

Energy Conservation

The primary energy demand in India has grown from about 450 million tons of oil equivalent (toe) in 2000 to about 825 million toe in 2015. This is expected to increase to somewhere between 1250 (estimated by International Energy Agency) and 1500 (estimated in the Integrated Energy Policy Report) million toe by 2030. This increase is driven by a number of factors, the most important of which are increasing incomes and economic growth which lead to greater demand for energy services such as lighting, cooking, space cooling, mobility, industrial production, office automation etc. This growth is also reflective of the current low level of energy supply in India. There is a large latent demand for energy services that needs to be fulfilled in order for people to have reasonable incomes and a decent quality of life.

Government of India has undertaken a two pronged approach to cater to the energy demand of its citizens while ensuring minimum growth in CO₂ emissions, so that the global emissions do not lead to irreversible damage to the ecosystem. In the generation side, the Government is promoting greater use of renewable in the energy mix mainly through solar and wind and at the same time shifting towards supercritical technologies for coal based power plants. Efforts are also being made to efficiently use energy in the demand side through various innovative policy measures under the overall ambit of Energy Conservation Act 2001 (EC Act). Also, as per India's Intended Nationally Determined Contribution (INDC) it is required to reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level.

EC Act was enacted in 2001 with the goal of reducing energy intensity of Indian economy. Bureau of Energy Efficiency (BEE) was set up as a statutory body on 1st March 2002 at the central level to facilitate the implementation of the EC Act. The Act provides regulatory mandate for: standards & labeling of equipment and appliances; energy conservation building codes for commercial buildings; and energy consumption norms for energy intensive industries.

PROMOTING ENERGY EFFICIENCY IN BUILDINGS

The updated version of Energy Conservation Building Code (ECBC) 2017 was launched on June 19, 2017 by Hon'ble Minister of State (IC) for Coal, Mines, NRE & Power. The scope of ECBC 2017 includes norms and standards for building design, including the envelope, lighting, heating, air-conditioning, and electrical systems. It sets minimum energy standard for new commercial buildings having connected load of 100 kW & above or contract demand of 120kVA & above. The ECBC 2017 will set the minimum efficiency standard for buildings aiming at near zero energy buildings in the future. While the ECBC has been developed by BEE, its enforcement lies with the State Governments with 11 States and 1 UT having already notified ECBC 2017.

Energy efficiency in existing buildings is also a key thrust area of the Government of India, and the voluntary scheme for star rating of commercial buildings was developed with an aim to create a market pool for energy efficient buildings. Currently the scheme is applicable to 4 categories of buildings i.e. Day use Office buildings, Shopping Malls, BPOs and Hospitals.

Achievements:

- The Energy Conservation Building Code has so far been notified in the following eleven States and one Union Territory: Assam, Rajasthan, Odisha, Punjab, Andhra Pradesh, Telangana, Karnataka, Uttarakhand, UT of Puducherry, Haryana and West Bengal, Kerala.
- ECBC Cells have been set up in all the States/UT under the institutional framework for capacity building on ECBC implementation in States/UT.
- Under the ECBC Master training programme a total of 122 ECBC Master Trainers have been certified so far.
- A Memorandum of Understanding (MoU) is signed between Bureau of Energy Efficiency (BEE) and Council of Architecture (COA) on "Training and Capacity Building of Architects".

- Development of Energy Conservation Building Code for Residential Buildings is under process and first edition of the code is expected to be released soon.
- A total of 188 commercial buildings have been star rated under different categories of buildings as on date.
- For monitoring of energy consumption pattern of all new and existing buildings, EMIS (Energy Management Information System) is being developed.

STANDARDS AND LABELING SCHEME

Standards and Labelling (S&L) scheme is a flagship initiative of Ministry of Power that was launched with the key objective of providing consumers an informed choice regarding the energy savings and thereby the cost-saving potential of various energy consuming appliances. S&L scheme covers the star labelling program for 21 appliances, out of which 10 appliances are under mandatory regime and remaining 11 appliances are under voluntary regime.

