



# Impact of Energy Conservation Act in the State of Kerala

## Final Report



**WINROCK**  
INTERNATIONAL  
INDIA

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## Abbreviations

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EC Act	Energy Conservation Act -2001
BEE	Bureau of Energy Efficiency
EMC	Energy Management Center
DC	Designated Consumers
SDA	State Designated Agencies
KSEB	Kerala State Electricity Board
KSPC	Kerala State Productivity Council
ANERT	Agency for Non-Conventional Energy and Rural Technology
BSNL	Bharat Sanchar Nigam Limited
KSCST	Kerala State Council for Science & Technology
KTDC	Kerala Tourism Development Corporation
WII	Winrock International India
NGO	Non-Governmental Organisation
VFD	Variable Frequency Drive
EC	Energy Conservation
ESCO	Energy Service Company
SME	Small & Medium Enterprises
KoDC	Kochi Development Corporation
IT	Information Technology
USGBC	United States Green Building Council
BPCL	Bharat Petro Chemicals Limited
CFL	Compact Fluorescent Lamps
GHG	Global Greenhouse Gases
KPIs	Key Performance Indices
BLY	Bachat Lamp Yojana
IGEA	Investment Grade Energy Audits
ECBC	Energy Conservation Building Code
S&L	Standards & Labeling

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## Executive Summary

### BACKGROUND

The Energy Conservation Act 2001 came into force in March 2002 with the setting up of the Bureau of Energy Efficiency. The mission of the Bureau of Energy Efficiency is to provide assistance in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act, 2001 with the primary objective of reducing energy intensity of the Indian economy.

BEE co-ordinates with Designated Consumers, State Designated Agencies and other organization; recognizes, identifies and utilizes the existing resources and infrastructure, in performing the functions assigned to it under the EC Act, 2001.

### THE PRESENT STUDY

The present study endeavours to understand the impact of energy conservation act 2001 in the state of Kerala. As a part of the impact evaluation exercise, there arises a need to gather information on and to establish the impact of broader objectives of the Act in terms of outreach and understanding of various the provisions of the Act, and implementation of the Act by different categories of stakeholders like Designated Consumers, households, commercial buildings etc.

With an overall objective of assessing the impact of EC Act in the State of Kerala, the Energy Management Center (EMC), Kerala, through the services of Winrock International India (WII) undertook a survey with the specific objectives of to analyze, evaluate and draw conclusions on the following:

- Policies and directives in vogue under the Energy Conservation Act 2001 in Kerala, and their effectiveness on the energy conservation practices.
- Notable energy efficiency measures implemented in the last three years in the State of Kerala
- 2 to 3 numbers of achievements & success stories
- Any deficiencies / shortfalls observed in respect to policies
- Suggestions for moving forward

### **Objective**

The objective of the present study is to assess the awareness level of citizens from various classes of population, occupations and livelihood sources, geographical locations of Kerala including a gender based approach; and also assess the impact of the Act on various sectors such as the industry, the commercial establishments, the domestic sector and so on in order to undertake measures for energy conservation. To achieve the specific objective of information generation from amongst the general population and local households, WII designed a questionnaire to collect the relevant information to reflect the level of understanding of the Energy Conservation Act, 2001 and its impact on energy conservation practices of the above mentioned sectors.

### Methodology

A survey team was constituted and adequate training was given for conducting interviews for each target group and also for collecting the relevant information. The key characteristics of the survey are as follows:

- A total of 30 no's of persons were interviewed in three major geographical regions of Kerala
- An attempt was made to include both the genders (male/female) in different age groups on a proportionate basis.
- It was ensured to cover different types of residential areas encompassing rural, semi urban and urban set ups to establish variation in the awareness level in different locations.
- The awareness level also depends on occupation levels of the respondents such as professional association, business, educational qualification, etc. Hence the survey has been conducted covering the following occupation groups:
  - ↳ Professionals (Engineers/Doctors/Lawyers/Professors, etc.)
  - ↳ Traders & business community
  - ↳ Students
  - ↳ Others (including housewives, farmers, workers, etc.)

The information collected as above was verified, compiled, and analyzed to draw meaningful conclusions. The summary of data collected, analysis, findings, and conclusions are discussed in detail in the main report.

### SURVEY – GEOGRAPHICAL GENDER AND OCCUPATIONAL BASED RESULTS

Out of total 30 candidates interviewed in three major regions of Kerala, 19 (63%) are male and 11 (37%) are females.

Out of 19 male candidates, 32% are from Northern region, 42% are from Central, and 26% are from Southern region. 42 % people from Central region are aware of EC Act-2001 followed by Northern (33%) and Southern (25%).

Out of 11 female candidates, 36% are from Northern, 18% are from Central, and 46% are from Southern region. Out of 11 females interviewed 67% of the female in Southern region is aware of EC Act-2001 followed by 33% in Northern region. During interview, not even one single woman from Central region responded positive regarding awareness on EC Act-2001.

A total of 4 housewives were interviewed in all regions and they were found not aware of the EC Act-2001.

Out of the 15 respondents who confirmed their familiarity with the EC Act-2001, 9 respondents were from urban areas while the rest 6 were from rural areas. The total awareness level constitutes 60% from urban area and 40% people in semi urban and rural areas.

- About 47% of the persons interviewed are employees, 20% are students and teachers, 13% are business men, and 20% are others comprising housewives, unemployed, workers, and miscellaneous
- Out of a total of 15 persons interviewed, who are familiar with the Act, 54% are employees, 27% are students and teachers, 13% are businessmen, and 6% are other.
- It can also be observed that 67% of students and teachers, 57% of employees, 50% of businessmen, and 16% of others are aware of the EC Act-2001
- A total of 15 people from the industry, commercial, and NGO sector were interviewed during the field survey. nearly 53% of the people interviewed are from industrial sector, 27% are from the commercial sector, and the remaining 20% from NGO sector.
- All the respondents from the industrial and NGO sector confirmed their awareness of the EC Act-2001, whereas only one respondent from the commercial sector said he is not aware of this policy aimed at energy conservation.
- Majority of the respondents from industrial and commercial sectors (over 90%) felt that there is significant scope for conservation of energy in their units and they are making efforts to conserve energy by adopting energy efficient technologies and practices.
- More than 80% respondents are aware of specific energy consumption of their industrial products.
- More than 70% of the respondents said they are keen to get energy audit done for their units and welcomed suggestions for conservation of energy.

## DESIGNATED CONSUMERS

As per information gathered from EMC, there are a total of 11 Designated Consumers listed in Kerala. The following Table presents the listed Designated Consumers across different sectors.

*Tentative List of Designated Consumers*

Industrial Sector	Designated Consumer in Kerala
Cement	Malabar Cement Ltd
Chlor-Alkali	Travancore Cochin Chemicals Ltd.
Paper & Pulp	Hindustan News Print Ltd.
Power Plant	BSES Kerala Power Ltd, Kochi
	Kozhikode Diesel Powr Project
	Rajiv Gandhi Combined Cycle Power Project (RGCCPP)
Fertilizer	The Fertilizers and Chemicals Travancore

Industrial Sector	Designated Consumer in Kerala
	Limited (FACT)
Textiles	GTN Textiles Ltd
	Patspin India Ltd.
	Sri Asoka Textiles Ltd.
	The Western Indian Cottons Ltd

## ENERGY MANAGERS AND ENERGY AUDITORS

There are about 150 BEE certified energy auditor / manager personnel in the State. Most of them are already employed with power generating companies (NTPC) and power distribution companies (KSEB). There is a substantial number of energy auditors/ managers working with the private sector as well.

Apart from the energy auditing firms, there also exist a number of independent and individually operating BEE accredited energy auditors and energy managers. For the same reasons as for the energy auditing firms, sixteen energy auditors and managers as listed below were interviewed.

