

ANNUAL REPORT 2017-18



**MAHARASHTRA ENERGY
DEVELOPMENT AGENCY (MEDA)**

(A Govt. of Maharashtra Institution)





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PREFACE

DIRECTOR GENERAL

I am happy to bring out the Annual Report of Maharashtra Energy Development Agency (MEDA) for the year 2017-18. The role of renewable energy sources in the grid connected power generation activity in the state has gained importance. I am also happy to state that MEDA has taken various measures for vigorous promotion of renewable energy. The foremost among them is the comprehensive RE policy-2015, under which capacity addition of 14,400 MW is planned by 2020. This flagship policy will definitely increase the contribution of renewable energy sources in the basket of electricity.

The potential of wind energy is assessed to be 9400 MW in Maharashtra. Grid-connected wind power projects of as much as 12.6 MW capacity have been commissioned during F.Y. 2017-18. We continue with our wind monitoring exercise - the largest in the country - with 409 wind monitoring stations installed by March 2018. MEDA has also initiated the solar resource assessment programme in the state. We are the first state in the country to set up Solar Radiation Resource Assessment Stations (SRRA) on its own. SRRA will generate accurate and investment-grade solar radiation data. So far MEDA and NIWE have installed 8 SRRA stations in the state.

There is a continuous effort to explore the potential of other renewable energy sources like solar and Bagasse Co-generation during the year 2017-18, Solar PV projects of 634.20 MW capacity have been commissioned. The capacity installation of renewable energy projects during 2017-18 adds up to 787.30 MW capacity addition in one year.

Roof top and ground based off-grid solar power plant scheme, under this scheme 70 nos. of off-grid solar power plant having capacity 890 kWp installed on various Government - semi-Government offices in the state during 2017-18 MEDA have developed web-based portal system (MH-GCRT) for online submission of applications. MEDA has registered around 700 empaneled channel partners and issued sanction for around 6000 nos. of beneficiary for 55 MW capacity projects till 31st March 2018. Under the Remote village electrification program, around 3179 nos. of Solar home lights and 296 nos. of solar street lights are installed in various villages in the state during 2017-18.

MEDA is also working as the State Designated Agency for energy conservation / energy efficiency activities in the State. The energy conservation activities are being promoted through various schemes from the state budget. Among the important schemes launched by MEDA, Financial assistance is given for one of the demonstration projects of energy efficiency in Govt. buildings. A total of 3 demonstration projects have been completed during this year. The schemes relating to energy audit have also gained momentum. These schemes have introduced and strengthened the concept of energy audit in the industry and government sector. The glorious tradition continues as MEDA won the Certificate of Merit prize in 2017-18 for its outstanding performance as the State Designated Agency for energy conservation and energy efficiency activities.

MEDA participated in several national and state level exhibitions to disseminate knowledge about renewable energy and energy conservation. With a different and public-oriented outlook, I am confident that MEDA with its inspired team will keep up the tradition of excellence in the spheres of renewable energy and energy conservation.



Director General, MEDA

1. INTRODUCTION

Maharashtra Energy Development Agency (MEDA) registered under Societies Registration Act – 1860, commenced actual functioning from July 1986. MEDA's mandate is to undertake development of renewable energy and facilitate energy conservation in the State of Maharashtra, as a State Nodal Agency. Controlling body of MEDA is the Governing Body, with Hon. Minister for Non-conventional Energy, Maharashtra State a Chairman, Hon. Minister of State for Non-conventional Energy as a vice Chairman, Secretaries / Principal Secretaries of six other departments of Govt. of Maharashtra are Members and Director General, MEDA, as a member secretary.

The broader objective is to promote, develop and diffuse knowledge in the various fields of Renewable Energy Source and assist the Government of Maharashtra and the Govt. of India in the efforts to develop and promote Renewable and alternate energy sources / technologies, evolve and promote energy conservation measures.

Life of today is impossible without energy. At present more than 70% of the total energy is based on fossil fuel (coal, mineral oil, natural gas). While remaining 30% is through hydro electric projects. When the electricity is generated by using the conventional sources, green house gases are emitted, i.e., carbon monoxide, carbon dioxide and sulphur dioxide etc. which when released into atmosphere cause global warming. The increase in temperature due to global warming has become a threat for the very existence of the human being. The scarce availability of conventional energy sources and ill-effects of their uses, it is the need of hour to produce energy that is pollution free and eco-friendly.

The Govt. of Maharashtra in line with the policy of Central Govt. has adopted the policy of achieving the target of renewable energy up to 12.5% of conventional energy in the State and accordingly declared policies from time to time. Among various non-conventional energy sources, Wind Energy is one of important resources that have been widely tapped in the state. Besides this, Biomass, Bagasse, Small Hydro, Urban & Industrial Waste & Solar Energy are other main resources of renewable energy. The potential of various non-conventional energy sources and its achievement is given below.

A. POWER GENERATION FROM RENEWABLES: MEDA'S NEW FRONTIER :

Maharashtra is second in the country in production of power from renewables by having around **8341.348 MW** installed capacity upto **31/03/2018**. (Including Small Hydro).

Sr. No.	Source	Potential in country (MW)	Potential in the state (MW)	Achievement (MW) (31/03/2018)
01	Wind	49130	9400	4781.81
02	Bagasse co generation	5000	2200	1953.85
03	Biomass	16881	781	215.00
04	*Small Hydro Power (SHP)	15000	732	335.525
05	Urban waste	1700	287	3.00
06	Industrial waste	1700	350	34.713
07	Solar Photovoltaic & Solar Thermal Power	20-30 / Sq.k.m.	49/sq.km.35/sq.km.	1017.45

Sr. No.	Source	Potential in country (MW)	Potential in the state (MW)	Achievement (MW) (31/03/2018)
	Total	89411	13750	8341.348

Small Hydro Power Projects are implemented by Irrigation Department, Govt. of Maharashtra

B. Cumulative Achievements Upto 31st March, 2018:

Sr No	Particulars	Cumul. Achievet. upto 31 st March, 2017	Achvt. in 2017-18	Cumul. Achievet. upto 31 Mar, 2018
1	POWER GENERATION			
01.	Wind Power Project	4769.21	12.6	4781.81
02.	Bagasse co generation Power Project	1848.85	105	1953.85
03.	Biomass Power Project	215.00	0	215.00
04.	Small Hydro Power Project	300.02	35.505	335.525
05.	Urban waste	3.00	0	3.00
06.	Industrial waste	34.71	0	34.713
07.	Solar Thermal & Photovoltaic	383.25	634.2	1017.45
	Total	7554.04	787.305	8341.348
2	Energy Conservation Programme			
a	Energy Audit (Nos.)	970	119	1089
b	Walk Through Energy Audit (Nos.)	2247	161	2408
c	Waster Heat Recovery	11	0	11
d	Replacement of CFL at Gram panchayat	153066	0	153066
e	Demo Project in Govt. / Semi Govt. office buildings of Energy Conservation (Nos)	87	3	90
f	Installation of EC Devices in Municipal Councils-(Nos)	34	2	36
3	Wind Monitoring Stations	406	3	409
4	Solar Radiation Assessment Centres	7	0	7
5	Common Study Room	18603	0	18603
6	Village Electrification (Villages)	586/703	0	586/703
7	Solar Power plants in Govt. Buildings	41	0	41
8	Briquetting Project (Nos.)	152	18	170
9	Solar Energy Applications in Ashram Shala – Solar Home Light, Street Light, Water Heating System & Power Packs	10	0	10
10	Wind Solar Hybrid System in Ashram Shala & Hostels (Nos.)	20	0	20
11	Exhibitions (Nos.)	277	11	288
12	Wind Solar Hybrid System (Nos./kW)	293/2283	0	293/2283

C. Grants received from State Govt. in 2016-17 & 2017-18.

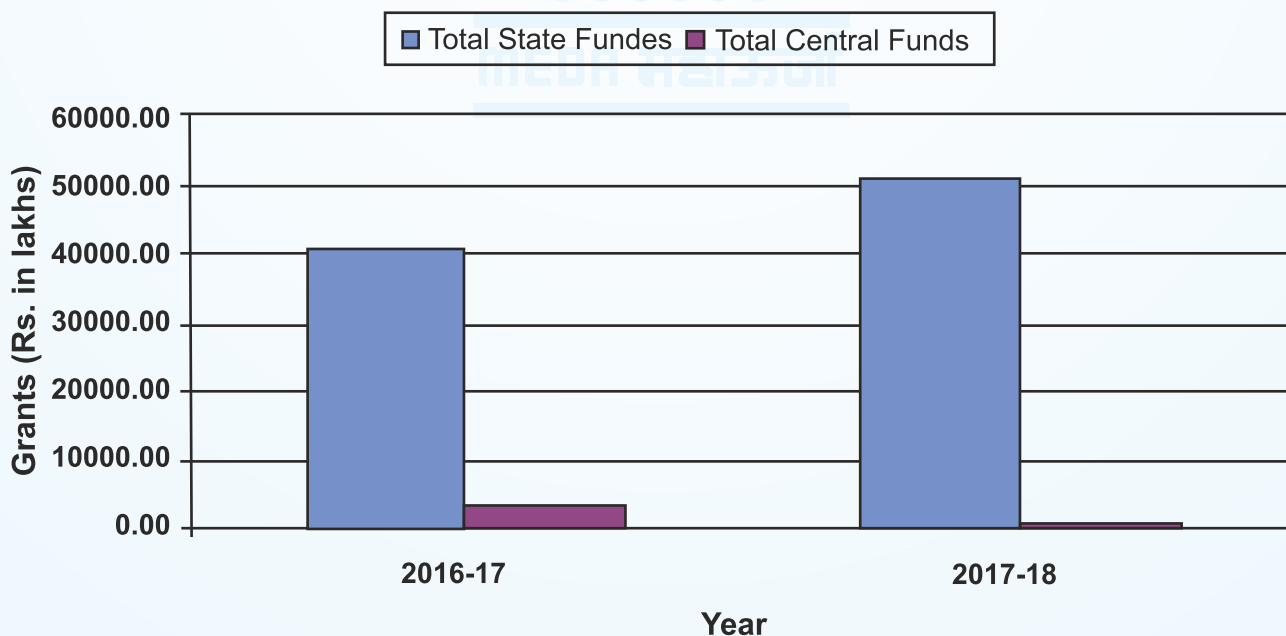
(Rs. in lakhs)

Sr. No	Programme	2016-17	2017-18
1	Non-Conventional & Renewable Sources of Energy (NRSE) - 28100034	1520.00	1760.00
2	Maharashtra Energy Development Fund / Green Cess Fund (GCF) - 28100123	9024.00	8940.00
3	Solar Agriculture Pump - 28100902	151.00	0.00
4	13 th Finance Commission - 28100911	30000.00	40150.00
	TOTAL	40695.00	50850.0

D. Comparison between State and Central Govt. Plan Grants in 2016-17 & 2017-18.

Year	2016-17	2017-18
Total State Funds	40695.00	50850.00
Total Central Funds	3242.42	378.51
Total	43937.42	51228.51

Comparison between State & Central Govt. Grants



2. WIND POWER PROJECTS

Wind Energy is the energy created due to uneven heating of the earth's surface and rotation of earth. Uneven heating causes difference in the air pressure, which causes air to flow from high pressure region to low pressure region. This phenomenon is termed as 'wind'. Wind contains tremendous amount of energy which can be utilized to generate power on a large scale.

History of Wind Power –

The application of wind energy for producing electrical energy was introduced later in the 20th century. By 1910 several hundred wind turbine generators rated between 5 KW and 25 KW were in operation in Denmark. By 1930s several wind power generators were installed in various parts of the world. But due to the higher cost of installation, the increase in number of systems was very less. By the early 1960s, interest in wind power as a viable and alternative source of power generation somewhat declined because other energy sources were simple and easily available. Wind energy was not found to be cost-effective in comparison with the fossil fuel systems of that age. After the oil crisis in 1970s, wind turbines have been developed on commercial scale and have received more importance after 1980, the second oil crisis. Presently it is one of the major sources for supplementing energy needs of many countries including India.

Progress of Wind Power in India –

India is now recognized as a leading country in the world for the development and utilization of renewable energy, particularly in wind power development. In fact, power generation from wind has emerged as one of the most successful programs in the renewable energy sector. With an installed capacity more than 34200 MW, India is the 4th largest wind-power producing nation in the world. Most of this capacity has come through private investment. Billions of units of electricity have been fed to various State grids from these projects. World's largest wind resource assessment program is also initiated to support these efforts. New initiatives have been taken for re-assessment and expansion of the wind resource data base; a centre for Wind Energy Technology; and motivating large private sector corporations, public sector units and power utilities to set up wind power projects. Local manufacturing capacity has been established and wind turbines and wind turbine components are being exported to USA, Europe and several developing countries.



Wind Power Projects in Maharashtra –

Wind Energy has paramount importance in the field of New & Renewable Energy Sources. Naturally, the Ministry of New and Renewable Energy, New Delhi has undertaken the Wind Energy program all over the country very intensively through nodal agencies in their respective states. In Maharashtra, this program is implemented through MEDA. 51 sites have been identified of more than 200 w/m² wind power density in the state of Maharashtra with the help of NIWE, Chennai.

Potential for wind power projects in the state is of 9400 MW. GOM has formulated conducive policy framework which has evoked positive response from entrepreneurs and investors to set up commercial wind power projects. With the declaration of attractive and conducive policies on Wind Power Projects, many private sector investors have been inspired to set up their projects in Maharashtra.

Govt. of Maharashtra has declared comprehensive policy for grid connected power projects based on New & Renewable (Non-Conventional) Energy Sources - 2015 vide Govt. Resolution No. NCE-2015/C.R. 49/Energy-7 dated 20th July 2015 & its amendment vide GR. No. NCE-2016/C.R.110/Energy-7 dated 3rd December 2016 and its methodology vide Govt. Resolution No. NCE-2015/C.R. 49/part-8/Energy-7 dated 9th September 2015.