Achievements:

- Transition of following four appliances from voluntary regime to mandatory regime
 - Cassette Air Conditioner
 - Direct Cool Refrigerator
 - Colour Television
 - Storage type Electric Water Heater
- Revision of energy consumption standards for Direct Cool Refrigerators, Room Air conditioners, Distribution Transformers, Storage type electric water heaters, Color Television, Frost Free Refrigerators with a view to up bring more energy efficient appliances in the market.
- The star labelling program for Inverter Air Conditioners and LED Lamps has been made mandatory w.e.f. 1st January, 2018. The energy consumption standards for Inverter Air Conditioners have been notified in the Gazette of India vide S.O. 2528

(E) dated 8th August, 2017. The energy consumption standards for LED lamps have been notified in the Gazette of India vide S.O. 4097(E) dated 27th December, 2017.

- Amendment Notification of Color Television regarding the up gradation of star rating plan has been notified in the Gazette of India vide S.O. 4066 (E) dated 26th December, 2017.
- Release of advertisements regarding the change in star label for LED lamps, new Air conditioners, Frost Free refrigerators, BEE star labelled LPG stoves, Bijli Bachao, Desh Banao advertisements.
- Organization of retailer training programme called “National Retailer Training Programme on Standards and Labelling (NRTP)”, under which in total 18 workshops have been conducted over a period of time in various cities. Approximately 2200 retailers were educated regarding the various facets of standards and labelling scheme.

CAPACITY BUILDING OF DISCOMS

A programme for capacity building of DISCOMs has been launched with an objective to carry out load management programme, Development of DSM action plan and implementation of DSM activities in their respective areas.

Achievements:

- BEE has selected 34 DISCOMs for participating as beneficiary DISCOMs under this programme.
- Manpower support was provided to each DISCOM to facilitate DSM related activities and providing support to DISCOMs.
- The load research studies for 34 DISCOMs are completed and DSM action plan for these DISCOMs have been finalized.
- Under this programme, 504 officials from 34 DISCOMs have been trained as Master Trainers on DSM and energy efficiency under Training of Trainers activity and training of about 5000 circle level officials of 34 DISCOMs are under progress.

AGRICULTURE DEMAND SIDE MANAGEMENT

Agriculture sector is one of the most important sector of Indian economy. Agriculture plays a significant role in the overall socio-economic development of India. This sector accounts for approximately 80% of India's total water consumption. Pumps being the most vital element of the irrigation process and presently there are about 20 million pump sets presently energized in India.

Upgrading of existing pumping systems presents an immediate need and an unprecedented opportunity. The sector is dominated by highly in-efficient pump sets having average efficiency range of 25%-30% while efficiency level of star rated energy efficient pump sets (EEPS) is 40%-45%. Therefore, there is a need to tap the huge energy savings potential promised in agriculture pumping sector.

Achievements:

- States of Haryana, Punjab, Karnataka, Kerala issued state wide notification for using EEPS. Chhattisgarh & Rajasthan are providing free power/incentive to consumers using EEPS.
- Pilot project for deployment of 2500 BEE star labelled irrigation pumps in the distribution circle has been implemented by a DISCOM in Andhra Pradesh. Similarly, a DISCOM in Karnataka, namely, Chamundeshwari Electricity Supply Corporation Ltd. has replaced 1337 no. of old inefficient agriculture pumps sets with BEE star labelled ones.
- BEE provided support to carry out M&V of the pilot Ag DSM project which was implemented at Solapur, Maharashtra. Currently, a total number of 2209 inefficient pumpsets were replaced with star rated pumpsets under the pilot project being implemented in Solapur. First, second, third and fourth year sampled M&V reports for pumpsets replaced were submitted and fifth testing of pumpsets has been carried out at project site in Solapur.
- One day training program for farmers on 'Energy & Water Conservation' was conducted in KVK - Baramati, KVK - Jalna and KVK - Beed, Pune.

- Mizoram has carried out the feasibility for demo project for implementation in Rural Drinking Water Pumping Systems.

MUNICIPAL DEMAND SIDE MANAGEMENT

The energy consumption of the municipalities is characterized by frequent changes and rising peaks in power load curves in the morning hours due to water pumping and evening hours for street lighting. The inefficient use of electricity due to limited diffusion of energy efficient technologies and demand side management (DSM) initiatives, have considerably increased the energy spent by the municipalities. The need for affordable electricity and the energy and peak shortages make the Municipal Demand Side Management (MuDSM) programme important for India, as it can improve the overall energy efficiency of the ULBs which could lead to substantial savings in the electricity consumption, thereby resulting in cost reduction/savings for the ULBs.

Achievements:

Steering committees were constituted in six states viz. Bihar, Chhattisgarh, Haryana, Madhya Pradesh, Maharashtra and Uttar Pradesh to identify ULBs for pilot project implementation and to ensure effective implementation of the energy efficiency pilot projects. The pilot projects include LED streetlighting at Ghaziabad (Uttar Pradesh), Ujjain (Madhya Pradesh), Faridabad, Yamuna Nagar (Haryana) and Durg (Chhattisgarh); installation of energy efficient appliances and equipment in office building of Nagpur municipality in Maharashtra; and improvement of energy efficiency in water supply pumping system of Patna municipality in Bihar.

- Existing 1000 no. of 250 W street lights have been replaced by 110 W (in some cases, 90 W) LED street lights in Ujjain. Further, the Ujjain Nigam has independently replaced 10,000 lights of 250 W with 110 W (in some cases 90 W) LEDs.

- Existing 600 no. of 150 W and 250 W street lights have been replaced by 60 W and 90 W LED streetlights respectively in Durg. In addition, investments have been made in cable and earthing work to ensure proper power quality.
- Pilot project involving installation of energy efficient appliances and equipment in office building of Nagpur municipality in Maharashtra has been implemented.
- Implementation of pilot project in Ghaziabad is underway.

SMALL AND MEDIUM ENTERPRISES (SMES)

A large number of Micro, Small and Medium Enterprises (MSMEs) spread across India offer immense opportunity for transition towards energy conservation by adopting energy efficient technologies. These are mostly located as clusters with the cluster size varying between 50 to a few thousand. According to a recent release by M/o MSME, there are around 36 million MSME units operating in India, contributing significantly to India's GDP numbers and providing jobs to approximately 80 million people. A good number of these MSMEs are energy intensive, where energy cost forms a major part of the production cost

In view of above, an ambitious program on energy efficiency and technology upgradation in five SME clusters in India was undertaken. The program titled "National Program on Energy Efficiency and Technology Upgradation in SMEs" is being implemented in Ludhiana (Forging), Punjab; Pali (Textile), Rajasthan; Kochi (See Food), Kerala; Indore (Food), Madhya Pradesh and Varanasi (Brick), Uttar Pradesh.

Achievements:

- Baseline Energy Audit (BEA) in selected units of Ludhiana, Varanasi, Indore, Kochi and Pali have been completed and best energy efficiency technologies have been identified for implementation.
- Increased awareness among the unit owners on the new EE technologies.
- 62 units out of 100 SME units agreed to implement the EE measures.

- **70 local service providers** identified for offering services and supplies of various energy efficient technologies.
- Post implementation audit completed in 21 units of Ludhiana - Forging Cluster; Indore - Food Cluster; Pali - Textile Cluster; and Brick Manufacturing cluster in Varanasi.
- 5 post audit awareness workshops conducted in different forging clusters of Punjab i.e in Moga, Phagwara, Jalandhar and Ludhiana.
- 5 post audit workshops conducted in Pali Textile Cluster.
- 9 Energy Management Centres have been established and made operational at MSME Clusters.