## SAVING POTENTIAL IN THE DOMESTIC SECTOR

In Kerala, the annual electricity sale to domestic sector is 5.6 BU which accounts for 46.3% of the total electricity sold. The domestic sector electricity consumption varies with respect to rural and urban segments and climatic seasonal variations. In the rural segment major use of electricity is towards usage of electrical energy in lights and fans. In the urban segment the typical energy consumption pattern is provided in Table placed below.

### *End Energy Usage Pattern in Household*

S. No.	Appliances	Energy Consumption (%)
1	AC & Refrigeration	56 %
2	Lights & Fans	26 %
3	Water Heaters, TV, Washing Machines, etc	14 %
4	Others	4 %

The energy use in air conditioners also varies significantly with seasons and climatic conditions.

The major avenues for energy savings in rural domestic sector include:

1. Replacement of GLS bulbs with CFLs
2. Adoption of BEE star labelled domestic appliances like ceiling fans, refrigerators, AC units, tube lights etc

3. The savings potential in rural segment by adopting CFLs and BEE star rated products is 40-50%.
4. The savings potential in urban segment by adopting BEE star rated products is 15-20%.

On the whole, the energy savings potential in domestic sector is estimated 20-25% which accordingly works out to 1.12 BU per annum.

### SAVING POTENTIAL IN THE INDUSTRY SECTOR

The annual electricity sales to the industry sector including low and medium voltage consumers (SME) and high voltage consumers (large industries) is 3.534 BU and works out to 29.1 % of the total electricity sold. The larger industries segment is covered for energy efficiency under the mandates of EC Act as Designated Consumers, while SME segment is being addressed for energy efficiency through cluster based initiatives by Bureau of Energy Efficiency.

Based on several studies and energy audits, the electrical energy saving potential in industry sector varies from 7-10%. The energy savings potential for the sector is assessed to be 0.247 BU.

### THE KEY PERFORMANCE INDICIES

S. No.	KPI	Relevance	Expected Behaviour
1	Carbon Foot Print	CDM projects will reduce carbon footprint Carbon footprint studies will help gauge energy efficiency in operations	Providing a number to carbon-footprints will help people / organizations realize the environmental impact of their operations and thus help in bringing awareness to reduce the carbon footprint
2	Instances (number) of successful energy efficiency project implemented	Demo projects help in convincing people to adopt new technologies by showing the way to energy efficiency	More demo project should come up
3	Green Buildings (number of), ECBC compliance in building Sector	Building and commercial sectors have a high proportion of electricity consumption	New buildings should be ECBC compliant The BEE has also come out with Green Buildings award
4	Specific Energy Norms in Industrial, Commercial, Agricultural etc.	Currently there are no specified norms. Norms need to be developed for industries, commercial and agricultural sector.	Norms should tend to go down
5	Energy Savings achieved – absolute and Year-over-Year	Energy Savings need to be calculated for various sectors	This figure should increase year over year
6	Number of Awareness Programmes by SDA, NGOS, Institutions etc.	Awareness program have to reach out to more people	People participation in the awareness program should increase
7	Reduction greenhouse gas (Amount of)	GHG emissions are directly linked to energy usage	GHG emissions should reduce

## Introduction

### 1.1 BACKGROUND

#### 1.1.1 *The Energy Conservation Act-2001*

Energy Conservation Act, 2001 came into force in March 2002. The Act empowers the Central Government and in some instances the State Governments to:

- (a) Specify the norms for processes and energy consumption standards for any equipment, appliances which consumes, generates, transmits or supplies energy;
- (b) Specify equipment or appliance or class of equipments or appliances, as the case may be, for the purposes of this Act;
- (c) Prohibit manufacture or sale or purchase or import of equipment or appliance specified under clause (b) unless such equipment or appliances conforms to energy consumption standards;
- Provided that no notification prohibiting manufacture or sale or purchase or import or equipment or appliance shall be issued within two years from the date of notification issued under clause (a) of this section;
- (d) Direct display of such particulars on label on equipment or on appliance specified under clause (b) and in such manner as may be specified by regulations;
- (e) Specify, having regard to the intensity or quantity of energy consumed and the amount of investment required for switching over to energy efficient equipments and capacity or industry to invest in it and availability of the energy efficient machinery and equipment required by the industry, any user or class of users of energy as a designated consumer for the purposes of this Act;
- (f) Alter the list of Energy Intensive Industries specified in the Schedule;
- (g) Establish and prescribe such energy consumption norms and standards for designated consumers as it may consider necessary;
- Provided that the Central Government may prescribe different norms and standards for different designated consumers having regard to such factors as may be prescribed;
  - (i) Direct, if considered necessary for efficient use of energy and its conservation, any designated consumer to get energy audit conducted by an accredited energy auditor;
  - (j) Specify the matters to be included for the purposes of inspection under sub-section (2) of section 17;
  - (k) Direct any designated consumer to furnish to the designated agency, in such form and manner and within such period, as may be prescribed, the information with regard to the energy consumed and action taken on the recommendation of the accredited energy auditor;

- (l) Direct any designated consumer to designate or appoint energy manager in charge of activities for efficient use of energy and its conservation and submit a report, in the form and manner as may be prescribed, on the status of energy consumption at the end of the every financial year to designated agency;
- (m) Prescribe minimum qualification for energy managers to be designated or appointed under clause (l);
- (n) Direct every designated consumer to comply with energy consumption norms and standards;
- (o) Direct any designated consumer, who does not fulfil the energy consumption norms and standards prescribed under clause (g), to prepare a scheme for efficient use of energy and its conservation and implement such scheme keeping in view of the economic viability of the investment in such form and manner as may be prescribed;
- (p) Prescribe energy conservation building codes for efficient use of energy and its conservation in the building or building complex;
- (q) Amend the energy conservation building codes to suit the regional and local climatic conditions;
- (r) direct every owner or occupier of the building or building complex, being a designated consumer to comply with the provisions of energy conservation building codes for efficient use of energy and its conservation;
- (s) direct, any designated consumer referred to in clause (r), if considered necessary, for efficient use of energy and its conservation in his building to get energy audit conducted in respect of such building by an accredited energy auditor in such manner and intervals of time as may be specified by regulations;
- (t) take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation;
- (u) arrange and organise training of personnel and specialists in the techniques for efficient use of energy and its conservation;
- (v) take steps to encourage preferential treatment for use of energy efficient equipment or appliances: Provided that the powers under clauses (p) and (s) shall be exercised in consultation with the concerned State. (h) direct, having regard to quantity of energy consumed or the norms and standards of energy consumption specified under clause (a) the energy intensive industries specified in the Schedule to get energy audit conducted by an accredited energy auditor in such manner and intervals of time as may be specified by regulations;

### **1.1.2 Bureau of Energy Efficiency (BEE) and Energy Management Center (EMC), Kerala**

Under the provisions of the Energy Conservation Act, 2001, Bureau of Energy Efficiency has been established with effect from 1st March, 2002. The mission of the Bureau of Energy Efficiency is to provide assistance in developing policies and strategies with a thrust on self-regulation and market principles, within the overall

framework of the Energy Conservation Act, 2001 with the primary objective of reducing energy intensity of the Indian economy.

BEE co-ordinates with Designated Consumers, State Designated Agencies and other organization; recognizes, identifies and utilizes the existing resources and infrastructure, in performing the functions assigned to it under the EC Act, 2001. The Act provides for regulatory and promotional functions.