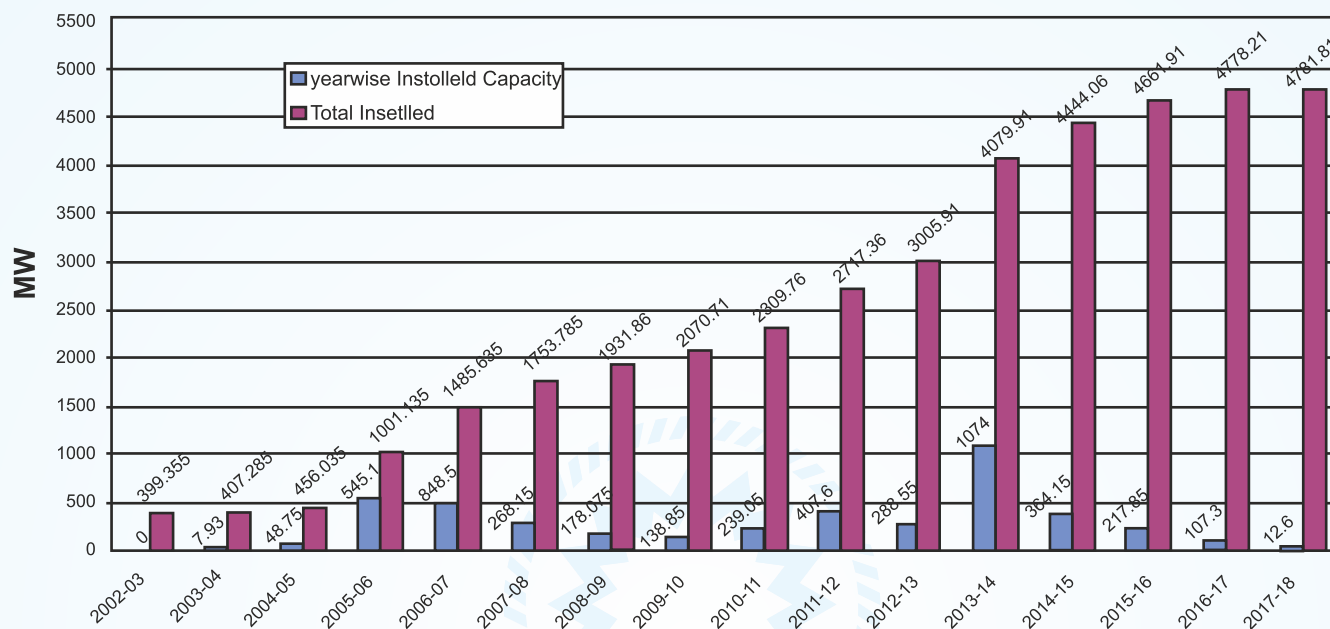
Renewable Energy Policy for Maharashtra – 2015

Target : - 5000 MW

1. Target for sale of power to Distribution Licensees: - 1500 MW
Achievement: - 1493 MW
2. Target for sale of power inside the state: - 500 MW
(Captive/Group Captive/Third Party Sale)
Achievement: - 123.10 MW
3. Target for sale of power outside the state: - 3000 MW
(Captive/Group Captive/Third Party Sale)
Achievement: - Nil

Cumulative Capacity of projects set up and commissioned by the private sector up to March 2018 is as follows:

Installed Capacity of Wind Power Project



Wind power project had fed 5888.911 Million units of electricity in the state grid in FY 2017-18.

Year wise installed capacity of wind power projects in the state of Maharashtra up to March 2018 is as follows :

Year Upto	Installed Capacity in MW
2002-03	399.355
2003-04	7.93
2004-05	48.75
2005-06	545.1
2006-07	484.5
2007-08	268.15
2008-09	178.075
2009-10	138.85
2010-11	239.05
2011-12	407.6
2012-13	288.55

Year Upto	Installed Capacity in MW
2013-14	1074
2014-15	364.15
2015-16	217.85
2016-17	107.30
2017-18	12.6



3. BAGASSE BASED CO-GENERATION POWER PROJECT

Bagasse is a by-product produced during crushing of cane in sugar factory. Bagasse is an excellent renewable source for generating steam and power. In view of continuous shortage of power and limited fossil fuel reserves, this source of renewable energy is more acceptable. Sugar industry is the backbone of the Indian agriculture sector. There are 225 registered sugar factories in the state. Power is co-generated from bagasse left after extraction of juice from cane in sugar industry. Along with the saving of fossil fuels, cogeneration also allows to reduce the emission of greenhouse gases (particularly CO₂ emission). The production of electricity being on-site, the burden on the utility network is reduced and the transmission line losses eliminated.

The available surplus power potential as estimated by VSI, Pune in the state through co-generation is about 2550 MW (on installed capacity). To tap this power potential, GoM declared an attractive policy on 20-7-2015. With advancement of technology, it has become possible to utilise the raw material from (bagasse) sugar industry as fuel in most efficient manner for generating surplus power. Due to this many sugar factories opted to go for efficient cogeneration. The surplus power now being fed in to the grid is approximately 1550 MW. Therefore, there is still enough potential left to be tapped.

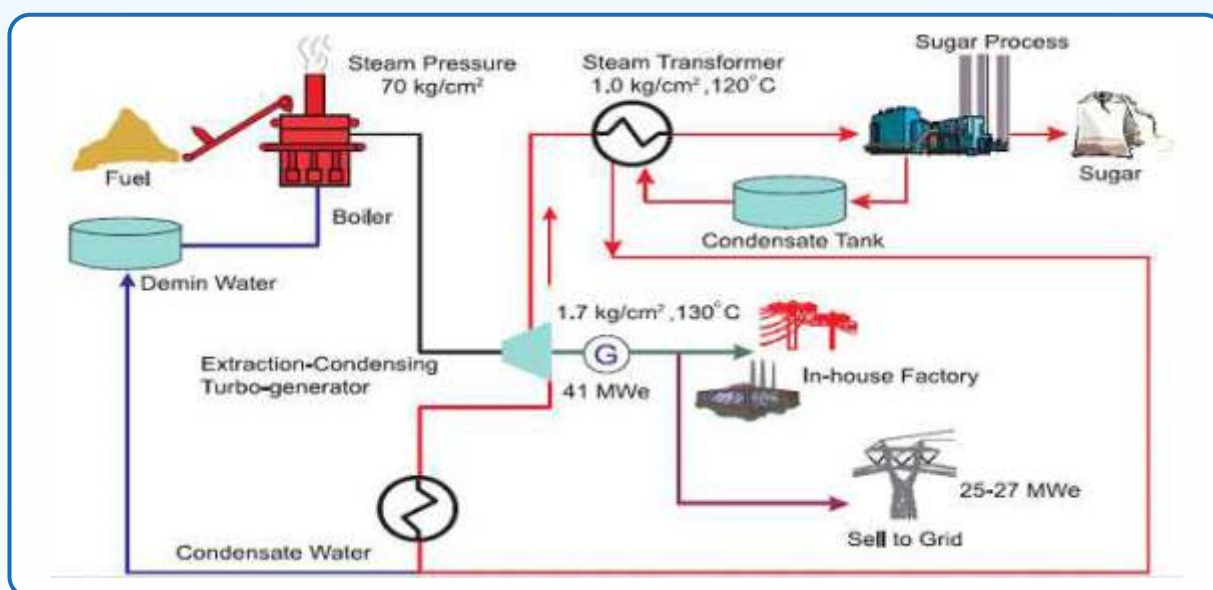


The available power potential with the cooperative sugar factories can be harnessed provided they are financially supported. In view of this, Urjankur Nidhi Policy has been declared by GoM for financing all types of RE projects. This fund can be utilized for the co-generation. Further an exclusive scheme for Cooperative sugar factories for setting up Cogeneration projects has also been declared by cooperative dept., GoM in the year 2008 in said scheme 5-10% contribution is to be borne by co-operatives. For setting up cogeneration, 30% from SDF and 60 % will come from Banks / FIS as a loan.

1) Technical Information and Application:

Principle –

Cogeneration or Combined Heat and Power (CHP) is defined as the sequential generation of two different forms of useful energy from a single primary energy source, typically mechanical energy and thermal energy. Mechanical energy can be used to drive an alternator for producing electricity. Thermal energy can be used either for direct process applications like sugar manufacturing or for indirectly producing steam. Bagasse is fed into the high-pressure boiler for producing high-pressure steam. This steam is injected into backpressure or extraction condensing turbine. The turbine is coupled to turbo generator for producing electricity. The condensing turbine is used during off-season whereas the backpressure turbine can be used only during the crushing season.



Working Cycle of Bagasse Based Cogen Power Plant

- I - Basic components of Bagasse Cogeneration power project–
Boiler, Turbine, Generator, Water / Air Cooled Condenser, Electrostatic Precipitator (ESP)
- II - Application –
The surplus power generated from cogeneration route is fed into the grid.
This helps to generate additional revenue to the factory.
- III - Projects taken up –
The total installed capacity of bagasse Cogen projects in the FY 2017-18 is 105 MW which has raised the total co-gen capacity in the state to 1953.85 MW by the end of March 2018.

2) Govt. Policies Announced –

A) MNRE Policy – The MNRE, Gol vide sanction No 13/10/2013-BM dated June 20th, 2014 is extending central financial assistance to bagasse cogeneration power projects. The brief details are furnished as below

a) In Private / joint / Coop. / Public sector sugar mills.

Project type	Subsidy details	
	Boiler Configuration	Subsidy per MW capacity
Bagasse Co-generation by private sugar mills	Nil	Rs. 15 Lakh x (Cap in MW) (Maximum Rs. 1.5 Crore After commissioning)

Bagasse Co-generation by Coop. / Public sector sugar mills.	40 bar and above	Rs. 40 lakhs
	60 bar and above	Rs. 50 lakhs
	80 bar and above	Rs. 60 lakhs

Maximum support ~ Rs.6.00 Crore per project above subsidy will be assessed on actual surplus power exported to the grid during crushing season.

- b) In Cooperative / Public sector sugar mills Bagasse based Cogeneration Project implemented by State govt. undertaking / State govt. joint venture Co. / Special purpose vehicle (Urjankur Trust) through BOOT / BOLT model.

Project type	Subsidy details	
	Boiler Configuration	Subsidy per MW capacity
Single Coop. mill through BOOT / BOLT model	60 bar and above	Rs. 40 lakhs
	80 bar and above	Rs. 50 lakhs

+

Maximum support ~ Rs.6.00 Crore per project on surplus power exported in season

- c) For existing cooperative sector sugar mills employing boiler modifications.

Project type	Subsidy details	
	Boiler Configuration	Subsidy per MW capacity
Existing cooperative sugar mill	40 bar and above	Rs. 20 lakhs
	60 bar and above	Rs. 25 lakhs
	80 bar and above	Rs. 30 lakhs

* The policy details can be seen at www.mnre.nic.in

B) State Policy -

GoM declared Integrated Non-conventional Energy Generation policy dated 20-07-2015 and its implementation methodology 09-09-2015.
The policy benefits are furnished as below –

- a) Cane Purchase Tax - 3% purchase tax with 100 % exemption for first 10 years subject to PPA with MSEDCL.

The additional details of the state NCE policy and 3% purchase tax exemption GR could be seen at www.mahaurja.com.

- b) The state govt. has established the 'Urjankur Nidhi Trust' for assisting the RE developers to implement the various RE projects. For giving greater impetus for implementation of Bagasse Co-generation power projects in co-operative sugar mills a suitable BOOT basis business model is developed. In this model 30% equity is contributed from which 10% share will come from GoM and 20% from private investors. The debt portion will be raised by RE developer from bankers/FIs. Under Urjankur projects the equity and debt portion will be managed entirely by IL and FS Company who is the fund manager for 'Urjankur Nidhi'.

C) Achievement for the current year –

The total installed capacity of bagasse cogen projects in the FY 2017-18 is 105 MW which has raised the total co-gen capacity in the state to 1953.25 MW by the end of March 2018.

D) Next Year Plan –

Having attractive central and state policies for cogeneration, target of 100 MW is fixed for implementation of bagasse cogeneration in sugar factories during the FY 2018-19. It is expected that the maximum Co-operative and private sugar factories will avail the benefit of this scheme and try to install the cogeneration power projects in following year.



4. SMALL HYDRO POWER PROJECT

Hydro Power is a renewable and pollution free resource. The importance of decentralized power generation has made Small Hydro Power (SHP) an attractive venture. It has short gestation and almost negligible impact on environment. The necessities to secure energy security and abate global warming renewable energy projects are gaining more attention not only in the developing countries but also in the developed ones. Small hydro is significant for off-grid, rural, remote area applications in far flung isolated communities having no opportunity of grid extension for years to come. Small Hydro is operationally flexible, suitable for peaking support to the local grid as well as for stand alone applications. Small Hydro power projects serves to enhance economic development and living standards especially in remote areas. In India Hydro power projects up to 25 MW capacities are classified as Small Hydro.

In order to develop this sector, the Govt. of Maharashtra vide its policy dated 8th December, 2005, has mandated MEDA for developing small hydro power projects up to 5 MW capacities on Run of the River, K T Weir and Water Falls in the state.

1) Technical Information and Application Principle

The hydro power potential is determined on the available discharge of water and height from which it is available. The kinetic energy of water impinging on the blades of turbine rotates the turbine and generates mechanical energy. This turbine is coupled to alternator which converts mechanical energy to electrical energy.

Basic component of SHP

- **Civil components** : Diversion weir, Intake, Power Channel, De-silting tank, Forebay, Penstock, Power House, Tail race etc.
- **Electro-mechanical components** : Generator, Protection Control, Hydro Turbines, Gates, Valves Transmission and Distribution etc.

a) Application : The micro / mini and small hydro power projects have less damaging effect on the environment and therefore are preferred. Such projects could be taken up in the remote areas where the transmission lines have not reached, availability of water is seasonal and requirement of energy is less.

2) Govt. Policies

- MNRE Policy: - The MNRE, GoI vide Policy No 14(03)2014-SHP dated 2nd July, 2014 is extending central financial assistance to Small hydro power projects. The brief details are furnished as below

a) Financial support for identification of new potential SHP sites and preparation of plan and preparation of DPR –

1. Rs. 6.00 lakhs for each project up to 1 MW capacity.
 2. Rs.10.00 lakhs for each project above 1 MW up to 25 MW capacities.
- (For State Govt. dept. / Agencies / Local Bodies)

b) Financial support to set up new SHP projects Upto 25 MW in private, Co-operative, joint sec

Area	Above 0.1 MW and Upto 25 MW
Maharashtra	Rs. 1.00 crores/MW limited to Rs. 5 crores/project

* The project developers / owners are required to contribute a minimum of 50 % of approved project cost.

c) Financial support to set up new SHP projects Upto 25 MW in Government / State / Public sector

Area	Above 100 KW & Upto 1000 KW	Above 1 MW and Upto 25 MW
Maharashtra	Rs. 35,000 / KW	Rs.3.5 crores / MW limited to Rs.20 crores / project

* A minimum of 10% of the total project cost is required to be borne by the state implementing agency or the owner of the project.

d) Financial support for renovation and modernization of existing SHP projects Upto 25 MW in Government sector

Area	Upto 1000 KW	Above 1 MW and Upto 25 MW
Maharashtra	Rs. 10,000 / KW	Rs. 1.00 crores/MW limited to Rs. 10.00 crores/project

* A minimum of 50% of the total project cost is required to be borne by the Central / State implementing agency or the owner of the project.

e) Financial support for Micro Hydel Projects

Micro Hydel projects Upto 100 KW capacity:

Area	Amount of CFA
Maharashtra	Rs. 1,25,000 / KW

- The policy details can be seen at www.mnre.nic.in

3) State Policy :

GoM declared Integrated Non-conventional Energy Generation policy dated 20- 07-2015 and its implementation methodology 09-09-2015.

The policy benefits are furnished as below –

- Capital Subsidy – Rs.50,000 per kW upto 25 MW limited to Rs. 1.00 cr per project for all types of hydro projects (to be availed after commissioning of project and producing certificate of export of power by distribution licensee)
- Evacuation expenses – Estimated cost and actual expenditure incurred for transmission line whichever is less will be considered subject to maximum Rs.1 Cr./ project after commissioning of project

The details of the policy could be seen at www.mahaurja.com

Besides above, the Water Resources Dept. GoM has declared SHP policy on 15th September, 2005 regarding development of small hydro power projects through private sector. This policy is still in continuation.

4) Achievement in the current year -

The cumulative installed capacity of commissioned Small Hydro Projects in the state arrives 335.525 MW.

5) Next Year Plan

Having attractive central and state policies for Small Hydro Power

Projects, target of 30 MW is fixed for implementation of Small Hydro Power Projects during the FY 2018-19.



Power House



Control Room Panel

5. INDEPENDENT BIOMASS BASED POWER PROJECT

Biomass is one of the important natural energy resources. Biomass is a fuel that is developed from organic materials, a renewable and sustainable source of energy used to create electricity. Agricultural residues, forestry residues and woods are the main source of biomass. Biomass can either be used directly or converted into other form of energy such as biofuel.

