PREFACE

DIRECTOR GENERAL

I am happy to bring out the Annual Report of Maharashtra Energy Development Agency (MEDA) for the financial year 2021-22. 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. MEDA is working as a State Nodal Agency (SNA) under the aegis of Ministry of New and Renewable Energy, Govt. of India and as a State Designated Agency (SDA) notified by Government of Maharashtra under section 15(d) of Energy Conservation Act 2001 in consultation with Bureau of Energy Efficiency (BEE), Ministry of Power Govt. of India.

Maharashtra has installed capacity of 10440.183 MW renewable energy projects as on 31st March, 2022 which includes Wind-5010.71 MW, Small Hydro -370 MW, Bagasse based co-gen.-2339.30 MW, Biomass Power - 215 MW, MSW & liquid Waste - 3 MW, Industrial Waste – 41.78 MW, Solar Power - 2460.36 MW.

MEDA has been promoting the Off-grid RE sector as well, along with the grid connected RE power generation. In Amrut Yojana, implementation of solar power projects of total 18.35 MW is in progress at 12 Municipal Corporations / Municipal councils / Nagar Panchayats out of which 14.209 MW grid connected solar power plants have been installed in the State of Maharashtra.

Ministry of New and Renewable Energy, New Delhi has given sanction for 1,00,000 no's of Solar Agriculture Pumps of Component-B under PM-KUSUM Scheme in the State of Maharashtra. As per directives, Letter of Award (LoA) has issued to 7 vendors and 1944 solar pumps are installed in the state of Maharashtra.

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 includes Save Energy Programme and Up to March, 2022 total 1851 energy audits have been carried out in various sectors, which has resulted in substantial energy saving in the industries.

Under Walk Through Energy Audit (SME scheme) 3839 SMEs have been completed upto March, 2022. Under Demonstration projects for energy conservation in Buildings of Government/ Semi Government/ Urban Local Bodies programme total 113 buildings are covered upto March, 2022. Under Installation of energy saving devices in Street lighting and water pumping systems of Municipal Councils / Municipal Corporations / Maharashtra Jeevan Pradhikaran programme total 40 Municipal Councils / Corporations are covered upto March, 2022.

Apart from State's EC schemes, MEDA also implement BEE sponsored energy conservation programmes including Replacement of Old Pumps with Energy Efficient Pumps in Municipal Corporation / Councils, Replacement / Retrofitting of Energy Efficient devices at Govt. Buildings and Hospitals. Energy Efficient measures in 181 Government Schools and 13 Modern Energy Efficient Village campaign programmes.

MEDA participated in several national and state level exhibitions to disseminate knowledge about renewable energy and energy conservation. I am sure 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

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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, as 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.

Energy from solar, water, wind, biomass, bagasse, ocean waves are renewable, clean and environment friendly energy sources. The importance of non-conventional renewable energy as well as energy saving is increasing day by day. While generating electricity from conventional sources, greenhouse gases are emitted, i.e., carbon monoxide, carbon dioxide and Sulphur dioxide etc. These gases cause global warming. The increase in temperature due to global warming has become a threat to existence of the human being. Further, taking into account the scarce availability of conventional energy sources and ill-effects of their uses, it is the need of an hour to produce energy that is pollution free and eco-friendly.

Maharashtra Electricity Regulation Commission (MERC) has set a target of achieving 25% Electricity generation from Renewable Energy by 2025. Among various non-conventional energy sources, Wind and Solar Energy have been widely tapped in the state. Besides these, Biomass, Bagasse, Small Hydro, Urban & Industrial Waste Energy are other sources 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:

In Maharashtra production of power from renewables by having around 10440.183 MW installed capacity upto 31/03/2022. (Including Small Hydro).

(Rs. in lakhs)

Sr. No.	Source	Potential in country (MW)	Potential in the state (MW)	Achievement (MW) (31/03/2022)
01.	Wind	695500	98210	5010.71
02.	Bagasse co generation	5000	3685	2339.30
03.	Biomass	16881	781	215.00
04.	* Small Hydro Power (SHP)	15000	732	370.025

05.	Urban waste	1700	287	3.00
06.	Industrial waste	1700	350	41.788
07.	**Solar Photovoltaic & Solar Thermal Power	749000	64320	2460.36
	Total	**1484781**	**168365**	**10440.183**

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

B) CUMULATIVE ACHIEVEMENTS UPTO 31 MARCH, 2022:

(Rs. in lakhs)

Sr No.	Particulars	Cumulative Achievement upto 31 March, 2021	Achievement in 2021-22	Cumulative Achievement upto 31 March, 2022
1	POWER GENERATION	(MW)	(MW)	(MW)
01.	Wind Power Project	4998.21	12.5	5010.71
02.	Bagasse co generation Power Project	2301.30	38	2339.30
03.	Biomass Power Project	215.00	0	215.00
04.	Small Hydro Power Project	370.025	0	370.025
05.	Urban waste	3.00	0	3.00
06.	Industrial waste	41.788	0	41.788
07.	Solar Thermal & Photovoltaic	1916.615	605.8	2460.36
	Total	**9845.938**	**656.3**	**10440.183**
2	Energy Conservation Programme			
a	Energy Audit (Nos.)	1620	231	1851
b	Walk Through EnergyAudit (Nos.)	3609	230	3839
c	Demo Project in Govt. / Semi Govt. office buildings of Energy Conservation (Nos)	113	0	113
d	Installation of EC Devices in Municipal Councils - (Nos)	39	0	39
3	Wind Monitoring Stations	409	0	409
4	Briquetting Project (Nos.)	191	6	197

5	Village Electrification (Villages) / Saubhagya Yojana	586/703	0	586/703
6	Solar Power plants in Govt. Buildings	439	86	525
7	Amrut Yojana	0	11.64	11.64
8	Kusum Yojana	0	0	0
9	Exhibitions (Nos.)	322	4	326

C. GRANTS RECEIVED FROM STATE GOVT. IN 2020-21 AND 2021-22.

(Rs. in lakhs)

Sr.	Programme	2020-21	2021-22
1	Non-Conventional & Renewable Sources of Energy (NRSE) - 28100034	2313.00	1500.00
2	Maharashtra Energy Development Fund / Green Cess Fund (GCF) - 28100123	0	1500.00
3	Solar Agriculture Pump – 28100902 (General Component – Kusum B)	0	458.00
4	13th Finance Commission - 28100911	5190.60	0.00
5	TOSE (Tax on Sale of Electricity) Atal Solar Agriculture Pump Scheme – 2 : 7,000 Pump)	4058.17	0.00
	TOTAL	**11561.77**	**3458.00**

D. Abstract of State and Central Govt. grants received in 2020-21 & 2021-22.

(Rs. in lakhs)

Year	2020-21	% of Total	2021-22	% of Total
Total State Funds	11561.77	61.30	3458.00	64.00
Total Central Funds	7298.21	38.70	1944.86	36.00
Total	18859.98	100.00	5402.86	100.00

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2 WIND POWER PROJECTS

I. Wind Energy:

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.