The State Government may, by notification, in consultation with the Bureau-

- (a) amend the energy conservation building codes to suit the regional and local climatic conditions and may, by rules made by it, specify and notify energy conservation building codes with respect to use of energy in the buildings;
- (b) direct every owner or occupier of a building or building complex being a designated consumer to comply with the provisions of the energy conservation building codes;
- (c) direct, if considered necessary for efficient use of energy and its conservation, any designated consumer referred to in clause (b) to get energy audit conducted by an accredited energy auditor in such manner and at such intervals of time as may be specified by regulations;
- (d) designate any agency as designated agency to coordinate, regulate and enforce provisions of this Act within the State;
- (e) take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation;
- (f) arrange and organise training of personnel and specialists in the techniques for efficient use of energy and its conservation;
- (g) take steps to encourage preferential treatment for use of energy efficient equipment or appliances;
- (h) direct, any designated consumer to furnish to the designated agency, in such form and manner and within such period as may be specified by rules made by it, information with regard to the energy consumed by such consumer;
- (i) specify the matters to be included for the purposes of inspection under sub-section (2) of section 17;

Energy Management Center (EMC), Kerala is the State Designated Agency (SDA) for implementing the Act in Kerala State, functioning in close coordination with Bureau of Energy Efficiency (BEE). The success of the Act is directly related to the impact it has made in various sectors of the economy and periodical impact is one of the meaningful functions to be carried out of each SDA, as per BEE guidelines.

### **1.1.3 Awareness and Impact of Energy Conservation Act, 2001 in Kerala**

The Energy Conservation Act, 2001 has now been in force for almost 9 years. During this period a number of schemes have been initiated and launched by the Bureau Of Energy Efficiency, with an underlying objective of implementation of the Act on a participatory basis among the stakeholders including the general population. As a part of the impact evaluation exercise, there arises a need to gather information on

and to establish the impact of broader objectives of the Act in terms of outreach and understanding of various the provisions of the Act, and implementation of the Act by different categories of stakeholders like Designated Consumers, households, commercial buildings etc.

With an overall objective of assessing the impact of EC Act in the State of Kerala, the Energy Management Center (EMC), Kerala, through the services of Winrock International India (WII) undertook a survey with the specific objectives of to analyze, evaluate and draw conclusions on the following:

- Policies and directives in vogue under the Energy Conservation Act 2001 in Kerala, and their effectiveness on the energy conservation practices.
- Notable energy efficiency measures implemented in the last three years in the State of Kerala
- 2 to 3 numbers of achievements & success stories
- Any deficiencies / shortfalls observed in respect to policies
- Suggestions for moving forward

In order to undertake the achieving of the objectives mentioned above and as part of the proposed activities to EMC, WII launched a survey exercise covering various stakeholder groups as mentioned in Table 1 below:

Table 1: *Categories and Survey Sample Size for Impact Assessment Survey*

Stakeholder Category	Survey sample size (No. of Units)
Designated consumers	4
Other Industries (small/medium/large)	10
Energy Auditing firms	7
Certified Energy Auditor and Managers	16
General population	30
Commercial establishments	9
Local Households	20

The survey was conducted on a pre defined methodology and by using structured interview sessions for institutional stakeholders. Exhaustive questionnaires were drawn up and discussions were held with various institutes' and organizations' personnel on the basis of the interview questionnaire.

The principal institutes and organizations covered under the survey exercise for conducting the Interviews were:

- Kerala State Electricity Board (KSEB)
- Kerala State Productivity Council (KSPC)
- Energy Management Center (EMC)

- Agency for Non-Conventional Energy and Rural Technology (ANERT)
- Otto Traction, Energy Auditing firm
- BSNL Ltd, Energy Auditing firm
- Kerala State Council for Science and Technology (KSCST)
- Kerala Tourism Development Corporation (KTDC)

Detailed scope of work and survey methodology is described in the upcoming sections of this chapter.

## 1.2 SCOPE OF WORK

The scope of work assigned to WII as per the above contract is as follows:

- Collection of energy savings and energy efficiency measures, projects and programs implemented and energy conservation opportunities identified for implementation in qualitative and quantitative terms from the energy managers, energy auditors, industries, industry associations, audit reports, resources from expert persons and organizations in the field and from published authentic sources: in various sector and various system / equipment.
- Identification of schemes and incentives available in the State of Kerala to promote energy efficiency / energy conservation measures and ascertain how much potential is tapped by each scheme / measures
- Estimation of energy saved from all the collected data
- Development of key performance indicator to measure the impact of Energy Conservation
- Barriers in tapping the total energy efficiency potential in Kerala
- Conclusion on impact of Energy Conservation Act-2001 in Kerala, by correlating various key performance indicators

## 1.3 METHODOLOGY

A kick off meeting was held at Office of EMC Kerala in September 2009 to brainstorm on tasks assigned, methodology to be adopted for collecting information, organizations / institutions to be contacted, and assistance required from EMC. The detailed discussions held between WII and EMC paved the way for formulation of the action plan.

The target groups (stakeholders) to be covered under the primary survey were identified. Also, the list of Designated Consumers to be contacted for obtaining the required information was finalized. The survey team consisting of WII personnel was provided the initial training consisting of information on the objectives of the project, information – type, requirement, sources, contact details, time frame, and reporting procedures and so on. As per the request of WII, EMC issued a letter authorizing WII to collect critical and sensitive data and information from Designated Consumers on a confidentiality basis.

Following categories of stakeholders were contacted to collect information as per the questionnaire.

- Designated Consumers
- Other Industries
- Audit firms
- Energy auditors and managers
- Households

Additionally, the following important stake holders were also covered:

- Kerala State Productivity Council (KSPC)
- Energy Management Center (EMC)
- Agency for Non-Conventional Energy and Rural Technology (ANERT)
- Otto Traction, Energy Auditing firm
- Planning Board
- State PWD
- Kerala Financial Corporation
- Panchayat Board

A review meeting was held at EMC office on 18<sup>th</sup> December 2009 to review the project activity status and to present the status report.

The data thus collected was analyzed and meaningful conclusion were drawn which have been systematically presented in the upcoming chapters of this report.

This report is the final Project Report covering Task 2 of the contractual scope of work based on reports of accredited energy auditors as well as energy managers and other sources of information in the State.

## Awareness and Impact of Energy Conservation Act, 2001 in Kerala

### 2.1 GENERAL POPULATION AND LOCAL HOUSEHOLDS

The objective of the present study is to assess the awareness level of citizens from various classes of population, occupations and livelihood sources, geographical locations of Kerala including a gender based approach; and also assess the impact of the Act on various sectors such as the industry, the commercial establishments, the domestic sector and so on in order to undertake measures for energy conservation. To achieve the specific objective of information generation from amongst the general population and local households, WII designed a questionnaire to collect the relevant information to reflect the level of understanding of the Energy Conservation Act, 2001 and its impact on energy conservation practices of the above mentioned sectors. The sample questionnaire for citizens (attached as **Annexure 1** with this report) was finalized and beta testing was conducted for a sample survey comprising of 10 interviews conducted in each of the three major geographical *regions* Northern, Central and Southern Kerala to assess and establish the effectiveness of the questionnaire and the procedure adopted. The regions represent almost the whole of the State of Kerala and thus have been chosen to make the sample representative. For a brief mention, the key aspects covered by the questionnaire are awareness about existence of Energy Conservation Act, 2001, sectors covered under the Act, voluntary or mandatory nature of the Act, understanding the difference between energy conservation & energy efficiency, efforts already made by the person in question for conserving energy, awareness regarding the Standards & Labeling program of BEE, awareness on star rating of household appliances, and ability to recognize energy efficient products in the market, among others.

