

Energy Efficiency Activities in Buildings in Maharashtra

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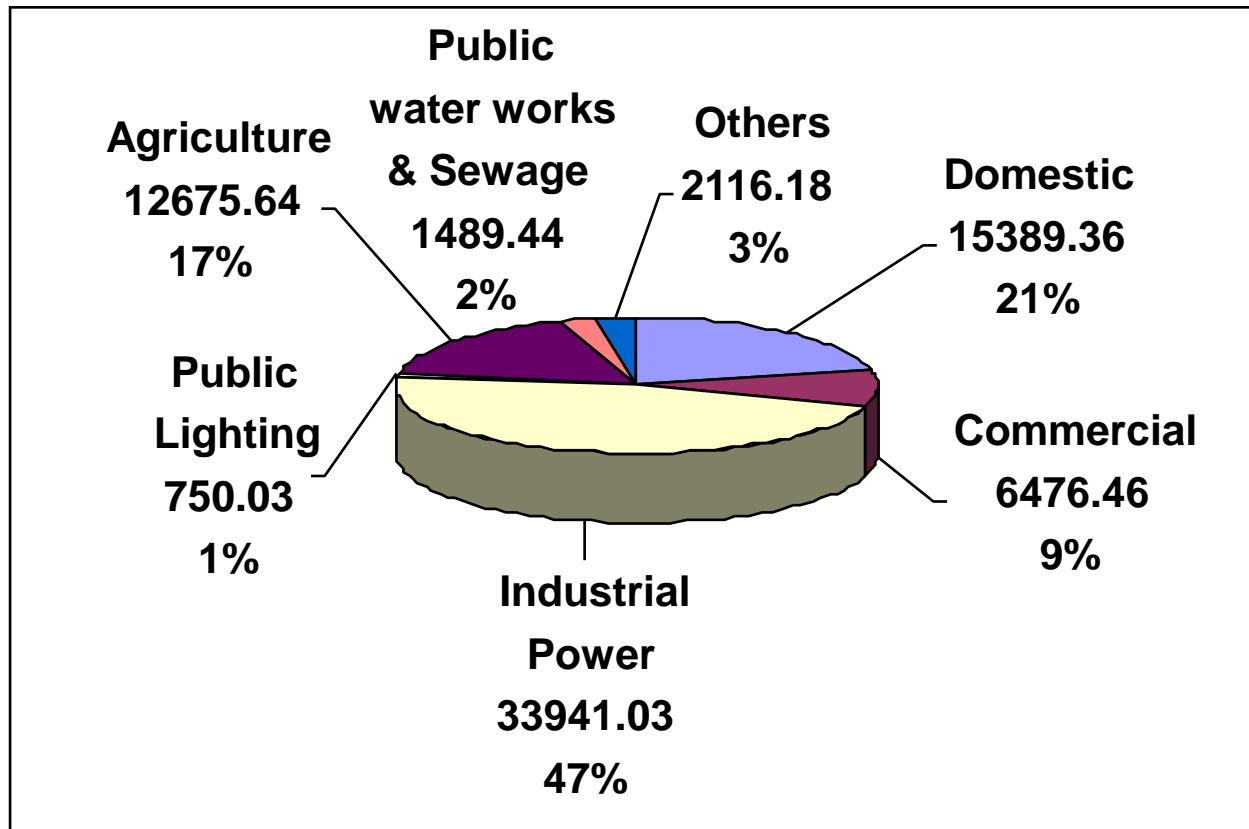
MAHARASHTRA ENERGY DEVELOPMENT AGENCY

(An ISO 9001, 14001 Organisation)





Maharashtra Overview



Sector-wise break up of Energy Consumption



POTENTIAL FOR ENERGY CONSERVATION IN STATE

SECTOR / INDUSTRY		CONSERVATION POTENTIAL (%)	POSSIBLE SAVING IN MUS (ANNUAL)
Industrial Sector		Up to 25	8485
Agriculture Sector		Up to 30	2154
Domestic Sector		Up to 20	3077
Commercial Sector		Up to 30	1942
		TOTAL	15658

