INDIAN ENERGY SCENARIO AND RENEWABLE ENERGY STATUS

A new dawn in Renewable Energy- India attains 4th position in global wind power installed capacity; 46.33 GW grid-interactive power; 7,518 MW of grid-connected power; 1502 MW Wind power capacity added; Small hydro power capacity reaches 4323 MW, 92305 Solar Pumps installed, 38,000 crore Green Energy Corridor is being set up; Surya Mitra" mobile App launched Solar Tariff as low as Rs 3/unit

Year End Review –MNRE

The Ministry of New and Renewable Energy (MNRE) has taken several steps to fructify Prime Minister Shri Narendra Modi's dream of clean energy. The largest renewable capacity expansion programme in the world is being taken up by India. The government is aiming to increase share of clean energy through massive thrust in renewable. Core drivers for development and deployment of new and renewable energy in India have been Energy security, Electricity shortages, Energy Access, Climate change etc.

A capacity addition of 14.30 GW of renewable energy has been reported during the last two and half years under Grid Connected Renewable Power, which include 5.8 GW from Solar Power, 7.04 GW from Wind Power, 0.53 from Small Hydro Power and 0.93 from Bio-power. Confident by the growth rate in clean energy sector, the Government of India in its submission to the United Nations Frame Work Convention on Climate Change on Intended Nationally Determined Contribution (INDC) has stated that India will achieve 40% cumulative Electric power capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost International Finance including from Green Climate Fund. As on 31st October, 2016, Solar Energy Projects with an aggregate capacity of over 8727.62 MW has been installed in the country.

The government is playing an active role in promoting the adoption of renewable energy resources by offering various incentives, such as generation-based incentives (GBIs), capital and interest subsidies, viability gap funding, concessional finance, fiscal incentives etc. The National Solar Mission aims to promote the development and use of solar energy for power generation and other uses, with the ultimate objective of making solar energy compete with fossil-based energy options. The objective of the National Solar Mission is to reduce the cost of solar power generation in the country through long-term policy, large scale deployment goals, aggressive R&D and the domestic production of critical raw materials, components and products. Renewable energy is becoming increasingly cost-competitive as compared to fossil fuel-based generation.

In order to achieve the renewable energy target of 175 GW by the year 2022, the major programmes/ schemes on implementation of Solar Park, Solar Defence Scheme, Solar scheme for CPUs Solar PV power plants on Canal Bank and Canal Tops, Solar Pump, Solar Rooftop etc have been launched during the last two years.

Various policy measures have been initiated and special steps taken in addition to providing financial support to various schemes being implemented by the Ministry of New and Renewable Energy (MNRE) for achieving the target of renewable energy capacity to 175 GW by the year 2022. These include, inter alia, suitable amendments to the Electricity Act and Tariff Policy for strong enforcement of Renewable Purchase Obligation (RPO) and for providing Renewable Generation Obligation (RGO); setting up of exclusive solar parks; development of power transmission network through Green Energy Corridor project; identification of large government complexes/ buildings for rooftop projects; provision of roof top solar and 10 percent renewable energy as mandatory under Mission Statement and Guidelines for development of smart cities; amendments in building bye-laws for mandatory provision of roof top solar for new construction or higher Floor Area Ratio; infrastructure status for solar projects; raising tax free solar bonds; providing long tenor loans; making roof top solar as a part of housing loan by banks/ NHB; incorporating measures in Integrated Power Development Scheme (IPDS) for encouraging distribution companies and making net-metering compulsory and raising funds from bilateral and international donors as also the Green Climate Fund to achieve the target.