A survey team was constituted and adequate training was given for conducting interviews for each target group and also for collecting the relevant information. The key characteristics of the survey are as follows:

- A total of 30 no's of persons were interviewed in three major geographical regions of Kerala
- An attempt was made to include both the genders (male/female) in different age groups on a proportionate basis.
- It was ensured to cover different types of residential areas encompassing rural, semi urban and urban set ups to establish variation in the awareness level in different locations.
- The awareness level also depends on occupation levels of the respondents such as professional association, business, educational qualification, etc. Hence the survey has been conducted covering the following occupation groups:
  - ➔ Professionals (Engineers/Doctors/Lawyers/Professors, etc.)

- Traders & business community
- Students
- Others (including housewives, farmers, workers, etc.)

The information collected as above was verified, compiled, and analyzed to draw meaningful conclusions. The summary of data collected, analysis, findings, and conclusions are discussed in upcoming sections.

## 2.2 GENDER BASED AWARENESS ASSESSMENT

The survey was conducted by WII field staff on awareness on EC Act-2001 by covering both genders in Kerala. The results of the survey, data analysis, and trends

Table 2: *Result of Gender Based Awareness Assessment on EC Act-2001*

Geographical Region	No. of Persons Interviewed		Awareness on EC ACT-2001		Awareness on EC ACT-2001	
	Male	Female	Male	Female	Male %	Female%
Northern Kerala	6	4	4	1	33	33
Central Kerala	8	2	5	0	42	0
Southern Kerala	5	5	3	2	25	67
<b>Total</b>	<b>19</b>	<b>11</b>	<b>12</b>	<b>3</b>	<b>100</b>	<b>100</b>

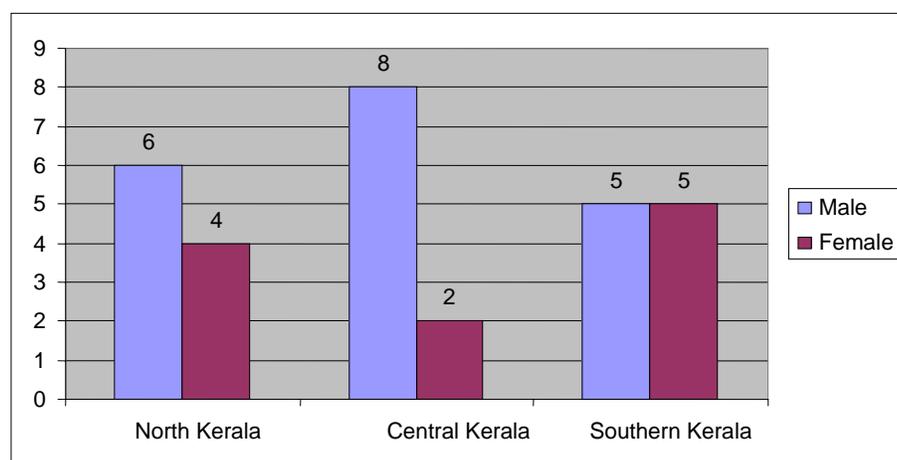


Figure 1: *Proportion of Male and Female Contributors Interviewed from each Geographical Region*

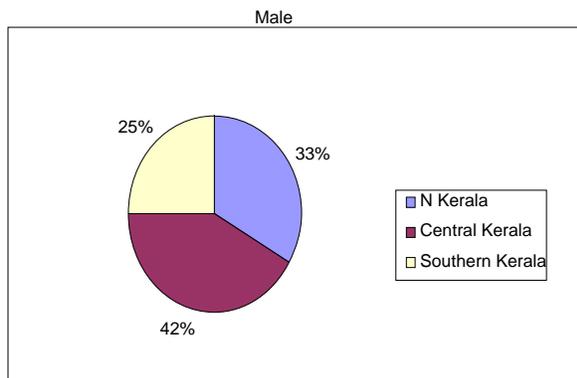


Figure 2: *Geographical Region Based Awareness EC Act- 2001 among Males*

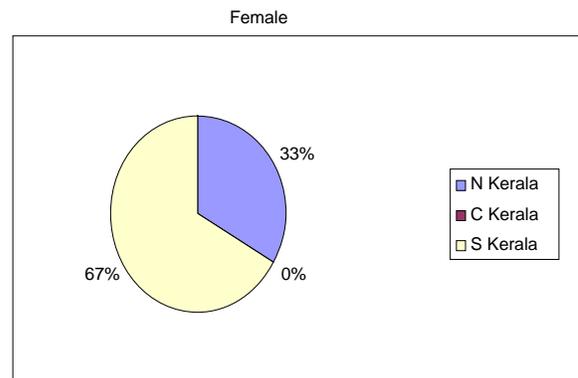


Figure 3: *Geographical Region Based on Awareness on EC Act-2001 among Females*

on awareness are summarized below in Table 2. The proportion of male and female contributors interviewed is shown in Figure 1. The result of awareness assessment based on gender and geographical region is shown in Table 1 and in Figures 2 & 3.

As can be seen from Table 2, out of total 30 candidates interviewed in three major regions of Kerala, 19 (63%) are male and 11 (37%) are females.

As shown in Figure 2 out of 19 male candidates, 32% are from Northern region, 42% are from Central, and 26% are from Southern region. 42 % people from Central region are aware of EC Act-2001 followed by Northern (33%) and Southern (25%).

Out of 11 female candidates as shown in Figure 3, 36% are from Northern, 18% are from Central, and 46% are from Southern region. Out of 11 females interviewed 67% of the female in Southern region is aware of EC Act-2001 followed by 33% in Northern region. During interview, not even one single woman from Central region responded positive regarding awareness on EC Act- 2001.

A total of 4 housewives were interviewed in all regions and they were found not aware of the EC Act-2001.

### 2.3 GEOGRAPHICAL LOCATIONS

It is important to gauge the awareness level of people about the EC Act at different geographic locations covering both urban and semi urban and identify areas where awareness is lacking. Hence the survey was conducted in the above mentioned areas covering different types of geographical locations and the same can be categorized into the following two groups:

- ➔ Urban locations
- ➔ Semi-urban locations

The results of the survey were documented, analyzed, and the results are summarized in Table 3. The awareness of the EC Act-2001 in three areas mentioned is depicted in Figure 4.

Table 3: *Results of Geographical Location Based Awareness Assessment on EC Act-2001*

S. No.	Location	No. of persons Interviewed		Awareness on EC ACT-2001	
		Numbers	%	Numbers	%
1	Urban	13	43	9	60
2	Semi urban	17	57	6	40
	<b>Total</b>	<b>30</b>	<b>100</b>	<b>15</b>	<b>100</b>

As shown in Figure 4, about 57% people interviewed are from semi urban and 43 % from urban areas.

Out of the 15 respondents who confirmed their familiarity with the EC Act-2001, 9 respondents were from urban areas while the rest 6 were from rural areas. This is also shown in Table 4. The total awareness level constitutes 60% from urban area and 40% people in semi urban and rural areas. The same has been shown pictorially in Figure 5.

Therefore, it can be inferred that the awareness about EC Act-2001 is higher in urban than semi urban areas.

Also, the awareness level about the Act is quite low in villages/rural areas compared to the urban centres. It is of utmost importance to address the situation on a priority basis, in order to make the EC Act-2001 impact phenomenal at the state level.

The impact of awareness about EC Act-2001 among the citizens is that it has contributed to understanding the need for energy conservation, developing ability to identify different energy-efficient products in the market, and to promote investment in energy efficient products.