II. History:

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.

III. Progress 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 41,666.08 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 has 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 expansion of the wind resource data base; 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.

IV. 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 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 98210 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 & 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: - 137.50 MW

3. Target for sale of power outside the State /MSEDCL Competitive Bidding:-

   3000 MW (Captive/Group Captive/Third Party Sale)

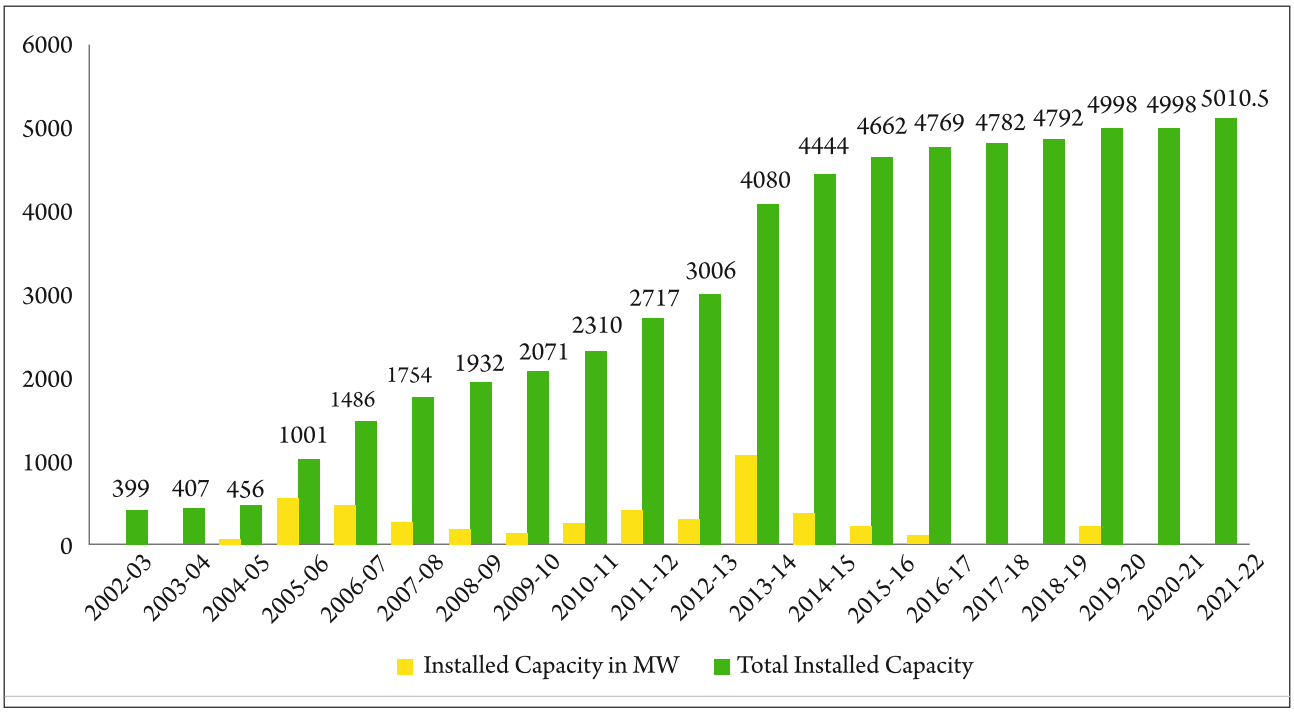
   Achievement: - 202 MW

Government of Maharashtra has declared New & Renewable Energy Generation Policy-2020 vide GR. No. Apau-2020/pra.kra.137/Urja-7 dated 31st December, 2020. Under this policy, the target of commissioning of new wind power projects of 2500 MW is being set.

Renewable Energy Policy for Maharashtra – 2020

- Target :- 2500 MW

Cumulative Capacity of projects set up and commissioned by the private sector up to March 2022 is as follows:



Wind power project had fed 7078.51 Million units of electricity in the state grid in FY 2021-22. Year wise installed capacity of wind power projects in the state of Maharashtra up to March 2022 is as follows:

Year	Installed Capacity in MW
Upto 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
2013-14	1074
2014-15	364.15
2015-16	217.85
2016-17	107.30
2017-18	12.6
2018-19	10.2
2019-20	206.2
2020-21	0
2021-22	12.50
Total	**5010.71**

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3 BAGASSE BASED CO-GENERATION POWER PROJECT

Introduction –

Bagasse is a byproduct 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 1374 MW (on installed capacity). To tap this power potential, GoM declared an attractive policy on 31-12-2020.

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 1300 MW. Therefore, there is still enough potential left to be tapped.

The available power potential with the co-operative 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 Co-operative sugar factories for setting up Cogeneration projects has also been declared by cooperative dept. GoM in the year 2008 in which 5-10% contribution is to be borne by co-operatives. For setting up cogeneration with 30% from SDF and 60 % will come from Banks / FIS-.

I – 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.

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.

2) Govt. Policies Announced –

A) MNRE Policy –

The MNRE, GoI vide sanction No. 3/141/2017-CPG dated May 11th, 2018 is extending Central Financial Assistance (CFA) to Bagasse Cogeneration power projects at the rate of Rs.25 Lakh/MW.

*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 on 31-12-2020.

C) MERC Order –

Financial Year	Variable Charge (Rs/kWh)
During FY 2021-22	4.38

D) Achievement for the current year –

The total installed capacity of Bagasse Based Cogeneration Projects in the FY 2021-22 is 38 MW cumulative capacity of co-gen projects is 2339.30 MW.

E) Next Year Plan –

Having attractive central and state policies for cogeneration, target of 270 MW is fixed for implementation of bagasse cogeneration in sugar factories during the FY 2022-23. 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.

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4 SMALL HYDRO POWER PROJECT

Introduction –

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 necessity 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 serve 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 2 nd 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 sector etc.

