state regulator to determine tariffs for renewable energy sources and to set renewable purchase obligations (RPOs) as a percentage of total electricity consumption in the area of a distribution licensee. It also provides that the State Electricity Regulatory Commission (SERC) would promote the generation and co-generation of electricity for renewable sources through suitable measures for connectivity with the grid.

Select states with RPOs and FIT

State	FIT	RPO
Andhra Pradesh	√	√
Gujarat	√	√
Haryana	√	√
Karnataka	√	√
Kerala	√	√
Madhya Pradesh	√	√
Maharashtra	√	√
Orissa	√	√
Rajasthan	√	√
Tamil Nadu	√	√
Uttar Pradesh	√	√
West Bengal	√	√

Note: States have promulgated FITs as per the renewable resource available in the state and not necessarily for all renewable energy sources.

Source: State Electricity Regulatory Commissions' websites

Sustained measures by the government and regulators and public awareness-generation campaigns have increased awareness around the benefits of renewable energy. The Government of India (GoI) has set a target of installing 15% of additional power generation capacity in the country through grid-interactive renewable power by 2012. Around 15,000 MW of power is expected to be generated from renewable sources in the Eleventh Plan period for this purpose. By 2030, the target is to generate 20–30% of power from renewable sources.

Growth dynamics in the sector

Renewable energy: achievements as on 31 July 2009

No.	Sources/Systems	Cumulative achievements
I. Power from renewable sources		
A. Grid-interactive renewable power		
1	Biomass power (agro residues)	773.30 MW
2	Wind Power	10464.00 MW
3	Small hydro power (up to 25 MW)	2461.00 MW
4	Cogeneration-bagasse	1155.00 MW
5	Waste to energy	59.00 MW
6	Solar power	2.00 MW
	Sub-total (in MW) (A)	14914.00 MW
B. Off-grid/distributed renewable power (including captive/combined heat and power [CHP] plants)		
7	Biomass power/co-generated (non-bagasse)	175.78 MW
8	Biomass gasifier	107.02 MWeq
9	Waste-to- energy	34.06 MWeq
10	Solar PV power plants and street lights	5.00 MWp
11	Aero-generators/Hybrid systems	0.89 MW
	Sub-total (B)	322.75 MWeq
	Total (A + B)	15,236.75 MW
II.	**Remote village electrification**	**4,297 villages + 1,156 hamlets**
III. Decentralized energy systems		
12	Family-type biogas plants	4.12 million
13	Home lighting system	4,50,000
14	Solar lantern	7,30,000.
15	SPV pumps	7,148 nos.
16	Solar water heating: Collector area	2.90 million sq.m.
17	Solar cookers	0.65 million
18	Wind pumps	1,347
IV. Other programs		
19	Energy parks	511
20	Akshay Urja shops	284

MWeq. = Megawatt equivalent; MWp = Megawatt peak; MW = Megawatt;
kW = kilowatt; kWp = kilowatt peak; sq. m. = square meter

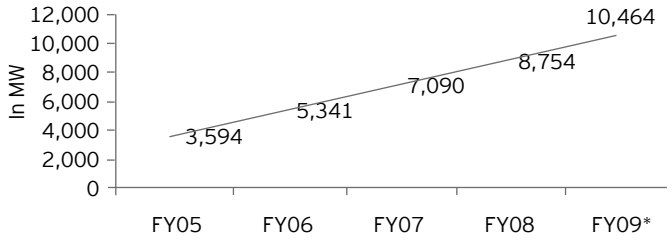
Sources: Ministry of Power, MNRE and CEA

Wind energy

Among the different sources of renewable energy, wind energy is the undisputed market leader in India, accounting for nearly 70% of total grid-interactive renewable capacity in the country. With an installed capacity of 10,464 MW, India has the fifth-largest wind power-installed capacity in the world after the US, Germany, Spain and China.

Initially, growth in wind energy generation was largely attributed to the provision of accelerated depreciation. However, last year, the MNRE launched the generation-based incentive (GBI) scheme to provide a level playing field for entities such as independent power producers (IPPs) who may not be able to fully absorb the benefits of such a provision . The scheme offers a GBI of INR0.50 per kWh of electricity generated, for a period of 10 years for grid-connected wind farms that do not avail the benefits of accelerated depreciation. However, the scheme is currently at a pilot stage, and there is a program limit of 49 MW in aggregate.