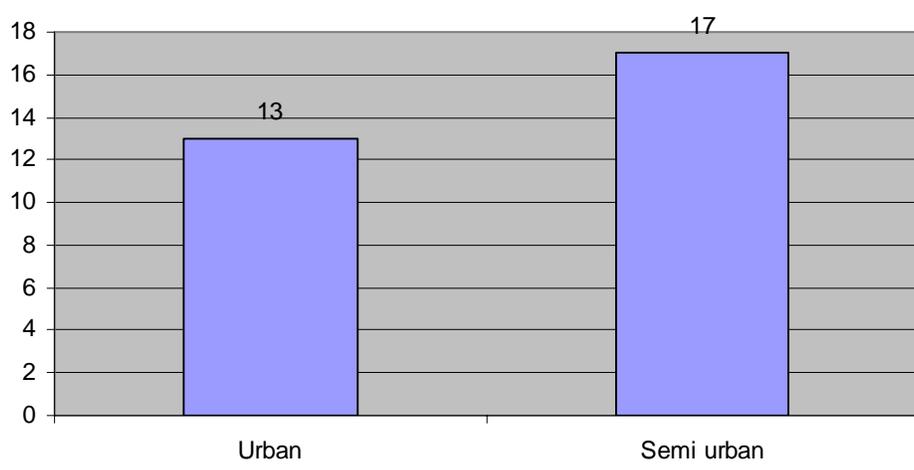


Figure 4: *Location Wise People Interviewed*

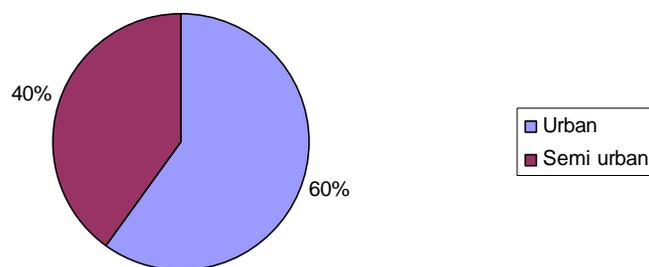


Figure 5: *Results of geographical location based Awareness assessment on EC Act-2001*

## 2.4 OCCUPATION

The awareness about the EC Act-2001 varies across different occupations of the people. Keeping this in view, an attempt has been made to contact people with different occupations in order to analyze the response on awareness. The respondents of the survey conducted by WII can be categorized under the following major groups:

- ↳ Employees
- ↳ Student and teacher
- ↳ Business
- ↳ Others

The responses gathered from field survey have been compiled, analyzed, and presented in Table 4. The number of persons interviewed in various occupations is depicted in Figure 6. The awareness of EC Act-2001 among people of different occupation is depicted in Figure 7.

Table 4: *Occupation & Awareness Levels on EC Act-2001*

S. No.	Occupation	No. of persons Interviewed		Awareness on EC ACT-2001		Awareness Level in %
		Numbers	%	Numbers	%	
1	Employees	14	47	8	54	57
2	Student & teacher	6	20	4	27	67
3	Business	4	13	2	13	50
4	Others	6	20	1	6	16
	<b>Total</b>	<b>30</b>	<b>100</b>	<b>15</b>	<b>100</b>	

- As can be seen from the Table 4 and Figure 6, about 47% of the persons interviewed are employees, 20% are students and teachers, 13% are business men, and 20% are others comprising housewives, unemployed, workers, and miscellaneous
- As shown in Figure 7, out of a total of 15 persons interviewed, who are familiar with the Act, 54% are employees, 27% are students and teachers, 13% are businessmen, and 6% are others
- It can also be observed from the Figure 8 that 67% of students and teachers, 57% of employees, 50% of businessmen, and 16% of others are aware of the EC Act-2001

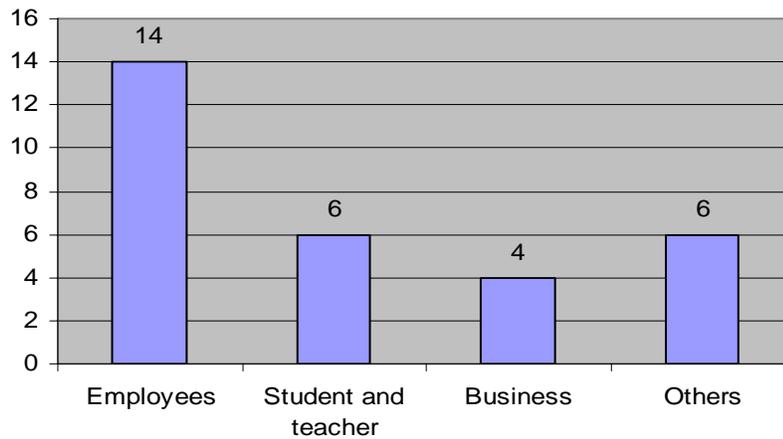


Figure 6: *Categorization of Persons Interviewed*

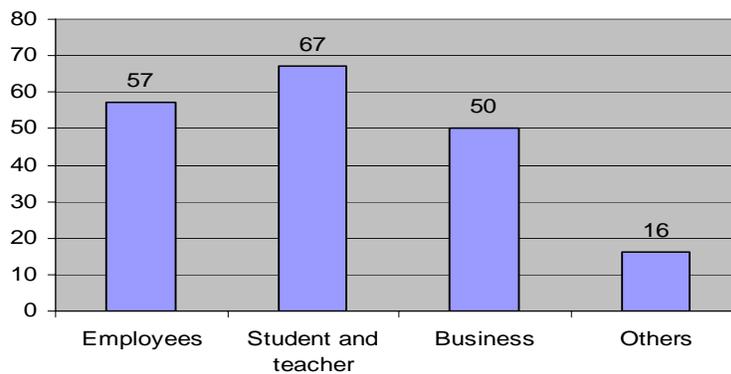


Figure 7: *Awareness Level on EC Act-2001*

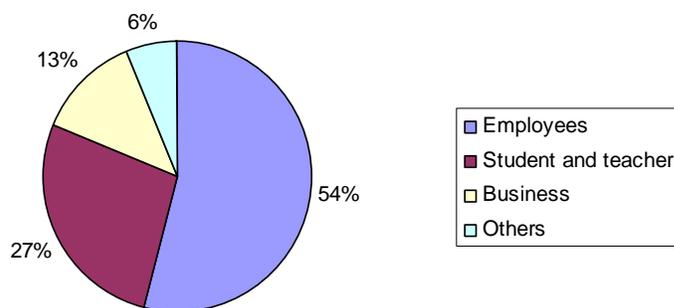


Figure 8: Awareness Level in % on EC Act-2001

## 2.5 INDUSTRIAL, COMMERCIAL AND NGO SECTORS

A separate questionnaire was designed for collecting inputs from persons employed with the industrial & commercial sectors. The sample questionnaire for the industrial and commercial sector survey is attached as **Annexure 2** with this report. A survey was conducted covering various employees of various industrial units. The commercial sector staff interviewed in this study included hotels, hospitals, shopping malls, retailers, etc. People from NGOs were also interviewed in Kerala on the basis of a specialized questionnaire focusing on the NGO sector. The sample survey questionnaire for NGO sector is attached as **Annexure 3** with this report.

The data thus collected was analyzed and the summary of the findings and conclusions are presented below in Table 5. The persons interviewed from different sectors are shown in Figure 9 and the awareness among the people in these sectors on EC Act 2001 is shown in Figure 10.