ENERGY CONSERVATION INITIATIVES

- Formed separate “**EC Department**”.
- Formation of State EC Committee to guide MEDA.
- Prepared Strategic Plan of 1000 MW power saving. Work started on it. In the year of 2008-09 energy saving of 743 Million Units are saved. (Verified by BEE, New Delhi)
- State level Award scheme for Energy Conservation
- Energy Audit Scheme
- Waste Heat Recovery Scheme
- Energy Efficient Street Lights Scheme for Grampanchayats
- Reduction of VAT of CFL from 12.5% to 4%. Saving of 33 MW.
- DSM Programme in Govt. buildings & Municipal Corporations.
- Awareness/ Capacity Building Programs for school students, Engineers, Architects, PWD & Municipal Engineers.
- Publicity Campaign for general public in electronic media, print media.

Energy Saved

S.N	Name of Program	Quantity	Cumulative Savings (in MW) from 2007-08
1	Save Energy Scheme	60	0.92
2	Energy Efficient Street Light	10000	0.5
3	Waste Heat Recovery	7	2.59
4	Use of energy efficient equipments in Govt. Buildings and Urban Local bodies	10 lakhs	28
5	Energy Conservation achieved by industries	58	108.93
6	Use of CFL in all sectors	163 lakhs	653
Total			793.73

EC AWARD SCHEME SAVING IN LAST FIVE YEARS

Sr. No.	Year	Equivalent Energy Saved By Participants in Million Units KWh	Equivalent MW Capacity addition Saved	Energy Bill Saved in Rs. (Crores)
1	2003-04	317	25	205
2	2004-05	400.7	37	200
3	2005-06	584	45	292
4	2006-07	789.2	90	394
5	2007-08	964	114	502
	Total	3054	307	1538

BUILDING SECTOR SCINARIO IN THE COUNTRY & STATE

Continued....

INDIA.

- India, the seventh largest country in the world, is a leading economy and home to over one billion people living in various climatic zones. The country's economy has been growing at a fast pace ever since the process of economic reforms started in 1991.
- Construction plays a very important role in its economy contributing on an average 6.5% of the GDP.
- Commercial and residential sectors continue to be a major market for the construction industry.
- With a near consistent 8% rise in annual energy consumption in the residential and commercial sector, building energy conservation has seen an increase from 14% in the 1970s to nearly 33% in 2004-05.
- Electricity use in both residential and commercial sectors is primarily for lighting, space conditioning, refrigeration, appliances and water heating.

MAHARASHTRA STATE

- Highest No. of Commercial Buildings in the country .
- Annual Rise in Commercial & residential sector 11 %
- Total Energy Consumption in Commercial & Residential sector - 30%
- BPO sector ranks 1st in rise in commercial sector
- EPI of commercial buildings is 180-400 kwh/sqmtr/annum.
- Saving potential exist 30 to 40 %
- Limited presence of ESCO

ENERGY EFFICIENCY INITIATIVES IN BUILDING SECTOR IN THE STATE

Govt. & Pvt. Sector

- Conducted Investment Grade Energy audits in 22 Government Buildings
- Issued mandatory purchase of 4 & 5 star labeled equipments in Government/semi government / Government own companies / local govt. organization
- Compulsory use of CFL, Electronic Ballasts, T-5,T-8 FTL in Government/ semi government Buildings
- Capacity buildings of Govt. & Pvt. Sector.
- Mandatory use of solar water heating systems in municipal areas.
- Promotion of ESCO's in Municipal sector.
- Mass Awareness through electronic media, print media, outdoor media

PROPOSED PROVISIONS FOR ENERGY EFFICIENCY AND USE OF RENEWABLE ENERGY IN BUILDINGS

- **Applicable to :**

This provisions shall be applicable to all types of non industrial new buildings (commercial & residential) having built up area of 2000 sq.m. and above or plot area of 500 sq.m and above or extensions or renovations of existing buildings of this criteria.