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	KWAbove 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

State Policy:

GoM declared Integrated Non-conventional Energy Generation policy dated 31-12-2020.

3) MERC Tariff:

In MERC RE Tariff Regulations 2019, at clause no.9) Project-specific tariff mentioned that "A Project-specific tariff shall be determined by the commission on a case to case basis for (C) Small Hydro, Mini Hydro project and Micro Hydro Projects."

More details are available on website: www.mercindia.org.in

4) Achievement in the current year-

The total installed capacity of Small Hydro Power Projects in the FY 2021-22 is NIL and the cumulative installed capacity of commissioned Small Hydro Projects in the state arrives at 370.025 MW.

5) Next Year Plan

Having attractive central and state policies for Small Hydro Power Projects, target of 5 MW is fixed for implementation of Small Hydro Power Projects during the FY 2022-23.

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5 SOLAR POWER PROJECTS - OFF GRID AND GRID CONNECTED

1. Pradhan Mantri Kisan Urja Suraksha Evam Utthan Mahabhiyaan (PM-KUSUM)

- MNRE, GoI launched PM KUSUM Scheme on 08.02.19 & issued guidelines on 22nd July, 2019.
- MNRE approved 1.00 Lakh no of Standalone Solar Pumps to Maharashtra vide sanction dated 13th January, 2021 and Government of Maharashtra issued GR dated 12th May, 2021.
- Central Government, State Government, ToSE share and beneficiary share (percentage) for solar agricultural pumps is as follows:

	CFA	Beneficiary	State	ToSE	Total
Share for Open category beneficiary	30%	10%	10%	50%	100%
Share for SC category beneficiary	30%	5%	65%	0%	100%
Share for ST category beneficiary	30%	5%	65%	0%	100%

- EESL, New Delhi floated the centralized tender dtd 21st August, 2019 to discover vendors and rates for FY 2019-20.
- As per Office Memorandum dtd. 27th August, 2021, MNRE directed to issue LoA as per rates of tender conducted for FY 2019-20. As per directives, Letter of Award (LoA) has been issued to 7 vendors and 1944 solar pumps are installed in the state of Maharashtra.
- As per MNRE email dated 10th December, 2021, name of the 15 vendors and rates of pumps for 2020-21 received. Accordingly, MEDA is in process of issuing LoA for next 50000 applications.

2. Rural Electrification Program: -

- The Central Government and the State Government has given importance for electrification of those remote villages / wadya / pade where electricity cannot be supplied through conventional energy sources and for that purpose electrification through non conventional energy sources of such houses at such places is given importance.
- Under this scheme solar energy based lamps and fans would be given to beneficiaries on 100% finance assistance basis.
- For this purpose target is fixed for 10000 houses per year to be supplied with domestic lamps operated on solar energy. For that purpose provision of Rs. 38 crore would be made by the State Government every year.
- Work order given to M/s. Prabhat Renewable Energy Pvt. Ltd, M/s. SG Enterprises, M/s. Pearl Energy Solutions India Pvt Ltd and M/s. GK Energy Marketers Pvt Ltd for 6069 Solar Home Light Systems (SHLs). Cost of each SHLs system is Rs. 46,400/- including GST etc. Installation of eligible 6069 households is completed.

3. Atal Mission for Rejuvenation and Urban Transformation (AMRUT) Scheme

- As per the Government of Maharashtra GR dated 17th December 2018, the projects regarding Solar Energy under Amrut Abhiyan and the Maharashtra Suvarnajayanti Nagarothan Mahabhiyaan are implemented by MEDA. Under this Scheme Installation of Grid connected solar power projects is done for water pumping stations, water treatment plants and sewage treatment plants under the premises of Urban Local Bodies. (Municipal Corporations/Municipal Councils). The manufacturer shall be responsible for 5 years of CMC. The project is expected to generate 15 Lakh units per MW.
- Under this scheme, Work orders have been issued to contractors for installation of total 18.354 MW Grid connected solar power plants at various 12 Municipal Corporations/Municipal Councils/ Nagarpanchyat. Out of which, 14.209 MW Grid Connected Solar power plants have been installed in the state of Maharashtra and remaining Solar Power Plant installation work is under process.

4. Renewable Energy Gom Policy-2015 - Grid Connected Solar Power Generation Project Scheme

- Government of Maharashtra declared a composite RE Policy 2015 dated 20th July 2015. Target ~ 7500 MW, MAHAGENCO ~ 2500 MW with PPP mode, Private Developers ~ 5000 MW, Project capacity ~ Min. 1 MW, Sale of Power PPP mode ~ Sale to MSEDCL at preferential tariff for RPO compliance. To develop 10% of PPP target on places viz. lakes, canals, local self Govt. land. Developer ~ Sale to DISCOMs at competitive bidding with consent from MERC, Captive & 3rd Party Sale within / outside state & REC route. Electricity Duty – exempted for captive consumption upto 10 years from CoD. 1855.775 MW of Solar Project Commissioned under the said policy.
- Further, Government of Maharashtra has declared a composite RE Policy 2020 dated 31st December 2020. Target for Grid Connected Solar Power Projects Under GoM Policy 2020 ~ 10000 MW. Till date 549 MW of solar project commissioned under the said policy.

5. Installation Of Solar Water Heater System And Solar Cooking Systems (CST)

- Government of Maharashtra has declared a Composite RE Policy 2020 dated 31st December 2020
- Under this scheme set target for every year of installation of 55000 Sq. meter.
- As per the policy, departments will take appropriate administrative approval to implement the scheme.

6. Micro Grid Project

- Government of Maharashtra has declared a composite RE Policy 2020 on 31st December 2020.
- As per the policy this scheme will be implemented on the basis of 100% financial assistance.
- Under this scheme for installation of single project in one village requirement of around 2 Cr funds was expected. Accordingly for implementation of this type of project, the provision of 40 CR for 20 villages was done by government of Maharashtra.

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6 BIO-ENERGY

India is recognized as one of the fastest growing economies of the world. Improving living standards, increasing population, industrial expansions in the country has posed 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 one of the growing environmental 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. 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 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. Th e brief information of various schemes/programmes promoted by Government of Maharashtra and Ministry of New and Renewable Energy, GoI is furnished below;

1. Government of Maharashtra policy

A) Comprehensive Policy on Decentralised (off-grid) Energy Generation Projects based on New & Renewable Energy (Non-conventional) Energy Sources-2016 dated 11.02.2016 & its methodology dated 08.06.2016.