The Ministry of New and Renewable Energy (MNRE), Govt with the help of ORG-Marg, Jaipur has conducted state level biomass assessment study for Maharashtra. This study shows the available biomass power potential in Maharashtra to be 781 MW.

The state government has been promoting energy generation from biomass power project. MEDA is giving technical support and guidance to induce private investment into this sector and ensures speedy implementation of the projects. At present, there are 19 nos. Biomass Power Projects of totalling 215 MW commissioned in the State.

I - Technical Information and Application –

a) Principle –

The basic principle of operation is based on Rankine Cycle. In an Independent Biomass Power Project, biomass is burnt in furnace and medium to high pressure steam is produced. This steam is injected into turbine coupled with turbo generator for producing energy. The low-pressure steam released from turbine exhaust is condensed and pre-heated water is recycled to the boiler.

b) Basic components of Biomass Power Project :

Boiler, Turbine, Condenser, Cooling Tower, Electrostatic Precipitator

c) Type of Biomass used are as follows:

The types of biomass used in the project are usually the ones which are used for burning purposes viz: domestic heating, cooking in rural areas. A few names are: Coconut shell, Jute sticks, Maize stalks, Ground nut straw/shell, Tur stalks, Chilly stalks, Rice husk, Juliflora etc.

II – Application:

The power produced from biomass power project is utility grade power and can be fed into the grid. Plant Load Factor from such projects could reach 80% and above. In order to set-up such project, it is essential to observe the - availability of sufficient surplus biomass in the vicinity of the project. Further water linkage & grid accessibility is essential for smooth functioning of the project.

III - Projects Taken-up –

Biomass Power project is being promoted in all districts of Maharashtra. With the available power potential, it has been decided to establish projects up to 300 MW capacity of the Non-Conventional Energy Policy dated 20-07-2015. MEDA has so far sanctioned 37 biomass-based power projects totaling 410.5 MW capacities projects in the state.

IV - Govt. Policies –

a) MNRE Policy:

The MNRE, Gol is providing financial assistance by giving back ended subsidy to biomass power project. This subsidy is linked to capacity (Cap in MW) of the project. This assistance is determined by using the equation as $\text{Rs.20 lakhs} \times (\text{Cap in MW})$ (Maxi. Support of Rs. 1.5 Crore/project)

Eligible criteria for availing this subsidy are a) Minimum Steam pressure shall be of 60 bar b) fossil fuel up to 15% of total energy consumption in kcals or as per DPR (whichever is less) is allowed & c) Boiler & turbine shall be new.

For more details, MNRE official site could be seen at www.mnre.gov.in.

b) State Policy:

GoM has declared the Integrated RE policy on 20-07-2015. For Biomass Power Projects the policy benefits are furnished as below:

1. Evacuation –

Financial assistance for laying transmission line is available from green cess (33 kv & above) after commissioning of project; subject to maximum Rs.1.00 Crores/project.

2. Capital Subsidy -

Capital subsidy of Rs.1.00 Crores/project is given after commissioning of the project.

The detailed tariff order can be seen at www.mercindia.org.in

V – Next Year Plan –

MEDA is going to call expression of interest for developing biomass power projects according to policy target.

6. Solar Power Project

Solar energy is an abundant and inexhaustible energy resource. Due to scarcity of fossil reserves, solar energy has become increasingly important. This energy resource, could be used for setting up large, centralized power generation plants, smaller distributed heat and power plants, or scaled down, at the individual consumer level. The Maharashtra State is endowed with vast potential of solar energy and the Government is keen to tap this resource for strengthening power infrastructure in the state by setting up solar energy-based power projects. Maharashtra is having average solar radiation of 5 to 5.5 kWh/sq. meter / day & 250-300 days of sunny days.

The land required for 1MW solar photovoltaic power project is around 4 to 5 acres; where as land required for 1 MW Solar Thermal power project is around 7.5 to 10 acres. The accounting of area is usually made on the basis of possible route for power generation going to be adopted viz. Solar PV or Solar thermal technology. Depending on Solar radiation Solar photovoltaic with crystalline silicon has the capacity to generate around 1.66 million units of energy per annum & solar thermal with parabolic trough collector could produce around 2.47 million units per annum. The potential to generate energy from 1 Sq.km (100 hector) using Solar Photovoltaic technology is around 49 MW; whereas from solar thermal technology it is roughly 35 MW.

Technical Information & Application :

Principle : - Solar energy can be utilized to generate electricity using two technological routes namely, Solar Photovoltaic and Solar Thermal. They are explained briefly as follows:

A) Solar Photovoltaic Technology : In this technology light energy from sun is converted directly into electricity. There are two types of solar cells that can be used in solar photovoltaic power project:

- 1) Crystalline Silicon (c-Si).
 - Mono-crystalline Cell.
 - Poly or Multi-crystalline Cell.
- 2) Thin Film
 - Amorphous Silicon (a-Si).
 - Copper Indium Gallium Selenide (CIGS).
 - Cadmium Telluride (CdTe).

B) Solar Thermal (CSP) Technology :- The CSP technology utilizes the thermal part of the solar radiation. Direct solar radiation can be concentrated and collected by a range of Concentrating Solar Power (CSP) technologies to provide medium- to high temperature heat. This heat is used to operate a conventional power cycle.

Generation Modes of Solar Thermal Technology –

- 1) Line Focusing Systems.
 - Parabolic Trough Systems.
 - Fresnel Trough Collector Systems.

2) Point Focusing Systems.

- Dish Stirling Systems / Concentrating Dish.
- Solar Tower Plants using central Receiver System.

Application –

Solar Energy is the popular solution to abate global warming. It is the most abundant energy resource on earth. The solar energy that hits the earth's surface in one hour is about the same as the amount of energy being consumed by all human activities on earth in one year. Having this abundant resource, solar power project can be setup in any region. For setting up a solar power project a suitable land has to be identified and the technology route has to be decided based on the climatic conditions at the project location. Solar thermal plants need water for power production whereas SPV power plants do not need it. The power generated from solar power project can be feed into the grid. This helps the grid to remain stable. The addition of power from this resource is clean & pollution free.

1. Central Government Policies -

The Government has declared the Jawaharlal Nehru National Solar Mission (JNNSM) for the promotion of grid & off grid solar power project. Through this mission Solar Power totalling 100 GW will be commissioned by year 2022. It is expected that Solar Power will be available with grid parity by this time.

2. State Policy -

In order to encourage power generation projects based on Renewable Energy, on July 20, 2015 the government of Maharashtra has declared Renewable Energy Policy 2015 and on dated 9.09.2015 declared detailed methodology for implementation of this policy. Under this policy, solar power project of 7500 MW capacity will be developed out of which, a total of 2500 MW capacity solar power projects will be developed by MAHAGENCO in Public Private Partnership (PPP) mode to fulfill the Renewable Generation Obligation (RGO). The remaining capacity of 5000 MW solar power projects will be developed by other developers.

3. Projects taken up -

Grid connected Solar Power Projects of 1017.45 MW capacity have been sanctioned and commissioned in the state under guidelines issued by Govt. of Maharashtra & Govt. of India from time to time.

4. Solar radiation resource assessment (SRRA) station -

To promote Solar Power Project using solar energy it is required to make study report regarding solar radiation in different geographical location in the state. In this context MEDA has commissioned Eight SRRA Stations (Pune, Thane, Nanded, Aurangabad, Latur, Washim, Nagpur and Chandrapur) in the state. Maharashtra is the first state to established SRRA stations by using state fund. In addition, National Institute of Wind Energy (NIWE) has commissioned nine SRRA station in the state.

5. MNRE Solar Park Scheme-

Ministry of New & Renewable Energy, GoI has declared Scheme for 20,000 MW capacity for “Development of Solar Parks and Ultra Mega Solar Power Projects” in the country on 12th December, 2014. Further, under this scheme vide letter dated 21st March 2017. MNRE has enhanced capacity under the scheme from 20,000 MW to 40,000 MW.

Solar Park -

The Ministry of New and Renewable Energy (MNRE), GoI has sanctioned three Solar Parks of 500 MW each for Maharashtra which will be implemented by 2020 namely as follows –

- a) M/s. Sai Guru Mega Solar Park Pvt. Ltd, Sakri, Dist. Dhule
- b) M/s. Paramount Solar Power Pvt. Ltd, Tal. Patoda, Dist. Beed
- c) M/s. Mahagenco Solar Park, Sakri, Dist. Dhule

Further, M/s. Maharashtra State Generation Co. Ltd (MAHAGENCO) will plan to implement totalling 450 MW capacity solar parks under MNRE solar park scheme at various locations i.e.- Tal- Ausa, Dist- Latur (60MW), Tal- Ner, Dist Yavatmal (75 MW), Tal & Dist Washim (170 MW), at Kacharla, Tal. Bhadravati, dist. Chandrapur (145MW).

6. Hon'ble Chief Minister Solar Agriculture Feeder Scheme -

Hon'ble Chief Minister Solar Agriculture Feeder Scheme as Govt GR has published on 14th June 2017. Under this scheme, in the rural area where separated Ag Feeder is present which has been solarized for electrification.

Under this scheme, two pilots solar power projects of 2 MW of each capacity (total 4 MW) are being implemented by MAHAGENCO at Vill. Ralegan Siddhi, Dist Ahmednagar and vill. Kolambi, Dist. Yavatmal respectively.



7. Bio-Energy

India is recognized as one of the fastest growing economies of the world. Improving living standards, increasing populations, industrial expansions in the country has possessed serious challenges on energy sector and accelerated the energy demand, due to which basic energy needs of thousands of millions of its citizens are yet to be fulfilled. The rising energy demand in India is expected to lead to a further increase in the use of fossil fuels. Hence, this will not only lead to growing GHG emissions and increased environmental problems, but will also to vast social problems such as inequalities between rural and urban populations, health-related disorders, and other community-level issues. Bio-energy, solar, wind and small hydro have been identified as the thrust areas of renewable energy development in India. Bio-energy is one of the key focus areas of renewable energy programs in India and its resources are relatively uniformly available in India compared to other renewable sources.

Bio-energy is the energy derived from waste like urban, industrial & agricultural residues etc. and which can also be utilized as a feedstock in the manufacture of biofuels. Mainly, Generation of wastes is the one of the environmental growing concern in today's society. Due to rapid growth in urbanization and industrialization the collection, treatment and safe disposal of wastes has become a matter of concern. In recent years, technologies have been developed & those are helpful in generating substantial quantity of energy by treatment on different wastes resulting in its safe disposal and provide opportunities for meeting energy needs in a sustainable manner, improving quality of life and protecting the environment, including addressing climate change. Energy in the form of biogas, Bio-CNG, heat or power is seen as additional benefits, which improves the viability of such projects. Bio-energy sources, predominantly fuel wood, chips and dung cakes, contribute around 30% ^(TERI report-2010) of the total primary energy consumption (dominated by coal and imported oil) mainly for cooking and space heating applications in rural areas. According to estimates, there exists power potential of 637 MW ^(TERI report) from urban, industrial & agricultural wastes in the State. Also, there exist huge potential in the state for setting up small scale decentralized biogas energy recovery projects based on biodegradable organic waste viz. animal waste, segregated MSW etc.

Realizing the potential, Ministry of New and Renewable Energy (MNRE), GoI has initiated several programs with encouraging fiscal and financial support. MNRE-GoI is also promoting the various technological options for setting up projects for recovery of energy from wastes. Beside this, Maharashtra Energy Development Agency (MEDA) has also come up with RE policies to support such projects in the state.

The brief information of various schemes/programmes promoted by the Ministry of New and Renewable Energy, GoI and Government of Maharashtra is furnished below;

Central Government Schemes : -

A) Biogas Power/Thermal (Off-Grid) Programme (Likely to be continue in 13th plan period)

Introduction :

It is important to encourage decentralized biogas-based projects from organic degradable waste. Encouragement to such kind of projects will benefit to the individual farmers, village industries

(e.g., agro/food processing/kitchen waste etc.). Recovery of energy from these wastes is possible through bio methanation process as anaerobic digestion is the most suitable alternative than composting. Methane gas (CH₄) popularly known as biogas is one such alternate sources of energy which has been identified as a useful hydrocarbon with combustible qualities as that of other hydrocarbons.

Technical Information & Criteria:

Biogas is produced when bacteria degrade organic matter in the absence of air. Biogas contains around 55-65% of methane, 30-40% of carbon dioxide and small quantities of Hydrogen, Nitrogen, Carbon Monoxide, Oxygen and Hydrogen Sulphide. The calorific value of biogas is appreciably high (around 4700 kcal or 20 MJ at around 55% methane content). The gas after dewatering and cleaning can effectively be utilized for thermal application as well as for power generation through a biogas-based system. In addition, the slurry produced in the process provides valuable organic manure for farming and sustaining the soil fertility.

In order to promote biogas based thermal/ power generation projects, specifically in the small capacity range (3 kW_{eq.} to 250 kW_{eq.}), such projects can be taken up at any village level organization, institution, private entrepreneurs, or individuals etc. in rural areas for generation of electricity as well as for thermal applications. The funds would be released on re-imbursement basis after successful commissioning of the biogas project. The biogas plants should be completed within 18 months from the date of sanction of the project.

Following are the main Components of a Biogas System;

- Biogas plants
- Gas cleaning system
- Engine with alternator (for power generation projects only)
- Control panel
- Machine room / shed
- Manure management system

Central Financial Assistance :

S.N.	Capacity Range (kW)	Power Generation (₹/kW)	Thermal Application (₹/kW _{eq.})
1.	3-20	40,000/-	20,000/-
2.	20-100	35,000/-	17,500/-
3.	100-250	30,000/-	15,000/-

Projects taken up: 06 projects totalling 188.4 kW (04 Power Generation- 180 kW and 02 Thermal Application- 8.4 kW_{th}) capacities are taken up during FY 2016-17.

Next Year Plan: Target will be set up after continuation of the above programme

B) Programme on Energy from Urban, Industrial & Agricultural Waste/Residues during 12th plan period (Likely to be continue in 13th plan period)

Introduction :

Large quantities of wastes are being generated due to growing industrialization leading to increased pollution. In conjunction with industrial waste, agricultural & urban wastes are also available in huge quantities. Most of the Urban, Industrial & Agricultural Waste/Residues generated, find their way into land and water bodies without proper treatment, causing severe contamination & emission of greenhouse gases. These wastes are resources for energy generation due to its ability to get degraded. For the energy recovery from these urban, industrial & agricultural waste/residues technologies such as bio methanation, combustion, gasification, pyrolysis or their combination can be used. There will be no minimum / maximum limit on capacity of projects supported under this programme; however, cattle dung-based power generation projects of up to 250 kW capacity will not be considered under this programme.

The main objectives of the programme are as follows;

- a) To promote setting up of projects for recovery of energy from Urban, Industrial & Agricultural wastes;
- b) To create conducive conditions & environment with fiscal and financial regime, to develop, demonstrate and disseminate utilization of wastes and residues for recovery of energy.

- **Industrial Waste to Energy :**

Most wastes that are generated, find their way into land and water bodies without proper treatment, causing severe water pollution. They also emit greenhouse gases like methane and carbon dioxide and add to air & water pollution. Any organic waste from industries is a resource for energy generation due to its ability to get degraded. Anaerobic digestion is applied for the treatment of industrial wastes. Under this policy, projects based on any bio-waste from industrial/agro –industrial sector (excluding bagasse) that requires pre-processing before utilization for energy recovery are promoted. This will accelerate the installation of energy recovery projects from industrial & agriculture wastes; also, various conversion technologies can be assessed and upgraded with a view to harness the available potential.

Mixing of other wastes of renewable nature (including rice husk, bagasse, sewage, cow-dung, other biomass and industrial effluents, including distillery effluents, up to a maximum of 25% are permissible) are also permitted.

- **Biomass Co-generation in Industry (non-bagasse) :**

Co-generation is the sequential generation of two different forms of useful energy using a single primary energy source. The objective of the programme is to encourage the deployment of biomass co-generation systems in industry for meeting their captive thermal and electrical energy requirements by conserving the use of fossil fuels & to bring about reduction in greenhouse gas emissions & also to create awareness about the potential & benefits of these alternative modes of energy generation in industry.

- **Urban Wastes to Energy :**

The proliferation of urban waste has direct impacts on sanitation in India. With crowded cities and significant poverty, millions of people in Indian cities are directly exposed to the harmful effects of all urban waste, especially from faecal and sewage sludge

from rivers and lakes. The economic costs of these harmful effects are prohibitive. Hence, bio-methanation based projects for recovery of energy from urban wastes such as sewage gas, cattle dung, vegetable market etc. can be considered under this programme.

- **Production of Bio-CNG :**

Biogas is produced after the digestion process consists of Methane & Carbon dioxide along with some trace gases such as Water Vapor, Hydrogen Sulphide, Nitrogen, Hydrogen & Oxygen. The hydrogen sulphide gas is corrosive also water vapor may cause corrosion when combined with H₂S on metal surfaces & reduce heating value. In other word, biogas can be cleaned & compressed & upgraded to Bio-CNG. The biogas is purified through the use of a scrubbing unit, which removes hydrogen sulphide & carbon dioxide. Once the biogas is scrubbed of impurities, it is pressurized & become Bio-CNG which can be filled into the cylinders.

The gas processing unit that consists of following three stages performs the conversion of biogas into Bio-CNG.

The following three systems are part of the Bio-CNG conversion process;

1. H₂S removal system
 - Scrubber
 - Sulphur removal catalyst
2. CO₂ removal system
3. Gas compression system

Bio-CNG to be produced will have to meet the BIS specifications as per IS 16087: 2013

Technical Information & Criteria :

The scheme provides Central Financial Assistance for following applications;

- I. Biogas production from industrial waste
- II. Power generation or production of bio-CNG from biogas produced from sewage and industrial wastes or from urban and agricultural wastes through bio methanation
- III. Production of bio-CNG
- IV. Power generation from solid industrial waste
- V. Installation of biomass co-generation projects (excluding bagasse co-generation) in industry for meeting the requirement of captive power and thermal energy

Central Financial Assistance :

1. Power generation and/or production of bio-CNG at sewage treatment plant
 - **Capital Subsidy:** - Rs.2.00 crore/MW or Bio-CNG from 12000 m³ biogas/day (Max. Rs. 5 crore/project) or 40% of the project cost whichever is lower
 - **Description:** - Project will be for utilization of biogas being produced/available at Sewage Treatment Plants
2. Power generation and/or production of bio-CNG from Urban, Industrial & Agricultural Wastes/residues

- **Capital Subsidy :-** Rs.2.00 crore/MW or Bio-CNG from 12000 m³ biogas/day (Max. Rs. 5 crore/project) or 20% of the project cost whichever is lower
 - **Description :-** Generation of biogas from bio methanation of Urban Waste [namely cattle dung, vegetable & fruit market waste, slaughter house wastes, poultry waste, etc.] or Agricultural Waste [paddy straw, agro processing industries residues/effluents, green grasses etc.] or mix of these wastes and used for power generation and/or production of Bio-CNG. For cattle dung-based projects, the eligible project capacity would be 250 kW and above.
3. Biogas Generation from Urban, Industrial & Agricultural Wastes/residues
- **Capital Subsidy :-** Rs.0.50 crore/MW or Bio-CNG from 12000 m³ biogas/day (Max. Rs.5 crore/project) or 20% of the project cost whichever is lower
 - **Description :-** Projects are for biogas generation only from Urban Waste, [namely cattle dung, vegetable & fruit market waste, slaughterhouse wastes, poultry waste, etc.] or Industrial Wastes / Effluents [Agro Processing Industry, Pulp & Paper, Milk Processing, Sugar Industry etc.] or Agricultural Wastes/Residues [paddy straw, agro processing industries residues/effluents, green gases etc.] or mix of these wastes
4. Power generation from Biogas (engine/gas turbine route) and/or Production of bio-CNG from Biogas from Industrial Wastes
- **Capital Subsidy :-** Rs.1.00 crore/MW or bio-CNG from 12000 m³ biogas (Max. Rs. 5 crore/project) or 20% of the project cost whichever is lower
 - **Description :-** Biogas already available/generated from Industrial Wastes/Effluent [namely Agro Processing Industry, Pulp & Paper, Milk Processing, Sugar Industry etc.] at project site and used for power generation through Engine/Gas Turbine Route and/or production of Bio-CNG
5. Power generation from Biogas, Solid, Industrial, Agricultural waste/residues excluding bagasse
- **Capital Subsidy :-** Rs. 0.20 crore/MW (Max. Rs. 1 crore/project) or 20% of the project cost whichever is lower
 - **Description :-** Project on power generation or co-generation through boiler & steam turbine configuration for utilization of biogas or solid industrial wastes and agricultural wastes/residues or mix of this excluding bagasse already available at project site

• **Projects taken up:**

S.N.	Name of the Project	Capacity	Status
Industrial Waste to Energy: -			
1.	M/s Universal Starch-Chem Allied Ltd., Dhule	1.16MW _{eq.}	Completed
Production of Bio-CNG: -			
1.	M/s Green Elephant India Pvt.Ltd.,Mumbai at Kisan Veer Satara SSK Ltd., Satara	7920 kg/day Bio-CNG from 19,200 m ³ /day (1.6 MW _{eq.})	Completed
2.	M/s Clarus Bioenergy Pvt. Ltd., Kolhapur	3613 kg/day Bio-CNG from 7200m ³ /day (0.6 MW _{eq.})	Completed

- **Next Year Plan:**

S.N.	Name of Project Promoter	Capacity
Industrial Waste to Energy :-		
1.	M/s Sanstar Ltd., Karvand, Dist. Dhule	13,500 m ³ /day (1.125 MW _{eq.})
2.	M/s Gujrat Ambuja Exports Ltd., Dist. Jalgaon	24,000 m ³ /day (2 MW _{eq.})

- **Achievements (In brief) :**

Installation of 7920 kg/day Bio-CNG from 19,200 m³/day (1.6 MW_{eq.}) biogas generation plant by M/s. Green Elephant India Pvt.Ltd., Mumbai at Kisan Veer Satara SSK Ltd., Satara



Digester

- Installation of 1.5 MW biogas to power generation plant based on distillery waste by M/s. Vitthal Corporation Ltd., Vitthalrao Shinde Nagar, Post - Mhaisgaon, Tal. Madha Dist. Solapur.



Digester



Gas Engine

C) National Policy on Biofuels

- **Salient Features:**

- An indicative target of 20% blending of biofuels both for biodiesel and bioethanol by 2017.
- Biodiesel production from non-edible oilseeds on waste, degraded and marginal lands to be encouraged.

- A Minimum Support Price (MSP) to be announced for farmers producing non-edible oilseeds used to produce biodiesel.
- Financial incentives for new and second-generation biofuels, including a National Biofuel Fund.
- Setting up a National Biofuel Coordination Committee under the Prime Minister for a broader policy perspective.
- Setting up a Biofuel Steering Committee under the Cabinet Secretary to oversee policy implementation.
- Several ministries are involved in the promotion, development and policy making for the biofuel sector.
- The Ministry of New and Renewable Energy is the overall policymaker, promoting the development of biofuels as well as undertaking research and technology development for its production.
- The Ministry of Petroleum and Natural Gas is responsible for marketing biofuels and developing and implementing a pricing and procurement policy.
- The Ministry of Agriculture's role is that of promoting research and development for the production of biofuel feedstock crops.
- The Ministry of Rural Development is specially tasked to promote Jatropha plantations on wastelands.
- The Ministry of Science & Technology supports research in biofuel crops, specifically in the area of biotechnology.

Recent Developments :

Ministry of New and Renewable Energy is in process of preparation of scheme and guidelines for providing financial support and a policy frame work for setting up of integrated Bioethanol projects using lingo-cellulosic Biomass and other Renewable Feedstocks.

- The scheme is to set up Bioethanol projects in the country for production up to 150 Million litres/annum ethanol from non-food biomass feedstocks i.e., Ligno-cellulosic and other renewable feedstocks with Viability Gap funding. 6 Million tons of surplus biomass is expected to be utilized.
- Feedstock includes mainly agricultural residues like rice straw, wheat straw, cotton stalks, bagasse, sugarcane trash, corn cobs, corn stover etc. and other renewable feedstock.

• **State Government Schemes**

A) Comprehensive Policy on Decentralised (off-grid) Energy Generation Projects based on New & Renewable Energy (Non-conventional) Energy Sources-2016

• **Technical Information & Criteria:**

- Projects can be taken up at urban areas of Municipal Corporations/Corporations or in rural areas of Gram panchayat' where large quantity of segregated organic biodegradable waste can be made available.
- Apart from this, biogas power projects can be set up at locations where large quantities of organic biodegradable waste is available i.e., in Government/Semi-government rganizations or private (viz. Prisons, Animal Husbandry Departments Bull rearing centres/Pedigree of bull's frozen semen laboratory etc., canteens of Industrial/Commercial organizations etc.)

- or at other places where huge quantities of organic biodegradable /kitchen wastes are available.
- Segregated MSW based power generation projects are supported under the policy.
 - Standard KVIC & fixed dome models (25-85 m³) are supported. Along with this, other biogas power projects those were approved by MNRE earlier would also be supported. However, biogas power projects based on new technology with proven performance in Indian environmental conditions & those have been accorded with certificate of successful continuous operation by Government/ Semi-government/ Urban Local Bodies can also be considered as a special case.

Private mode projects would also be supported

- Beneficiary from rural areas can also avail the Central Financial Assistance from MNRE-GOI (as per MNRE guidelines except segregated MSW projects)

- **Subsidy :**

To develop such kind of projects (Range: 3-250 kW capacity & 100% biogas based engine) in the State, the financial assistance of Rs.40,000 per kW is available & it will be released on “first come first serve basis” in accordance with the budgetary provision on reimbursement basis as per availability & after fulfilment of terms and conditions stipulated in the Comprehensive Policy on Decentralised (off-grid) Energy Generation Projects based on New & Renewable Energy (Non-conventional) Energy Sources-2016 & Methodology-2016.

- **Achievement in this year:** 08 projects of 336 kW capacities have been registered under this policy.
- **Next Year Plan:** 10 projects of 744 kW capacities are targeted in FY 2018-19.

B) Biomass Briquettes Scheme

- **Introduction:**

Huge quantities of agro residues are produced but are inefficiently burnt reducing its thermal efficiency & causing extensive pollution to the environment. These agro residues can be converted to efficient green fuel by means of briquetting / pelleting. The major residues are rice husk, bagasse, soyabean husk, cotton stalks, groundnut shells, sawdust, mustard stalks, coir pith, jute sticks and coffee husk etc. Apart from the problems of transportation, storage and handling, the direct burning of loose biomass in conventional grates is associated with very low thermal efficiency and widespread air pollution. In addition, a large percentage of un-burnt carbonaceous ash has to be disposed of. Hence if, these materials are processed into high density fuel briquettes/pellets they can be efficiently utilized. Biomass briquetting is the densification of loose biomass material to produce compact solid composites of different sizes with the application of pressure.

- **Technical Information & Criteria:**

A Briquette machine allows compressing above mentioned wastes into briquettes that are environmentally friendly and have high calorific value. Burning briquettes as a fuel completes a natural cycle; on combustion they only release as much carbon dioxide back in the atmosphere as was originally absorbed by the growing tree during photosynthesis. Biomass briquettes can be used for power generation or for thermal application but mostly they are used for thermal application in industries replacing conventional fuel.

- **Subsidy :**

20% of the briquette/pellet machine cost or max. Rs. 4 lakhs whichever is less.

- **Projects taken up :**

Sr. No.	Financial Year	Subsidy released (No. of projects)
1.	2007-08	08
2.	2008-09	19
3.	2009-10	05
4.	2010-11	15
5.	2011-12	20
6.	2012-13	07
7.	2013-14	15
8.	2014-15	14
9.	2015-16	17
10.	2016-17	32
11.	2017-18	18
	Total	170

As a result of government's promotional efforts, Maharashtra is the State where briquetting sector is growing gradually promoting entrepreneurship thereby creating extra source of income to farmers & generating employment at village level. Due to MEDA's incentive scheme, many entrepreneurs are benefited.

- **Next Year Plan :** 19 projects are targeted in **FY 2018-19.**

8. POWER GENERATION FROM INDUSTRIAL, URBAN AND MUNICIPAL SOLID WASTES

1. Waste to Energy – Overview

Waste generation due to domestic, commercial and industrial activities is not a new thing. It was not considered a problem just a few centuries ago since it was manageable. The post-industrial revolution era saw rapid urbanization and industrialization resulting in large-scale waste generation concentrated at certain urban centres. Every year municipal solid waste (MSW), sewage generation and industrial waste is expected to increase in the urban areas. In addition, large quantities of solid, liquid and gaseous wastes are generated by industries. As more people migrate to urban areas and as incomes increase, consumption levels are likely to rise, as are rates of waste generation. This has significant impacts on the amount of land that is and will be needed for disposal, economic costs of collecting and transporting waste, and the environmental consequences of increased MSW generation levels. Most wastes that are generated find their way into land and water bodies without proper treatment causing severe water pollution. They also emit greenhouse gases viz. methane and carbon dioxide and add to air pollution. The problems caused by solid, liquid and gaseous wastes can be significantly mitigated through the adoption of environment friendly waste to energy technologies that will allow treatment and processing of wastes before disposal. These measures would reduce the quantity of wastes, generate substantial quantity of energy from them, and greatly reduced environmental pollution.

2. Urban Waste / Municipal Solid Waste (MSW) :-

The essential components of an Integrated Solid Waste Management System are public education and involvement, collection and transfer, source reduction, recycling, composting, land disposal and energy recovery. The use of solid wastes for energy generation would provide a two-fold solution to the waste disposal problem- viz. secure disposal of wastes and conversion into energy. The state potential of power from urban waste is approximately 287 MW.

3. Industrial Waste :-

In Maharashtra, the major industries producing wastes, which have high potential for energy generation, include distilleries, sugarcane press mud, dairy industry waste, paper & pulp, poultry, abattoir etc. The gross estimation of power potential from industrial wastes is approximately 350 MW. In this context, GoM has announced RE policy on Grid-connected Industrial waste-based Power Projects published on 20th July 2015.

4. Waste to Energy – Technologies :-

The waste generated in the urban and industrial sector is scrutinized and processed by adopting suitable technologies. The type of treatment to be adopted for waste disposal mostly depends on the quantity of waste, characteristics of waste and local condition. The organic waste is usually, preferred to be treated by bio-methanation technology, since it is favourable to Indian climatic conditions & can give both power & manure. Recent technological advances have proven that waste-to-energy projects are commercially viable. The following technologies for energy recovery from waste can be used.

- Incineration
- Refused Derived Fuel (RDF)
- Anaerobic Digestion
- Landfill Gas
- Pyrolysis
- Gasification

5. State Policy –

GoM has declared comprehensive policy for Grid-connected power project based on New and Renewable (Non-conventional) energy sources-2015 dated 20th July 2015 and its methodology declared on 09th September 2015. This policy aims to generate and promote electricity from projects based on solar, wind, bagasse / biomass co-generation, small hydro and from agriculture, mineral, bio-medical, industrial waste.