- **Section: 1 Energy Efficiency**
- **Section: 2 Renewable Energy**

- **Section: 1 Energy Efficiency**

Salient features

1. **Environment Architecture:**

A. Climate responsive design to achieve thermal comfort to reduce or avoid energy use for space cooling /heating .

B. Waste water recycling.

C. Solid Waste management (composting)

2. **Efficient Building Material**

Use of 25% pozzolana material blended Portland cement, fly ash etc.

Reuse of recycled products, furniture.

3. **Water Conservation/ Rain Water Harvesting.**

4. Energy Efficient Lighting

- A.** For internal lighting developer should use CFL(s)/ T-8/ T-5 fluorescent lamps/ LED lamps operating on ISI marked electronic ballast / driver for general lighting, halls and common areas etc. Minimum average luminous efficacy should be 75 lumens/ watt. Only LED lamps for common passages, staircases, lifts, corridors, lobbies etc. Minimum average luminous efficacy should be 100 lumens/ watt.
- B.** Only LED lamps for common passages, staircases, lifts, corridors, lobbies etc. Minimum average luminous efficacy should be 100 lumens/ watt.
- C.** Developer should use only LED lamps /T-5 /T-8 fluorescent lamps operating on ISI marked electronic driver / ballast for common areas, internal roads, pathways, landscaping area and façade lighting etc. for external lighting. Minimum average luminous efficacy should be 90 lumens/watt.
- D.** Developer shall use T-8 fluorescent lamps having minimum 4 Star Label as per BEE.

Lighting continue.....

- E.** Developer shall confirm that lighting systems and equipment shall comply with the mandatory provisions of ECBC
- F.** Lighting Control & Automatic shut off.
- G.** Exit Signs : All exit signs should be of LED & should not exceed 5 watt.

Lighting continue.....

5. Internal Ceiling and Exhaust Fans

- A. Ceiling fans used shall be having minimum 4 star label as per BEE
- B. The fan regulator shall be of electronic type only.
- C. Exhaust fans should be used having energy efficient motor with minimum efficiency of 80%.

6. Pumps

Developers shall select the water pump as per following criteria:

- 6.1** Pump set shall have minimum 4 star labeled as per BEE.
- 6.2** Submersible pump sets shall preferably be used.
- 6.3** For multi storey building having building height 25m and above hydro-pneumatic system shall be used.
- 6.4** Automatic level control device shall be used in all buildings.
- 6.5** For hydro pneumatic pumping system VFD shall be used.

7. Lifts

Developers shall select the lift as per following criteria:

- 7.1** Variable voltage and variable frequency drives shall be used.
- 7.2** Duplex controls shall be used where two or more lifts in one passage are used.
- 7.3** Preferably Regenerative motors shall be used.
- 7.4** Cabin fan should be interlocked with operation of lift motor.
- 7.5** In lift cabin and lift hoist only LED bulb should be used.
- 7.6** Preferably machine room less lifts shall be provided.
- 7.7** For escalators motion sensors and VF drives shall be used.

8. Service water and hot water

8.1 General

Developers should provide all service water heating equipment and systems conforming the mandatory provisions of 5.2

8.2 Mandatory requirements

8.2.1 Solar Water Heating/Heat Recovery System

Residential facilities, hotels and hospitals with a centralized system shall have solar water heating for at least **50%** of the design capacity.

Exception to 8.2.1: Systems that use heat recovery for at least 50% of the design capacity.

8.2.2 Equipment Efficiency

Service water heating equipment shall meet or exceed the performance and minimum efficiency requirements presented in available Indian Standards.

- a) Solar water heater shall meet the performance/minimum efficiency level mentioned in IS 13129 Part (1&2)
- b) Gas Instantaneous Water heaters shall meet the performance/minimum efficiency level mentioned in IS 15558 with above 80% thermal efficiency.