Rising wind power generation capacity



*Note: Generation capacity as on 31 July 2009

Sources: MNRE and Indian Wind Energy Association

Central sector

- Import duty concession on specified wind turbine parts
- 80% accelerated depreciation
- Customs and excise duty relief
- Loans through IREDA
- Tax holiday for power generation projects

State sector

- Fiscal and financial incentives
- Wheeling, banking, third party sale, buy-back facility by State Electricity Boards (SEBs)
- Capital subsidies and sales tax incentives in certain states
- Soft loans from the Indian Renewable Energy Development Agency Ltd. (IREDA)
- FIT and RPO of respective states

Factors that may impede growth

There are several issues that may impede the growth of the wind power generation sector. These include the following:

Costs and perfromance	Investment skew	Policiy and investment issues	Technology and land
▸ Wind power projects on a turnkey basis cost INR 55-60 million/MW. This is significantly higher than that of conventional energy plants. ▸ The average PLF of these plants at around 15% is low compared to international numbers and is a deterrrent for IPP activity in the sector.	▸ A large portion of wind capacity addition in India is geared towards maximising the fiscal incentive of accelerated depreciation. This leads to bunching up of new capacity additions and strains the Discom resources in providing the evacuation infrastructre	▸ The GBI cap of 49 MW is too small push IPP acitivy in wind to a meaningful level. ▸ The recent Regulatory guidelines on sharing of environmental credit benfits with the utility further reduce the attractiveness of the sector.	▸ The unique nature of the wind industry in India with the project developer, EPC vendor and O&M all being provided by a single entity is likey to undegro a significant change in the future with the entry of new pure EPC players offerring WTGs of vaying capacities. ▸ This poses significant challenegs of land acquisition and technology selection for deveopers propsing to set up new WEG's.

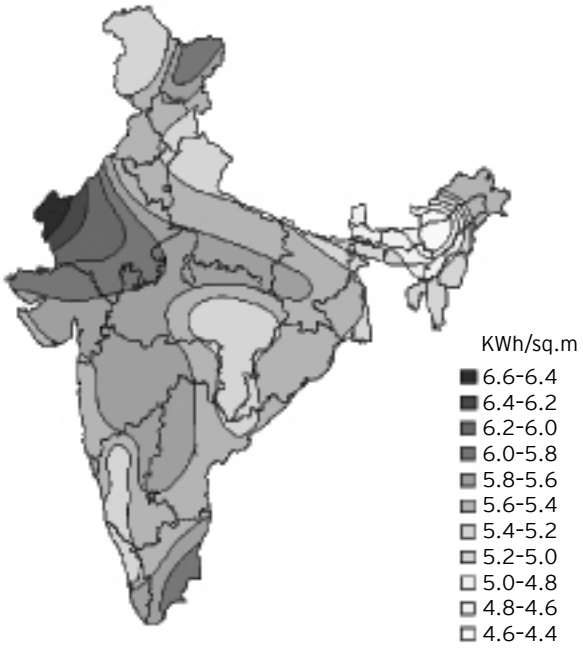
Sustaining the growth momentum in wind-energy generation would, therefore, require renewed efforts at resource assessment, identifying new avenues for growth such as offshore wind and facilitating the entry of multiple wind energy equipment suppliers in the country. Such initiatives could help reduce overall costs and improve efficiency in wind generation.

Solar energy

Solar energy is an attractive prospect for India, as the country receives solar radiation of 5 to 7 kWh/m² for 300 to 330 days in a year. This translates to a power generation potential of approximately 20 MW/km² for solar photovoltaic (SPV) applications and 35 MW/km² for solar thermal generation. This implies that India receives solar energy equivalent to nearly 5,000 trillion kWh/year, which, in turn, is equivalent to 600 GW. This far exceeds the country's current energy consumption.

India ranks fifth in SPV installations and ninth in solar thermal application installations in the world. India has 10–12 manufacturers producing around 100 MW of SPV cells and approximately 20 manufacturers with a total installed

capacity of 120 MW in module manufacturing. India also has a large number of integrators-cum-service providers (around 80), with a total capacity of approximately 245 MW.