Table 5: Awareness of Industrial & Commercial Sectors on EC Act-2001

S. No.	Sectors	No. of persons Interviewed		Awareness on EC ACT-2001		Awareness Level in %
		Numbers	%	Numbers	%	
1	Industry	8	53	8	58	100
2	Commercial	4	27	3	21	75
3	NGO	3	20	3	21	100
	<b>Total</b>	<b>15</b>		<b>14</b>	<b>100</b>	

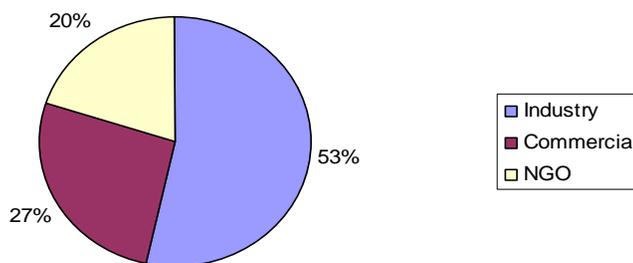


Figure 9: Person Interviewed From Different Sectors

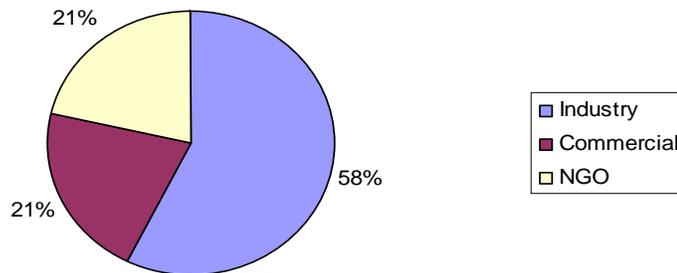


Figure 10: Awareness Level on EC Act- 2001

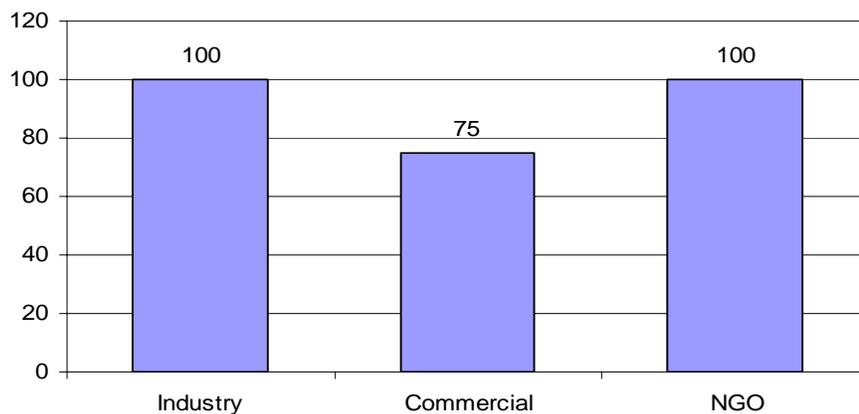


Figure 11: Awareness Level in % on EC Act-2001

- As can be seen from the Table 5, a total of 15 people from the industry, commercial, and NGO sector are interviewed during the field survey. As shown in **Figure 9**, nearly 53% of the people interviewed are from industrial sector, 27% are from the commercial sector, and the remaining 20% from NGO sector.
- All the respondents from the industrial and NGO sector confirmed their awareness of the EC Act-2001, whereas only one respondent from the commercial sector said he is not aware of this policy aimed at energy conservation.
- Majority of the respondents from industrial and commercial sectors (over 90%) felt that there is significant scope for conservation of energy in their units and they are making efforts to conserve energy by adopting energy efficient technologies and practices.
- More than 80% respondents are aware of specific energy consumption of their industrial products.
- More than 70% of the respondents said they are keen to get energy audit done for their units and welcomed suggestions for conservation of energy.
- The awareness levels were reasonably high as found out in the survey. For industrial and NGOs the awareness levels were found to be 100%, while in the

household section it was only marginally lower at 75% (see Figure 11). It may be noted that the industrial and NGO sectors contributed 73% of the respondents.

- In the Industrial and Commercial sector the awareness with regard to EC Act is there. Clients are aware of the existence of the EC Act-2001. However, the details of the act like what are all the sectors covered under the act, who is the implementing agency, what are the powers vested in it, and, how the act is going to be implemented, not many people are aware of. About 40% people in the above sectors mentioned that only industries and buildings are covered under this Act.
- In the overall observation, the software/ hotels/ hospitals/ shopping malls have major thrust in energy efficiency on lighting. In steel/ re-rolling/ foundry sectors the thrust is on Energy Efficiency of motors, installation of VFD's and capacitors for improvement of Power Factor.
- Majority of the respondents felt that the Government should take more interest in implementing the Act at once. About 60% people responds about the implementation of EC Act should be on voluntary basis and most of the people are from private firms. Few people respond that as long as voluntary approach is there the required seriousness is not projected in implementing the EC Act.

## 2.6 DESIGNATED CONSUMERS

Specialized questionnaire for Designated Consumers was designed (attached as **Annexure 4**) and three Designated Consumers (DCs) were interviewed during the survey and the feedback from the authorized persons are analyzed and presented below. The following are the three DCs interviewed.

- Travancore – Cochin Chemicals Limited, Udyogamandal, Kerala
- Malabar Cements Limited, Walayar, Kerala
- Hindustan Newsprint Limited, Newsprint Nagar, Kerala

Out of these three DCs, two of them said EC Act-2001 is mandatory. Travancore-Cochin Chemicals executive said, Government is proactive in implementing the EC Act but it is not adequate and Malabar Cement executive said that it is not proactive and EC act is also voluntary. Malabar Cement does not have certified energy auditor and all the three DCs interviewed implemented Energy conservation measures and savings. Travancore-Cochin Chemicals said, there was no job created on account of EC Act-2001. The expectation from the State Nodal Agencies is the following:

- ➔ Conduct more awareness generation initiatives
- ➔ More publicity materials like posters, flyers
- ➔ Support from resources
- ➔ More incentives for implementation

## Survey Results

### 3.1 DESIGNATED CONSUMERS

As per information gathered from EMC, there are a total of 11 Designated Consumers listed in Kerala. The following Table 6 presents the listed Designated Consumers across different sectors.

Table 6: *Tentative List of Designated Consumers*

Industrial Sector	Designated Consumer in Kerala
Cement	Malabar Cement Ltd
Chlor-Alkali	Travancore Cochin Chemicals Ltd.
Paper & Pulp	Hindustan News Print Ltd.
Power Plant	BSES Kerala Power Ltd, Kochi
	Kozhikode Diesel Powr Project
	Rajiv Gandhi Combined Cycle Power Project (RGCCPP)
	Brahmaputra Diesel Power Plant KSEB, Brahampuram, Kochin
	Kasargod Power Corporation Ltd., Mylatti, PO - Kasargod
Fertilizer	The Fertilizers and Chemicals Travancore Limited (FACT)
Textiles	GTN Textiles Ltd
	Patspin India Ltd.

Out of all Designated Consumers as listed in Table 6 above, three, as mentioned below, were selected for conducting the interview and information collection exercise.

- Hindustan Newsprint Ltd.
- Malabar Cements Ltd., and
- Travancore Cochin Chemicals Ltd.

The principal outcomes of the interview are as follows:

- Two of the three DCs had designated / appointed an officer as energy manager for the facility.
- All the three units had information about various provisions of the EC Act
- Two DCs perceived all provisions of the Act as mandatory.

The above outcome for the awareness impact assessment is quite expected as the provision for filing Energy Returns and therefore conducting energy audits in the unit, has been made mandatory for the Designated Consumers.

However, apart from the mandatory provision, there exists a substantial degree of awareness about profitable aspect of energy conservation activities as all these units have also applied for the Energy Conservation Award at the national level and/or the state level. Further, the interviewed DCs also expect the State Designated Agencies to provide more information on enhancing energy efficiency in their respective production processes. No Designated Consumer reported the actual specific energy consumption value, however, the plant management keeps record of the quantum of energy being used in the plant. The companies perceive the government and the SDA as proactive in implementation of the EC Act.

### 3.2 INDUSTRIES OTHER THAN DESIGNATED CONSUMERS

Apart from the Designated Consumers, the survey activity was also extended to various industrial sectors i.e. large, medium and small scale industrial units. The following industrial units from each sector were selected for conducting the survey.