8. Service water and hot water continue...

8.2.3 Supplementary Water Heating System

Supplementary heating system shall be designed to maximize the energy efficiency of the system, and shall incorporate the following design features in cascade:

- a) Maximum heat recovery from hot discharge system like condensers of air conditioning units,
- b) Use of gas fired heaters whenever gas is available

8.2.4 Piping Insulation

Piping insulation shall comply with table no. 2.2 The entire hot water system including the storage tanks, pipelines shall be insulated conforming to the relevant IS standards on materials and applications.

8.2.5 Heat Traps

Vertical pipe risers serving storage water heaters and storage tanks not having integral heat traps and serving a non-recalculating system shall have heat traps on both the inlet and outlet piping as close as practical to the storage tank.

8.2.6 Swimming Pools

Electrical heating should not be used for swimming pools.

8.2.7 Compliance Documentation

The application for approval shall furnish detailed calculation showing the design to ensure that at least 80% of the heating requirement shall be met from solar heat/heat recovery and not more than 20% of the heat shall be met from gas heating.

9. Electrical Power

9.1 General

Developers should provide all electric equipment and systems confirming the mandatory requirements of 6.2.

9.2 Mandatory Requirements

9.2.1

Transformers of only 5 Star Labeled shall be used. Transformer of rating which is not covered in Star Label Programme should not have total losses more than 0.09%.

9.2.2 Energy Efficient Motors

Motors shall comply with the following:

Motors of only 4 & 5 star Labeled shall be used. Motors of rating which is not covered in Star Label Programme should have efficiency level of at least EFF 1& as per relevant Indian standard.

9. Electrical Power continue....

9.2.3 Power Factor Correction

All electricity supplies exceeding 100 A, 3 phase shall maintain their power factor between 0.95 lag and unity at the point of connection.

Check-Metering and Monitoring

- a) Services exceeding 1000kVA shall have permanently installed electrical metering to record demand (kVA), energy (kWh), and total power factor. The metering shall also display current (in each phase and the neutral), voltage (between phases and between each phase and neutral), and total harmonic distortion (THD) as a percentage of total current.
- b) Services not exceeding 1000 kVA but over 65 kVA shall have permanently installed electric metering to record demand (kW), energy(kWh), and total power factor (or kVARh).
- c) Services not exceeding 65 kVA shall have permanently installed electrical metering to record energy (kWh).

9. Electrical Power continue....

9.2.5 Power Distribution Systems & its Losses

The power cabling shall be adequately sized as to maintain the distribution losses not to exceed 1% of the total power usage. Record of design calculation for the losses shall be maintained.

9.2.6

Separate cable from main switch shall be provided for lighting purpose.

Total Harmonic Distortion of the supply system shall not be more than 5%

9.2.7

For inverter and UPS shall have to design for sine wave only.

9.2.8

In case of installation of generating set the fuel efficiency (kWh/ litre) shall be more than 3.5

9.2.9

For external lighting and passage lighting shall preferably be provided with renewable energy (solar PV/ wind) sources.

Section 2

- **Renewable Energy**

Use renewable energy based (solar PV, biomass, wind, fuel cells) lighting system for 50-100 % external lighting (wattage) requirement in kW/kWh on site namely walkways, driveways, & landscaped areas, internal roads etc.



SOLAR POWER

Solar energy - most readily available source of energy.



It is also the most important among the non-conventional sources of energy because it is non-polluting and, therefore, helps in lessening the greenhouse effect.

Solar energy is used for 2 applications

Thermal

Photovoltaic (Electrical)

SOLAR THERMAL SYSTEMS



SOLAR THERMAL SYSTEMS

One of the areas of applications of Solar Thermal Technology is heating of water, air for domestic, commercial and industrial use. The radiation from the sun is collected by the solar collector, which converts the radiation into heat energy. The heat is exchanged with water/ air resulting in increase in temperature of the water/air.