ESTIMATED POTENTIAL OF RENEWABLE ENERGY

The increased use of indigenous renewable resources is expected to reduce India's dependence on expensive imported fossil fuels. India has an estimated renewable energy potential of about 900 GW from commercially exploitable sources viz. Wind – 102 GW (at 80 meter mast height); Small Hydro – 20 GW; Bio-energy – 25 GW; and 750 GW solar power, assuming 3% wasteland

TARGETS

The Government of India has set a target of 175 GW renewable power installed capacity by the end of 2022. This includes 60 GW from wind power, 100 GW from solar power, 10 GW from biomass power and 5 GW from small hydro power.
A target of 16660 MW grid renewable power (wind 4000 MW, solar 12000 MW, small hydro power 250 MW, bio-power 400 MW and waste to power 10 MW), has been set for 2016-17. Besides, under off-grid renewable system, targets of 15 MW eq. waste to energy, 60 MW eq. biomass non-bagasse cogeneration, 10 MW eq. biomass gasifiers, 1.0 MW eq. small wind/hybrid systems, 100 MW eq. solar photovoltaic systems, 1.0 MW eq. micro hydel and 100,000 nos. family size biogas plants have been set for 2016-17.

The target set for the various renewable energy sources for the next three years are:

Source	2016-17	2017-18	2018-19
Solar Power	**12,000**	**15,000**	**16,000**
Wind	4000	4600	5200
Biomass	500	750	850
SHP	225	100	100
Grand Total	**16725***	**20450***	**22150***

***(Capacities in MW)**

SHARE OF RENEWABLE POWER IN TOTAL INSTALLED CAPACITY

Economic growth, increasing prosperity, a growing rate of urbanisation and rising per capita energy consumption has increases the energy demand of the country. In order to meet the energy demand, India has total installed power generation capacity of 307.27 GW as on 31.10.2016 from all resources. With 46.33 GW installed renewable power capacity, the renewable power has a share of about 15% to the total installed capacity.

ACHIEVEMENTS

The details of year round initiatives and achievements of the Ministry of New and RenewableEnergy are as follows:

Green Power Capacity Addition

A total of 7,518 MW of grid-connected power generation capacity from renewable energy sources has been added so far this year (January 2016 to October 2016) in the country.
A total of 7060 MW of grid-connected power generation capacity from renewable energy sources like solar (3019 MW) and wind (3423 MW), Small Hydro Power (218 MW), Bio-Power (400 MW) has been added during 2015-16 in the country against target of 4,460 MW. During 2016-17, a total 3575 MW capacity has been added till 31.10.2016, making cumulative achievement 46,327 MW.

Sector-wise highlights of achievements

· Largest ever wind power capacity addition of 3423 MW in 2015-16 exceeding target by 43%. During 2016-17, a total 1502 MW capacity has been added till 31.10.2016, making cumulative achievement 28,279 MW. Now, in terms of wind power installed capacity India is globally placed at 4th position after China, USA and Germany.

- Biggest ever solar power capacity addition of 3,019 MW in 2015-16 exceeding target by 116%. During 2016-17, a total 1750 MW capacity has been added till 31.10.2016, making cumulative achievement 8728 MW.
- 31,472 Solar Pumps installed in 2015-16, higher than total number of pumps installed during last 24 years i.e. since beginning of the programme in 1991. So far, 92305 Solar Pump have been installed in the Country as on 31.10.2016.
- Solar projects of capacity 20,904 MW were tendered in 2015-16. Of these, 11,209 MW capacity already awarded.
- A capacity addition of 0.53 GW has been added under Grid Connected Renewable Power since last two and half years from Small Hydro Power plants.
- Biomass power includes installations from biomass combustion, biomass gasification and bagasse co-generation. During 2016-17, against a target of 400 MW, 51 MW installations of biomass power plants has been achieved making a cumulative achievement to 4882 MW.
- Family Type Biogas Plants mainly for rural and semi-urban households are set up under the National Biogas and Manure Management Programme (NBMMP). During 2016-17, against a target of 1.00 lakh biogas plants, 0.26 lakh biogas plants installations has been achieved making a cumulative achievement to 49.35 lakh biogas plants as on 31.10.2016.

The sector wise achievements from January 2016 to October are as follows:

Programme/ Scheme wise Achievements in Year 2016 (January- October 2016)

Sector	**Achievement (January-October 2016)**	**Cumulative Achievements as on 31.10.2016**
I. GRID-INTERACTIVE POWER (CAPACITIES IN MW)		
Wind Power	3191.21	28279.40
Solar Power	3848.77	8727.64
Small Hydro Power	146.47	4323.37
BioPower (Biomass & Gasification and Bagasse Cogeneration)	331.78	4882.33
Waste to Power	7.50	114.08
Total	**7525.73**	**46326.82**
II. OFF-GRID/ CAPTIVE POWER (CAPACITIES IN MW_{EQ})		
Waste to Energy	14.61	161.12
Biomass(non-bagasse) Cogeneration	49.54	651.91
Biomass Gasifiers -Rural	0.19	18.34
-Industrial	15.58	176.30
Aero-Genrators/Hybrid systems	0.26	2.93

SPV Systems	84.98	373.99
Water mills/micro hydel	1.60	18.81
Total	**166.80**	**1403.40**
III. OTHER RENEWABLE ENERGY SYSTEMS		
Family Biogas Plants (in Lakhs)	1.014	49.354

Major Initiatives taken by Ministry

Solar Power

- Under National Solar Mission, the target for setting up solar capacity increased from 20 GW to 100 GW by 2021-22. Target of 10,500 MW, set for 2016-17 which will take the cumulative capacity to 17 GW till 31st March 2017.

- As on date, 19,276 MW has been tendered out, of which LOI issued for 13,910 MW/PPA signed for 10,824 MW.

- 34 Solar Parks of capacity 20,000 MW in 21 states have been sanctioned which are under various stages of execution.

- As on 31.10.2016, a total of 90,710 solar pumps have been installed throughout the country.

- **Also,** A total amount of Rs. 67.01 crore has been sanctioned for preparation of master plans, solar city cells, promotional activities and installation of renewable energy projects and an amount of Rs. 24.16 crore has been released, so far, under **Solar City Programme.**

- Various departments and ministries under central government have collectively committed to **deploying 5,938 MW of rooftop solar capacity** for their internal power consumption. SECI is aggregating demand for a part of this requirement and helping in procuring rooftop solar systems. **SECI has issued a tender for development of 1,000 MW rooftop solar capacity on pre-identified central government/ department owned buildings**. It is the largest such tender in India's fledgling rooftop solar market.

- Several schemes namely (i) Defence scheme (ii) Central Public Sector Undertakings (CPSUs) scheme (iii) Bundling scheme (iv) Canal Bank/ Canal Top scheme (v) VGF

Scheme (vi) Solar Park scheme (vii) Solar rooftops, have been initiated/launched by the Ministry under National Solar Mission which are under implementation.

- Under **Defence scheme** against a target of 300 MW, 347 MW sanctioned, under **Central Public Sector Undertakings (CPSUs) scheme** against a target of 1000 MW, all capacity sanctioned, under **3000 MW Bundling scheme**, Tranch-I: 3000 MW has been tendered, under **100 MW Canal Bank/ Canal Top scheme**, all capacity sanctioned, under **2000 MW & 5000 MW VGF Scheme**, tenders issued for 4785 MW, and under **20,000 MW Solar Park scheme**, 34 Solar parks have been approved in 21 States with aggregate capacity of 20,000 MW.

Solar Rooftop

- A target of 40 GW grid connected solar rooftops to be achieved by 2022 has been set. So far, about 500 MW have been installed and about 3,000 MW has been sanctioned which is under installation. All major sectors i.e. Railways, Airports, Hospitals, Educational Institutions, Government Buildings of Central/State/PSUs are being targeted besides, the private sector.

- A massive Grid Connected Solar Rooftop Programme launched with 40 GW target. State Electricity Regulatory Commissions of **30 States/UTs notified regulations** for net-metering/feed-in-tariff mechanism. **Rs.5000 crore approved for solar rooftops.About 500 MW solar rooftop capacity** installed till 30.09.2016.

- A total sanction of 1300 million dollars has been received from World Bank, KFW, ADB and NDB through which the SBI, PNB, Canara Bank and IREDA will be in the position to fund at the rate of less than 10%.

- Ministry has tied up with ISRO for Geo tagging of all the Rooftop plants using ISRO's VEDAS Portal.

Wind Power

- During the year 2015-16, wind power capacity addition of 3.42 GW was made, which is highest ever wind power capacity addition in the country during a single year. The present wind power installed capacity in the country is around 28.28 GW. Now, in terms of wind power installed capacity India is globally placed at 4th position after China, USA and Germany.

- India has a strong manufacturing base of wind power equipment in the country. Presently, there are 20 approved manufacturers with 53 models of wind turbines in the country up to a capacity of 3.00 MW single turbines. Wind turbines being manufactured in India are of international quality standards and cost-wise

amongst the lowest in the world being exported to Europe, USA and other countries.

- The wind power potential of the country has been reassessed by the National Institute for Wind Energy (NIWE), it has been estimated to be 302 GW at 100 meter hub-height. Online wind atlas is available on NIWE website. This will create new dimension to the wind power development in the country.

- India has long coastline where there is a good possibility for developing offshore wind power projects. The cabinet has cleared the National Offshore Wind Energy Policy and the same has been notified on 6th October 2015. Certain blocks near Gujarat and Tamil Nadu coast line have been identified. NIWE is in process of doingthe wind resource assessment in these coastal areas.

- Comprehensive Guidelines for Development of On-shore Wind Power Projects in the country have been formulated and issued on 22nd October 2016.

- Guidelines for implementation of "**Scheme for Setting up of 1000 MW Inter-State Transmission System (ISTS) - connected Wind Power Projects**" issued on 22nd October 2016.

- The Policy for Repowering of the Wind Power Projects has been released on 5th August, 2016 to promote optimum utilization of wind energy resources by creating facilitative framework for repowering.

Small Hydro Power

A capacity addition of 14.30 GW of renewable energy has been reported during the last two and half years under Grid Connected Renewable Power, 0.53 GW from Small Hydro Power.

Biomass Power

Biomass power includes installations from biomass combustion, biomass gasification and bagasse co-generation. During 2016-17, against a target of 400 MW, 51 MW installations of biomass power plants has been achieved making a cumulative achievement to 4882.33 MW.

Family Size Biogas Plants

Family Size Biogas Plants mainly for rural and semi-urban households are set up under the National Biogas and Manure Management Programme (NBMMP). During 2016-17, against a target of 1.00 lakh biogas plants, 0.26 lakh biogas plants installations has been achieved making a cumulative achievement to 49.35 lakh biogas plants.

Off-Grid Solar Applications

A special programme for **1,00,000 solar pumps launched** of which 31,472 Solar Pumps installed in 2015-16, higher than total number of pumps installed during last 24 years i.e. since beginningof the programme in 1991.

Amendments in Tariff Policy to promote Renewable Energy

- Enhancement in Solar RPO to 8% by March 2022.
- Introduction of RGO for New coal/lignite based thermal plants after specified date.
- Ensuring affordable renewable power through bundling of renewable power.
- No inter-state transmission charges and losses to be levied for solar and wind power.
- Further, pursuant to the revised tariff policy, the Ministry of Power on 22nd July 2016 has notified the long term growth trajectory of RPO for solar and non-solar energy for next 3 years 2016-17, 2017-18 and 2018-19 as under:-

Long term trajectory	**2016-17**	**2017-18**	**2018-19**
Non-solar	8.75%	9.50%	10.25%
Solar	2.75%	4.75%	6.75%
Total	11.50%	14.25%	17.00%

IREDA

Indian Renewable Energy Development Agency (IREDA) has been awarded Mini Ratna Status and the authorised capital of IREDA is increased from Rs.1000 Cr. to Rs.6000 Cr.

New Office Building of MNRE

Foundation Stone Laying Ceremony of '**Atal Akshay Urja Bhawan'**, an integrated headquarters building for the Ministry of New and Renewable Energy was held on 19th October, 2016. The Foundation Stone was laid by **Shri Piyush Goyal, Hon'ble Minister of State (Independent Charge) for Power, Coal, New and Renewable Energy and Mines.**

Installation of 200 MW or more Capacity Solar Power Plant at the Central State Farm at Jetsar, Rajasthan

The Union Cabinet chaired by the Prime Minister Shri Narendra Modi has given its approval for utilization of 400 hectares of un-cultivable farm land at the Central State Farm (CSF), Jetsar in Sri Ganganagar District, Rajasthan for setting up of a solar Power Plant of capacity exceeding 200 MW. The land is presently in possession of National Seeds Corporation (NSC), a Central Public Sector Enterprise (CPSE) under the administrative control of the Ministry of Agriculture and Farmers Welfare. The Solar Power Plant will be set up by a CPSE, which would be selected through negotiation. The Project, by utilizing un-cultivable land for a Solar Power Project, will yield revenue for NSC and will also generate clean energy for the nation

Green Energy Corridor

Rs.38,000 crore Green Energy Corridor is being set up to ensure evacuation of Renewable Energy. Power Grid Corporation of India Limited (PGCIL) has sought a Loan assistance of US$ 1,000 million from the Asian Development Bank (ADB) comprising of Sovereign guaranteed loan of US$ 500 million and Non-Sovereign loan of US$ 500 million. the Loan would be utilized for funding of the following transmission projects including a project under Green Energy Corridor projects in next 3-4 years:

(i) HVDC Bipole link between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)- Scheme 1: Raigarh-Pugalur 6000 MW HVDC System.

(ii) HVDC Bipole link between Western Region (Raigarh, Chhattisgarh) and Southern Region (Pugalur, Tamil Nadu) - North Trichur (Kerala)- Scheme 3: Pugalur- Trichur 2000 MW VSCbased HVDC System.

(iii) Real Time Measurement/ monitoring scheme.

(iv) Inter State Transmission System (ISTS) associated with Green Energy Corridor as under:

a) Ajmer(New) – Bikaner (New) 765 kV D/c
b) Bikaner(New) – Moga (PG) 765 kV D/c
c) LILO of one circuit of 400kV Bhadla- Bikaner (RVPN) line at Bikaner(New)
d) Establishment of 2x1500 MVA, 765/400 kV S/s at Bikaner (New)

Enhancement of Budget

Ministry's budget enhanced from Rs.1500 crore to Rs.9,000 crore (Rs.5,000 crore gross budgetary support + Rs.4,000 crore in way of bonds to be raised by IREDA) by 2016-17.

LOWEST SOLAR TARIFFS

Solar tariffs have fallen to an unprecedented low of Rs. 4.34 / kWh through reverse auction for one of six projects of 70 MW each to be put up in Rajasthan under the National Solar Mission. NTPC on 18.01.2016 conducted the reverse bidding for 420 MW solar power projects However, the tariff had further fallen to Rs 3 per unit, which was quoted by Amplus Energy Solutions in an auction for rooftop solar power conducted by Solar Energy Corporation of India (SECI).

SKILL DEVELOPMENT

Surya Mitra Scheme has been launched for creating 50,000 trained solar photovoltaic technicians by march 2020. A total number of 5492 Surya Mitra's have been trained as on 30.09.2016 and more than 3000 are undergoing training. A network of over 150 Institutions, spread all over the country, have been created for implementing Surya Mitra scheme.

In addition, short term training programmes for small hydro, entrepreneurship development, operation & maintenance of solar energy devices and boiler operations in co-generation plants, have been organised.

About 7800 persons have been trained through these short term training programmes during the last two years.

Shri Piyush Goyal, Minister of State (IC) for Power, Coal and New & Renewable Energy launched "**Surya Mitra" mobile App** at National Workshop on Rooftop Solar Power on 07.06.2016. The GPS based mobile app has been developed by National Institute of Solar Energy (NISE) which is an autonomous institution of Ministry of New & Renewable Energy (MNRE). The Surya Mitra Mobile App is currently available in Google play store, which can be downloaded and used across India. This App is a high end technology platform which can handle thousands of calls simultaneously and can efficiently monitor all visits of Suryamitra's. The trained Suryamitra's who opts for entrepreneurship have joined in the Mobile App in several states. These Suryamitras are once again sensitized by NISE on soft skills Customer Relations Management, Punctuality and are now ready to deliver the services.

Other Initiatives

- **International Solar Alliance** was launched as a special platform for mutual cooperation among 121 solar resource rich countries lying fully or partially between Tropic of Cancer and Tropic of Capricorn at COP21 in Paris on 30th November, 2015 to develop and promote solar energy, with its headquarter in India. On 25th January, 2016, the Foundation Stone for the proposed Headquarters of the ISA was laid at Gurgaon, Haryana (India) and its interim Secretariat was inaugurated. The International Steering Committee (ISC) of the ISA has held four meetings so far. The Framework Agreement of

ISA has been finalized after discussions with various stakeholders. It was presented in the fourth meeting of the ISC of ISA. **The Framework Agreement of ISA has been signed by 20 member countries including India, France, Brazil and others on 15th November,2016 at Marrakech, Morocco on the side-lines of COP-22.**

- **Bank loans up to a limit of Rs.15 crores** will be given to borrowers for purposes like solar based power generators, biomass based power generators, wind power systems, micro-hydel plants and for renewable energy based public utilities viz. Street lighting systems, and remote village electrification. For individual households, the loan limit willbe **Rs.10 lakh per borrower**.

- Coal cess has been increased 8 times from Rs.50 to Rs.400/ton in last two years (2014-15) which will make available around Rs.40,000 crore/year for supporting and incentivizing development of Clean Energy projects in the country.

- Foreign Direct Investment (FDI) up to 100% is permitted under the automatic route for renewable energy generation and distribution projects subject to provisions of The Electricity Act, 2003.

In order to achieve the targets, various initiatives have been taken by the Government which includes:

- Amendments in the Tariff Policy for strong enforcement of Renewable Purchase Obligation (RPO) and for providing Renewable Generation Obligation (RGO);
- Setting up of exclusive solar parks;
- Development of power transmission network through Green Energy Corridor project;
- Identification of large government complexes/ buildings for rooftop projects;
- Provision of roof top solar and 10 percent renewable energy as mandatory under Mission Statement and Guidelines for development of smart cities;
- Amendments in building bye-laws for mandatory provision of roof top solar for new construction or higher FAR;
- Infrastructure status for solar projects;
- Raising tax free solar bonds;
- Making roof top solar a part of housing loan by banks/NHB;
- Incorporating measures in Integrated Power Development Scheme (IPDS) for encouraging distribution companies and making net-metering compulsory
- Raising funds from bilateral and international donors as also from the Green Climate Fund to achieve the target. and
- Creation of Surya Mitras for installation and maintenance of the Solar Projects.

MNRE ACHIEVEMENT IN 2017

Ministry of New & Renewable Energy			
Programme/ Scheme wise Physical Progress in 2017-18 & cumulative upto the month of September, 2017			
Sector	FY- 2017-18		Cumulative Achievements
	Target	Achievement (April - September, 2017)	(as on 30.09.2017)
I. GRID-INTERACTIVE POWER (CAPACITIES IN MW)			
Wind Power	4000.00	420.88	32700.64
Solar Power - Ground Mounted	9000.00	2348.81	13981.64
Solar Power - Roof Top	1000.00	134.22	790.22
Small Hydro Power	200.00	9.70	4389.55
Bio-Power (Biomass & Gasification and Bagasse Cogeneration) #	340.00	0.00	8181.70
Waste to Power	10.00	0.00	114.08
Total	**14550.00**	**2913.61**	**60157.83**
II. OFF-GRID/ CAPTIVE POWER (CAPACITIES IN MW_{EQ})			
Waste to Energy	15.00	3.21	174.29
Biomass(non-bagasse) Cogeneration	60.00	9.50	661.41
Biomass Gasifiers	7.50	.92	163.37
Aero-Genrators/Hybrid systems	.50	0.14	3.29
SPV Systems	100.00	66.23	528.77
Total	**183.00**	**80.00**	**1531.13**
III. OTHER RENEWABLE ENERGY SYSTEMS			
Family Biogas Plants (in Lakhs)	1.10	0.00	49.56*
Water Mills / Micro Hydel (Nos.)	150/25	0.00	2690/72

Progress of Biomass has been revised to installed capacity from exportable power
* Cumulative achievement as on February 2017

Source: Ministry of New and Renewable Energy