Eligible persons/entities for subsidy:

- Municipal Corporations/Corporations/ Urban Local Bodies or Grampanchayat'
- Government/Semi-government organizations (viz. Prisons, Animal Husbandry Departments Bull rearing centers/Pedigree of bulls frozen semen laboratory etc., canteens of Industrial/Commercial organizations etc.) or private mode or Individual person etc.

- **Subsidy :**

Capacity Range	Eligible Subsidy
3 kW - 250 kW	Rs. 40,000 per kW

B) Biomass Briquette/Pellet Scheme dated 11.09.2007:

- Eligible persons/entities for subsidy: Proprietary firms/Partnership firms/Company etc.
- Subsidy: 20% of the briquette/pellet machine cost or max. Rs. 4 lakhs whichever is less.

Proposed plan for this year:

Sr. No.	Name of Projects
1.	The Packaging Corporation of India, D-53, MIDC, Wardha

2. Central Government Programmes:-

A) Biogas Power/Thermal (Off-Grid) Programme dated 29.11.2018

Eligible projects for subsidy:

- Municipal Corporations/Corporations/ Urban Local Bodies or Grampanchayat'
- Government/Semi-government organizations (viz. Prisons, Animal Husbandry Departments Bull rearing centers/Pedigree of bulls frozen semen laboratory etc., canteens of Industrial/Commercial organizations etc.) or private mode or Individual person etc.

Central Financial Assistance :

S.N.	Capacity Range (kW)	Power Generation (i/kW)		Thermal Application (i/kWeq.)	
		SC/ST	Others	SC/ST	Others
1.	3-20	40,000/-	35,000/-	20,000/-	17,500/-
2.	20-100	35,000/-	30,000/-	17,500/-	15,000/-
3.	100-250	30,000/-	25,000/-	15,000/-	12,500/-

Achievement in this year:

Sr. No.	Name of Projects	Capacity (kW)
1.	M/s. Haribhau M. Sutar Village & Post Chale Tal. Mulshi Dist. Pune	24
2.	M/s. Namdev Laxman Ghojge	24

B) Programme dated 30.07.2018 on Energy from Urban, Industrial & Agricultural Waste/ Residues Objectives:

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.

Eligible projects for subsidy:

The scheme provides Central Financial Assistance for following applications.

I) Project based on Biogas production

Output	Capital Subsidy	Description Biogas
Biogas	Rs. 1 Crore Per 12000 m^3 Biogas/day (Max. Rs. 10 Crore/project)	Biogas generation from Urban Waste/ Agricultural Waste/ Industrial Waste/ Effluents or mix of these wastes. (Distillery waste is excluded)

ii)Project based on Power generation

Output	Capital Subsidy	Description Biogas
Power	Rs. 3 Crore Per MW (Max. Rs. 10 Crore/project)	Power generation based on Biogas generated from Urban Waste/ Agricultural Waste/ Industrial Waste/ Effluents or mix of these wastes. In case, developer wants to set up power generating unit at already existing Biogas generation unit, in that case, the applicable CFA will be only Rs. 2 crore per MW.

iii) Project based on Production of Bio-CNG

Output	Capital Subsidy	Description Biogas
Bio-CNG/ Enriched Biogas	Rs. 4 Crore Per 4800 kgs of Bio-CNG/day generated from 12000 m^3 of Biogas/day. (Max. Rs. 10 Crore/project)	Bio-CNG generation based on Biogas generated from Urban Waste/ Agricultural Waste/ Industrial Waste/ Effluents or mix of these wastes. In case, developer wants to set up Bio-CNG unit at already existing Biogas generation unit, in that case, the applicable CFA will be only Rs. 3 crore.

v) Project based on Biomass Gasifier

Output	Capital Subsidy	Description Biogas
Gasifier Thermal/ Electrical in Industries/ Villages	Electrical • Rs. 2500 per kW with duel fuel engines. • Rs. 15000 per kW with 100% gas engines. Thermal • Rs. 2 lakh per 300 kW for thermal applications.	Biomass Gasifier based Captive Power and thermal applications in industries. Distributed off-grid power for villages using Biomass Power Systems.

C) National Policy on Biofuels dated 04.06.2018

Salient Features :

- An indicative target of 20% blending of ethanol in petrol and 5% of biodiesel in diesel is proposed by 2030
- Reinforcing ongoing ethanol/biodiesel supplies through increasing domestic production
- Setting up Second Generation (2G) bio refineries
- Development of new feedstock for biofuels
- Development of new technologies for conversion to biofuels
- Creating suitable environment for biofuels and its integration with main fuels.
- Blending ethanol in petrol through Ethanol Blended Petrol (EBP) Programme using ethanol derived from multiple feedstock
- Development of Second Generation (2G) ethanol technologies & its commercialization
- Blending biodiesel in diesel through Biodiesel Blending Programme exploring multiple feedstocks including straight vegetable oil in stationery, low RPM engines.
- Focus on drop-in fuels produced from MSW, industrial wastes, biomass etc.
- Focus on advanced biofuels including bio-CNG, bio-methanol, DME, bio-hydrogen, bio-jet fuel etc.
- Government of Maharashtra is planning to set up Biofuel Board in the State.

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7 ENERGY CONSERVATION

1. Introduction

With the intent of legislature to provide energy efficiency in Indian economy, the National Energy Conservation Act, 2001 came into force on 1st March 2002. The Government of India has set up Bureau of Energy Efficiency (BEE) on 1st March 2002 under the provision of the Energy Conservation Act, 2001. The mission of Bureau of Energy Efficiency is to assist in developing policies and strategies with a thrust on self-regulation and market principles with the primary objective of reducing energy intensity of the Indian economy within the overall framework of the Energy Conservation Act, 2001. This will be achieved with active participation of all stakeholders, resulting into accelerated and sustained adoption of energy efficiency in all sectors.

The Energy Conservation Act (EC Act), 2001 mandates creation of a two-tier organization structure to promote the efficient use of energy and its conservation in the country with BEE as the nodal agency at central level and SDAs as nodal agencies at State level. Section 15(d) of the EC Act stipulated that the State Government may designate any agency at the State level to co-ordinate, regulate and enforce the provisions of the Act within the State. In-line with this, Government of Maharashtra (GoM) vide notification dated 12th March, 2003, appointed Maharashtra Energy Development Agency (MEDA), as the State Designated Agency.