- Small scale units (2 units) – Herbal Isolates, Sidco
- Medium scale units (3 units) – KFL, Milma, RPL, Bombay Rayon
- Large scale units (3 units) – TTP, SÜD Chemie, Indian Rare Earths Limited

The following principal outcomes arised from the survey and interview activities conducted in above mentioned industrial units:

- Small scale industries are aware of the EC Act upto a fair degree.
- However, the adequate level of concern regarding compliance with the mandatory provisions does not exist.
- The general perception is that many provisions are not mandatory for small scale industry and that most provisions at this stage are voluntary.
- The small scale units acknowledge the state's mandate to propagate and implement the EC activities envisaged in the Act.
- Medium scale units are aware of the Specific Energy / Fuel Consumption in their respective plants.
- Medium scale units have also opted for conducting Energy Audits in their respective plant earlier.
- Medium scale unit have tendency to participate in the state's Energy Conservation Award.
- Medium scale sector looks up to SDA to aquire additional information, training, capacity building and technological upgration for further incorporation of EC measures in their respective plants.
- Large scale units which are not Designated Consumers have considerably clearer knowledge about the EC Act and its broader provisions.
- The respondents from large scale units have conducted energy audits in their respective plants.

- Large scale units also possess knowledge of specific provisions of EC Act which directly concern with their product sector.

### 3.3 ENERGY AUDITING FIRMS

The energy auditing firms are directly concerned with the implementation of EC measures across various end use sectors. Therefore, it was envisaged to include the prominent energy auditing firms working in the state to be covered under the survey and the information gathering exercise. The following auditing firms were selected for conducting the survey and interview activities:

- Kerala State Productivity Council
- Otto tractions
- BSNL

The following outcomes were well in accordance with the expectations:

- All the three firms are well aware of the EC Act.
- All the three firms, BSNL, KSPC & Otto tractions have been conducting regular energy audits across various end use sectors for the past several years.
- They have also been undertaking regular awareness events throughout the state aimed at promoting energy efficiency among various industrial and commercial sectors.
- Energy auditing firms envisage a larger role for themselves in the upcoming Years.

A separate survey questionnaire was designed for the Energy Auditing firms which is attached as **Annexure 5** with this report.

### 3.4 ENERGY AUDITORS AND MANAGERS

There are about 150 BEE certified energy auditor / manager personnel in the State. Most of them are already employed with power generating companies (NTPC) and power distribution companies (KSEB). There is a substantial number of energy auditors/ managers working with the private sector as well.

Apart from the energy auditing firms, there also exist a number of independent and individually operating BEE accredited energy auditors and energy managers. For the same reasons as for the energy auditing firms, sixteen energy auditors and managers as listed below were interviewed based on the following selection.

- Pradip Nettor
- Nisha Jose
- Sudhendran
- Suresh Babu
- Sudha Kumari
- Promod P Mani
- TV Mohandas
- G Krishnakumar

- Shahnawaj Khan
- K K George
- Ajith
- Madhusoodan
- Jose
- PL Manoj
- Vijay Kumar
- Baburaj

The major outcomes of the survey conducted for the energy auditors and managers are cited below:

- All of the above mentioned energy auditors and energy managers have accreditation certification from the BEE.
- Several of above have not done a comprehensive audit by themselves.
- The general perception among the above is existence of scope for a larger market generation through compulsory energy audits for a large variety of industries and other large scale consumers.
- The auditors are well aware of the EC Act and know the correct nature of voluntary and mandatory provisions.
- The auditors seek a larger number of provisions of the Act to be made mandatory.
- The auditors envisage a larger role of EMC and ESCOs towards creating awareness among the local population and towards enhancing energy efficiency within the state.

### 3.5 COMMERCIAL ESTABLISHMENTS

Commercial establishments are the life line for proper functioning of any city. Several large scale/size commercial and institutional establishments listed below were selected and survey and interview exercise were conducted in cooperation with the management of these commercial establishments.

- Big Bazaar
- Ginger Hotel
- SUT Hospital
- Cosmo Hospital
- Sainik School
- SUT Hospital
- Technopark Alliance
- Technopark
- Mascot Hotel
- Taj Residency
- LV Prasad Studio

The principal outcomes of the survey are listed below:

- The respondents were all aware of the EC Act.
- The mandatory / voluntary provisions are not very clear to the management of such commercial establishments.
- The management was generally appreciative of the government's role in trying to spread awareness about the EC Act, but also, the same time, envisaged a greater role to be played by the State Designated Agency.

Apart from the above mentioned stakeholders, specialized institutes and organizations were approached for incorporating their understanding of the EC Act into the survey. Such organizations included Kerala State Productivity Council (KSPC) and Agency for Non-Conventional Energy & Rural Technology (ANERT), Planning Board, PWD and State Panchayat Office. Customized questionnaire was prepared for such institutional survey and the sample survey questionnaire is attached as **Annexure 6** with this report.

### 3.6 GENERAL PUBLIC AND HOUSEHOLDS

The respondents were interviewed in Malabar, Kochi and Travencore. A total of 30 households / individuals were interviewed. Most people had an idea of the Standard & Labeling scheme of the BEE under the EC Act, but did not know much about the Act itself.

While respondents had fair good idea on the energy cost incurred on electricity or fuel, but they failed to quantify the actual energy consumed by them. The analysis reveals that energy cost is more accepted and easily understood terms by household or common people.

People usually do not understand the difference between energy efficiency and energy conservation. Most people also depend upon the shopkeeper / salesman to decide which appliance to buy. Energy efficiency is an important criteria for the citizens but their understanding of the energy efficiency or the star labeling is not complete.

### 3.7 ENERGY EFFICIENCY SECTOR EXPERTS

A number of discussions were held with important stakeholders in the area of energy conservation. The experts comprised energy auditors, planning board member, panchayat board officers, experts in the field like the energy experts in large buildings like hotels and hospitals. The discussions with these experts are presented in relevant sections.

There are not many energy intensive industries in the state of Kerala. Electricity is the main form of commercial energy used in the state. Hence the best way of ensuring better energy efficiency in the state is through use of better and energy efficient equipments in the state. The advantage with this strategy is also that this can be ensured at the design stage. Most of electricity driven equipments can be

chosen at the design stage and thus streamline the process of building energy efficiency into the projects. This leads to better energy security, ensures electricity in peak demand hours is not bought at the high prices and leads to considerable saving.

Energy auditors, planning experts and other stakeholders have all reiterated this point from their own angles of vision. The planners and higher ups in both the private sector and the government are fully aware of the need for energy conservation and energy efficiency. Actors like BSNL have identified and implemented energy conservation opportunities (ECOs). Similarly the Kerala State Productivity Council has also undertaken many energy conservation opportunities in the state.

Planning Board has also communicated that a number of investment grade energy audits have been conducted (under the aegis of the EMC) and the outcome of these reports (the Energy Conservation Opportunities – ECOs) have to be implemented now. The preferred way to do this is through the ESCO route.

## Analysis of Survey Data

### 4.1 MAJOR ENERGY CONSUMERS IN KERALA

The list of Designated Consumers in Kerala is presented as Table 6 in the previous Chapter. Apart from the Designated Consumers, the major consumers of electricity are the five major municipalities, namely

### 4.2 MUNICIPAL CORPORATIONS IN KERALA

#### ➤ *Thiruvananthapuram*

Thiruvananthapuram, the southern most district of Kerala State is situated between north latitudes 8° 17' and 8° 54' and east longitudes 76° 41' and 77° 17'. The southern most extremity, Kaliyikkavila, is only 54 kms away from Kanyakumari (Cape Comarin), the land's end of India. The district stretches 78 kms. along the shores of the Arabian sea on the west, Kollam district lies on the north with Thirunelveli and Kanyakumari districts of Tamil Nadu on the east and the south respectively.