APPLICATIONS

- ! Domestic water heating
- ! Commercial and industrial process heat
- ! Drying of agricultural produces e.g. tea leaves, coffee seeds, grapes, etc.
- ! Industrial drying of chemicals
- ! Water distillation
- ! Steam and power generation

ADVANTAGES

- ! Non-polluting
- ! Simple, low cost
- ! Require very little maintenance
- ! Ease of installation
- ! Long life: 15-20 years

SAVINGS

- ! A 100 liters per day capacity Solar Water Heating System saves approximately 1500 units of electricity, annually.
- ! Payback Period
 - ~ 2-3 years when electricity is replaced
 - ~ 4-5 years when furnace oil is replaced
 - ~ 6-7 years when coal is replaced



ENERGY CONSERVATION



NEED OF THE HOUR

! Maharashtra has nearly 10000 industries who are H.T. consumers. ! 1 MW power plant cost is near about Rs 4.5 to 5 Crores and another cost of about Rs 2 Crores for P&D.

! To set power plant it takes ...5 years, to set up transmission lines it takes...1year, To plan energy conservation it takes ...1month ! To promote energy conservation it takes ...1 hour, But to save energy it needs only 1 second

! There is scope of energy saving up to 2000 MW in the State ! The gap between demand and supply of electricity can definitely be reduced as a result of energy conservation.

! The estimated scope of energy conservation in industrial, agriculture, domestic and commercial sector is 25%, 30%, 20% and 30% respectively. ! 1 kWh of electricity generated at thermal power station emits

-3015 Kcal of waste heat -1Kg of CO

-0.6 Kg of NO₂

-0.09 Kg of CO

-0.007 Kg of SO₂ and generates 0.201 Kg of flash ash.

! Such pollution can be avoided by saving each unit of electricity.

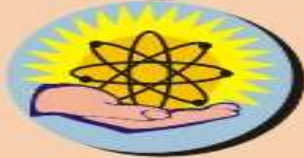




Tips for Energy Conservation in



DOMESTIC SECTOR



- ! Ensure optimum lighting
- ! Turn OFF lights/ fans when they are not required
- ! Avoid using large appliances during peak hours from 6.00a.m. to 9.00 a.m. and 6.00 p.m. to 9.00p.m.
- ! Use the daylight and turn off unnecessary lighting.
- ! Use of CFL in place of GLS lamp can save energy upto 70%
- ! Use the sleep mode on your computer, monitor and printer.
- ! Run full loads in your washing machine.
- ! Turn off kitchen and bathroom ventilating fans when not essential.
- ! Avoid using electric heaters.
- ! Shut down your computer and monitor when you leave for lunch.
- ! Replace standard fluorescent lamps with slimmer fluorescent lamps
- ! Use of electronic ballast in place of conventional choke save energy upto 20%
- ! Paint the inner walls and ceiling by faint colors
- ! For the outer ceiling of the house, use white color ceramic tiles or paint by using white lime !Keep the regular maintenance of all electrical appliances



1Unit of Energy Saved is equivalent to avoid 2.5 units of fresh addition at the generation level.



Tips for Energy Conservation in INDUSTRIAL SECTOR



GENERAL - THERMAL

! Undertake regular Energy Audits.

! The maintenance in plant should follow the "Zero Leak" philosophy, particularly in the areas of steam, water and air so that loss of energy could be totally eliminated.

! Plug all oil leakage. Leakage of one drop of oil per second amounts to a loss of over 2000 litres/year. ! Pre-heat the Oil to correct temperature. For proper combustion, oil should be at right viscosity at the burner tip. ! Incomplete combustion leads to wastage of fuel. Observe the color of smoke emitted from chimney. ! Black smoke indicates improper combustion and fuel wastage. White smoke indicates excess air & hence loss of heat. Hazy brown smoke indicates proper combustion. Regularly carry out the flue gas analysis.

GENERAL - ELECTRICAL

! Improve power factor by installing capacitors to reduce KVAdemand charges and also line losses within plant ! Improvement of power factor from 0.85 to 0.96 will give 11.5% reduction of peak KVA and 21.6% reduction in peak losses. This corresponds to 14.5% reduction in average losses for a load factor of 0.8. ! Avoid repeated rewinding of motors. Observations show that rewind motors practically have and efficiency loss of upto 5%. This is mainly due to increase in no load losses. Hence use such rewind motors on low duty cycle applications only.

! Use of variable frequency drives, slip power recovery systems and fluid couplings for variable speed applications such as fans, pumps, etc helps in minimizing consumption.

! Use of Energy Efficient motors should be promoted on large scale. **PUMPS**

! ~~Select and~~ operate pumps according to the load

! Explore using variable speed drives or sequenced control in case of process variations ! Minimize number of bends and leakages

in the pipelines
! Utilise gravity to advantage

FURNACES

! Control excess air in furnaces. A 10% drop in excess air amounts to 1% saving of fuel in furnaces. For an annual consumption of 3000 kilo litres of furnace oil, means a saving of Rs. 3 lakhs.

! Improve insulation if the surface temperature exceeds 20°C above ambient. Studies have revealed that heat loss from a furnace wall 115 mm thick at 650°C amounting to 2650 Kcal/m²/hr can be cut down to 850 kcal/m²/hr by using 65 mm thick insulation on the 115 mm wall.

! Reduce heat losses through furnace openings. Observation shows that a furnace operating at a temperature of 1000 °C having an open door Results in a fuel loss of 10 lit/hr. For a 4000 hrs. Furnace operation this translates into a loss of approx. Rs. 4 lakhs per year.

REFRIGERATION & AIR CONDITIONING

! Use of double doors, automatic door closures, air curtains, double glazed windows, polyester sun films etc. reduces heat ingress and air-conditioning load of buildings.

! Maintain condensers for proper heat exchange. A 5°C decrease in evaporator temperature increases specific power consumption by 15%.

COMPRESSED AIR

! Compressed air is very energy intensive. Only 5% of electrical energy is converted to useful energy. Use of compressed air for cleaning is rarely justified.

! Reduction in discharge pressure by 10% saves energy consumption upto 5%. It should be examined whether air at lower pressure can be used in the process.





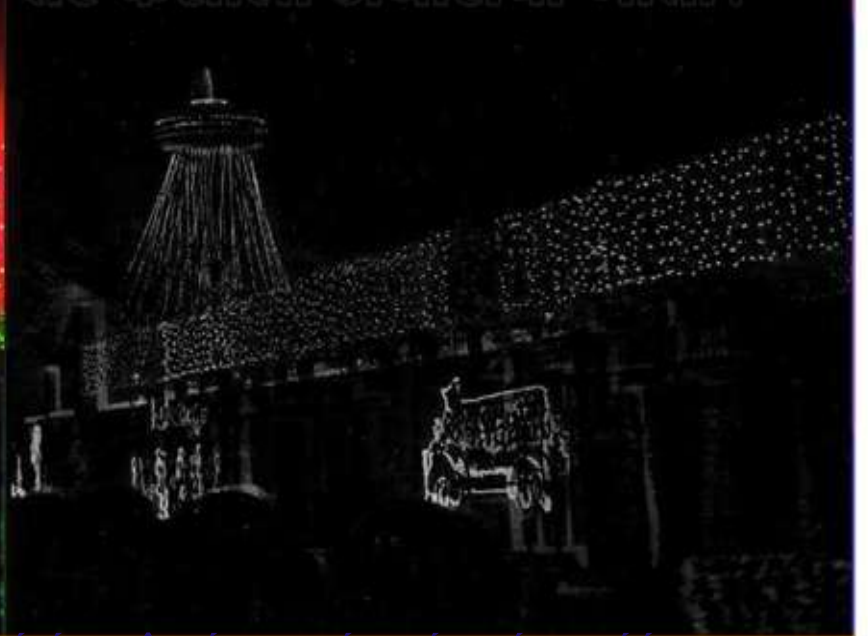
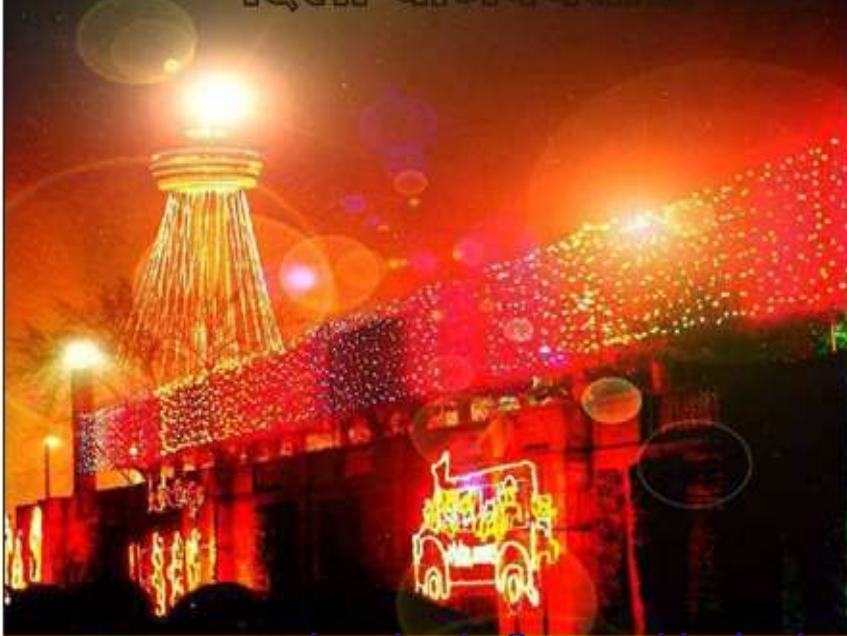
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 ÈòC°É : 26683631 E-mail : meda@vsnl.com; Website : www.mahaurja.com

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विजेची बचत. काळाची गरज.

१ युनिट विजेची बचत म्हणजे २.५ युनिट विजेची निर्मिती

वीजबचतीची सुरुवात स्वतःपासून करा -

- गरज नसताना विद्युत उपकरणे बंद करा.
- ऊर्जा कार्यक्षम उपकरणांचा वापर करा. जसे: CFL दिवे
- फ्रीजचा दरवाजा वारंवार उघडू नका.
- वातानुकूलित यंत्रांचा वापर टाळा.

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तुम्ही वीज/ऊर्जा वाचवू शकता..



वेळेवर स्विच बंद करून...

- साध्या बल्ब ऐवजी ऊर्जावचत (CFL) दिव्यांचा वापर करा.
- आवश्यक नसेल तेव्हा विद्युत उपकरणे मेन स्विचपासून बंद करा.
- विद्युत जोडणी उपकरणे आयएसआय (ISI) प्रमाणित असावित.



सूर्यचूल / सौरदीप यांचा वापर करून...

- इलेक्ट्रीक शेगडी ऐवजी सुधारीत चूल किंवा सूर्यचूलीचा वापर करावा.
- नवीन उपकरणे, सुविधा विकत घेताना ऊर्जा बचत कारणीय घ्यावीत.
- इलेक्ट्रीक मिश्र ऐवजी पाणी तापवण्यासाठी सौर उष्णजलसयंत्राचा वापर करा.



एअरकंडीशनरच्या वापरात वचत करून...

- एअरकंडीशनरला फॅनच्या सहाय्यत जास्त वीज लागते म्हणून शक्यतो एअरकंडीशनरचा वापर टाळावा.
- खोलीतून बाहेर पडण्यापूर्वी अर्धा तास अगोदर एअरकंडीशनर बंद करावा.
- एअरकंडीशनरचा तापमान नियंत्रक नेहमी २४ ते २६ डिग्री सेंटिग्रेड मध्ये ठेवावा.



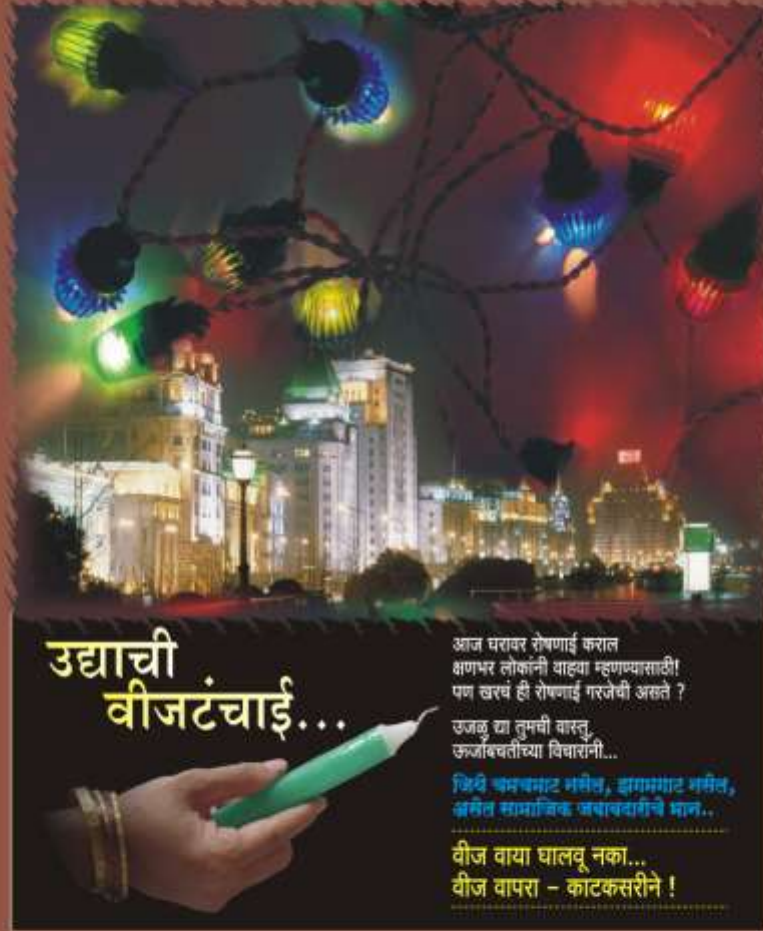
महाराष्ट्र ऊर्जा विकास अभिकरण (महाऊर्जा)

(महाराष्ट्र शासन पुरस्कृत)

येरवडा, पुणे- 411 006.

Website : www.mahaurja.com





उद्याची वीजटंचाई...

आज घरावर रोषणाई करात
क्षणभर लोकांनी वाहत्या म्हणण्यासाठी!
पण खरपं ही रोषणाई गरजेची असते ?

उजळु घा तुमची वारतु,
ऊर्जाबिचतीच्या विचारांनी...

क्रिडे बसवनाट मसैल, झगमगाट मसैल,
असैल सामाजिक जबाबदारीचे भाग..

वीज वाया घालवू नका...
वीज वापरा - काटकसरीने !



महाराष्ट्र ऊर्जा विकास अभिकरण (महाऊर्जा)

(महाराष्ट्र शासन पुरस्कृत)

येरवडा, पुणे- 411 006.

Website : www.mahaurja.com



एकच सेकंद
थांबा साहेब..

आधी लाईट
बंद करून येतो.



■ १ सेकंदही वीज वाया घालवू नका ■ दिवे, पंखे, विद्युत उपकरणे वेळेवर बंद करा ■ वीजेची बचत करा.



महाराष्ट्र ऊर्जा विकास अभिकरण (महाऊर्जा)

(महाराष्ट्र शासन पुरस्कृत)

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वीज वाया घालवणे म्हणजे नैसर्गिक खजिन्यावर कुऱ्हाड चालवणे!



- गरज नसताना विद्युत उपकरणे बंद करा.
- खोली/कार्यालयामध्ये जास्तीतजास्त सूर्यप्रकाश येईल याकडे लक्ष द्या.
- दिवे व ट्युबज यांवर धूळ साचू देऊ नका.
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