For effective implementation of provisions under EC Act 2001 in the State, GoM formulated "State Energy Conservation Committee" on 30th April 2005 and restructured the same on 1st July 2011. In exercise of the powers conferred by sub-section (1) and (4) of section 16 of EC Act 2001, GoM on 12th February 2013, notified Maharashtra State Energy Conservation Fund Rules, 2013 for the purpose of promotion of efficient use of energy and its conservation within the State.

2. The Mission

The mission of Maharashtra Energy Development Agency (MEDA) is to facilitate and enforce efficient use of energy and its conservation, within the overall framework of the Energy Conservation Act, 2001 (EC Act). This will be achieved with active participation of all stake holders in the State, resulting in accelerated and sustained adoption of energy efficiency in all sectors of the economy.

3. The Objective of MEDA and its role

- To coordinate, regulate and enforce provisions of Energy Conservation Act, 2001 (EC Act) within the State of Maharashtra.
- Take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation.
- Arrange and organise training of personnel and specialists in the techniques for efficient use of energy and its conservation.
- Take steps to encourage preferential treatment for use of energy efficient equipment or appliances.
- Authority to administer the State Energy Conservation Fund (SECF).
- To appoint Inspecting officers for the purpose of ensuring compliances, within the overall framework of the EC Act.

- Ensure implementation of BEE's flagship programs (PAT, ECBC, S&L, SME, DSM) and schemes under Strengthening of SDAs to promote efficient use of energy and its conservation.
- Ensure implementation of various State's schemes and Policy related to Energy Conservation.

4. State Level Energy Conservation Schemes

MEDA has implemented following State Government Energy Conservation schemes in Maharashtra.

a. Save Energy Programme

Maharashtra Energy Development Agency (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 potential sectors. MEDA has done remarkable work up to March, 2022 and total 1851 energy audits have been carried out in various sectors, which has resulted in substantial energy saving in the various sectors.

b. 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 (WTA). MEDA provides financial assistance to Empanelled Auditing Firm of Rs.3000/- per unit (SME). Under this scheme, around 3839 Walk through Energy Audits in SMEs have been completed up to March, 2022.

c. 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 is up to Rs. 25 lakhs per building. Under this programme total 113 buildings are covered up to the financial year March, 2022; having estimated potential saving of 12.96 MUs per year.

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

Street lighting systems of municipal and other bodies use 1.5 to 2% of State's total energy consumption while water pumping systems use 4% of State's total energy consumption. 30% energy savings can be achieved by installation of energy saving devices in street lighting and water pumping systems. Under this programme financial assistance is up to Rs. 25 lakhs. Under this programme total 40 Municipal Councils / Corporations are covered up to the financial year March, 2022; having estimated potential saving of 2.38 MUs per year.

e. Maharashtra State Level Energy Conservation Award Scheme

One of the important endeavour under awareness and outreach programme has been the Energy Conservation Awards. To raise awareness on energy efficiency and its conservation, the MEDA, under the guidance of Ministry of Power, GoM, recognizes and encourages endeavours of industrial units, institutions and establishments in reducing energy consumption by felicitating them with Maharashtra State Energy Conservation Awards (MSECA), celebrated every year.

Sector wise number of participating units

Sr. No.	Sector/Industries	Number of applications received – 2021
1	Automobile & Engineering	12
2	Cement	1
3	Chemical & Petrochemical	2
4	Individual & NGO	5
5	Municipal Corporation	1
6	Metal & Steel	3
7	Paper	2
8	Textile	7
9	Thermal Power Stations	2
10	General category (Industries)	2
11	Commercial Building	2
12	Educational Institutions	9
13	Government	10
14	Residential	4
15	Energy Consultants, Energy Auditor & ESCOs	4
16	Co-Operative Industries	2
17	SME	3
	Total	**78**

MEDA organised 4-days online presentation for the participants of 16th State Level EC awards. Results of the 16th EC award has been declared by MEDA. List of the winners is uploaded on www.mahaurja.com.

During FY 2021-22, the participating units have saved approx. 27343 Million kWh of electrical energy, which is equivalent to the energy generated form a 3845.90 MW thermal power.

In the last 16 years of Award Scheme (2003-2021), the participating units have cumulatively saved approx. 5390 Crores & during FY 2020-21 its around Rs. 366 Crores in energy terms, 2695 Million kWh of electrical energy and 307 MW equivalent avoided capacity was saved through the energy conservation measures by the all-participating units during FY 2020-21.

YEAR WISE ENERGY SAVINGS ACHIEVED BY PARTICIPATING UNITS UNDER MHARASHTRA STATE LEVEL ENERGY CONSERVATION AWARD SCHEME

Baseline Year of energy saving	Award Scheme	No. of partici-pating units	Annual Saving in Rs. Crores	One-time Investment in Rs. Crores	Equivalent Electrical Energy Saving (Electrical + Thermal)	
					Million kWh	Equivalent Avoided Capacity in MW
2003-04	1st	46	150	205	317	25
2004 -05	2nd	50	200	285	400	37
2005 -06	3rd	75	292	356	584	45
2006 -07	4th	68	394	442	789	90
2007-08	5th	113	502	448	964	114
2008 -09	6th	117	515	-	1031	117
2009 -10	7th	67	304	-	608	88.9
2011- 12	8th	113	330	-	2100	308
2012-13	9th	114	349	556	2880	422
2014-15	10th	110	155	86	1843	270
2015-16	11th	136	421	577	2640	386
2016-17	12th	120	316	436	2430	355
2017-18	13th	100	287	407	2210	327
2018-19	14th	87	447	444	2969	484
2019-20	15th	77	362	194	2883	470
2020-21	16th	78	366	440	2695	307
Total 16 years		**1471**	**5390**	**4790**	**27343**	**3845.90**

5. Progress under Maharashtra State Energy Conservation (EC) Policy - 2017

Government of Maharashtra notified State Energy Conservation Policy -2017 on 22th June 2017. Under this policy, energy saving of 1000 MW is targeted to be achieved by implementing various energy efficient programs and energy conservation awareness in energy intensive sectors like Industry, Commercial/Government Buildings, Municipa

Corporations/Councils, Distribution Companies, Generation Companies, Transmission companies other Cross Sectors etc.