200 MW target has been set up for Industrial Waste based power project under this RE Policy-2015. Organic degradable and Inorganic degradable types of wastes are included and Policy benefits are as follows...

- **Evacuation** - Reimbursement for evacuation arrangement will be maximum Rs. 1 Cr/ project.
- **Electricity Duty** - Electricity Duty exempted for captive consumption upto 10 years from date of commissioning.

For more details, visit www.mahaurja.com

6. MNRE Policy-

The central assistance available for implementing waste to energy project during FY 2017-18 is as below-

- **Scope:**
The scheme provides for Central Financial Assistance in the form of capital subsidy and Grants-in-Aid in respect of the following activities:
 - i) Setting up of five pilot projects based on Municipal Solid Waste.
 - ii) Biogas production from Industrial waste.
 - iii) Power generation or production of bio-CNG from biogas produced from sewage and industrial wastes or from Urban and Agricultural wastes through bio methanation.
 - iv) Power generation from solid industrial waste.
 - v) Promotional activities.
 - vi) R&D, Resource's assessment, technology up-gradation and performance evaluation, etc.
 - vii) Installation of biomass co-generation projects (excluding bagasse co-generation) in industry for meeting the requirement of captive power and thermal energy with at least 50% of power for captive use, and an option for the surplus power to be exported to the grid.
- **Eligibility of projects for Central Financial Assistance:**
Criteria based on type of waste :- the eligibility criteria for type of waste are as follows
 - i) Projects based on any bio-waste from urban, agricultural, industrial/agro – industrial sector (Excluding bagasse).
 - ii) Projects for co-generation /power generation and production of bio-CNG from biogas.

- i) Mixing of other wastes of renewable nature, including rice husk, bagasse, sewage, cow-dung, other biomass and industrial effluents (excluding distillery effluents) will be permissible.
- ii) Biogas generation projects based on distillery effluents and projects based on wastes from fossil fuels and waste heat (flue gases) shall not be supported.
- iii) Municipal Solid Waste based projects selected through transparent competitive procedure would only be eligible for central financial assistance.
- iv) In MSW to Power projects, any waste of renewable nature or biomass can be mixed to the extent of 25 % based on gross Calorific Value. Use of a maximum of 25 % conventional fuels would be allowed in Biomass Co-generation (Non-Bagasse) projects based on agricultural wastes and residues other than bagasse.

- **Capital subsidy to the promoters :**

Power generation and/or production of bio-CNG at sewage treatment plant

- **Capital Subsidy:** - Rs.2.00 crore /MW or Bio-CNG from 12000 m³ biogas/day (Max. Rs.5 crore /project) or 40% of the project cost whichever is lower
- **Description:** - Project will be for utilization of biogas being produced/available at Sewage Treatment Plants

Power generation and/or production of bio-CNG from Urban, Industrial & Agricultural Wastes/residues

- **Capital Subsidy:** - Rs. 2.00 crore/MW or Bio-CNG from 12000 m³ biogas/day (Max. Rs. 5 crore/project) or 20% of the project cost whichever is lower
- **Description:** - Generation of biogas from bio methanation of Urban Waste [namely cattle dung, vegetable & fruit market waste, slaughter house wastes, poultry waste, etc.] or Agricultural Waste [paddy straw, agro processing industries residues/effluents, green grasses etc.] or mix of these wastes and used for power generation and/or production of Bio-CNG. For cattle dung-based projects, the eligible project capacity would be 250 kW and above

Biogas Generation from Urban, Industrial & Agricultural Wastes/residues

- **Capital Subsidy:** - Rs.0.50 crore/MW or Bio-CNG from 12000 m³ biogas/day (Max. Rs.5 crore/project) or 20% of the project cost whichever is lower
- **Description:** - Projects are for biogas generation only from Urban Waste, [namely cattle dung, vegetable & fruit market waste, slaughterhouse wastes, poultry waste, etc.] or Industrial Wastes/Effluents [Agro Processing Industry, Pulp & Paper, Milk Processing, Sugar Industry etc.] or Agricultural Wastes/Residues [paddy straw, agro processing industries residues/effluents, green gases etc.] or mix of these wastes

Power generation from Biogas (engine/gas turbine route) and/or Production of bio-CNG from Biogas from Industrial Wastes

- **Capital Subsidy:** - Rs.1.00 crore/MW or bio-CNG from 12000 m³ biogas (Max. Rs.5 crore/project) or 20% of the project cost whichever is lower

- **Description:** - Biogas already available/generated from Industrial Wastes/Effluent [namely Agro Processing Industry, Pulp & Paper, Milk Processing, Sugar Industry etc.] at project site and used for power generation through Engine/Gas Turbine Route and/or production of Bio-CNG

Power generation from Biogas, Solid, Industrial, Agricultural waste / residues excluding bagasse

- **Capital Subsidy:** - Rs. 0.20 crore/MW (Max. Rs. 1 crore/project) or 20% of the project cost whichever is lower
- **Description:** - Project on power generation or co-generation through boiler & steam turbine configuration for utilization of biogas or solid industrial wastes and agricultural wastes/residues or mix of this excluding bagasse already available at project site
For more policy details visit at www.mnre.gov.in

7. Commissioned projects status -

Before RE Policy- 2015, total 11.725 MW Grid connected waste to energy power projects are commissioned in Maharashtra in which 8.725 MW are based on industrial waste and 3 MW is based on Municipal Solid Waste (MSW). The details of project are as follows.

• **Grid Connected Industrial Waste to Energy Power Project**

Sr. No.	Name of Project	Capacity (MW)	Year of commissioning
1	M/s. Pioneer Distilleries Ltd., Dist.	4.725	2010-11
2	Nanded M/s Lokmangal Agro Industries Ltd., Solapur	4	2012-13
TOTAL		8.725	

• **Grid Connected Municipal Solid Waste (MSW) to Energy Power Project**

Sr. No.	Name of Project	Capacity (MW)	Year of commissioning
3	M/s. Solapur Bio-Energy systems Pvt.Ltd, at Solapur Dist.-Solapur	3	2013-14
TOTAL		3	

8. Achievement for the current year –

Under RE Policy-2015, one project has given infra-clearance and it is based on inorganic degradable type waste. The details of project are given as follows.

Sr. No.	Name of Project	Capacity (MW)	Status
1	M/s Gupta Energy Pvt. Ltd, Located at Usegaon, Tal & Dist.- Chandrapur.	60 x 2 (120)	Infra clearance is given.

9. Next Year Plan – Infrastructure Clearance may be given to 2 no's of Waste to Energy projects having capacity of 15 MW & 30 MW under RE Policy-2015.

9. OFF-GRID SOLAR APPLICATIONS

COMPREHENSIVE POLICY ON DECENTRALIZED OFF GRID ENERGY PRODUCTION FROM THE NEW AND RENEWABLE ENERGY SOURCES (NON-CONVENTIONAL ENERGY RESOURCES) – 2016

- Considering the increasing demand for energy in the state the development of new and renewable energy resources (renewable energy) is crucial. Focusing above it is essential to develop off grid projects by using abundantly available Solar and biological resources to produce energy. In light of this Govt. of Maharashtra has declared the Comprehensive Policy on Decentralized Off-Grid Energy Production from the New and Renewable Energy Sources (Non-Conventional Energy Resources) - 2016 for next five years.

Policy :

Under this comprehensive policy of the state following objectives has being declared for the next 5 years.

- 1) Roof top and ground based off grid solar power generation programs: - 200 MW
- 2) Installation of Solar pumps for small water and tap water supply: - Total 10,000 solar pumps.
- 3) Installation of Solar energy-based Cooking System: - 150,000 Sq.m Capacity project.
- 4) Installation of Solar Thermal power plants: - 5.1 lakhs Sq.m (318.75 lakhs liters)
- 5) To make it mandatory to install solar water heating system.
- 6) Installation of biogas based decentralized power generation projects: - Total 4000 kW
- 7) Decentralized micro grid pilot project: - 2 villages.

According to specified above objectives, after installation of electricity generation project savings per year is as follows:

- Solar Power Plant - 4.8 Crores kW Hours (kWh) (48 million units) electricity generation.
- Solar Pump - 0.96 Crores kW Hours (kWh) (9.6 million units) electricity generation.
- Solar Water Heating System - Reduction in the 60 MW peak electricity demands.
- Solar Cooking System - 1.02 Crores kW Hours (kWh) (10.20 million units) of electricity savings.
- Biogas project – 0.144 Crores kW Hours (kWh) (1.440 million units) electricity generation.

Main object of the policy is installation of various New & Renewable systems at Government / Semi-government Institutions, Urban Local Bodies along with Government granted educational institutions & private buildings.

Financial assistance is available for installation of various New & Renewable systems as per policy. To meet the objective mentioned above, a provision of funds of Rs.2682.00 crore will be allocated for the next 5 years. Funds will be canalized through District Planning Committee (DPC) from each district, Green Cess Fund and 13th Finance Commission grants.

IMPLEMENTATION OF OFF-GRID SOLAR POWER PLANT ON GOVERNMENT / SEMI GOVERNMENT OFFICES IN THE STATE OF MAHARASHTRA

- Government of Maharashtra has announced a scheme for implementation of Off-Grid Solar Power Plant on Government / Semi Government Offices in the state of Maharashtra on 13th February, 2013.
- Under this scheme, 70 nos. Off-Grid Solar Power Plant having capacity 890 kWp installed on various Government / Semi Government Offices in the state of Maharashtra in financial year 2017-18.



SOLAR POWERED PUMPS FOR DRINKING WATER SUPPLY SCHEME

- In order to establish Solar Powered Pumps for Drinking Water Supply Scheme, MEDA release administrative approvals on the basis of technical sanction as per number of pumps and capacity.
- According to the administrative approvals, the number of solar pumps is as follows: -

Sr. No.	Name of the MEDA Divisional Office	Nos. of Solar Pumps	Work Order Cost (Rs.)
1)	Amaravati	89	30877000.00
2)	Akola	122	45887968.00
3)	Aurangabad	160	55792500.00
4)	Kolhapur	166	59872314.00
5)	Latur	178	59688000.00
6)	Mumbai	148	54305361.00
7)	Nagpur	269	91690000.00
8)	Chandrapur		
9)	Nashik	196	60696784.00
10)	Pune	178	68528000.00
	Total :	1506	527337927.00

- Accordingly, MEDA released work order for installation of Solar Powered Pumps to various manufacturers in financial year 2017-18.



GRID CONNECTED ROOF TOP SOLAR PV POWER PLANT (GCRT)

- Ministry of New and Renewable Energy, GoI has announced a scheme for implementation of grid connected rooftop solar power plant with maximum 30% central financial assistance on 26th June, 2014.
- The CFA is 30% of benchmark cost or project cost whichever is minimum.
- Sector wise / Category wise eligibility for availing CFA of grid connected roof-top solar power plant are as following: -

Sr. No.	Category	Coverage of building	Central Financial Assistance
1.	Residential	All type of residential buildings	CFA upto 30% of benchmark cost or project cost whichever is minimum.
2.	Institutional	Schools, health institutions including medical college & hospitals, universities, educational institutions etc. [including those registered under the Societies Registration Act 1860 and the Indian Trust Act 1882.]	CFA upto 30% of benchmark cost or project cost whichever is minimum
3.	Social sector	Community centres, welfare homes, old age homes, orphanages, common service centres, common workshops for artisans or craftsman, facilities for use of community. Trusts / NGOs / Voluntary organizations / Training institutions, any other establishments for common public use etc. [including those registered under the Societies Registration Act under the societies Registration act 1860 and the Indian Trust Act 1882]	CFA upto 30% of benchmark cost or project cost whichever is minimum.

Note: - No CFA is applicable for all types of Govt. buildings, Govt. institutions/Govt. organizations including PSUs.

- MEDA finalized the benchmark cost of Rs.61000/- per kWp and the CFA of Rs.18,300/- per kW for financial year 2016-17.
- MEDA have developed web-based portal system (MH-GCRT) for online submission of applications. MEDA has registered around 700 empanelled channel partners and issued sanction for around 6000 nos. of beneficiary for 55 MW capacity projects till 31st March 2018. MEDA disbursed Rs. 32,94,00,000/- to around 1700 nos. of beneficiaries.
- We received Sanction for year 2018-19 from MNRE, GoI vide their letter dated on 15th February, 2018 for cumulative project capacity of 50 MWp in residential, social & institutional sector.



PRADHANMANTRI SAHAJ BIJALI HAR GHAR (SAUBHAGYA) YOJANA

- Central Government of India has announced the Pradhan Mantri Sahaj Bijali Har Gar (Saubhagaya) Yojana. Under the guidelines dated 20 October, 2017 according to guidelines of saubhagaya the unelectrified households in the remote areas are to be installed with 200- watt, 250- watt and 300-watt solar power plant for 5 years comprehensive maintenance, for which financial provision has been approved by REC for Rs.50,000/- per plant.
- Accordingly, a 250-watt capacity plant has been proposed in this scheme. REC has provided a provisional sanction of Rs.117.80 crore to the total number of 26011 households. Accordingly, under the SAUBHAGYA scheme, as informed by the MSEDCL, 26011 households in 754 villages and Habitations have been electrified.



REMOTE VILLAGE ELECTRICIFICATION PROGRAMME

- LED based Solar Home Light (Model-IV) and Solar Street Light (Model-III) proposed to be installed from financial year 2017-18.
- It is proposed to implement Solar Home Light and Solar Street Light in 45 villages through MEDA. Accordingly, MEDA release work order to two manufacturers for installation of Solar Home Light and Solar Street Light in 45 villages.
- Under this scheme 3179 nos. Solar Home Light and 296 nos. Solar Street Light installed in various villages in the state of Maharashtra in the financial year 2017-18.



10. ENERGY CONSERVATION

Introduction -

The socio-economic development of any country is largely dependent on stable & secure sources of energy and its efficient use. The availability of energy sources within the country far outstrips the demand. Hence, concerted efforts need to be made in all sectors of the economy to use the available energy efficiently & judiciously. Considering the importance of energy efficiency in the country, the Energy Conservation Act, 2001 has been enacted with the objective of providing necessary legal frame work for promotion of energy conservation measures in the country.

Government of Maharashtra has designated Maharashtra Energy Development Agency (MEDA) as the “Designated Agency” to implement the said Act in the State of Maharashtra. Maharashtra is a leading industrial State in the country and one of the larger generators and consumers of electricity and hence there is wide scope for energy saving in all sectors. Besides various energy conservation schemes and programmes of State Government, MEDA has implemented the various Energy Conservation programmes and schemes of Bureau of Energy Efficiency (BEE) at State level. Maharashtra Energy Development Agency (MEDA) has implemented Energy Conservation programme in different sectors since inception. MEDA has been awarded with Certificate of Merit in National Energy Conservation Award (NECA), Delhi for the best performance as the State Designated Agency in Energy Conservation & Energy Efficiencies activities.

1. State Level Energy Conservation Award Scheme

13th STATE LEVEL ENERGY CONSERVATION AWARDS

The EC Award Scheme has motivated the participating units to undertake serious efforts in saving energy and protecting environment. During year 2016-17 & 2017-18, the participating units have saved approx. 2210 Million kWh of electrical energy, which is equivalent to the energy generated from a 327 MW thermal power (13th State Level EC Award Participant data).

In the last 13 years of Award Scheme (2003-2017), the participating units have collectively saved approx. Rs.287 Crores per year. In energy terms, 2210 Million kWh of electrical energy was saved through the energy conservation measures of the participating units.

The progressive industrial units and other establishments have already realized the cost effectiveness of energy conservation measures. It is hoped that State Level Energy Conservation Award Scheme would help in motivating the other energy consumers in joining and promoting of a nation wise energy conservation movement.

Year	Award Scheme	No. of participating units	Annual Saving in Rs. Crores	Equivalent Electrical Energy Saving (Electrical +Thermal)	
				Million kWh	Equivalent Avoided Capacity in MW
2003-04	1	46	150	317	25
2004-05	2	50	200	400	37
2005-06	3	75	292	584	45
2006-07	4	68	394	789	90
2007-08	5	113	502	964	114
2008-09	6	117	515	1031	117
2009-10	7	67	304	608	88.9
2011-12	8	113	330	2100	308
2012-13	9	114	349	2880	422
2014-15	10	110	155	1843	270
2015-16	11	136	421	2640	386
2016-17	12	120	316	2430	355
2017-18	13	100	287	2210	327
Total 13 Years		1229	4215	18796	2584.9

YEAR WISE ENERGY SAVINGS ACHIEVED BY PARTICIPATING UNITS IN MEDA'S ENERGY CONSERVATION AWARD SCHEME (2003- 2017)



2. Save Energy Programme

MEDA has implemented energy conservation programme in different sectors, since inception. Under “Save Energy Programme” MEDA provides financial assistance to conduct Detailed Energy Audit in various potential sectors. MEDA has done remarkable work up to March, 2018 and total 1089 energy audits have been carried out in various sectors, which has resulted in substantial energy saving in the various sectors.

3. Walk Through Energy Audit (SME scheme)

Scheme aims to promote energy efficiency in small and medium enterprises (SMEs) by providing technical and financial assistance for conducting walk through energy audit. MEDA provides financial assistance to Empanelled Auditing Firm of Rs.3000/- per unit (SME). Under this scheme, around 2408 Walk through Energy Audits in SMEs have been completed upto March, 2018.

4. Scheme for implementing demonstration projects in Government/ Semi Government/ Urban Local Bodies buildings

There is scope of around 20-25% energy saving in building sector. A scheme is designed for Government/ Semi Government and Urban Local Bodies for implementation of energy conservation demonstration projects in their buildings. Under this programme financial assistance upto Rs. 25 lakhs per building is provided. Under this programme total 90 buildings are covered upto the March, 2018.

5. Energy Efficiency in Streetlights in Municipal Councils / Municipal Corporations/ Maharashtra Jeevan Pradhikaran.

Street lighting system of municipal and other bodies uses around 1.5 to 2% of State's total energy consumption while water pumping system uses around 4% of State's total energy consumption. 25-30% energy savings can be achieved by installation of energy saving devices in street lighting and water pumping systems. Under this programme financial assistance upto Rs. 20 lakhs for energy efficiency measures in street lighting and Rs. 5 lakhs for energy efficiency measures in water pumping systems are provided. Under this programme total 36 Municipal Councils / Corporations are covered upto March, 2018.

6. Establishment of Energy Conservation Building Code Cell in MEDA

- The Energy Conservation Building Code (ECBC) was developed and introduced by Bureau of Energy Efficiency (BEE), New Delhi, under Ministry of Power which sets minimum energy performance standards for commercial buildings. It is projected that ECBC has the potential to reduce average energy consumption by 30-40% in new commercial buildings and can achieve an annual energy saving of 1.7 billion kWh.
- Under section 14(P) of Energy Conservation Act, 2001 as amended by the EC Act-2010, the Central Government, by notification, in consultation with the Bureau of Energy Efficiency (BEE), prescribe ECBC for efficient use of energy and its conservation in the building or building complex having a connected load of 100 kW or contract demand of 120 KVA and above.
- To implement the ECBC in the State, MEDA has established the ECBC Cell in MEDA. Under this cell Bureau of Energy Efficiency (BEE), New Delhi in

association with European Union is assisting to MEDA for effective implementation of ECBC in the State.

7. Workshops/Trainings on Energy Conservation Building Code (ECBC) & Green Building for Stakeholders.

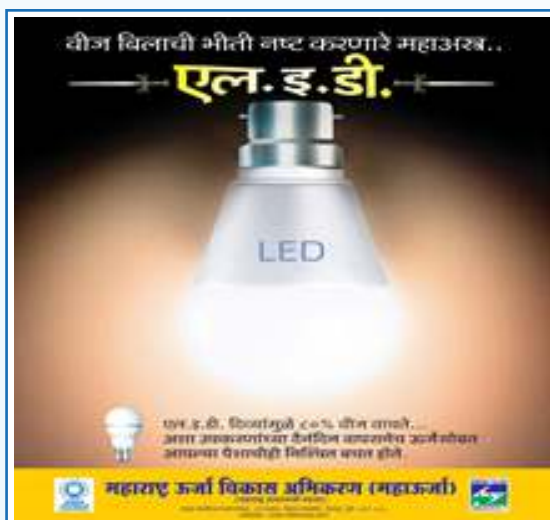
- One Day ECBC Workshop for Architects & Engineers of Municipal Corporation of Greater Mumbai (MCGM) at Civic Training Institute & Research Centre, Borivali, Mumbai.
- One Day awareness-cum-training workshop on ECBC for Students at YASHADA Pune.
- One Day Consultation workshop on ECBC for Electricity Distribution Utilities at Yashwantrao Chavan Pratisthan Mumbai.

8. Development of materials on Energy Conservation for its incorporation in the ITI and Diploma Engg. College Curriculum of the State.

- MEDA has developed curriculum on Energy Conservation & Management for its incorporation in Diploma Engg. Curriculum in co-ordination with Educational Consultant and committee experts. MEDA has submitted the draft of curriculum to Director, MSBTE for its incorporation in Diploma Engg. College curriculum. Now, incorporation of course material on Energy Conservation & Management in Diploma Engg. Curriculum is in the process. Incorporation of Course material in Electrical branch has been completed and for Civil branch, incorporation of course material on Energy Conservation is in process.

9. Energy Conservation Day and Energy Conservation Week:

- Every year MEDA celebrates National Energy Conservation day on 14th December and energy conservation week from 14th to 20th December on large scale. Following activities were taken up in the week for creation of awareness.
- Industries, Industries association, all government departments, all local government organizations were asked to celebrate the EC day and EC Week by carrying out various activities like:
- Administer Energy Conservation pledge by employees
- Display of banner and posters at various locations to create mass awareness





- Distribution of pamphlets giving tips on energy conservation and energy pledge
- Energy conservation slogan competition for employees and their wards
- Seminar for employees on energy conservation activities in the plant
- MEDA also distributed leaflets, banners and posters to more than 1500 Government/ Semi-Government Offices, Designated Consumers and State Level EC Award participants.
- The promotional material was specifically prepared for celebration of the energy conservation day and week.

10. Perform, Achieve & Trade (PAT) Scheme:

PAT scheme is a regulatory instrument to reduce specific energy consumption in energy intensive industries, with an associated market-based mechanism to enhance the cost effectiveness through certification of excess energy saving which can be traded.

Under this scheme, reductions in specific energy consumption targets are assigned to Designated Consumers (DCs) for a three-year cycle. Verification of the performance of DCs at the end of the cycle is carried out by a cadre of energy professional i.e., Accredited Energy Auditors empaneled with Bureau of Energy Efficiency.

MEDA periodically reviewed the energy conservation measures implemented by Designated Consumers in line with target set out by BEE under various PAT schemes.

During FY 2017-18, under PAT Cycle III, 8 DCs from 3 energy intensive sectors are identified by BEE in the Maharashtra State.

11. PUBLICITY AND MASS AWARENESS PROGRAMME

During 2017-18 MEDA carried out wide publicity campaigns through various media like exhibition, electronic media, print media etc.

A. Exhibitions:

1. **Times Renewable Energy Expo-2017** - Vision India organized Times Renewable Energy Expo-2017 collaboration with MCCIA Times of India held at YASHADA, Baner Road, Pune on 18th May 2017. The conference inaugurated Hon. Mr. Arun Firodia, Chairman, Kinetic Green Engineering and Power Solutions Ltd, along with Mr. Ashwin Gambhir, Senior Research Associate- Renewable Energy climate change-Prayas Energy Group, and other delegates. Navitas Green Solutions Pvt Ltd, Gold Green Technologies Pvt Ltd, Amplus Energy Solution Pvt Ltd, Sun Shot Technologies Pvt Ltd, Enerparc Energy Pvt Ltd, State Bank of India, Maharashtra Energy Development Agency etc., participated in this exhibition. MEDA's stall depicted information about Solar Roof Top Greed Connected Solar Power Project, Biomass and Bagasse Co-generation Scheme.

2. **Non conventional Energy and Energy Conservation 2017** - Maharashtra Energy Development Agency and Shri.Mahalaxmi Jagadamba Sansthan, Koradi Nagpur has jointly organized Non conventional Energy and Energy Conservation 2017 exhibition at Koradi Nagpur from 24th to 27th September 2017. This exhibition was inaugurated by Hon'ble Shri. Chandrashekhar Bavankule, Minister of Energy, New & Renewable Energy and State Excise Maharashtra State along with respective delegates. In this exhibition display of Live Demo model has been installed & presented of Solar Water Heater Systems, Solar Agricultural Water Pumps etc, MEDA stall has distributed information brochure Various schemes Exhibition has participated by prestigious institutes and companies Live Demo Projects exhibited in this exhibition. Policies & Information related to New & Renewable Energy Sources, Projects in future related to this subject information understood by peoples from Vidharbha Region.

3. **Non conventional Energy and Energy Conservation 2017** - This Exhibition organized by MEDA from 17th to 20th November 2017 at Dr.Babasaheb Ambedkar Ground (Town Hall) Latur, This Exhibition inaugurated by Hon'ble Shri.Sambhaji Patil Nilengekar, Minister of Labour, Re-habilitation, Skill Development, Govt. of India. in presence of Shri. Suresh Pawar Mahapaur, Latur. Shri. Milind Lature, President of Municipal Corporation Latur Institutes and companies such like D&D Aditya Solar Shoppe Latur, Soyo Systems, Mecon Industries, Green Sense Solar Water Heater, Aditya Green Energy Pvt. Ltd, Pragat Akshay Urja Limited., Pearl Enterprises, E.E.S.L, Prompton Grives, P.C.R.A. Urja Bio System Pvt. Ltd., Mahavitaran Latur, Zila Parishad Latur, MEDA participated in this exhibition etc. Policies & Information related to Non conventional Energy and Energy Conservation has taken from Exhibition, by People visited from Marathwada Division. Information Literature & Brochures has distributed among the Peoples who visited the Exhibition.

4. **Agro vision 2017** - 9th, Agro vision - 2017 held at Nagpur from dt. 10 to 13 November 2017 by Agro vision Foundation and MMACTIV Sci-Tech Communication, Vidharbha Economic Development Council, Purti Power and Sugar Ltd. 9th Agro vision - 2017 was inaugurated by Hon'ble Shri Radha Mohan Singh Union Minister for Agriculture and Farmers welfare Govt. of India in presence of Hon'ble. Shri. Nitin Gadkari Union Minister for Road Transport, Highways and Shipping Govt. of India, Hon'ble. Shri. Devendra Fadnavis Chief Minister of Maharashtra, Hon. Shri. Chandrashekhar Bawankule, Energy, New & Renewable Energy, State Excise

Maharashtra and other Delegates. In this exhibition MEDA Stall display Live Demo model has been installed & presented, Solar Electric System, Net Metering Systems, Feeder Agricultural Systems, Solar Water Heater Systems, Solar Street Lights Systems, Solar Cooker Systems, Solar Agricultural Pumps etc. This Exhibition has been attended about 5 Lakh Farmers; MEDA Information related books has been distributed to Farmers.

5. Krushithon – This exhibition held at Thakkar Ground, Trimbak Road, Nashik from dt 23 to 27 November, 2017 organized by Human Service Foundation and Media Exhibitor Pvt Ltd. Nasik. where stall exhibited by MEDA. Various Energy related banners & information brochures & live Demo models has been installed & presented such as Solar Water Heater Systems, Solar Panels etc. This exhibition has been visited by about 3 Lakh Peoples from Nashik Division Peoples & farmers were informed about Alternative Energy generation methods & products. Energy saving importance explained to peoples who visited to MEDA stall & MEDA Information brochures were distributed among them.

6. Green Energy & Challenges over smart Grid - All India seminar on Green Energy & Challenges over smart Grid In association with IEEE Organized by The Institution of Engineers Nagpur 10 to 11 March, 2018 This seminar & exhibition inaugurated by Hon'ble Shri. Chandrashekhar Bawankule Minister of Energy, New & Renewable Energy & State Excise Maharashtra State in presence of Executive Director Power Grid owner of Ocean Wave Energy Co. USA, Vice President International Energy Foundation, Singapore & other delegates. Adani Power Group, Reliance Power, India Bulls Ltd., NTPC Mauda Power Grid Corporation of India Ltd. Nagpur, MSEDCL, Maha Genco, MEDA etc. participated in this exhibition MEDA's Stall depicted Information about Solar Rooftop, Solar Pump, Solar Power Project etc.

Publicity through Print Media –

1) Advertisements-

Advertisements are published in various leading newspapers, magazines and special supplements to promote renewable energy and energy conservation aiming at the target group of industries, private investors etc.

2) Information Brochures-

Information brochures are prepared illustrating various renewable energy programs being implemented by MEDA. The brochures also contain the present status of installed capacity of various projects based on power generating sources like wind, biomass, solar etc. Information brochures distributed to general public to create awareness about renewable energy and energy conservation.

12. HUMAN RESOURCE AND ORGANIZATION DEVELOPMENT

HUMAN RESOURCE MANAGEMENT -

Human Resource Development plays an important and vital role in effective management of an organization.

Maharashtra Energy Development Agency, during financial year 2017-18, has nominated its staff members from various levels for short and long-term training courses all over India. This was particularly done taking into consideration their job requirements and academic qualifications. The details of category-wise staff attended various training courses during the period is as under.

Manager - 03

Account Officer - 01

MEDA has spent 0.28 lakhs on these training programs during financial year 2017-18.

Details of Training 2017-18

Shri. H. V. Botre - Account Officer Shri. C. M. Deshpande - Manager	Labour Laws, Pune 13 May 2017
Shri. A. A. Agnihotri - Manager Shri. V. S. Sirsat - Manager	Institute of Renewable Energy 7-9 February 2018

Manager - 03

Account Officer- 01

13. RPO, REC AND R&D PROGRAMME

Renewable Purchase Obligation (RPO) - Maharashtra Electricity Regulatory Commission (MERC) has declared (Renewable Purchase Obligation, Its Compliance and Implementation of REC Framework) Regulation, 2010 vide its order dated.7th June, 2010. For implementation of this regulation MEDA has been designated as State Agency in Maharashtra State.

Renewable Purchase Obligation (RPO) is the obligation mandated by the Maharashtra Electricity Regulatory Commission (MERC) under the Act, to purchase minimum level of renewable energy with respect to the total consumption by the Obligated Entity.

As per MERC (Renewable Purchase Obligation, Its Compliance and Implementation of REC Framework) Regulations, 2016. RPO obligation shall be applicable to all Distribution licensees, Open Access Consumers and captive users within the Maharashtra, subject to the following conditions:

- (a) Any person who owns a grid-connected Captive Generating Plant based on conventional fossil fuel with installed capacity of 5MW and above, or such other capacity as may be stipulated by the state commission from time to time and consumes electricity generated from such plant for his own use his consumption met through such fossil fuel based captive source:
- (b) Any person having a contract demand of not less than 5 MVA and who consumes electricity procured from conventional fossil fuel-based generation through open access shall be subject to RPO to the extent of a percentage of his consumption met through such fossil fuel based open access source:

Captive user(s) consuming power from grid connected fossil fuel-based cogeneration plants are exempted from applicability of RPO.

Every Obligated Entity may meet its RPO target by way of (i) Own generation or procurement of power from RE developer or (ii) Purchase from other licensee or (iii) Purchase of renewable energy certificate or (iv) Combination of any of the above options.

Obligation to purchase electricity generation based on solar as RE source can be fulfilled by purchase of solar REC only. Obligation to purchase electricity generation based on non-solar as RE source can be fulfilled by purchase of non-solar REC only. Procurement of REC's issued for RE generation outside the State of Maharashtra as well as REC's issued for renewable energy generation within the State of Maharashtra shall be considered as an eligible instrument for the purpose of RPO compliance.

RPO Targets as per MERC's RPO-REC Regulation 2016 are as below:

Year	Quantum of purchase (In %) from Renewable Energy sources (In terms of energy equivalent in KWh)		
	Solar	Non-Solar (other RE)	Total
2016-17	1.00%	10.00%	11.00%
2017-18	2.00%	10.50%	12.50%
2018-19	2.75%	11.00%	13.75%
2019-20	3.50%	11.50%	15.00%

Others details of RPO can be viewed from RPO / REC TAB on MEDA website www.mahaurja.com.

REC (Renewable Energy Certificate) Mechanism

CERC REC Regulations, 2010.

[www.recregistryindia.nic.in/pdf/RECRegulation/2\(a\)CERC_Regulation_on_Renewable_Energy_Certificates_REC.pdf](http://www.recregistryindia.nic.in/pdf/RECRegulation/2(a)CERC_Regulation_on_Renewable_Energy_Certificates_REC.pdf)

CERC REC regulation 2010 (First Amendment)

https://www.recregistryindia.nic.in/pdf/REC_Regulation/REC_Amendment_Regulation.pdf

CERC REC regulation 2010 (Second Amendment)

www.recregistryindia.nic.in/pdf/REC_Regulation/Second_Amendment_Notification.pdf

CERC REC regulation 2010 (Third Amendment)

www.recregistryindia.nic.in/pdf/REC_Regulation/REC_Regulations_3rd_Amendment.pdf

CERC REC regulation 2010 (Fourth Amendment)

www.recregistryindia.nic.in/pdf/REC_Regulation/REC_Regulations_Fourth_Amendment30.03.2016.pdf

Revised Approved Procedure dated.5.11.2015

https://www.recregistryindia.nic.in/pdf/ProcedureREC/REC%20Approved%20Procedures_2015.pdf

Revised Approved Procedure dated.16.03.2018

https://recregistryindia.nic.in/pdf/Procedure_REC/CERC_REC_Procedure_16-03-2018.pdf

REC (Renewable Energy Certificate) is a market-based instrument to promote renewable energy and to address the mis-match between available RE sources and the requirement of the obligated entities to meet their renewable purchase obligations.

For meeting the RPO targets Purchase of renewable energy certificate is an option for obligated entities. Obligation to purchase electricity generation based on solar as RE source can be fulfilled by purchase of solar REC only. Obligation to purchase electricity generation based on non-solar as RE source can be fulfilled by purchase of non-solar REC only. Procurement of REC's issued for RE generation outside the State of Maharashtra as well as REC's issued for renewable energy generation within the State of Maharashtra shall be considered as an eligible instrument for the purpose of RPO compliance. Others details of REC can be viewed from MERC website www.recregistryindia.nic.in Significant Characteristics of the REC Framework

Maharashtra Electricity Regulatory Commission vide its order dated. 01.07.2010 has designated Maharashtra Energy Development Agency (MEDA) as a State Agency to undertake functions as envisaged in MERC (Renewable Purchase Obligation (RPO), its Compliance and REC Framework Implementation) Regulations, 2010.

MEDA as a State Agency will give REC Accreditation only to RE Generators. REC would be issued to RE generators and to the eligible Distribution Licensee. Grid connected RE Technologies approved by MNRE would be eligible under this scheme.

There will be a Central Agency designated by the Central Commission i.e., National Load Dispatch Centre (NLDC) for registration of RE generators participating in the scheme.

The RE generators will have two options - either to sell the renewable energy at preferential tariff fixed by the concerned Electricity Regulatory Commission or to sell the electricity generation and environmental attributes associated with RE generation separately.

On choosing the second option, the environmental attributes can be exchanged in the form of REC. The REC once issued shall remain valid for One thousand and ninety-five days from the date of issuance of such Certificate and up to 31.03.2017, whichever is later.

The Central Agency NLDC will issue the REC to RE generators. The value of REC will be equivalent to 1MWh of electricity injected into the grid from renewable energy sources.

The REC will be traded only in the Power Exchanges approved by CERC within the band of a floor price and a forbearance (ceiling) price to be determined by CERC from time to time.

There are two categories of RECs, viz., solar RECs and non-solar RECs.

a) Solar RECs are issued to eligible entities for generation of electricity based on solar as renewable energy source & non-solar RECs are issued to eligible entities for generation of electricity based on renewable energy sources other than solar.

b) The solar certificate shall be sold to the obligated entities to enable them to meet their renewable purchase obligation for solar, and non-solar certificate shall be sold to the obligated entities to enable them to meet their obligation for purchase from renewable energy sources other than solar.

The price of REC would be determined in power exchange. REC would be traded in power exchange within the forbearance price and floor price determined by CERC from time to time.

Supreme Court Order dated 8.5.2017 in Civil Appeal Nos. 6083/2017 and 6334/2017 regarding CERC order dated 30.3.2017 on REC Floor & Forbearance Price.

Obligated Entities/Power Exchanges shall deposit the difference between floor price prevalent earlier (i.e., Rs.1500/MWh) and the floor price as determined vide order dated 30.3.2017 (Rs.1000/MWh) with the Commission in SB A/C No.209900301170005, Bank Corporation Bank Branch K.G. Marg New Delhi - 110 001, Bank IFSC, CORP 0002099 Branch Code, 2099.

Deposit of the differential amount shall be subject to the outcome of the Appeal No.105/ 2017 by the Appellate Tribunal for Electricity and further order of the Commission in the regard.

c) Trading in Solar REC's shall remain suspended until further orders, since stay order dated 8.5.2017 in Civil Appeal No.6334/2017 filed by Green Energy Association in case of Solar REC's is still in operation.

The floor and forbearance price for Solar & Non-Solar REC starting from 01.04.2017 as determined by the Commission are as under:

	Non solar REC (₹/MWh)	Solar REC (₹/Mwh)
Forbearance Price	3000	2400
Floor Price	1000	1000

The distribution companies, Open Access consumer, Captive Power Plants (CPPs) will have option of purchasing the REC to meet their Renewable Purchase Obligations (RPO). Pertinently, RPO is the obligation mandated by the State Electricity Regulatory Commission (SERC) under the Act, to purchase minimum level of renewable energy out of the total consumption in the area of a distribution licensee.

There will also be compliance auditors to ensure compliance of the requirement of the REC by the participants of the scheme.

On national level REC mechanism has been started in November 2010. Accordingly, MEDA received applications from RE generators for getting accreditation to their projects. MEDA in first stage scrutinize the application & enclosures submitted by RE generator. In second stage carry out field inspection & confirm the eligibility of project and after that issue an approval to concern RE project for accreditation.

Accreditation status :

Particulars	Total Capacity accredited till 31 st March 2018	
Source	Nos. Of Project	MW
Wind	136	326.26
Solar PV	40	67.752
Smal Hydro	10	31.5
Others	1	1.67
Bio-mass	7	67.5
Bio fuel Co-generation	29	241.434
Total	223	736.114

R&D (Research & Development)

MNRE R&D policy and guidelines

- 1) Policy Guidelines of Research, Design, Development, Demonstration (RDD&D) and Manufacture of New and Renewable Energy: Aims, Focus, Manufacturing Areas, Activity, Deployment Aims & Needs, Partners, Monitoring, Committee Composition, Procedure and Guidelines
www.mnre.gov.in/file-manager/rd-scheme/om-rnd18102010.pdf
- 2) Performa for Submission of Proposals for RDD&D Projects
www.mnre.gov.in/file-manager/rd-formats/rnd-tech-dpf-a1.pdf

Latest amendments in policy guidelines

- 1) NEW TECHNOLOGY PROGRAMMES /SCHEMES:-
www.mnre.gov.in/file-manager/new-technology/nt2010-11.pdf
- 2) Indian Geothermal Energy Development frame work:

Geothermal Power -

Radioactive activities. Earth has a large reservoir of geothermal heat and its potential has not been completely exploited for the process heat or power generation. The survey conducted by the Geological Survey of India regarding the available stored energy in the upper 3 km- depth range, estimates the potential of 40.9×10^{18} calorie in 13 well- defined and structurally controlled "Geothermal Provinces" [A. B. Dhaulakhandi et.al. SESI Journal 6(1): 9-27, 1996].



Hot Spring

Geothermal energy is the natural heat generated within the earth due to radioactive activities. Earth has a large reservoir of geothermal heat and its potential has not been completely exploited for the process heat or power generation. The survey conducted by the Geological Survey of India regarding the available stored energy in the upper 3 km- depth range, estimates the potential of 40.9×10^{18} calorie in 13 well- defined and structurally controlled "Geothermal Provinces" [A. B. Dhaulakhandi et.al. SESI Journal 6(1): 9-27, 1996].

Among these provinces, Maharashtra shares -

West Coast (Konkan) geothermal province

Narmada-Tapi Garben geothermal province

Godavari valley geothermal province.

Some of the identified sites are Tapi basin, Jalgaon, Dhule and Salbardi hot spring in Maharashtra. Nearly 340 hot springs have been identified in the country having temperatures in the range of $60-120^{\circ}\text{C}$.

Some of the possible use patterns of geothermal energy are space heating, binary-cycle power generation, food processing, refrigeration, cold storage etc. Space heating and refrigeration have already been tried successfully at Manikaran, (Himachal Pradesh) and Puga (J&K). A pilot power plant of 5 kW based on close loop organic Rankine cycle was installed in Manikaran. Most of the geothermal sites are in low and moderate temperature range.



Deep Hot Spring Illustration

The initial high cost and negligible low running cost make them commercially viable in the long run with a payback period of around 8 years. Based on the tried and tested technologies abroad, geothermal energy needs to be utilized specially for socio-economic development of the backward hilly areas. With suitable governmental support, private investment can be an attractive proposition.

Wave Power

Overview



Ocean Waves

Sea waves are the result of transfer of mechanical energy of wind to wave energy. The wave quality varies for different periods and seasons. It is possible to have a realistic formula to calculate the overall wave energy potential. A general study of the wave nature has shown that there is potential of 40,000 MW along the Indian coasts.

A similar study along the coast of Maharashtra has shown that there are some potential sites such as Vengurla rocks, Malvan rocks, Redi, Pawas, Ratnagiri and Girye, possessing an average annual wave energy potential of 5 to 8 kW/m and monsoon potential of 15 to 20 kW/m. Considering this, the total potential along the 720 km-stretch of Maharashtra coast is approximately 500 MW for wave energy power plants. Fortunately, after decades of research and development activities all over the world, some technologies are now available commercially. We need to explore the possibility of wave energy power plants at the identified sites by inviting proposals from private investors / promoters / technology providers from all over the world. They attract the private investment to the tune of Rs.3000 crores. The Govt. of Maharashtra and Govt. of India have plans to announce policies to attract private investors in this field on BOO (Build Own Operate) basis.

Energy Potential of Sea Waves

Wave energy is, in fact, the storage of mechanical energy of wind in the sea water. Sea waves are variable in nature and their height and width changes with time and season. The power available in a sea wave is expressed as the following formula: -

The average potential along the Indian coast is around 5 to 10 kW /m. India has a coast line of approximately 7500 km. Thus, the total potential comes to around 40,000 MW. Even a 15% utilization would mean the availability of approximately 6000 MW. Generally, it has been observed that the western coast is more useful than the eastern coast. This is because the former has more stable waves and is less vulnerable to cyclones that can damage the power plant.

Available Technologies

All over the world many types of technologies have been tried way back since 1970s. They are:

- Cockerel raft
- Flexible Bag energy Converter
- Submerged circular cylinder converter
- Clamp wave energy converter
- Oscillating water column Converter
- Ocean swell powered renewable energy Converter

Of these, the oscillating water column converter (OWC) has been found to be more dominant due to its simplicity and adaptability to use the existing coastal structure of sea harbours. The OWC system consists of a chamber in the sea exposed to wave action through an entrance at the bottom or on the side. The air inside the chamber gets pressurized or expanded owing to the wave action

The air movement through a small opening from or into the chamber, depending on the pressure inside, is used to drive an air turbine. This technology has been tried at Vizhinjam along the Kerala coast, near Thiruvananthapuram by National Institute of Ocean Technology, Chennai. (150 kW).

Status in Maharashtra

MEDA sponsored a study, conducted by Centre for Earth Science Studies, Thiruvananthapuram, to find the wave energy potential along the Maharashtra coast. The study completed in 1994, has shown the Maharashtra coast has an annual wave potential ranging between 4 to 8 kW per metre of the length of the wave crest. During the monsoon, i.e., between June and August, the potential is quite high, i.e., 12 to 20 kW/m. The wave energy potential of the most feasible sites in Maharashtra are given in the following table: -

Wave power at selected sites along Maharashtra coast					
OFF SHORE Avg.Wave Power kW/m			COASTAL Avg.Wave Power kW/m		
Site	Annual	(Jun-August)	Site	Annual	(Jun-August)
Vengurla	8.01	20.61	Girye	5.90	14.21
Square Rock	6.79	16.64	Vijaydurg	5.86	13.58
Redi	6.35	16.57	Ambolgarh	5.74	13.48
Malvan Rock	6.91	16.73	Kunkeshwar	5.64	13.35
Kura Inset	5.79	13.74	PawaPoint	5.36	13.10
			Wagapur	5.70	13.10

The Vengurla and Malvan rocks and Redi are on the top among the offshore locations. In the other group, Pawas and Ratnagiri top the list followed by Girye and Miyet point.

DEVELOPMENT IN MAHARASHTRA - Power Generation Projects based on Wave Energy are not yet commercially established in India. MEDA has taken initiative for establishing Demonstration Power Generation Project at Budhal, Taluka: Guhagar, District: Ratnagiri.

14. FINANCIAL REPORT



MEHTA SHAH & COMPANY CHARTERED ACCOUNTANTS

AUDITORS' REPORT

We have audited the Balance Sheet of **MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)** as on 31st March 2018 and the Income & Expenditure account of the Agency for the year ended on that date and report that:

1. We have obtained all the information and explanation, which to the best of our knowledge and belief were necessary for the purpose of our audit.
2. In our opinion, books of account are maintained regularly and in accordance with the provisions of the Bombay Public Trust Act and Rules and Societies Registration Act and Rules, so far as appears from our examination of these books.
3. The Balance Sheet and Income and Expenditure Account dealt with by this report are in agreement with the books of account.
4. In our opinion and to the best of our information and according to the explanations given to us, the said accounts give a true and fair view of the assets and liabilities as at 31st March 2018 and receipts and payments as on that date prepared on cash receipts and disbursements basis as described in Notes appearing as a part of Balance Sheet.
5. In our opinion and to the best of our information and according to the explanations given to us and subject to annexure attached to this report, the said accounts give a true and fair view.
 - a) In the case of the Balance Sheet of the State of affairs of the Agency as at 31st March 2018, and
 - b) In case of Income & Expenditure Account of the surplus for the year ended on that date.

FOR MEHTA SHAH & CO,
Chartered Accountants
F.R. No. 106315W

Sandeep R. Mundada

SANDEEP R. MUNDADA
Partner
M. No. 120096
Place: Pune
Date: 29/09/2018



A/1/1, Amitshree Apts., 852, Bhandarkar Institute Road, Pune-04.
Tele/Fax: 9595330518, 8983600518. Email: mehtashah83@gmail.com

THE BOMBAY PUBLIC TRUSTS ACT 1950
[SCHEDULE VIII (Vide Rule 17(2))]
MAHARASHTRA ENERGY DEVELOPMENT AGENCY (Registration No. F-11906)
BALANCE SHEET AS AT 31ST MARCH, 2018

FUNDS & LIABILITIES	SCD.	AMOUNT (RS)	AMOUNT (RS)	PROPERTY & ASSETS	SCD.	AMOUNT (RS)	AMOUNT (RS)
TRUSTS FUNDS OR CORPUS				IMMOVABLE PROPERTIES (at cost)	F (A)		119,572,447
TRUST FUNDS			203,139,584	FURNITURE & FIXTURES	F (B)		7,253,015
Balance as per last Balance Sheet				OTHER FIXED ASSETS	F(C)		580,155,352
Adjustment during the year				BUILDING WORK IN PROGRESS	F(D)		199,500,000
OTHER EARMARKED FUNDS				ADVANCES			
Development Fund (created under the provision of the Trust Deed of Scheme or out of the income)		2,383,349,771		Towards employees	D	4,361,360	4,361,360
Infrastructure Rd/WPP fund		177,137,801		TDS income tax receivable			
Publicity Fund		4,554,459		OTHER CURRENT ASSETS	E		396,795,194
Depreciation Fund	F	599,273,790	3,164,315,821	CASH AND BANK BALANCE			
LIABILITIES				a) In Current Account		309,690,556	
For expenses	A		362,277,579	b) Fixed Deposits		8,129,676,021	
For interest & Other Deposits	B		329,941,884	c) Cash in hand		66,130	8,439,432,707
GRANTS PAYABLE TO GRANTORS INCLUDING GREEN CESS FUND	C		869,994	DUTIES & TAXES			7,565,575
INCOME & EXPENDITURE ACCOUNT							
Balance as per last Bal. Sheet		4,965,523,462					
Add : surplus as per Income and Expenditure a/c		728,567,326					
Add :income in respect of previous year			5,694,090,788				
TOTAL			9,754,635,650	TOTAL			9,754,635,650

Notes forming part of Balance Sheet

As per our report of even date
FOR MEHTA SHAH & CO.
Chartered Accountants
F.R. No. 106315W

SANDEEP R. MUNDADA
Partner
M. No. 120096
Place : Pune
Date : 08/09/2018



The above Balance Sheet to the Best of our belief contains a true account of the Funds and Liabilities and of the Property and Assets of the Trust.
FOR MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Hon. Director General
Place : Pune
Date : 08/09/2018

THE BOMBAY PUBLIC TRUSTS ACT, 1950
(SCHEDULE IX (Vide Rule 17(2))
MAHARASHTRA ENERGY DEVELOPMENT AGENCY (REGISTRATION NO. F - 11906)
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2018

EXPENDITURE	SCH- DULE	AMOUNT (RS)	INCOME	SCH- DULE	AMOUNT (RS)
TO EXP IN RESPECT OF PROPERTIES			By Rent		-
Rates and Taxes		401,828	By Interest	J	550,044,551
Depreciation	F	5,121,905	By Dividend		-
Establishment Expenses	G	116,010,017	By Donations in cash or kind		-
Miscellaneous Expenses	H	2,261,973	By Grants	K	5,191,801,048
Expenditure on objects of the Trusts			By Income from Other Sources	L	66,020,341
a) Religious			By Transfer from Reserve		-
b) Educational					
c) Medical Relief					
d) Relief of Poverty					
e) Other Charitable objects	I	4,955,502,891			
Surplus carried over to Balance Sheet		728,567,326			
TOTAL		5,807,865,940	TOTAL		5,807,865,940

Notes forming part of Income and Expenditure Account

As per our report of even date

MEHTA SHAH & CO.

Chartered Accountants

Sandeep R. Mundada

SANDEEP R. MUNDADA

Partner

M. No.120096

Place : Pune

Date : 08/09/2018



FOR MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Hon. Director General

Place : Pune

Date : 08/09/2018

MAHARASHTRA ENERGY DEVELOPMENT AGENCY
HEAD OFFICE
SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31 st MARCH, 2018

PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE A		
LIABILITY FOR EXPENSES		
RECOVERY OF EMPLOYEES ON DEPUTATION	124,255	
GROUP INSURANCE SCHEME	168,279	
LIB E C ACT 2001	41,582,942	
LIB ENERGY CON 2012	16,470,762	
LIB INFRASTRUCTURE ROAD MAINT	265,515,697	
RPO RENEWABLE PURCHASE OBL	23,116,664	
EC ENERGY EFFNT ST LIGHT FITTING 15-16	15,295,794	
LIB SERVICE TAX	3,000	
SUNDRY CREDITORS	186	
Total of Schedule A		362,277,579

PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE B		
OTHER LIABILITIES- Other Deposits		
EARNEST MONEY DEPOSIT	9,469,077	
SECURITY DEPOSIT	29,889,840	
DEPOSIT RECEIVED	-	
PENALTY RECOVERED	4,595,312	
WPP SECURITY DEPOSIT	285,858,750	
C P F [Deput. M S E B]	128,905	
Total of schedule B		329,941,884

PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE C		
GRANTS PAYABLE TO GRANTORS		
LIB GREEN CESS FUND 1419	815,124	
LIB TSP GRANT 1606	39,275	
LIB GRANT FOR SPECIFIC PURPOSE	15,595	
Total of schedule C		869,994

PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE D		
ADVANCES- To Employees		
PROJECT OFFICE	188,040	
H.O. EMPLOYEES	254,839	
COMPUTER ADVANCE	606,688	
FESTIVAL ADVANCE	318,000	
ADVANCE TO FUEL	79,535	
ADVANCE TO DIRECTOR GENERAL	15,160	
ADVANCES TO EMPLOYEES (SCHEDULE G)	142,848	
ADVANCE FOR OFFICE PREMISES (MUMBAI)	2,756,250	
Total of Schedule D		4,361,360

PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE E		
OTHER CURRENT ASSETS		
OTHER CURRENT ASSETS	295,618,926	
Branch and Division		
PROJECT OFFICE-AKOLA DIVISIONAL OFFICE	2,401,409	
PROJECT OFFICE-AMRAVATI DIVISIONAL OFFICE	12,062,579	
PROJECT OFFICE-AURANGABAD DIVISIONAL OFFICE EXPS.	14,150,960	
PROJECT OFFICE-CHANDRAPUR DIVISIONAL OFFICE EXPS.	2,473,087	
PROJECT OFFICE-KOLHAPUR DIVISIONAL OFFICE EXPS.	5,394,497	
PROJECT OFFICE-LATUR DIVISIONAL OFFICE	4,901,507	
PROJECT OFFICE-NAGPUR DIVISIONAL OFF EXPS	24,466,610	
PROJECT OFFICE-NASIK DIVISIONAL OFFICE EXPS	7,830,356	
PROJECT OFFICE-PUNE DIVISIONAL OFFICE EXPS	12,981,540	
PROJECT OFF- MUMBAI DIVISIONAL OFFICE	14,513,723	
Total of Schedule E		396,795,194



MAHARASHTRA ENERGY DEVELOPMENT AGENCY
HEAD OFFICE
SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT
FOR THE YEAR ENDED 31 st MARCH 2018

PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE G		
EASTABLISHMENT EXPENSES		
STAFF EXPENSES	81,797,661	
TRAVELLING EXPENSES	1,834,988	
VEHICLE EXPENSES	2,851,299	
RENT	1,261,640	
TELEPHONE EXPENSE	825,265	
LEGAL FEES	97,000	
REPAIRS & MAINTENANCE	423,971	
POSTAGE & TELEPHONE	303,418	
PRINTING & STATIONERY	852,922	
OFFICE EXPENSES	23,519,576	
INSURANCE,ELECTRICTY,INTERNET EXP,ETC.	2,242,276	
Total of Schedule G		116,010,017
SCHEDULE H		
MISCELLNEOUS EXPENSES		
BOOKS AND PERIODICALS	6,656	
MEMBERSHIP EXPENSES	4,320	
MEETING ALLOWANCE & EXPENSES	284,643	
COMPUTERS EXPENSES	405,714	
PUBLIC RELATIONS EXPENSES	497,265	
PROFESSIONAL CHARGES	875,200	
ADVERTISEMENT & PUB (ADMIN)	141,032	
XEROX EXPENSE	26,566	
BANK CHARGES	20,576	
Total of Schedule H		2,261,973

PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE I-		
Schedule I1		
EXPENSES INCURRED FROM STATE FUND		
13TH FINANCE COMM.16-17	4,015,000,000	
GCF-SOLAR POWER PUMP 15-16	15,100,000	
GREEN CESS FUND 2016-17	79,387,861	
GREEN CESS FUND 2017-18	439,538,113	
N R S E 2011-12	218,160	
N R S E 2015-16	-	
N R S E 2016-17	29,889,049	
N R S E 2017-18	29,035,031	
T S P REGULAR 15-16	3,905,571	
T S P REGULAR 2004-05	-	
Total of Schedule I1		4,612,073,785
Schedule I2		
EXPENSES INCURRED FROM CENTRAL FUND		
MNRE ADVISEMENT & PUBLICITY PROG-6506	672,900	
MNRE BIOGASS POWER GEN PROJECT 6075	9,421,000	
MNRE GRID CONNECT.SOLAR ROOFOP PLANT PROG.	232,706,934	
MNRE SADP PROJ (RE)-6095	4,160,000	
MNRE SKILL DEVELOPMENT PROG.	1,012,294	
MNRE SOLAR COOKING SYSTEMS PROJ	144,000	
MNRE SOLAR WATER HEATING SYSTEM PROJ EXP 6016	1,482,203	
MNRE SPV PROJECT [SOLAR SHOPPEE -6097	105,000	
MNRE WIND MONITORING STATIONS 6043	642,000	
Total of Schedule I2		250,346,331



Schedule I3		
EXPENSES INCURRED FROM BENEFICIARY CONTRIBUTION		
BEN.PAY.ENERGY AUDIT-8261	119,070	
BEN.PAY SOLAR COOKING SYSTEMS PROJ.	1,198,500	
BEN.PAY.SOLAR POWER PLANT 8274	25,587,420	
BEN.PAY. WIND SOLAR HYBRID SYSTEM	5,507,211	
Total of Schedule I3		32,412,201
Schedule I4		
EXPENSES INCURRED FROM OWN / DEV FUND		
DEV FUND ADVT & PUBLICITY EXPENSES-7506	23,711,900	
DEV FUND CHALKWADI PROJECT EXPS 7047	5,981,385	
DEV FUND-C M SOLAR KRUSHI VAHINI PROJ.	25,000,000	
DEV FUND ENERGY CONSERVATION 7062	1,750,053	
DEV FUND EXIBITION EXPENSES 7502	2,737,281	
DEV FUND FOUNDATION DAY	103,800	
DEV FUND G'PACHGANI W F EXPS 7048	13,800	
DEV FUND RESEARCH & DEVELOPMENT 7055	7,000	
DEV FUND SOLAR POWER SPRAYER PUMP	-	
DEV FUND SOLAR R.ASSESTMENT CENTER STUDY	225,000	
DEV FUND TRAINING PROG. EXPENSES	428,136	
DEV FUND VUJAYDURG PROJECT EXPS 7046	688,785	
DEV FUND WIND MONITORING STATION7043	118,434	
DEV FUND WIND SOLAR HYBRID SYS. 7044	25,000	
DEV FUND - WORKSHOP ON SOLAR / WASTE TO ENERGY	(120,000)	
Total of Schedule I4		60,670,574
Total of Schedule I		4,955,502,891

PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE J		
INTEREST RECEIVED FROM BANK AND INVESTMENTS	550,044,551	
Total of Schedule K		550,044,551
SCHEDULE K		
SCHEDULE K1		
GRANTS RECEIVED		
STATE GOVERNMENT		
STATE GRANT-13TH FINANACE COMM.17-18	4,015,000,000	
STATE GRANT- GREEN CESS FUND 17-18	894,000,000	
STATE GRANT - GREEN CESS FUND 2016-17	68,799,646	
STATE GRANT N R S E 2017-18	176,000,000	
Total of Schedule K1		5,153,799,646
Schedule K2		
CENTRAL GOVERNMENT		
CENT SUB BIOGASS POWER GENERATION-4075	9,421,000	
CENT SUB INFORMATION AND PUBLICATION - 4067	1,336,869	
CENT.SUB SACP (RE)	4,160,000	
CENT.SUB-SOLAR ROOF TOP WORKSHOP PROG.	150,000	
CENT.SUB SURYAMITRA SKILL DEVELOPMENT PROG.	8,176,033	
CENT.SUB. WIND MONITORING- 4043	1,347,500	
CENT.SUB. WIND SOLAR HYBRID SYSTEM-4044	13,260,000	
Total of Schedule K2		37,851,402
Schedule K3		
BENEFICIARY SHARE RECEIVED		
BEN CONT.ENERGY AUDIT 4261	150,000	
Total of Schedule K3		150,000
Total of Schedule K		5,191,801,048

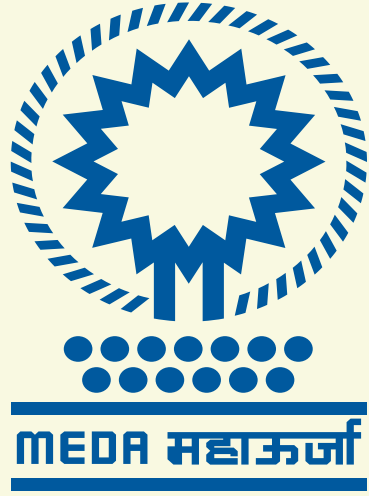


PARTICULAR	AMOUNT (RS.)	AMOUNT (RS)
SCHEDULE L		
INCOME FROM OTHER SOURCES		
1 % TECHNICAL FEES	148,019	
RECT ACCREDITATION FEES & CHARGES 4620	2,760,000	
RECT INTEREST ON ACRREDITATION	1,220	
RECT MISCELLANEOUS INCOME 4603	800	
RECT OTHER INCOME 4649	28,954	
RECT REGISTRATION FEES-4602	13,581,080	
RECT SEETIN UP NEW WIND POWER PROJ-4618	22,000	
RECT SERVICE CHARGES 4655	646,000	
RECT TENDER FEES-4601	1,695,220	
RECT TRANSFER AND CLEARANCE FEES-4622	12,934,000	
RECT WIND FARM CHALKEWADI M S E D C L 4647	474,488	
RECT WIND FARM GUDEPANCHGANI MS DCL	3,406,665	
RECT WIND FARM JAGMIN (CHALKEWADI-2)	15,313,465	
RECT WIND FARM MOTH A MS DCL	13,900,430	
RECT WIND ZONE PROCESSING FEES-4621	1,108,000	
Total of Schedule L		66,020,341











MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)

(A Govt. of Maharashtra Institution)

Aundh Road, Opp. Spicer College, Near Commissionerate of Animal Husbandry,
Aundh, Pune - 411 007. Ph. 020 - 35000450

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