

save energy, save environment

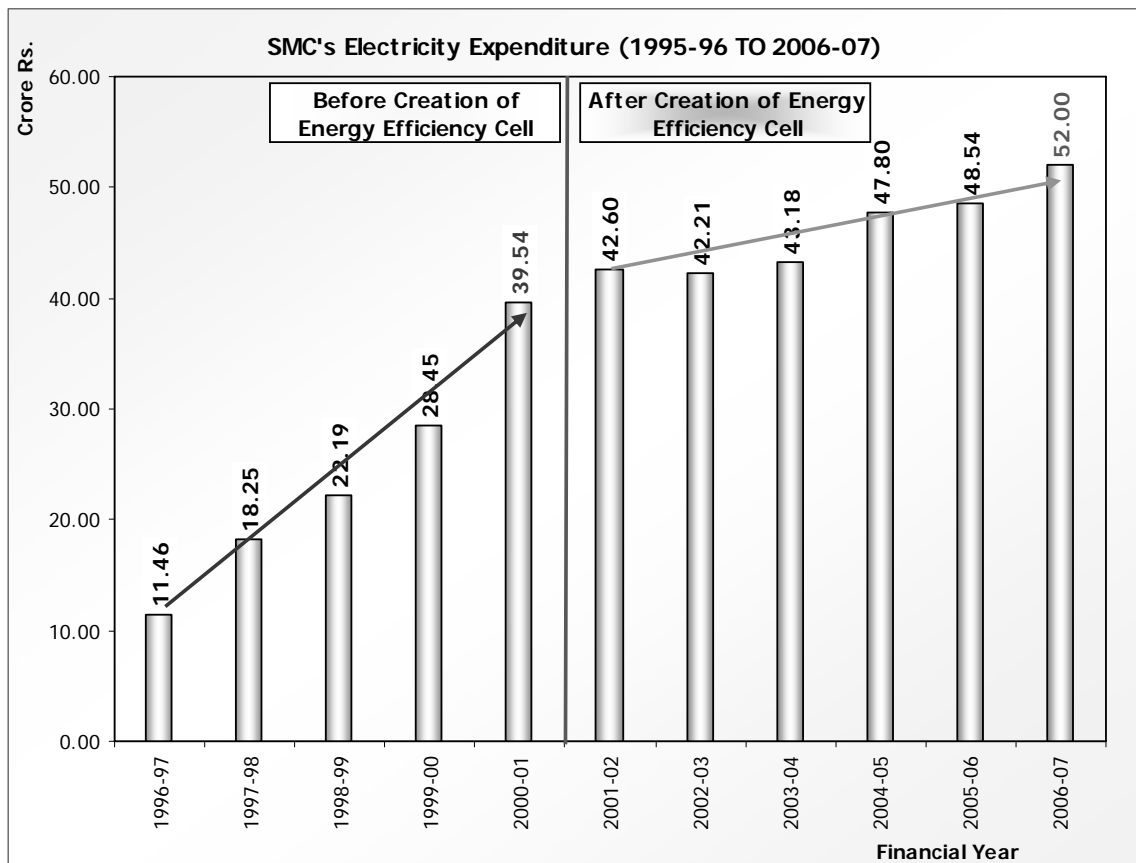


Surat Municipal Corporation

Introduction:

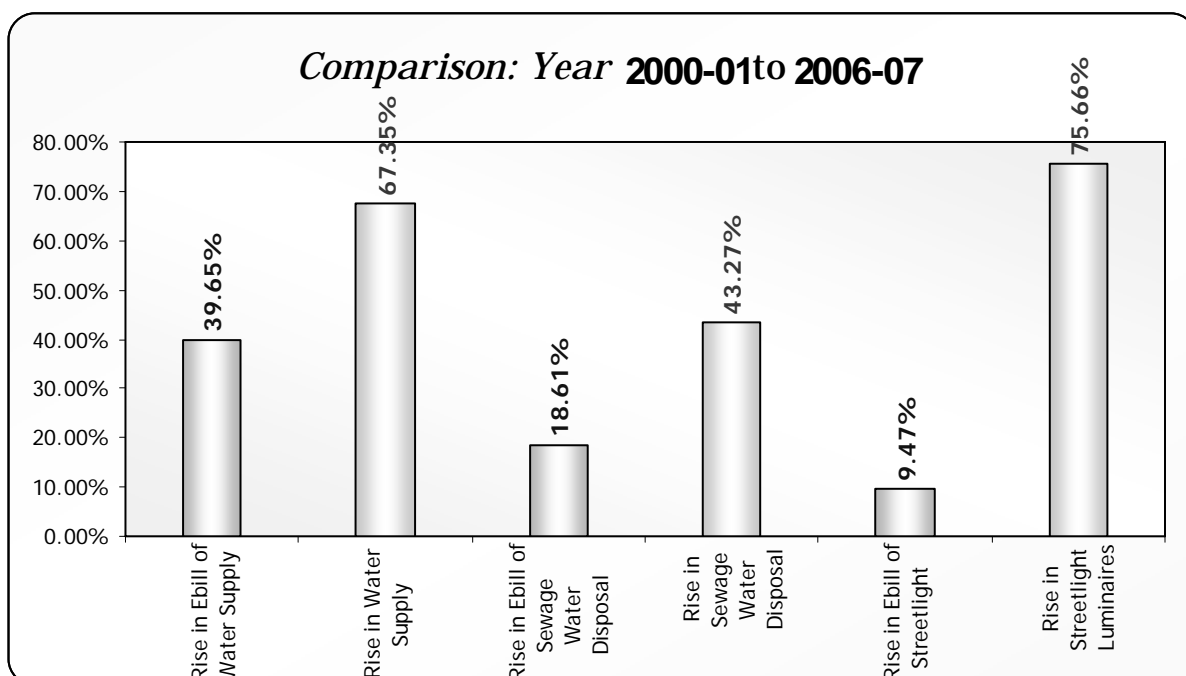
Surat Municipal Corporation one of the oldest corporation in India established in 1852 A.D. At that time Corporation (known as Surat Sudharai) has installed 624 nos. of castor oil based lamp but as it was inefficient, Surat Sudharai has installed 17 nos. of Arc lamp operated by electricity in 1882. Further in 1955 Surat Sudharai has first time installed PHILIPS make 80 nos. of Fluorescent Tube Fitting for improving the efficiency. Thus, since inception, Surat Municipal Corporation has always strived for energy efficiency in its day to day operation.

Presently, Surat Municipal Corporation is probably the only corporation in India, which has dedicated Energy Efficiency Cell having one accredited Energy Auditor (certified by B.E.E.) along with one electrical engineer exclusively working for energy efficiency in Municipal Corporation. Energy Efficiency Cell has been established in Nov-2001 and after its inception, 12.47 million KWH/annum recurring energy saving has been realized and in terms of Rs. 5.40 crores per annum has been saved.



The increase in the electricity bill is compared below in the context of increase in the services.

Sr. No.	Year	Total	Water Supply		Sewage Disposal		Streetlight	
			Electricity Bill Amount (in Lacs Rs.)	Average Water Supplied (MLD)	Electricity Bill Amount (in Lacs Rs.)	Average Sewage Water Disposed (MLD)	Electricity Bill Amount (in Lacs Rs.)	Nos. of Luminaires
1	2000-2001	3953.64	2272.53	354.10	887.23	244.30	507.38	36,419
2	2006-2007	5200.30	3173.70	592.60	1052.36	350.00	555.42	63,973
**	% Rise	31.53%	39.65%	<u>67.35%</u>	18.61%	<u>43.27%</u>	9.47%	<u>75.66%</u>



Surat Municipal Corporation has 4 nos. of water treatment plants, 10 nos. of water distribution station supplying 650 MLD water, 6 nos. of sewage treatments, 27 nos. of sewage pumping stations treating 400 MLD sewage water, 65,596 nos. of various kinds of streetlight luminaires and one Main office, 7 zone offices, 16 city civic centres, 55 ward offices, 31 hospitals & nursing homes, 274 schools, 1 medical college, 2 auditoriums, Indoor stadium etc.

Energy Efficiency Step Taken During Year 2004-05, 2005-06, 2006-07

(I) **Water Transmission Grid**

– A huge potential for energy saving

A. Umarwada WDS UGTs Filling from Sarthana WW

What was previously?

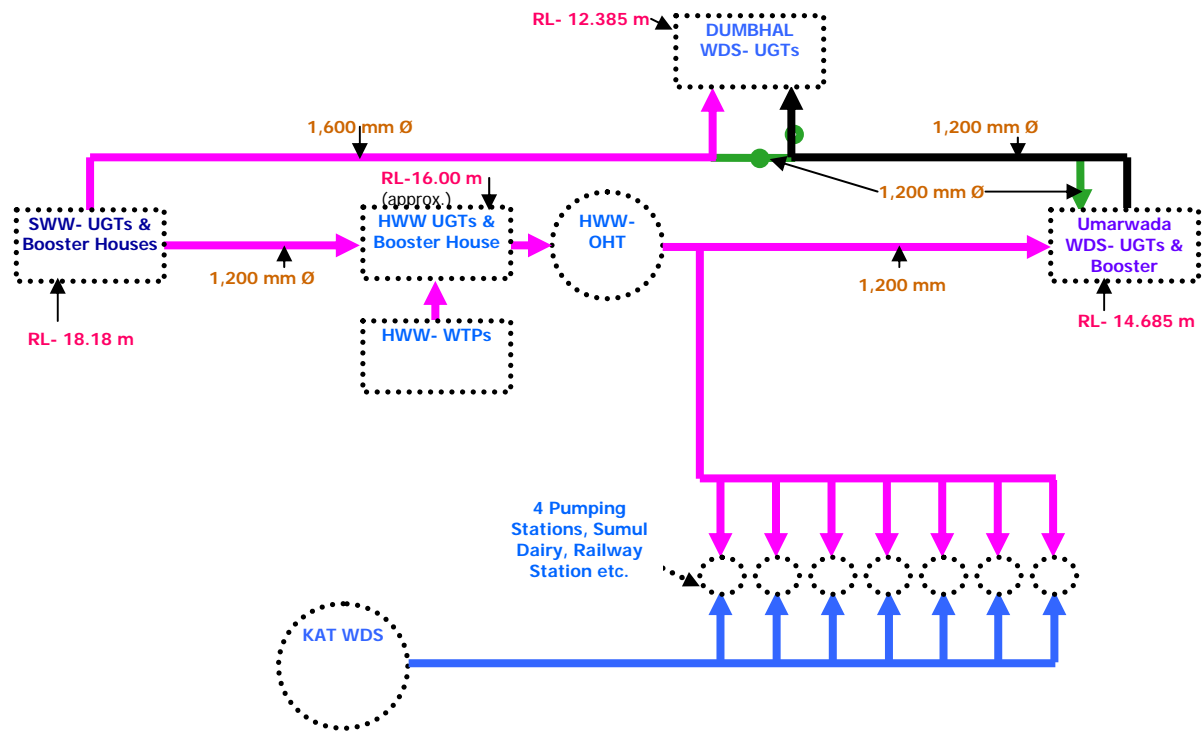
As mentioned earlier, Water supply system consists of 4 water treatment plant, 9 water distribution station (presently 10) & 4 pumping stations. Most of the water distribution stations are interconnected and water transmission grid is made for achieving reliability in availability of the water. Water Supply Grid System is important part of water supply system to ensure continuous water supply to the Surat City.

What has been done?

Details study of interconnections between water distribution station (WDS) & Water Treatment Plant (WTP) has been made in the context of specific energy consumption i.e. KWH/ML required for transmitting the water from each water treatment plant to each water distribution station and accordingly the most economical route for transmitting water has been found.

During study we found that, Umarwada WDS was supplying around **59 MLD** of potable water in various areas of City in 2004. Umarwada WDS was previously receiving water from Head Water Works, which in turn was receiving water from Sarthana Water Works. In past, Dumbhal WDS was receiving water from Umarwada WDS via 1200 mm ϕ pipe line. Presently Dumbhal is receiving water supply from Sarthana Water Works via **1,600 mm ϕ** to feed water directly to Dumbhal WDS. Hence, **1,200 mm ϕ** pipe line between Umarwada WDS to Dumbhal WDS was not in use.

Considering the above facts & figures, connection has been made between the existing 1,200 mm ϕ pipe line and 1,600 mm ϕ pipe line, which is connecting Sarthana Water Works directly to Umarwada Water Distribution Station. Thus duplicate pumping from S.W.W. to H.W.W. & H.W.W. to Umarwada WDS has been stopped.



Note: Lines in **Green** colour indicates the energy efficiency actions.



Advantage:

By changing the transmission route for Umarwada WDS Underground Tank from Varachha Water Works to Sarthana Water Works, specific energy consumption has been reduced to 256.77 from earlier 313.14 KWH/ ML & SMC has saved Rs. 1.68 crore per annum (41.63 Lacs KWH/ annum).

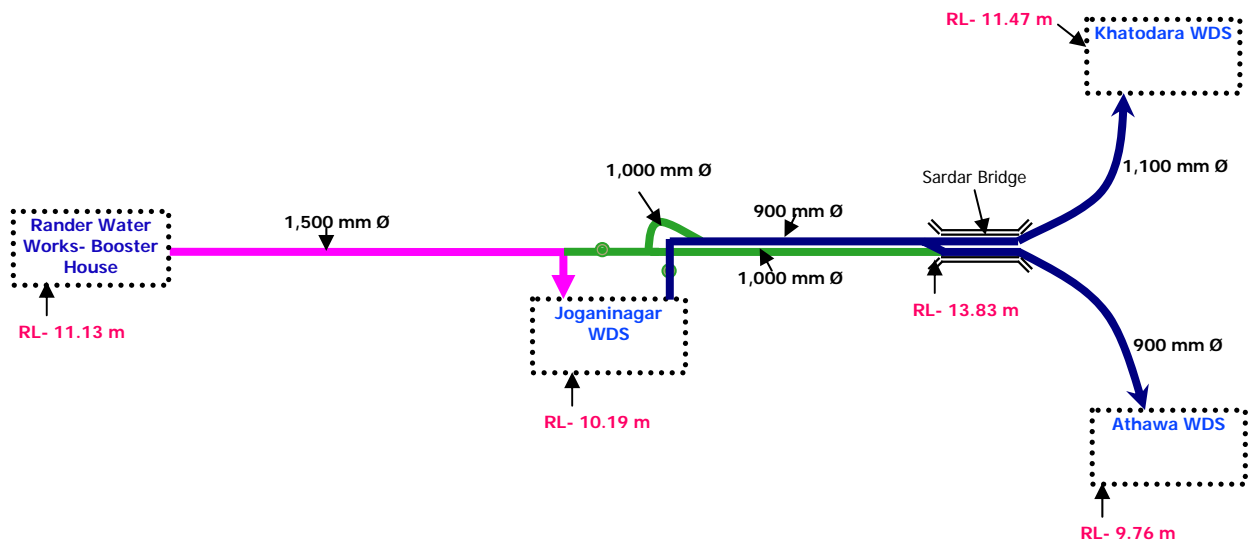
Estimated saving: **121.00 Lacs Rs./ annum**

Saving Realized: **168.00 Lacs Rs./ annum**

41.63 Lacs KWH/ annum

[Implemented in **Year 2004**]

B. Athawa & Khatodara WDS- UGTs Filling from Rander WW



In the similar way, specific energy consumption has been reduced by 43.71 KWH/ ML from earlier 208.71 KWH/ ML to transmit 95 MLD of water to Athawa & Khatodara WDS & saving of Rs. 85 lacs per annum (20.88 Lacs KWH/ annum) has been achieved. [Implemented in Year 2005]

(2) ***Street Light***

- Lighting the lamp by efficient way

Surat Municipal Corporation is also only one corporation in India which has converted all the existing fluorescent tube fittings having conventional magnetic ballast & FL Lamp consuming average 50 watt with energy efficient electronic ballast and triphosphor technology FL lamp having three times more life and consuming total power of 28 watt. After successful implementation, SMC has made a policy such that any new fluorescent luminaires in street light system are installed with electronic ballast and high lumen fluorescent lamp only. At present, there more than 44,000 fluorescent luminaires having electronic ballasts and triphosphor technology fluorescent lamps.

(a) Switching Off streetlight after midnight:

SMC had adopted practice of switching "OFF" 50% streetlights on **major 155 roads** during low traffic period between 12:00 AM to morning, which has resulted in saving of **15.38 Lacs KWH/ annum** and in terms of **50.00 Lacs Rs./ annum**.

[Implemented in Year **2004**]

(b) Use of efficient HPSV lamps:

SMC had started the use of efficient HPSV SON-T lamps in 2005 on Gauravpath and now it has been made as a policy to use these efficient HPSV SON-T lamps for all capital and maintenance works. These lamps have rated life over 28,000 hours and having lumen depreciation (rated) of only 10% after 16,000 operating hours. Comparison of rated lumen output of conventional and efficient HPSV SON-T lamps is as below, which have] 17% efficiency than the conventional HPSV SON-T lamps: -

Sr. No.	Lamp	Conventional	lm/ W	Hi-lumen	lm/ W
1	70 W HPSV	5,600	80.00	6,600	94.29
2	150 W HPSV	14,000	93.33	17,500	116.67
3	250 W HPSV	27,000	108.00	33,000	132.00
4	400 W HPSV	47,500	118.75	56,500	141.25



(3) Traffic Signal

- Green Signal to Energy Efficiency

- ☞ SMC had installed LED based retrofits having 9.2 watt power consumption instead of conventional 100 Watt GLS lamps at **28 traffic junctions** and replaced **1,739** lamps used for signals & blinkers by LED retrofits.
- ☞ The colour selected for the LED Lamps are Red, Amber and Green. The average brightness for Red lamp is 265 cd, for Amber lamp, for Green lamp is 385 cd and for Green is 100 cd.



- ☞ Installation of LED based retrofits has resulted in saving of around **2.76 Lacs KWH/ annum** and in terms of **9.00 Lacs Rs./ annum**.

(4) Power Factor
- micro-adjustment great results

What was previously?

SMC was maintaining average power factor **0.9861** in **2003-04** for **40 HT** services to run its water supply, sewage and other utilities.



What has been done?

SMC has given more emphasis on improvement of average power factor for all HT services by installing **Thyristor based APFC panels having HT sensing** at several locations and quick replacement of faulty & de-rated capacitors wherever required. Average power factor is improved to **0.9894** (average of **Jun-04 to Sep-07**) from **0.9861** for all 43 (latest) HT Services.

Achievement:

Additional PF rebate gained : **12.94 Lacs Rs./ annum.**

(5) External Energy Audit
– Scanning our Operations

Energy Auditing of 34 services having contract demand of more than 75 kW was done through auditor approved by Government of Gujarat. The results are as below:

Total Energy Saving Possibilities (Implemented)	: Rs.	80.42 Lacs per annum
Total Energy Saving Realised	: Rs.	77.09 Lacs per annum
	:	16.40 Lacs KWH/ annum
Total Actual Investment Done	: Rs.	130.17 Lacs

Pump Replacement
– supplying water efficiently ...



During external energy audit, it has been found that several pumps were operating inefficiently due to deviation in operating condition from rated condition

Sr. No.	Implementation of Suggestions	Saving amount envisaged (Rs./ annum)	Investment made (Rs.)	Energy Saving Realized	
				Rs./ annum	KWH/ annum
(i)	4 Nos. of 300 HP Capacity HSCF Pumps at Khatodara WDS	834,100.00	1,466,700.00	801,900.00	178,200
(ii)	12 Nos. of 90 HP Capacity VT Pumps at Katargam Water Works	5,100,000.00	9,600,000.00	5,000,000.00	1,250,000
(iii)	1 No. of 300 HP Capacity HSCF Pumps at Head Water Works	114,737.49	366,650.00	89,776.00	20,404

(E) Representing in GERC (Gujarat Energy Regulatory Commission)

-Representing voice of all local body

☞ Successfully represented in GERC against the Tariff revision (From HTP-I to HTP-II {A}) for 18 HT Services meant for Water Supply & Sewage Disposal System.

Saving in electricity bills: **Rs. 130.00 lacs per annum**

☞ Successfully represented in GERC to Receive Special Consideration in the Demand Charges for the HT Services taken from DGVCL for Water Supply & Sewage Disposal System.

Saving in electricity bills: **Rs. 15.80 lacs per annum**

☞ As per Gujarat Government policy for Wind Power Generation- 2002, the facility of wheeling of the power to consumer end was only given to the Industrial Unit having HT connection. SMC has successfully represented in GERC to provide the wheeling facility to non industrial segment i.e. SMC as SMC is interested to install Wind Power Plant. GERC has first time allowed for wheeling of power generated by Wind power plant to all the non-industrial units wef 21-Jun-2007.

(7) Ongoing/ Future Planning: -
-persistent efforts in energy conservation

(a) Energy Generation from Sewage Liquid Waste:

SMC is first Corporation of India to install 0.5 MWe capacity power plant based on bio-gas based generated from liquid sewage waste at Anjana Sewage Treatment Plant in Oct-2003. Till date, this plant has generated 5.18 million KWH & amounting to Rs. 2.03 Crores.



Bio-Gas based power plant at Anjana Sewage Treatment Plant

Inspiring from the success of aforesaid plant, SMC has started to install three other 1 MWe capacity at Bhatar, Singanpore and Karanj Sewage Treatment Plant. The details of important aspects are as below: -

Total Project Cost: -	1375 Lacs Rs.
Expected Energy generation: -	110 lacs KWH/ annum
	Rs. 432 lacs Rs./ annum

(b) Water Supply System: -

Recently verification energy conservation measures implemented is going on at Sarthana & Head Water Works, which shall save more than Rs. 1.40 crore per annum. The pump sets installed earlier are either inefficient or operating at lesser head than the rated head. These pump sets are replaced by appropriate head as per the changed & latest operating conditions. In these projects, SMC has put two novel conditions in the contract as follows: -

- (i) To determine the duty point by studying all the parameters affecting it.
- (ii) Verification of head, discharge and pump operating efficiency at site.

The brief summary of energy saving is as tabulated below: -

Place	Location	Activity (Replacement of pump sets)	Water to be Collected/ Transmitted/ Supplied (MLD)	Expected Energy Saving {approx.}	
				Lacs Rs./ annum	Lacs KWH/ annum
Sarthana Water Works	French Well 1	4 Nos.	22.50 (Water Collection)	25.30	6.04
	French Well 2	4 Nos.	45.00 (Water Collection)	26.14	6.24
	Old Booster House	9 Nos.	67.00 (Water Transmission)	22.69	5.41
Head Water Works	Jack Well	4 Nos.	50.00 (Raw Water Collection)	69.38	16.55
Total	IIII	21 Nos.	IIII	143.50	34.24

(c) Wind Power Generation: -

As the effective energy rate is higher due to higher contract demand and peak hour usages for water works & water distribution stations, SMC has planned to install 1.5-2.5 MW capacity WTG(s) for Sarthana Water Works, which is the highest energy consuming service of SMC.

Primary feasibility study has been done by SMC. The important aspects are as below: -

- ◇ Investment required: **Rs. 4.65 – 5.4 Crore per MW**
- ◇ Average Net Energy Available for Use: **19 - 21 Lacs KWH/ annum**
- ◇ Average Energy Saving: **Rs. 91 - 101 Lacs/ MW/ annum**
- ◇ Payback period with Interest: **~ 7 Years**

SUSTAINABILITY

– vital issue for maintaining the performance

To sustain the energy efficiency activities successfully,

- ◆ Energy Consumption pattern & Bill data of all HT & LT Services is continuously monitored. 41 HT services are accounting for 81% of electricity bill, which more closely monitored.
- ◆ Further, database of specific energy consumption e.g. KWH/ ML of potable water distributed is prepared and it is also being monitored.
- ◆ Measurement of efficiency of most important machineries like pumps, motors, transformers, air conditioners are periodically checked through in-house/ external energy auditing. Accordingly, improvement of efficiency of machineries/ equipments is planned/ executed.
- ◆ In the context of Energy Conservation Act 2001, although it is not compulsory for SMC, SMC is going to create the post of Energy Manager at the middle level management. SMC is also going to appoint additional junior level staff for improving the work efficiency of EEC.





LESSON LEARNT

Surat Mahanagar Seva Sadan has tried to use electrical energy efficiently for its basic services Water Supply System, Sewage Disposal System and Street Lighting so that services can be delivered at optimum cost. So in the process of conserving energy without affecting service quality, it was learnt that

- (i) You must have precise data of energy consumption of equipments in various operation conditions, operating efficiency of all the equipments/ machineries are in usages, specific energy consumption details of plants/ stations so that quantification of improvement in efficiency can be forecasted.
- (ii) The selection of pumping machineries i.e. pumps & motors, which has most share of energy consumption of corporation must be done considering short term and long term increase in potable water & sewage disposal system up to maximum possible extent.
- (iii) Further, if planned design is altered/ changed during the execution of works arises due to unavoidable circumstances; installation of related machineries should be done accordingly altered/ changed situations.

REPLICABILITY

Looking to the importance of energy efficiency in coming years, such kind of "Energy Efficiency Cell" should be created in every municipal corporation with following facilities/ support: -

-  Top management Support
-  Appointing Exclusive staff having technical knowledge and experience for Energy Efficiency Related Work
-  Inter Department Co-operation
-  Providing basic necessary infrastructure like computer systems, printers, measuring instruments etc.