The district can be divided into three geographical regions; highlands, midlands and lowlands. Chirayinkeezhu and Thiruvananthapuram taluks lie in the midland and lowland regions, while Nedumangad taluk lies in midland and highland regions and Neyyattinkara taluk stretches over all the three regions.

#### ➤ *Kollam*

Kollam District is situated on the South west coast of kerala. The District is bound on the north by Alappuzha and north east by Pathanamthitta Districts on the east by Thirunelveli District of Tamilnadu, on the South by the Thiruvananthapuram District and on the west by Arabian sea.

Two rivers Kallada and Ithikkara flows through this District. The Sasthamcotta lake, the only major fresh water lake in the state is in Kollam District.

#### ➤ *Kochi*

**Kochi** formerly known as **Cochin** (the erstwhile colonial name), is a major city in the Indian [state](#) of [Kerala](#). The city is one of the principal [seaports](#) of the country and is located in the district of [Ernakulam](#), about 220 kilometres (137 mi) north of the state capital, [Thiruvananthapuram](#). It has an estimated population of 600,000, with an [extended metropolitan](#) population of about 1.5 million, making it the largest [urban agglomeration](#) in the state and the second largest city in Kerala after the state capital.

#### ➤ *Thrissur*

The term Thrissur is the abbreviated anglicized form of the Malayalam word "THRISSIVAPERUR" which means the town of the "SACRED SIVA". The town is built on an elevated ground, at the apex of which is the famous

"VADAKKUMNATHAN" Temple. A place of great antiquity, Thrissur was also known as "VRISHABHADRIPURAM" and "TEN KAILASAM" in ancient days.

### ➔ **Kozhikode**

Kozhikode pronounced [ko ɪk o ɪ] (listen)), also known as Calicut, is a city in the southern Indian state of Kerala. It is the third largest city in Kerala and the headquarters of Kozhikode district. During Classical antiquity and the Middle Ages, Calicut was dubbed the "City of Spices" for its role as the major trading point of eastern spices.[1] Kozhikode was once the capital of an independent kingdom of the same name and later of the erstwhile Malabar District.

Kozhikode has a population of 436,556 as per 2001 census, with an extended metropolitan population of about 0.9 million, making it the third largest urban agglomeration and the third largest city in Kerala

### ➔ **Municipalities**

Most of the officials in the municipalities who are capable to implement the EC Act are not aware of the closes and conditions of the Act. But the awareness creation activities different agencies including SDAs have made these officials as most of the educated common people about the necessities of saving energy especially electricity.

Thrissur Municipal Corporation is one of the corporations in Kerala which has license to distribute electricity in its jurisdiction area. Only one engineer from this agency got one day training in the EC Act and not aware of much of its provisions. The head of the electric division of the corporation is totally over burdened with responsibilities to be able to set aside time for any further training. More over since energy conservation can be achieved by the collective efforts of different departments of the municipalities and corporations but generally the trainings of EC Act is being given only for the officials in the electric division, these results in the ineffectiveness of the implementation of not only EC Act but also general energy conservation measures.

People representatives of the local bodies are comparatively close to the people than other legislative or parliament members representing the area, this makes them more demanding for developmental activities to be implemented in their area irrespective of the level of necessities of the same. Most of these activities are like street lighting, pumping houses etc. which burdens the existing distribution grids. Since there is no training given to these public representatives it become difficult to the officials to implement energy conservation measures. Most of the energy conservation measures need replacement and establishment of equipments and different grid components which s associated with public expenditure. Objections and priorities of the finance departments and public representatives becomes another constraints of the implementation of energy conservation measures. Since the local bodies are not carrying out proper energy auditing and reports the officials have no convincing facts for the expenditures.

These leads to a paradigm shift in the mode of awareness programs of the SDA are required. The batch size, time given for the training and training modules has to be reconsidered to improve the effectiveness of the course. Participation of the heads of the electric departments has to be confirmed for all new trainings along with at least one more staff. Separate course modules should be designed for different line departments of the municipalities with special emphasis to the implementable options during the routine activities of the departments. Regular awareness training should be given to the municipal counselors also. SDA should carry out model energy auditing of the selected municipalities and produce results to convince the state government to make the energy auditing mandatory for the municipalities and allocate specific funds for energy conservation activities. The municipality officials also should be trained in carrying out self auditing and priorities fund allocations to activities which can benefit better conservation. Street lighting is a major energy consuming sector in the municipalities in Kerala. GIS assisted classification of all roads in Kerala has to be carried out with specifications of the wattage and types of lights required for different road classes. Separate grids for street lightings with dimmers to reduce lighting after midnight hours should be installed. SDA has to take initiative to make assessments to estimate the energy saving which can come from the activities and the option of forming the activity as a CDM project as carried out in case of CFL lamp distribution scheme has to be scouted.

### 4.3 MAJOR SME INDUSTRY IN KERALA

In the State of Kerala around 36 prominent SME industries has been identified, the sector-wise categorization revealed that Textile (7 nos.) and Engineering (6 nos.) type of sector are prevailing. Table 7 below gives the sector-wise categorization of the type of industries while a more detailed presentation is attached as **Annexure 7** with this report.

Table 7: *Sector-wise type of Industries*

S. No.	Sector	Nos. of Industry
1	Engineering	6
2	Forest	4
3	Handloom & Handicraft	2
4	Textiles	7
5	Electronics	5
6	Mining	2
7	Industry	5
8	Drugs, Chemicals & Pharmaceuticals	3
9	Cement	2
<b>Total</b>		<b>36</b>

#### 4.4 ENERGY AUDITOR FIRMS IN KERALA

There are 25 energy auditing firms recognized by the EMC. Among them, seven major energy audit firms have their registered offices in Kerala and actively operating with the State, namely:

1. Kerala State Productivity Council
2. KITCO Ltd.
3. Bharat Sanchar Nigam Ltd.
4. Otto Traction
5. APITCO
6. Academy for Conservation of Energy

#### 4.5 SUCCESS STORIES

##### ➤ *Wipro Limited, Ernakulam*

Wipro Limited, Kochi Development Corporation (KODC), is leading end-to-end IT service provider. One of the major energy saving activities taken up by the organization is to build Environment Friendly and Energy Efficient Buildings. The Kochi Development Centre is one such energy efficient building with significant reduction in energy consumption achieved with a nominal increase of 10% in the construction cost. The potential recurring energy savings is in the order of 30%. The building has also provided a template where all issues of energy and environment with regard to the building design have been dealt with. Kochi Development Centre is a Gold Rated LEED Building as per the standards set by the United States Green Building Council (USGBC).

The Energy saving approach and methodology adopted in the building design and operations parameters are:

- Implementation of Building Automation System
- Installation of Biogas Plant
- Thermal Storage System for power demand management
- Implementation of Water efficient landscaping
- Use of treated sewage from Sewage Treatment Plant
- Use of energy efficient Lighting System
- Reduction in water usage
- Periodic energy audits are conducted and innovative solutions are implemented

##### ➤ *Bharat Petroleum Corporation Ltd (BPCL), Kochi Refinery*

BPCL Kochi Refinery, a 9.5 MMTPA fuels refinery is located at Ambalamugal, Kochi in the Kerala State in a green, sprawling campus of 1200 acres. Commissioned in 1966 as a 2.5 MMTPA refinery, Kochi Refinery (then known as Cochin Refineries Ltd) has gone through a series of expansions and modernizations to be the present Kochi Refinery. Major products of the refinery include LPG, Motor Spirit, Naphtha,

Aviation Turbine Fuel, