

**Shri P M Sayeed, Hon'ble Minister of Power's article on the occasion of  
Energy Conservation Day, on 14<sup>th</sup> December 2005.**

**ENERGY CONSERVATION IN INDIA**

**INTRODUCTION**

India has made rapid strides towards economic self-reliance over the last few years. Impressive progress has been made in the fields of industry, agriculture, communication, transport and other sectors necessitating growing consumption of energy for developmental and economic activities. If India is to achieve the targeted growth in GDP, it would need commensurate input of energy, mainly commercial energy in the form of coal, oil, gas and electricity. However, India's fossil fuel reserves are limited. The known reserves of oil and natural gas may last hardly for 18 and 26 years respectively at the current reserves to production ratio. India has huge proven coal reserves (84 billion tonnes), which may last for about 200 years but the increasing ash content in Indian Coal as well as associated greenhouse gas emissions are the major concern.

Energy being an important element of the infrastructure sector has to be ensured its availability on sustainable basis. On the other hand, the demand for energy is growing manifold and the energy sources are becoming scarce and costlier. Among the various strategies to be evolved for meeting energy demand, efficient use of energy and its conservation emerges out to be the least cost option in any given strategies, apart from being environmentally benign.

The steps to create sustainable energy system begin with the wise use of resources, energy efficiency is the mantra that leads to sustainable energy management.

**ENERGY DEMAND AND SUPPLY**

On the energy demand and supply side, India is facing severe shortages. 70% of the total petroleum product demand is being met by imports, imposing a heavy burden on foreign exchange. Country is also facing Peak power and average energy shortages of 12% and 7% respectively.

To provide power for all , additional capacity of 100,000 MW would be needed by 2012, requiring approximately Rs.8000 billion investment. Further, the per capita energy consumption in India is too low as compared to developed countries, which is just 4% of USA and 20% of the world average. The per capita consumption is targeted to grow to about 1000 kWh per year by 2012 , thus imposing extra demand on power system.

## **IMPORTANCE OF ENERGY CONSERVATION**

In a scenario where India tries to accelerate its development process and cope with increasing energy demands, conservation and energy efficiency measures are to play a central role in our energy policy. A national movement for energy conservation can significantly reduce the need for fresh investment in energy supply systems in coming years. It is imperative that all-out efforts are made to realize this potential. Energy conservation is an objective to which all the citizen in the country can contribute. Whether a household or a factory, a small shop or a large commercial building, a farmer or a office worker, every user and producer of energy can and must make this effort for his own benefit, as well as that of the nation.

## **PROGRESS MADE IN ENERGY CONSERVATION IN INDIA**

The progress made by India in energy conservation can be seen in the following three areas:

- A. POLICY AND INSTITUTIONAL
- B. END –USERS
- C. TECHNOLOGY

### **A. POLICY AND INSTITUTIONAL**

Recognizing the fact that efficient use of energy and its conservation is the least-cost option to mitigate the gap between demand and supply,

Government of India has enacted the Energy Conservation Act – 2001 and established Bureau of Energy Efficiency . The mission of BEE is to develop policy and strategies with a thrust on self regulation and market principles, within the overall framework of the EC Act with the primary objective of reducing energy intensity of the Indian economy.

The EC Act provides for institutionalizing and strengthening delivery mechanism for energy efficiency services in the country and provides the much-needed coordination between the various entities.

Important features of Energy Conservation Act include:

a) STANDARDS AND LABELING

- ❖ Evolve minimum energy consumption standards for notified equipment and appliances.
- ❖ Prohibit manufacture, sale and import of equipment and appliances not confirming to standards.
- ❖ Introduce mandatory labeling to enable consumers to make informed choice

This programme will initially focus on energy policy issues of energy efficiency improvement in unorganized sectors such as domestic and agriculture sectors through improvement of designed energy efficiencies of energy consuming appliances and providing this information on comparative basis in the form of energy labels.

b) DESIGNATED CONSUMERS

- ❖ Schedule to EC Act provides list of 15 energy intensive industries and other establishments to be notified as designated consumers (DC). DCs to appoint or designate energy managers.
- ❖ Get energy audits conducted by accredited energy auditors and Implement techno-economic viable recommendations.
- ❖ Comply with norms of specific energy consumption fixed, and
- ❖ Submit report on steps taken

This programme will initially focus on energy policy issues of energy efficiency improvement in organized sectors such as energy intensive industries and commercial sector through establishment of energy management system, capacity building of energy professionals, implementation of energy audits, establishments of specific energy consumption norms and support to consumers on providing information on authentic energy data

c) ENERGY CONSERVATION BUILDING CODES

- ❖ Central Government to prepare guidelines on ECBC
- ❖ To be modified by States to suit local climatic conditions
- ❖ To be applicable to new buildings having connected load of 500 kW or more

## ***Promotional Provisions to support EC Act***

Various promotional provisions in support of the EC Act have, been initiated by the Bureau of Energy Efficiency, which are briefly explained below:

### **1. *Indian Industry Program for Energy Conservation (IIEEC)***

This voluntary program of sharing of best practices, undertaking and specific energy consumption targets has full acceptance in the 8 sectors of industry including aluminium, cement, chlor-alkali, fertilizer, pulp & paper, petrochemicals, refinery and textile sector. Best practices have been recorded and published through CDs and also incorporated in BEE's website which is being updated periodically for use of designated consumers.

### **2. *Voluntary EC Policy Declaration by Indian Industry***

Industries have been approached to declare their top management commitments on energy conservation. 44 industrial units under the National Campaign on Energy Conservation 2005 declared their energy management policies and have committed to reduce their specific energy consumption levels.

### **3. *Small Group Activities on Energy Conservation***

BEE supports designated consumers in improving their energy efficiency through launch of voluntary programs. BEE launched Small Group Activity focused on energy conservation in 4 industrial units in textile and cement sector. Feed back received from the units indicate that about 5 % savings through housekeeping and no cost measures is possible through this concept.

### **4 *National Energy Conservation Awards***

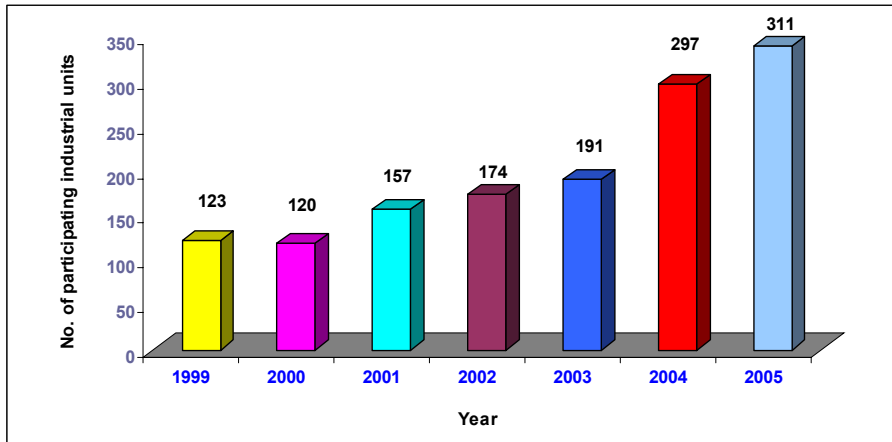
Industrial units have been motivated through National Energy Conservation Award scheme. In EC Award 2005, 311 participating industrial units saved Rs. 9891 millions per year against an investment of Rs. 13161 millions, on account of implementation of various energy conservation projects. Electricity savings achieved by the participating industrial units resulted in saving in avoided capacity equivalent to 250 MW. Response from the first time introduced schemes for Government Buildings and Commercial

Buildings (Private Sector) was also encouraging. In total, 32 buildings establishment participated (16 each in both types of establishments) and collectively saved Rs.36 million.

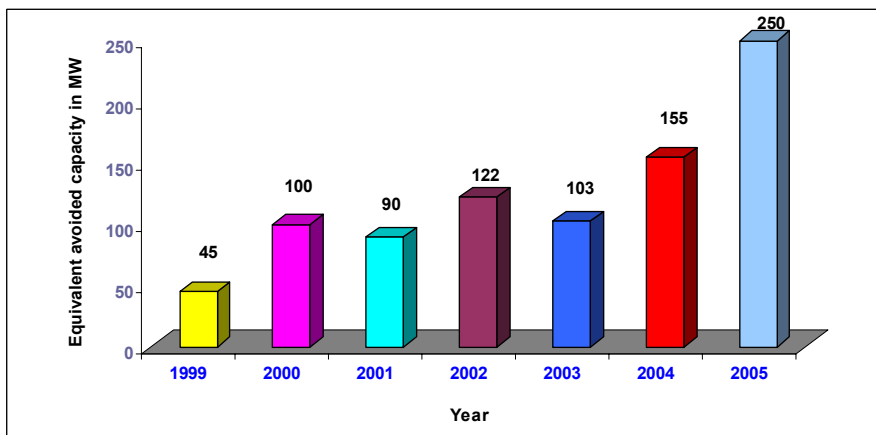
**SUMMARY OF ENERGY SAVINGS ACHIEVED BY INDUSTRIAL  
UNITS PARTICIPATING IN  
MINISTRY OF POWER'S  
ENERGY CONSERVATION AWARD SCHEME  
(1999, 2000, 2001, 2002, 2003, 2004 & 2005)**

| Year                 | No. of participating units | Savings in Rs. Crores | Investment in Rs. Crores | Electrical Energy Saving |                                   | Furnace Oil Savings in Lakhs KL | Coal Savings in Lakh Metric tonnes | Gas savings in Lakh Cubic Metres |
|----------------------|----------------------------|-----------------------|--------------------------|--------------------------|-----------------------------------|---------------------------------|------------------------------------|----------------------------------|
|                      |                            |                       |                          | Million kWh              | Equivalent Avoided Capacity in MW |                                 |                                    |                                  |
| 2005                 | 311                        | 989                   | 1316                     | 1316                     | 250                               | 2.40                            | 7.58                               | 13122                            |
| 2004                 | 297                        | 763                   | 1364                     | 814                      | 155                               | 2.49                            | 5.37                               | 18585                            |
| 2003                 | 191                        | 539                   | 1071                     | 542                      | 103                               | 2.21                            | 12.65                              | 73181                            |
| 2002                 | 174                        | 594                   | 691                      | 641                      | 122                               | 1.7                             | 7.4                                | 35588                            |
| 2001                 | 157                        | 587                   | 659                      | 485                      | 90                                | 2.21                            | 4.79                               | 3929                             |
| 2000                 | 120                        | 366                   | 630                      | 524                      | 100                               | 1.327                           | 0.64                               | 707                              |
| 1999                 | 123                        | 205                   | 940                      | 205                      | 45                                | 1.62                            | 2.15                               | 2444                             |
| <b>Total 7 years</b> |                            | <b>4,043</b>          | <b>6,671</b>             | <b>4,527</b>             | <b>865</b>                        | <b>13.957</b>                   | <b>40.58</b>                       | <b>1475,56</b>                   |

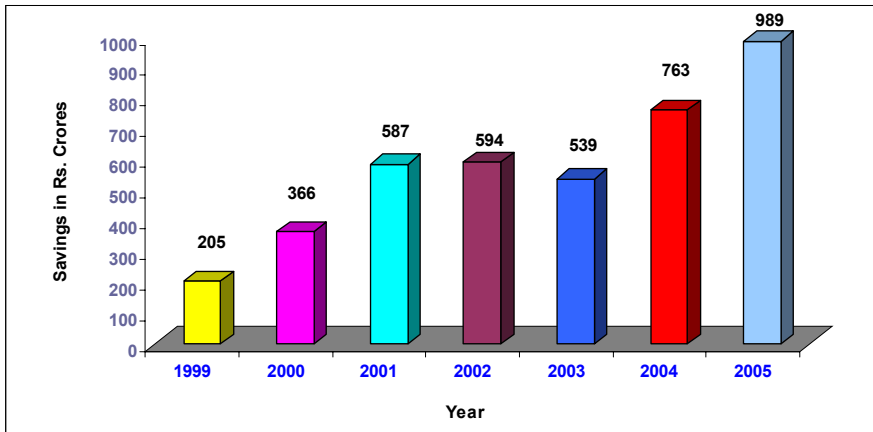
## Encouraging response from Indian Industry in the EC Award Scheme (1999-2005)



## Electrical Energy Savings, equivalent avoided capacity in MW



## Money savings achieved by participating units in EC Award Scheme (1999-2005)



### 5. National Campaign On Energy Conservation 2005

On 14<sup>th</sup> December, 2004, the Hon'ble Prime Minister of India, Dr. Manmohan Singh launched the National Campaign on Energy Conservation, under which various measures, activities are being undertaken during 2005 by Bureau of Energy Efficiency, industries, Schools, State Governments and Designated Agencies, Public Sector units of Ministry of Power, etc. . The Hon'ble Prime Minister as a part of the national campaign also released a postal stamp on energy conservation.





## **Milestones Achieved in National Campaign on Energy Conservation-2005**

- Secured the support of 75 industrial and commercial units in the campaign
- 117 Seminars, Workshops and Training Programmes on Energy Conservation organized (2700 participants)
- Opportunity provided to 8400 students to visit industry and make them aware about the Energy Conservation practices and methods adopted by the Indian Industry;
- 17560 nos. of Schools and 3.43 lakhs students of 4th & 5th standard participated in the School Level Painting Competition on Energy Conservation in 35 States/UTs
- 44 Industrial units and hotels declared their Energy Policies bringing in the top management commitment
- New Award Scheme for Government Buildings and Commercial Buildings launched and executed

### ***Mandatory provisions of the EC Act***

#### ***1.Strengthening energy management and energy auditing capabilities of energy professionals:***

To strengthen the energy management and energy auditing capabilities in the country, First and Second National Certification examination for Energy Managers and Energy Auditors has been successfully conducted in 2004 & 2005 in 23 centers all over the country. To assist candidates, Course books and question bank were also prepared and uploaded on Bureau's web sites [www.bee-india.com](http://www.bee-india.com) & [www.energymanagertraining.com](http://www.energymanagertraining.com) .

**1156 Certified Energy Managers and 820 Certified Energy Auditors are in place.** Certified energy managers will be required to be appointed or designated by designated consumers whereas certified energy auditors will be considered for accreditation

## **2. Accreditation of energy auditors:**

64 energy auditing agencies have been cleared for accreditation on the bases of their energy auditing capabilities and institutional set up. These auditors have carried out over 2000 energy audit studies during 2003-05

### **3. Fixation of norms for different industrial sector**

To start with, Cement and Pulp & Paper sectors have been selected for fixation of specific energy consumption norms.

### **4. Manuals and Codes for standardizing the process of energy auditing**

Draft code on 7 Technologies (Equipment) Lighting Systems; Dryers; Cogeneration Plants; Electric Motors; Electric Transformers; Fluid piping systems (network) ,insulation and Air Conditioners/Chillers (HVAC) are prepared. The energy performance codes would provide a definite method of field testing of utility equipment in the designated consumer premises. The energy performance codes would improve credibility of energy audits & provide industry and energy managers as to what to expect from the energy audit.

### **5. Notification of Designated Agencies**

27 States Governments and union Territories have notified State level Designated Agencies for the prose of implementing EC Act within the state, which are as under:

#### **List of Designated Agency to coordinate, regulate and enforce the provisions of Energy Conservation Act 2001**

- 1. Andaman and Nicobar UT: Electricity Department, UT of Andaman and Nicobar, Port Blair;**
- 2. Andhra Pradesh: Non-Conventional Energy Development Cooperation of Andhra Pradesh Ltd. (NEDCAP);**

3. Arunachal Pradesh: Arunachal Pradesh Energy Development Agency (APEDA);
4. Assam: Electricity Department, Government of Assam, Guwahati;
5. Bihar: Bihar Renewable Energy Development Agency (BREDA), Bihar
6. Chhattisgarh: Chhattisgarh State Renewable Energy Development (CREDA), Raipur;
7. Delhi: Delhi Transco Limited, Delhi
8. Gujarat: Gujarat Energy Development Agency (GEDA), Gujarat
9. Haryana: Department of Non-conventional Energy Sources (DNES), Chandigarh;
10. Himachal Pradesh: Director (Enforcement & Energy Audit), Office of the Chief Engineer (Commercial), H.P. State Electricity Board, Shimla;
11. Jharkhand: Chief Engineer-cum-Chief Electrical Inspector, Energy Department, Government of Jharkhand, Ranchi;
12. Karnataka: Karnataka Renewal Energy Development Limited (KREDL);
13. Kerala: Energy Management Centre, Kerala, Thiruvananthapuram;
14. Lakshadweep UT: Department of Electricity, Union Territory of Lakshadweep, Kavaratti;
15. Madhya Pradesh: M.P. Urja Vikas Nigam Limited (MPUVNL);
16. Maharashtra: Maharashtra Energy Development Agency (MEDA), Pune;
17. Mizoram: Chief Engineer (Power), Power & Electricity Department, Government of Mizoram, Mizoram;
18. Nagaland: Electrical Inspectorate, Department of Power, Government of Nagaland, Kohima.
19. Orissa: Electricity-cum-Principal Chief Electrical Inspectorate, Bhubaneswar
20. Pondicherry: Thiru G. Joseph Adrien Auto, Executive Engineer, Division-II, Electricity Department, Pondicherry;
21. Punjab: Punjab Energy Development Agency, Chandigarh;
22. Rajasthan: Rajasthan Renewable Energy Cooperation, Jaipur;
23. Tamil Nadu: Electrical Inspectorate Department, Chennai
24. Tripura: Department of Power, Tripura, Agartala;
25. Uttaranchal: Electricity Safety Department, Government of Uttaranchal, Haldwani;
26. Uttar Pradesh: Uttar Pradesh Power Corporation Ltd., Uttar Pradesh;
27. West Bengal: West Bengal State Electricity Board, Kolkata;

## 6. *Standards & Labeling*

The preparatory work relating to standard and labeling program of electrical appliances including household refrigerators, window air conditioners, distribution

transformers, fluorescent tube lights and ballasts has been initiated. Scheme for empowering manufacturers to affix energy labels on voluntary basis to be issued by end 2005 for two products ( household refrigerator and FTL).

### **7. Energy Conservation Building Codes ( ECBC )**

ECBC structure and analysis methodology has been prepared. Data collection and stringency analysis has also been completed and the first draft of ECBC for stakeholder review is ready .

#### **POLICY AND INSTITUTIONAL - Results achieved /expected**

- ❖ **64 Accredited Energy Auditing firms in place**
- ❖ **1156 Certified Energy Managers and 820 Certified Energy Auditors in place..**
- ❖ **3rd National Certification Examination for Energy Managers and Energy Auditors announced**
- ❖ **Two interactive Websites in place**
- ❖ **7 energy auditing codes for utility equipment in place**
- ❖ **Voluntary scheme empowering manufacturers to affix energy labels to be issued during December 2005 for two products ( household refrigerators and Fluorescent tube lights).**
- ❖ **ECBC structure draft prepared**
- ❖ **27 States Governments and union Territories have notified State level Designated Agencies for the purpose of implementing EC Act within the state**
- ❖ **Savings of 865 MW of electric power, as equivalent avoided capacity, achieved during 1999-2005 through National Energy Conservation Award Scheme**

## B. END –USERS

### ***1. Energy Efficiency In Indian Industry***

Industry is the major energy consumer utilising about 50% of the total commercial energy use in India. The six key industries – namely aluminium, cement, fertilizers, pulp & paper, petrochemicals and steel - consumes about 65% of the total energy use in India. The energy intensity in some of these industries is reported to be higher than the industries in developed countries. One of the main reasons for higher energy use is the presence of obsolete and energy inefficient processes in some of these sectors. To promote adoption of energy efficient processes, they are identified as designated consumers under Schedule to the Energy Conservation Act. By complying with various provisions of EC Act, as applicable to designated consumers- namely meeting specific energy consumption norms, conduct of regular energy audits and implementation of techno economic viable recommendations and establishment of energy management system through appointment of certified energy manager -is expected to boost adoption of energy efficient processes and technologies.

### ***2. Energy Efficiency in Government Buildings***

Bureau of Energy Efficiency has undertaken Energy audit studies in 8 Government buildings to set up an example for private buildings to pursue similar efforts. The buildings included - Rashtrapati Bhawan, Prime Minister's Office and Defence Ministry blocks in South Block, Rail Bhawan, Sanchar Bhawan, Shram Shakti Bhawan, Transport Bhawan, R&R Hospital, Terminal I, Terminal II and Cargo Sections of Delhi Airport, and AIIMS. Energy savings potential between 23 to 46 % has been identified in the above buildings.

Energy audit study has been Implemented in Rashtrapati Bhawan. Implementation work in Prime Minister Office ,Sharam Shakti Bhawan and Transport

Bhawan is under progress. 16 more Government buildings are being taken up in second phase for energy auditing and its implementation through ESCO mode

**TABLE 7: Energy Audit Result**

| Building particulars            | Annual Energy Consumption (Lakh kWh) | Annual Energy Savings (Lakh kWh) | % Savings (kWh) | Annual Energy Savings (Rs. Lakhs) | Investment (RS. Lakhs) | Payback period (Years) |
|---------------------------------|--------------------------------------|----------------------------------|-----------------|-----------------------------------|------------------------|------------------------|
| PMO                             | 8.3                                  | 2.7                              | 32              | 18.9                              | 50.5                   | 3                      |
| Rashtrapathi Bhawan             | 34.1                                 | 7.8                              | 23              | 49.9                              | 51.2                   | 1                      |
| Sanchar Bhawan                  | 25.6                                 | 11.9                             | 46              | 78                                | 147.1                  | 1.9                    |
| Shram Shakti & Transport Bhawan | 20.4                                 | 8                                | 39              | 42.9                              | 157.5                  | 3.7                    |
| RR Hospital                     | 100                                  | 28.8                             | 28              | 88.3                              | 44.9                   | 0.5                    |
| Air Port                        | 713                                  | 145                              | 20              | 586                               | 810                    | 1.5                    |
| Rail Bhawan                     | 23.5                                 | 6                                | 25              | 40                                | 163                    | 4.2                    |
| AllMS                           | 369                                  | 93.1                             | 28              | 712                               | 1070                   | 1.5                    |

**C. TECHNOLOGY**

The new generation industrial plants installed in India have excellent energy efficiency norms comparable with the best and most energy efficient plants in the World. This shows the deep penetration of advanced energy efficient technologies in many of the Indian industrial plants. For example, in Indian cement plants, the technology penetration is very high and the energy efficiency norms are comparable to the best energy efficient plants in the World. Further, some of the Indian Steel plants are already undergoing a process of modernization and are adopting more energy efficient practices. Technology updating is also positive in the Indian Power and Pulp & paper

sector. There has been commendable progress in energy efficient technologies employed in thermal and electric utilities. Use of fluidised bed boilers and furnaces, variable frequency drives, energy efficient pumps, fans, compressors and cooling towers are widely employed in Indian industries. Energy efficient compact fluorescent lamps and electronic ballasts are penetrating domestic, commercial and industrial sector at a very faster rate. Standard and labelling program of EC Act will further boost manufacturing and adoption of energy efficient technologies.

## **CONCLUSIONS**

The increasing preference for commercial energy has led to a sharp increase in the demand for electricity and fossil fuels. Use of Fossil Fuels has resulted in emission of huge quantity of carbon dioxide causing serious environmental damages. There is still a considerable potential for reducing energy consumption by adopting energy efficiency measures at various sectors of our country. Energy efficiency will not only reduce the need to create new capacity requiring high investment, but also result in substantial environmental benefits. With the enactment of the Energy Conservation Act, 2001, a legal framework is now available for promoting energy efficiency in all sectors of the economy .Efficient use of energy and its conservation will succeed as a programme if opinion leaders and captains of industry take the lead in supporting the conservation programme