Sources: TERI Presentation, ASSOCHAM South Asia Renewable Energy Conference, New Delhi

According to estimates by TERI, 492 x 10^6 MU/year electricity can be generated if 1% of land is used to harness solar energy for electricity generation at an overall efficiency of 10% However, despite the potential and presence of solar manufacturing capacity in India, the progress has been slow. This is largely on account of the extremely high capital cost of around INR170 m/MW. Consequently, the cost of generation, at around INR15 per kWh is manifold when compared to the cost of generating INR2–3/units from conventional sources.

The GoI has been cognizant of this concern, and as such, is making efforts to reduce the capital through economies of scale in production and market simulation measures. These include initiatives such as the GBI scheme, the Special Incentive Package Scheme (SIPS) and the National Solar Mission, which is being further supplemented with state-level measures such as the Solar Energy Policy in Gujarat.

The MNRE's GBI scheme works toward guaranteeing a power purchase rate of INR15 for SPV and INR13 for solar thermal energy per unit. However, there is a program cap of 5 MW per developer, 10 MW per state and 50 MW in aggregate. This incentive is expected to be a balancing figure, to be paid to a solar energy generator after deducting the tariff as per the PPA signed by the developer.

The SIPS, on the other hand, seeks to reduce capital costs through economies of scale in production and government subsidies to lower capital investment on solar equipment manufacturing facilities. Under the SIPS, the GoI is expected to provide grants of up to 20–25% for setting up fabrication units in the country, depending upon their location in a special economic zone (SEZ) or non-SEZ area. The unit can claim incentives in the form of capital subsidy or equity participation.

The proposed National Solar Mission under the National Action Plan on Climate Change (NAPCC) seeks to provide long-term vision for the development of solar energy in India. The draft objectives of the proposed mission include:

- 20,000 MW of installed solar generation capacity by 2020 and 100,000 MW by 2030, or 10–12% of total power generation capacity estimated for the year
- Solar power cost reduction to achieve grid tariff parity by 2020
- Achieve parity with coal-based thermal power generation by 2030
- 4–5 GW of installed solar manufacturing capacity by 2017

The mission proposes a phased approach for meeting these objectives, and a number of measures supporting the objectives have been detailed in the proposal document.

Several state governments have also been proactively promoting the development of solar energy in their respective states. The most notable of these is the Solar Energy Policy of Gujarat, under which the state government aimed to set up 500 MW of grid-interactive solar power by 2104. However, the state government recently went one step further by allocating 716 MW of solar power capacity to 34 developers.

Factors that may impede growth

The high capital cost of solar energy projects is often cited as the stumbling block in the establishment of substantial grid-interactive solar capacity. However, most industry authorities agree that such costs are likely to decrease in the near future as large planned manufacturing capacities initiate production in countries such as China, particularly in SPV. This has created a "wait-and-watch" situation, with most developers waiting for costs to decrease.

Solar technology, both SPV and solar thermal, is rapidly evolving in terms of system performance, efficiency and longevity. Still newer and promising technology is also on the anvil, thus leading to uncertainty in terms of the selection of technology for augmenting capacities.

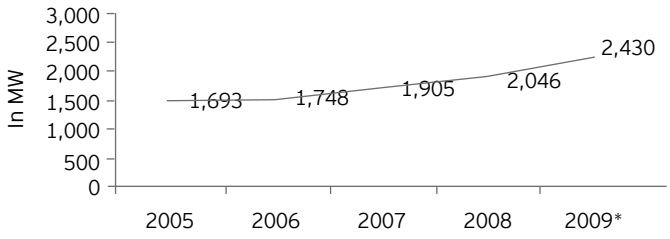
Technical and operational experience as well as human resources to build and operate such large solar capacities is very limited globally and still further in India. Developing large solar capacities in the country requires considerable investments and efforts for developing supporting human resource requirements for the manufacture, construction, commissioning and operation of solar cells and power plants.

The burgeoning nature of the solar energy industry requires an integrated approach, wherein industry, R&D, government, researchers and not-for-profit organizations collaborate to not only address capex costs, efficiency and technology, but also provide a systemic platform for enhancing R&D efforts, both in terms of incremental technology enhancements and disruptive technology.

Small hydropower

The first small hydro project was set up in 1837 in Darjeeling. In India, projects up to 25 MW classify as small hydro. The installed capacity of small hydro power (SHP) in India has grown from 1.7 GW in FY05 to 2.3 GW in FY09. Private sector investments have largely driven this growth, as the technology for SHP is relatively mature, and the MNRE has created a database for potential sites by collecting information from various sources and the country's state governments.

Rising SHP generation capacity



*Note: Generation capacity as on 31 March 2009

Source: MNRE and CEA

The MNRE has a database of 5,415 potential sites with an aggregate capacity of 14,305.47 MW. A master plan has also been prepared for the participating states to identify SHP potential in a systematic manner and state-wise strategies.

The MNRE also provides a number of incentives for taking up small hydro projects in the country. Some of these measures are:

- Support for the preparation of a detailed project report (DPR): INR0.125 million to INR0.5 million per MW (Range: 10 MW to 25 MW)
- There are special incentives for the northeast region and Sikkim, where a capital grant of INR22.5 million per MW is available for SHP projects. For other states, the grant is INR15 million per MW.
- Financial support for the renovation, modernization and capacity upgrade of old SHP stations to the extent of INR26 million per MW or 75% of the R&M cost, whichever is lower, is offered.
- IREDA provides soft loans for setting up SHP projects, each with a capacity of up to 25 MW.

Factors that may impede growth

- Most SHPs are located in the challenging Himalayan region. Its difficult terrain and remote location leads to higher project development and operational costs.
- Another setback for such SHPs is silting during monsoons, which further reduces the operating lifecycle of equipment.
- The bidding process for SHPs in certain states has seen the entry of traders who primarily bid to make short-term profit through the onward sale of the project at a premium. This further reduces the viability of the project and delays setting up new capacities.
- Project developers often have limited experience in engaging local communities and/or rehabilitating displaced communities from project sites, thereby leading to local resentment toward the creation of new capacities.
- SHPs have a longer gestation period as compared to other renewable sources, since it requires a detailed and reliable assessment of hydrological, geological, seismological and environmental conditions, which are carried out over a longer period.

Biomass power generation

Biomass power generation comprises the use of agro or forest biomass residue waste to generate electricity. The availability of biomass in India is estimated at around 540 million tons per year, including residues from agriculture, forestry and plantations. It has been estimated that only around 20–25% of this may be available for power generation after accounting for various other end uses such

as for fodder, as fuel for domestic cooking and other economic purposes. The technology used includes direct combustion, cogeneration and gasification. The grid-interactive biomass-generation capacity was approximately 2 GW as of 31 July 2009. Bagasse-based cogeneration is the largest contributor, with 1155 MW, while agri-residue-based power accounts for the remaining 773 MW. In addition, India has 175.78 MW of off-grid biomass power capacity. An indicative table for the growth of biomass power over the years is provided below.

S.No.	State	upto 31.03.2003	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	Total
1	Andhra Pradesh	160.05	37.70	69.50	12.00	22.00	33.00	9.00	334.25
2	Chattisgarh	11.00	-	-	16.50	85.80	33.50	9.88	156.10
3	Gujarat	0.50	-	-	-	-	-	-	0.50
4	Haryana	4.00	-	2.00	-	-	-	-	6.00
5	Karnataka	109.38	26.00	16.60	72.50	29.80	8.00	12.00	274.28
6	Madhya Pradesh	0.00	1.00	-	-	-	-	-	1.00
7	Maharashtra	24.50	-	11.50	-	40.00	38.50	41.50	155.50
8	Punjab	22.00	-	-	6.00	-	-	-	28.00
9	Rajasthan	0.00	7.80	-	7.50	8.00	-	8.00	31.30
10	Tamil Nadu	106.00	44.50	22.50	-	42.50	75.00	18.20	308.70
11	Uttar Pradesh	46.50	12.50	14.00	48.50	-	79.00	172.00	372.50
	Total	**381.30**	**129.50**	**136.10**	**163.00**	**228.10**	**266.00**	**270.50**	**1,677.13**

Source: MNRE

Factors that may impede growth

- The biomass market is largely unorganized and little comfort exists for securing fuel supplies by way of contracts such as an FSA.
- Biomass as a generic term includes various species and types, some of which may require special treatment before being used as fuel depending upon technology being used, e.g. briquetting and/or drying.
- Biomass price can typically be characterized as a low mean price (INR1/kg) fuel with high seasonal variations. Orders of various SERC's reflect the difficulty in pricing biomass. Distributed availability of biomass necessitates collection and transportation further adding up costs.
- States such as Bihar, Punjab, Rajasthan and Madhya Pradesh have a catchment area approach to setting up biomass power projects, which limit project size over a defined area.