STRENGTHENING INSTITUTIONAL CAPACITY OF STATE DESIGNATED AGENCIES

The State Designated Agencies (SDAs) have been set up in 35 states by designating one of the existing organizations under State Government, as required under section 15(d) of the Energy Conservation Act 2001.

Achievements:

The SDAs have carried out capacity building activities like workshops and training programmes involving the Energy Managers, Energy Auditors and Designated Consumers appraising about their roles as per the mandate of the EC Act 2001. Media and awareness campaign has been undertaken by the SDAs in their respective states. The major focus areas include promotion through electronic and print media, awareness campaign in schools and colleges through brochures and banners etc. Most of the SDAs celebrate Energy Conservation Day with due recognition given to those who have taken lead in promoting the cause of energy efficiency in the state. In addition to this, some of the major successful accomplishments of the scheme are as follows:

- 20 demonstration projects in the areas of street lighting and water pumping systems have been successfully completed by SDAs.

- The LED Village Campaign has been successfully implemented by 16 states.
- Successful completion of Monitoring & Verification of energy reduction targets assigned to Designated Consumers during PAT Cycle-I and Energy Saving Certificates have been issued to the over achievers.
- All the SDAs have established dedicated website highlighting energy efficiency measures undertaken in the state. The websites are linked with Bureau of Energy Efficiency and other SDAs to ease information exchange.

CONTRIBUTION TO STATE ENERGY CONSERVATION FUND (SECF)

Section 16(1) of the Energy Conservation Act 2001 requires State Governments to constitute a fund called SECF for the purpose of promotion of efficient use of energy and its conservation within the state. In this context, a scheme called “Contribution to State Energy Conservation Fund (SECF)” was approved.

The scheme contributes with a maximum ceiling of Rs. 4 Crores to all the States with Rs. 2 Crores each in two installments. The second installment of contribution to SECF is released only after the States have provided a matching contribution to the BEE’s first installment. An exemption for the North Eastern States is that the matching contribution by State Government for North Eastern States is relaxed to Rs. 25 Lakhs instead of Rs 2Crores.

Achievements:

Fund to the tune of Rs. 2 Crores each has been disbursed to 27 States for constitution of SECF, out of which matching contribution has been provided by 25 State Governments.

NATIONAL ENERGY CONSERVATION AWARD AND PAINTING COMPETITION

The National Energy Conservation Awards are presented to industry and other establishments every year by the Ministry of Power with the objective of promoting energy

conservation among all sectors of economy. These awards are acknowledgment of commitments and efforts towards energy conservation and efficiency by the industries and establishments. The scheme has motivated industries and other establishment to adopt energy efficiency measures.

Achievements:

- Hon'ble President was the Chief Guest and awards were presented to the awardees by the Hon'ble President and Hon'ble Minister of State (IC) for Power & NRE.
- In the previous year's applications for participating in the National Energy Conservation award were invited from 59 sectors but from 2017 onwards, applications are invited for NECA on rolling cycle of three years, which implies that few sectors are allowed to participate every year and every sectors will get a chance to apply for the NECA within a block of three years.
- A new Award "Appliance of the Year" for promoting Energy Efficiency through Equipment/Appliances was introduced.
- The participating units of NECA 2017 have collectively invested Rs. 1495 Crores in energy conservation measures, and achieved a monetary savings of Rs. 1895 Crores during FY 2016-17, implying a simple payback period of 9.5 Months.
- The participating units have also saved electrical energy of 2762 Million kWh which is equivalent avoided generation capacity of 527 MW of thermal power station.



Awardees with Hon'ble President of India



An Awardee receiving award from Hon'ble President of India

Painting Competition on Energy Conservation for School Children

Today's children are the citizens and nation-builders of tomorrow. The habit of conservation is best introduced and inculcated at the school age. It has been seen that Children are the best agents of change and for energy saving, we need to equip them with the information and knowledge on energy conservation and create interest among them on this important subject.

The painting competition is held in three stages, namely, School, State and National Level under two categories. Students of 4th, 5th & 6th standard are under **Category 'A'** and 7th, 8th & 9th standard students are under **Category 'B'**.

Achievements:

In 2017, a record number of 1.226 crores students participated in the School level Painting Competition as against 1.14 crore students in 2016. This competition is organized all over the country in association with 11 CPSUs under Ministry of Power. The paintings drawn by children reflect their interest in the energy conservation activities and their concern about energy crises and climate change, and have effectively conveyed inspiring ideas through their impressive paintings. The number of participation from school children in Painting Competition since 2005 is indicted in the graph below:





Winners of the National Painting Competition with Hon'ble President



A child explaining about his painting to the Hon'ble President

NATIONAL MISSION FOR ENHANCED ENERGY EFFICIENCY (NMEEE)

The National Mission for Enhanced Energy Efficiency (NMEEE) is one of the eight missions under the National Action Plan on Climate Change (NAPCC). NMEEE aims to strengthen the market for energy efficiency by creating conducive regulatory and policy regime and has envisaged fostering innovative and sustainable business models to the energy efficiency sector.

The NMEEE spelt out four initiatives to enhance energy efficiency in energy intensive industries which are as follows:

- (i) **Perform Achieve and Trade Scheme (PAT)**, a regulatory instrument to reduce specific energy consumption in energy intensive industries, with an associated market based mechanism to enhance the cost effectiveness through certification of excess energy saving which can be traded.

(ii) **Market Transformation for Energy Efficiency (MTEE)**, for accelerating the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable.

(iii) **Energy Efficiency Financing Platform (EEFP)**, for creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings.

(iv) **Framework for Energy Efficient Economic Development (FEEED)**, for development of fiscal instruments to promote energy efficiency.

The Mission seeks to upscale the efforts to unlock the market for energy efficiency which is estimated to be around Rs. 74,000 crore and help achieve total avoided capacity addition of 19,598 MW, fuel savings of around 23 million tonnes per year and green- house gas emissions reductions of 98.55 million tonnes per year at its full implementation stage.

Achievements:

(i) Perform Achieve and Trade Scheme (PAT):

- Perform, Achieve and Trade (PAT) has become the new mantra for our energy intensive industries. Quantified energy savings beyond target by Designated Consumers (DCs) is converted to Energy saving Certificates (ESCerts). One ESCert is equal to one tonne of oil equivalent. The National Load Despatch Centre (POSOCO) is the National registry and Trading through Indian Power Exchanges is administered by BEE.
- In the first cycle of PAT (2012-13 to 2014-15), 478 industrial units in 8 sectors (Aluminum, Cement, Chlor- Alkali, Fertilizer, Iron & Steel, Paper& Pulp, Thermal Power, Textile) were mandated to reduce their specific energy consumption (SEC) i.e. energy used per unit of production. The achievement in respect to 427 DCs

comes out to be 8.67 Mtoe against a given target of 6.686 Mtoe for 478 DCs of PAT Cycle I.

- PAT Cycle II has commenced from 1st April, 2016 under which 621 DCs (448 existing and 84 new DCs) from the 8 existing and 3 new sectors (Railways, Electricity DISCOMs and Refineries) have been notified with overall reduction targets of 8.869 mtoe.
- The PAT cycle-III has commenced from April, 2017 with projected savings of 1.06 mtoe. The scheme now has 737 designated consumers up by 116 from the PAT cycle-III which commenced in April, 2016.
- Energy Saving Certificates (ESCerts): Trading in ESCerts has started from 26.09.17. Total 38.25 lakhs ESCerts have been issued to 306 DCs. 110 DCs have been entitled to purchase ESCerts (14.25 lakhs). Trading is done on every Tuesday and till 31st December, 2017 (14 trading sessions) about 10 lakh ESCerts have been traded at an overall cost of around INR 87 crores.

(ii) Market Transformation for Energy Efficiency (MTEE)

This initiative under the National Mission for Enhanced Energy Efficiency (NMEEE) aims to accelerate the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable.

- **Super-Efficient Equipment Program (SEEP)** is a program designed to bring market transformation for super-efficient appliances by providing financial stimulus innovatively at critical point/s of intervention. Under this program, ceiling fan has been identified as the first appliance to be adopted. The goal is to support the introduction and deployment of super-efficient 35W ceiling fans, as against the current average ceiling fan sold in Indian market with about 70W rating.

(iii) Framework for Energy Efficient Economic Development (FEEED)

Framework for Energy Efficient Economic Development (FEEED), seeks to develop fiscal instruments to promote energy efficiency including innovative fiscal instruments and policy measures like the Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) and Venture Capital Fund for Energy Efficiency (VCFEE).

➤ **Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)**

PRGFEE is a risk sharing mechanism to provide financial institutions (banks and NBFCs) a partial coverage of risk involved in extending loans for energy efficiency projects. The guarantee will not exceed Rs. 10 crore per project or 50% of loan amount, whichever is less. Government of India has approved funds of Rs. 312 crore for PRGFEE. Sectors to be covered under PRGFEE are Government buildings, Private buildings having commercial or multi-storey residential accommodations, Municipalities, SMEs and Industry.

Achievements:

- BEE has appointed a consortium of RECPDCL-REC-EESL as Implementing Agency (IA) for operationalization of PRGFEE.
- Andhra Bank, YES Bank, IDFC Bank and Tata Cleantech Capital Ltd. have been empanelled as Participating Financial Institutions.
- BEE and Implementing Agency are in the process of creating pipeline of few projects to be covered under this guarantee mechanism.
- PRGFEE Rules have been notified.
- Operations Manual for the PRGFEE has already been approved.

➤ **Venture Capital Fund for Energy Efficiency (VCFEE)**

Venture Capital Fund for Energy Efficiency (VCFEE) is a fund to provide equity capital for energy efficiency projects. Any single investment by the fund shall not exceed Rs. 2 crore. The Fund will provide last mile equity support to specific energy efficiency projects, limited to a maximum of 15% of total equity required, through Special Purpose Vehicles or Rs. 2 crore, whichever is less. Sectors covered under VCFEE are government buildings, Private buildings and Municipalities. The support

under VCFEE has been provided to only government buildings, private buildings (commercial or multi-storey residential buildings) and municipalities.

Achievements:

- The Trust of VCFEE has been constituted under provisions of Indian Trust Act 1882, the trust deed was registered with jurisdictional sub-registrar Government of Delhi.
- Board of Trustees for VCFEE has been constituted.
- Fund Manager for operationalization of VCFEE has been identified.
- VCFEE Rules have been notified.

(iv) Energy Efficiency Financing Platform (EEFP)

EEFP is one of the important initiatives under NMEEE with the objective to provide a platform to interact with financial institutions and project developers for implementation of Energy Efficiency projects. Under this programme, MoUs have been signed with financial institutions to work together for development of energy efficiency market and for identification of issues related to this market development. MoUs are already being signed by BEE with M/s. PTC India Ltd, M/s. SIDBI, Tata Capital and IFCI Ltd. to promote financing for Energy Efficiency projects.

For capacity building of FIs, BEE has signed MoU with Indian Banks' Association for training programme on Energy Efficiency financing for Scheduled Commercial Banks. With an objective "to build greater knowledge and confidence through training programme within the financial sector on EE financing", in Phase 1 BEE has successfully completed 4 training of trainers (ToT) workshops. Presently, BEE has launched the Phase 2 of these training workshops to create awareness amongst the loan officers / risk managers / credit managers towards technical/financial appraisal of EE projects. More than 200 banking/NBFC officials have been trained on EE financing in these programmes.

Following are the publications:

- Training Manual for Energy Efficiency Financing in India
- Success stories for Energy Efficiency Projects Financed in India
- Market Assessment for Partial Risk Guarantee Fund for Energy Efficiency and Venture Capital Fund for Energy Efficiency.
- Guidelines for Financing Energy Efficiency Projects in India