Following is the Sector wise progress on EC Policy – 2017

Industry:

- Energy Audit of Industrial & Commercial consumers whose contract demand is 1000kVA and above. Implementation of this through Chief Electrical Inspector is in progress.
- MSME Cluster formation: - Department of Industries, GoM had already completed MSME Cluster formation for 63 Industries.

b. Implementation of energy efficiency activities in Government schools – Replacement of existing conventional appliances with energy efficient appliances in Govt. schools is undertaken by MEDA under this head. The main objectives of these activities are to make schools energy efficient by replacing old luminaries & fan with energy efficient one and disseminate the awareness of energy efficiency and energy conservation amongst the school children. Till date MEDA has implemented Energy Efficient Activities in total 181 Schools. The estimated energy saving potential will be 7,37,844 kWh/year and CO2 reduction 590 tone per year.

ii. Model Energy Efficient Village Campaign

The Model Energy Efficient Village Campaign is initiated to convert villages into model energy efficient villages by replacing existing inefficient electrical equipment / appliances with BEE star rated appliances including bulbs, street lights, fans, water pumps, etc. The aim of this campaign is to introduce new energy efficient technologies for energy saving as well as to compare new technologies on an experimental basis as well

MEDA has implemented this campaign in 13 villages. Those villages are follows,.

a. Village Radhanagari, Tal. Radhanagari, Dist. Kolhapur.
b. Village Jategaon, Tal. Shirur, Dist. Pune.
c. Village Nategaon, Tal. Mahad, Dist. Raigad.
d. Village Bamburdi Ghumat, Tal. & Dist. Ahmednagar.
e. Village Ashiv, Tal. Ausa, Dist. Latur.
f. Village Utka, Tal. Ausa, Dist. Latur.
g. Village Karepur (Govind Nagar) Tal. Renapur, Dist. Latur.
h. Village Patoda, Tal. Dist. Aurangabad.
i. Village Yenikoni, Tal. Narkhed, Dist. Nagpur.
j. Village Palandur, Tal. Lakhani, Dist. Bhandara.
k. Village Wambori, Tal. Rahuri, Dist. Ahmednagar.

Replacement of energy efficient equipment / appliances is carried out at Gram Panchayat office, Common communities lighting, Street Lighting, water pumping station, bus stand, Tourist Guest house, Government school Hostels, Government schools etc.

The expected Energy Saving Potential and CO2 reduction in above 13 villages will be 6,06,429 kWh/year and 466 tone per year.

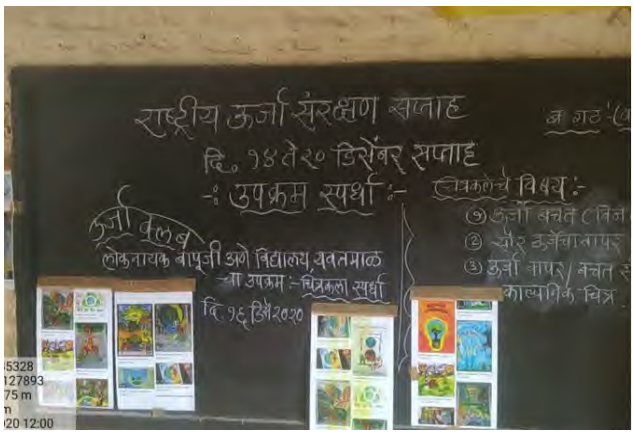
7. Workshops/Trainings on Energy Conservation programmes

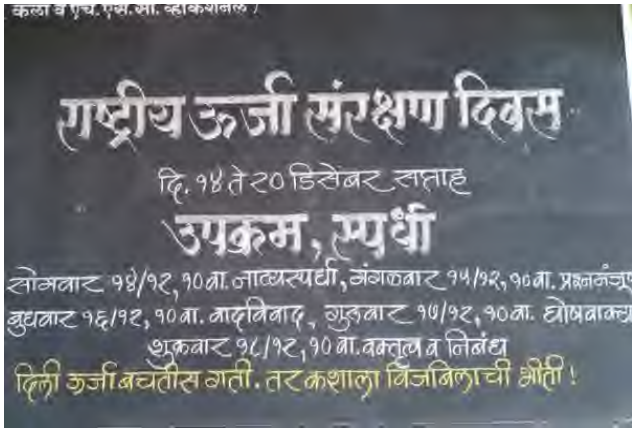
MEDA conducted various workshops, seminars and capacity building programme of energy professionals in the area of Energy Conservation Building Codes, Capacity Building of DISCOMs, Energy Efficiency in Industrial clusters and Energy Efficiency Financing for Financial Institution.

8. Energy club:

Under the BEE programme, the awareness amongst school children by way of establishing energy clubs, organizing Elocution competitions, Essay competition, Painting competition, Slogan Competition, Quiz contest and celebration EC week etc. are also proposed. Under this program, MEDA provided financial assistance of Rs. 5000/- per school.

MEDA has established total 533 nos. of Energy Clubs till date. Through these established energy clubs, various energy conservation-based programme is organized. During FY 2021-22 out of proposed 400 nos. Energy Clubs, as on date total 297 nos. Energy Clubs are established.





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 have taken up in the week for creation of awareness.

a. Industries, Industries association, all government departments, all local 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 & energy pledge.
   - Energy conservation slogan competition for employees and their wards.
   - Seminar for employees on energy conservation activities in the plant.

b. Information and awareness messages were regularly disseminated through MEDA's web portal, Facebook, Twitter.

c. Energy conservation awareness advertisement in local newspapers during Energy Conservation week.

d. Energy conservation awareness through Radio Jingle during Energy Conservation week.

e. Energy conservation awareness through conducting Wall painting/Graffiti competition amongst the students of Architecture/ Art colleges.

f. Display of various Energy Audit Measuring Instruments for engineering students from Pune district during EC week.

g. Energy conservation awareness through Van activation across MEDA Divisional Offices during EC week.

10. Establishment of Energy Conservation Building Code in state

The Central Government vide notification dated 13th February, 2018 in consultation with Bureau of Energy Efficiency notified the Energy Conservation Building Code (ECBC) in 2007 which got amended in 2017. The code is applicable to all commercial buildings having connected load of 100 KW or above or contract demand of 120 kVA or above.

Energy Department, Govt of Maharashtra under section 57 (2) of Energy Conservation Act, 2001 published the draft "MAHA ECB Rules, 2019" on August 22nd, 2019 in official gazette No. MAHBIL/2009/31733 for comments & suggestions in public domain. All the received comments & suggestions have been compiled & the rules have been amended with incorporation of Third-Party Assessor (TPA) model and submitted to GoM for consideration.

Energy Department, Govt of Maharashtra through government resolution dated 8th March 2021, established Technical Steering Committee for effective implementation and to decide roadmap for Maha ECB Rules in the State. Later a letter to the Energy Department has been requested for the restructuring of the ECBC Technical Committee under the chairmanship of Chief Secretary and one invitee member from BEE in Feb 2022.

Further, Bureau of Energy Efficiency (BEE) had established ECBC cell (VK:e Environmental LLP, Pune) in May 2019 till Dec 2020 at MEDA, to provide technical assistance for effective implementation and enforcement of ECBC in the State.

Later the ECBC & ENS Cell (Administrative Staff College of India, Hyderabad) was established by BEE in August 2021 for a period of two years in MEDA to provide technical assistance for effective implementation and enforcement of ECBC & ENS in the State.

Major activities carried out by the ECBC Cell are as below:

Demonstration projects: -

a. Technical assistance had been provided for 7 demonstration projects in 2019-20 for different categories of buildings in different climatic zones were supported to showcase ECBC compliance across the State.

b. Later in 2021-22, technical assistance for 4 number of demonstration projects has been provided. List of demo projects are as below:

Sr. No.	Project name	Building Type	Compliance level	Climate zone	Est. Annual Energy Saving kWh
1	Umred Court Building	Assembly	ECBC	Composite	318270
2	Deori Court Building	Assembly	ECBC	Composite	87428
3	Trauma Hospital, Savner,	Hospital	ECBC	Composite	22985
4	Workshop Building, College, Khapri	Institutional	ECBC	Composite	38470

Webinars/Workshops: -

a. Due to pandemic situation there were restrictions in conducting physical workshops. To spread awareness about ECBC 2017 and draft Maha ECB Rules total 10 number of trainings have been organised during financial year 2021-22 out of which 06 were physical and 4 were webinars.

b. These were conducted for participants from Govt Offices like ULBs, Town Planning Department, PWD Department, Architects, Engineers, Environment Consultants, Manufacturers, Students, Various associations etc.

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

Perform Achieve and Trade (PAT) scheme is a flagship progarmme of Bureau of Energy Efficiency under the National Mission for Enhanced Energy Efficiency (NMEEE). NMEEE is one of the eight national missions under the National Action Plan on Climate Change (NAPCC) launched by the Government of India in the year 2008.

Perform Achieve and Trade (PAT) scheme is a market-based compliance mechanism to accelerate improvements in energy efficiency in energy intensive industries. The energy savings achieved by notified industries is converted into tradable instruments called Energy Saving Certificates (ESCerts). The ESCerts after issuance by Bureau of Energy Efficiency (BEE) are traded at Power Exchanges.

BEE launched new PATNet portal (https://escerts.gov.in) on 17th March 2019, for Designated Consumers (DCs), SDAs, EmAEAs for filling up forms, giving comments and registration. Role of MEDA as a SDA is to maintain list of DCs, to perform scrutiny documents uploaded by DCs and give comments on submissions of Form 1/2/3, Performance Assessment Document (Form A), cross check Monitoring & Verification (M&V) report and subsequently issue show cause notice to DCs for non-compliance.

BEE has rolled out seven PAT cycles till 31st March, 2022, with a total of 99 DCs covering 12 sectors in State of Maharashtra. Details are as follows:-

PAT Cycle	Registration Year	Targeted Year	Nos. Of DCs
I	2012-13	2014-15	45
II	2016-17	2018-19	57
III	2017-18	2019-20	08
IV	2018-19	2020-21	15
V	2019-20	2021-22	09
VI	2020-21	2022-23	12
VII	2022-23	2024-25	47

To ensure effect implementation and enforce compliance for policy / scheme / programs covered under the section 17 of the Energy Conservation Act 2001, MEDA appointed officials as a Inspecting Officers. Details of the same are published on www.mahaurja.com.

Overall achievement of PAT scheme in Maharashtra:

PAT CYCLE	TARGET YEAR	NO OF DCs	OVERALL ACHIEVEMENT (ESCerts)	TOTAL ENERGY SAVING (Million TOE)	GHG EMISSION REDUCTION (Million Tonnes of CO2)
I	2014-15	45	1,60,003	0.16	0.46
II	2018-19	57	7, 02, 621	0.702	6.69

8 PUBLICITY AND MASS AWARENESS PROGRAMME

During 2021-22 MEDA carried out wide publicity campaigns through various media like Exhibition, electronic media, Print Media etc.

Exhibitions

1. AGROVISION 2021 –

MEDA Division office Nagpur participated in this exhibition. Agrovision 2021 was organized by Agrovision foundation on 24 to 27 December, 2021 which was held at Reshimbagh. This exhibition was inaugurated by Shri. Nitin Gadkari, Hon'ble Minister for Road Transport & Highways, GoI, Chief Patron, Agrovision and Shri. Narendra Singh Tomar, Hon'ble Minister for Agriculture & Farmers Welfare, GoI MEDA displayed the information boards of New and Renewable Energy and Energy Conservation schemes at the stall. The program was attended by Mr. Aswathnarayan C. N, Minister of Information and Technology, Karnataka, Hon. Sanjay Aggarwal, Central Secretary, Mr. Shri. Chandrasekhar Bawankule, MLA Vidhan Parishad and Mr. Shri. Kripal Tumane, MP etc. In this exhibition MEDA officials gave information regarding MEDA schemes like P.M. Kusum, Solar Roof top, Saubhagya, Energy Conservation etc. Around 30,000 people visited MEDA stall.

2. Shining Maharashtra 2022 -

MEDA Division office Pune participated in this exhibition which was held at Phaltan, Maharashtra from 25 to 27 March, 2022 organised by Sansa Foundation.

This exhibition was inaugurated by Hon'ble Member of Parliament (Lok Sabha) Shri. Ranjit Singh Naik Nimbalkar. A seminar on various topics related to agriculture was organized in the said exhibition. Many experts guided the farmers. Information boards on Renewable energy and Energy conservation were displayed. In this exhibition MEDA demonstrated live demo of Solar Krushi Pump, so that the students, Businessmen, farmers can know the working of solar pump on solar energy. Information brochures were distributed among the people who visited the Exhibition.

Advertisements

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

Information Brochures

To illustrate various renewable energy programmes being implemented by MEDA, the renewable energy technology information brochure is available on website of MEDA. This brochure creates awareness of Renewable Energy and Energy Conservation.

Library

MEDA has a library with books on Renewable Energy. It also consists of books on various topics like laws, taxes, literatures etc. for ready reference.

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9 RPO, REC AND R & D PROGRAMME

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, 2019. RPO obligation shall be applicable to all Distribution licencees, 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 1 MW 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 shall be subject to RPO to the extent of a percentage of his consumption met through such fossil fuel-based captive source;

(b) Any person having a Contract Demand of not less than 1 MW 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 :

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 2019 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
2020-2021	4.50%	11.50%	16.00%
2021-2022	6.00%	11.50%	17.50%
2022-2023	8.00%	11.50%	19.50%
2023-2024	10.50%	11.50%	22.00%
2024-2025	13.50%	11.50%	25.00%

The provisional achievement of state DISCOMs for FY 2021-22 is as follows:

Year	Gross Energy Consumption (GEC)(MUs)	Requirement of Non-Conventional Energy as per RPO (MUs)	RE procurement actual (MUs)	Target (in %)	Target Achieved (in %)	Shortfall (in %)
2021-22	155370.37	27189.81	21677.85	17.5%	13.95%	3.55%

Renewable Energy Certificate) Mechanism -

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

- According to Maharashtra Electricity Regulatory Commission (Renewable Purchase Obligation, Its Compliance and Implementation of Renewable Energy Certificate Framework) Regulations, 2019 dated. 27.12.2019 Maharashtra Energy Development Agency (MEDA) has designated as a State Agency to undertake functions of this Regulation.
- 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 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.
- 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.

The floor and forbearance price as determined by the Commission to be applicable from 01.04.2017 are as under:

	Non solar REC (Rs./MWh)	Solar REC (Rs./MWh)
Forbearance Price	2,900	2,500
Floor Price	1,000	1,000

- 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 31st March 2022	
Source	No. of Projects	MW
Wind	30	94.96
Solar PV	12	33.5
Small Hydro	01	4.5
Bio-mass	01	5
Bio fuel Co-generation	09	88.959
Others	0	0
Total	**53**	**226.919**

- R&D (Research & Development) - MEDA as a State Nodal Agency implementing New Technology programme of MNRE in the state as under:

R&D Programmes:

- Solar - https://mnre.gov.in/research-and-development/solar
- Wind - https://mnre.gov.in/research-and-development/wind
- Small Hydro- https://mnre.gov.in/research-and-development/small-hydro
- Waste to Energy - https://mnre.gov.in/research-and-development/waste-to-energy
- Bio Energy-https://mnre.gov.in/research-and-development/bio-energy

Informative :-

1) Hydrogen Energy:-

MNRE has been supporting a broad based Research Development and Demonstration (R&D) programme on Hydrogen Energy and Fuel. Projects are supported in industrial, academic and research institutions to address challenges in production of hydrogen from renewable energy sources, its safe and efficient storage, and its utilization for energy an transport applications through combustion or fuel cells. With respect to transportation, major work has been supported to Banaras Hindu University, IIT Delhi, and Mahindra & Mahindra. This has resulted in development and demonstration of internal combustion engines, two wheelers, three wheelers, and mini buses that run on hydrogen fuel. Two hydrogen refuelling stations have been established (one each at Indian Oil R&D Centre, Faridabad and National Institute of Solar Energy, Gurugram).https://mnre.gov.in/new-technologies/hydrogen-energy

2) Energy storage:-

Energy storage can play a very important role in grid integration and balancing of variable generation sources. By increasing the system's overall flexibility, it can improve power quality, reduce peak demand, enhance capacity of distribution / transmission grids, avoid/reduce deviation penalties etc. Use of energy storage systems by residential, commercial or industrial consumers, in conjunction with renewable energy has potential to improve power quality and reliability for such consumers. This would also allow for minimization of diesel consumption from back-up power applications. Energy storage is the main component of EVs both in terms of cost and performance determination. The thrust for electric mobility utilizing indigenous modern and reliable energy storage would significantly reduce the country's dependence on imported fossil fuels and energy storage systems. The NITI Aayog is coordinating the work relating to energy storage. https://mnre.gov.in/new-technologies/energy-storage

3) Ocean Energy:-

As per a study conducted by the Indian Institute of Technology, Chennai in association with CRISIL Risk and Infrastructure Solutions Limited in December 2014, the tidal power potential is estimated at around 12,455 MW. The potential areas with low/medium tidal wave strength are in the Gulf of Khambat, Gulf of Kutch & southern regions in Gujarat, Palk Bay- Mannar Channel in Tamil Nadu, and Hoogly river, South Haldia & Sunderbans in West Bengal. Tidal energy is still in Research & Development (R&D) phase and has not been implemented on a commercial scale in India. The earlier efforts for harnessing tidal power were not successful due to high capital cost ranging from Rs. 30 crore to Rs. 60 crore per MW. https://mnre.gov.in/new-technologies/ocean-energy

4) Geothermal Energy:-

Geo-thermal resources in India have been mapped by Geological Survey of India (GSI). Broad estimate suggests that there could be 10 GW geo-thermal power potential. Present efforts are towards establishing cost-competitive geo-thermal potential in India. https://mnre.gov.in/new-technologies/geo-thermal-energy

Geothermal Power-

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 x 1018 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 basin 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 0C.

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.

Wave Power –

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 coast.

Hot Spring

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 Rs3000 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.

Deep Hot Spring Illustration

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 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.

Overview

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 is estimated as 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 Rock	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.

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10 HUMAN RESOURCES 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 2021-22, 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.

Sr. No.	Designation	Subject	Period	Nos
1.	General Manager	Nomination for two days online training programme on "Good Governance and Transparency through RTI act 2005"	9 to 10 September 2021	01
2.	Manager	Nomination for two days online training programme on "Good Governance and Transparency through RTI act 2005"	9 to 10 September 2021	01

MEDA has spent Rs. 10,000/- on these training programs during financial year 2021-22.

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MEHTA SHAH & COMPANY
CHARTEREDACCOUNTANTS

AUDITORS' REPORT

We have audited the balance sheet of Maharashtra energy development agency (MEDA) as on 31st march 2022 and the income and 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 examinationof these books.
3. The balance sheet and the income and expenditure account dealt by with 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 explanation given to us, the said accounts give a true and fair view of the assets and liabilities as at 31st march 2022.
5. In our opinion and to the best of our information and according to the explanation 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 2022, and
   b) In case of the income and expenditure account of the Deficit for the year ended on that date.

FOR MEHTA SHAH & CO.
Chartered Accountants

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

SANDIP R. MUNDADA
Partner
M. No.120096
Date : 29/09/2022
Place : Pune

UDIN: 22120096AXPOGZ6371

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