Other renewable energy technologies

The MNRE is proactively pursuing the development of other renewable sources such as energy from urban and industrial waste, geothermal energy and ocean energy and alternative fuels such as hydrogen, fuel cells and bio fuel. The Ministry is implementing broad-based programs on these frontier technologies, and has taken several initiatives to accelerate their development and demonstration with the participation of premier research and academic Institutions, universities, laboratories and the industry.

CERC Tariff Regulations, 2009

The recent Central Electricity Regulatory Commission (CERC) (Terms and Conditions of Tariff) Regulations, 2009 under Section 61, read with Section 178 (2) (s) of the Electricity Act 2003, are in pursuance of the requirement under the Electricity Act 2003. These regulations encompass wind, small hydro, biomass, non-fossil fuel-based cogeneration projects, SPV and solar thermal, which are either owned centrally or supply power to more than one state.

Eligibility and other principles

Type of project	Eligibility criteria
Wind	Located at wind sites with minimum annual mean wind power density (WPD) of 200 watt/m^2, measured at a hub height of 50 m using the new wind turbine and generator (WTG).
Small hydro	Located at sites approved by state nodal agencies or the state government, using new plant and machinery and with an installed capacity of 25MW or less.
Biomass	Biomass projects using new plant and machinery, based on the Rankine Cycle, using biomass fuel, provided that the use of fossil fuel is restricted to only 15% of total fuel consumption
Non-fossil Fuel-based Cogeneration: topping cycle Topping cycle mode	In accordance with the definition and use of new plant and machinery. Provided that the sum of the useful power output and one half of the thermal output is greater than 45% of the facility's energy consumption during season
SPV and solar thermal	Based on MNRE-approved technologies

The control period for this order is three years, ending on 31 March 2012, while the tariffs shall be valid for 13 years. However, this is with exception to small hydro, ASPV and solar thermal projects.

The renewable energy tariff has been designated on a cost-plus approach as a single part tariff consisting of various constituents such as capital cost, return on equity (ROE), debt-equity ratio, interest rate, depreciation, interest on working capital and operational and maintenance (O&M) expenses.

Recent regulatory changes

Financial principles overview

Type	Wind	Small hydo	SPV	Solar thermal	Biomass	Non-fossil fuel-based cogeneration
Capital cost	INR51.5 million/ MW	INR50-70 million/ MW (depending on size of plant 25 MW-5 MW)	INR170 million/ MW	INR130 million/ MW	INR45 million/MW	INR44.5 million/ MW
Debt-equity ratio	70:30	70:30	70:30	70:30	70:30	70:30
Loan tenure	10 years	10 years	10 years	10 years	10 years	10 years
Interest charges	Avg. (1 year) LTPR of SBI + 150bp	Avg. (1 year) LTPR of SBI + 150bp	Avg. (1 year) LTPR of SBI + 150bp	Avg. (1 year) LTPR of SBI + 150bp	Avg. (1 year) LTPR of SBI + 150bp	Avg. (1 year) LTPR of SBI + 150bp
Depreciation	10% ,salvage value, 90% depreciation	10% ,salvage value, 90% depreciation	10% ,salvage value, 90% depreciation	10% ,salvage value, 90% depreciation	10% ,salvage value, 90% depreciation	10% ,salvage value, 90% depreciation
Capacity utilization factor (CUF)/ Plant load factor (PLF)	20-30% depending on Annual Mean Wind power density of 200->400 W/m^2	45% for HP, Uttarakhand, NE states and 30% for others	19%	23%	60% during stabilization, 70% during the remaining part of the first year, 80% thereafter	UP, AP-455 TN and Maharashtra - 60% Other states: 53%
Auxiliary consumption	-	1.0%	-	10%	10.0%	8.5%
Station heat rate	-	-	-	-	3800kcal/kWhr	3600Kcal/kWhr
Fuels	-	-	-	-	Calorific values and cost of fuel for various states provided. Fuel price indexation mechanism also indicated	Calorific values and costs of fuels for various states provided. Fuel price indexation mechanism also indicated
ROE	Pre Tax 19% pa for first 20 years, pre tax 24% thereafter	Pre Tax 19% pa for first 20 years, pre tax 24% thereafter	Pre Tax 19% pa for first 20 years, pre tax 24% thereafter	Pre Tax 19% pa for first 20 years, pre tax 24% thereafter	Pre Tax 19% pa for first 20 years, pre tax 24% thereafter	Pre Tax 19% pa for first 20 years, pre tax 24% thereafter
Interest on working capital	Previous year avg. short-term PLR of SBI + 100bp	Previous year avg. short-term PLR of SBI + 100bp	Previous year avg. short-term PLR of SBI + 100bp	Previous year avg. short-term PLR of SBI + 100bp	Previous year avg. short-term PLR of SBI + 100bp	Previous year avg. short-term PLR of SBI + 100bp

Type	Wind	Small hydo	SPV	Solar thermal	Biomass	Non-fossil fuel-based cogeneration
O&M	First year at INR0.6 million/ MW Escalation @ 5.72% per annum	INR1.2 million to INR2.1 million depending on capacity and location of plant. Escalation @ 5.72% per annum	INR0.9 million/ MW for the first year. Escalation @ 5.72% per annum	INR1.3 million/ MW for the first year. Escalation @ 5.72% per annum	INR2.0–.2.5 million/MW	INR1.335 million/ MW Escalation @ 5.72% per annum
Rebate	2% for payment through LC, 1% if paid within a month	2% for payment through LC, 1% if paid within a month	2% for payment through LC, 1% if paid within a month	2% for payment through LC, 1% if paid within a month	2% for payment through LC, 1% if paid within a month	2% for payment through LC, 1% if paid within a month
Late payment surcharge	Beyond 60 days of billing, 1.25% per month	Beyond 60 days of billing, 1.25% per month	Beyond 60 days of billing, 1.25% per month	Beyond 60 days of billing, 1.25% per month	Beyond 60 days of billing, 1.25% per month	Beyond 60 days of billing, 1.25% per month
Sharing of CDM benefits	100% to the developer in year 1, 10% per year to beneficiaries, progressively increasing by 10% per annum till it reaches 50%	100% to the developer in year 1, 10% per year to beneficiaries, progressively increasing by 10% per annum till it reaches 50%	100% to the developer in year 1, 10% per year to beneficiaries, progressively increasing by 10% per annum till it reaches 50%	100% to the developer in year 1, 10% per year to beneficiaries, progressively increasing by 10% per annum till it reaches 50%	100% to the developer in year 1, 10% per year to beneficiaries, progressively increasing by 10% per annum till it reaches 50%	100% to the developer in year 1, 10% per year to beneficiaries, progressively increasing by 10% per annum till it reaches 50%
Subsidy by central/state government	To be considered while determining tariff	To be considered while determining tariff	To be considered while determining tariff	To be considered while determining tariff	To be considered while determining tariff	To be considered while determining tariff
Taxes and duties	Pass through as per actual insurance	Pass through as per actual insurance	Pass through as per actual insurance	Pass through as per actual insurance	Pass through as per actual insurance	Pass through as per actual insurance
Capital cost indexation mechanism	Yes, based on WPI for steel and electrical machinery	Yes, based on WPI for steel and electrical machinery	–	–	Yes, based on WPI for steel and electrical machinery	Yes, based on WPI for steel and electrical machinery

Source: CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009

Project-specific tariffs for renewable energy projects

The CERC has recognized the diverse and nascent nature of renewable energy technologies, which may require special consideration through the provision for project-specific tariffs. The provision allows developers to approach the central regulator for approving the cost- and performance-related parameters of their proposed technology. This is the first time that a project-specific tariff has been allowed in the cases of renewable energy projects. Specifically, this would include a variety of projects, as provided in the accompanying list.

Project specific tariffs for:

- Municipal solid waste projects
- Any other renewable energy technologies approved by MNRE
- Renewable energy projects commissioned before notification of these regulations, but no PPA in place
- Solar PV and solar thermal projects where the developer wishes to opt for project specific tariffs
- Hybid solar thermal plants
- Biomass projects other than those based on Rankine cycle

This provision is a positive affirmation that there are several new and emerging technologies in renewable energy, whose costs and operational parameters may not be benchmarked effectively. Further, such projects may be of different economically feasible capacities, and the ownership and funding arrangements for such projects may vary significantly. This provision may be still more relevant in the context of a proof of concept technologies attempting economies of scale for the first time and because RPOs, by and large, continue to be blind to technology in the country. Such project-specific tariffs will ensure that promising but not yet commercially proven technologies have the potential to become commercial and the opportunity to compete with their more commercial renewable peers, such as wind energy.

Proposed renewable energy certificate mechanism by MNRE

The MNRE, according to the directives of the NAPCC initiated a study to develop a renewable energy certificate (REC) mechanism, which is expected to enable a large number of stakeholders to purchase renewable energy cost-effectively.

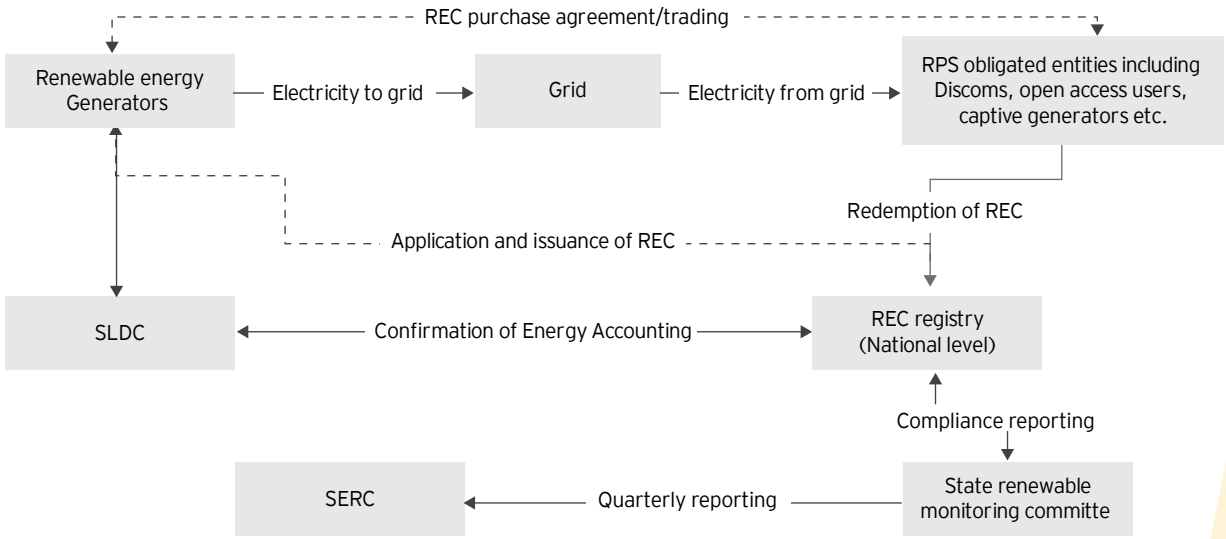
Drivers and objectives for an REC mechanism in India

While India is abundantly gifted with a variety of renewable energy sources, not all states are endowed with the same level of renewable energy sources. There are RPOs for power in many states, as directed by the respective SERCs under the EA 2003. However, a number of states are not in a position to generate enough electricity through renewable energy sources to meet their target RPOs. Currently, RE-scarce states are not able to procure RE generation from other states. The main objectives of the proposed REC mechanism in India are:

- Reducing transaction costs in RE
- Creating competition among different RE technologies
- Developing an all-encompassing incentive mechanism for RE
- Effectively implementing RPO regulation in all states across India
- Increasing flexibility for participants to carry out RE transactions
- Overcoming geographical constraints to harness available RE sources
- Reducing risks for local distribution licensees

RECs have been used extensively as a successful market-based policy instrument to promote renewable energy in many countries, such as Australia, Japan, the US, the Netherlands, Denmark and the UK. However, these schemes vary in detail and need to be customized for local legislations and market situations. The MNRE has already uploaded on its web site a draft report on the proposed REC framework for broader discussion.

Explanation and mechanism of the proposed REC



Source: Adapted from Report on Development of Conceptual Framework For Renewable Energy Certificate Mechanism for India

Outlook

India is faced with the dilemma of not only sustaining its economic growth but also with the global threat of climate change. Difficult times call for novel measures, and the current global debate on the emission ceiling for developed versus developing nations provides ample justification for "pro-active" government participation to spark off the next cycle of growth and employment generation. Much like IT and networking, which led to wealth creation in the 1990s and the housing and finance sectors that spurred growth in the first decade of the new millennium, the central government needs to champion the cause of renewable energy. The geopolitics of the last century has largely been centered on countries and regions that have held the key to the world's quest for energy- fossil or nuclear. Governments both at the central and state level should take a proactive approach to enable India to position itself as the global energy lifeline of the future.

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Notes

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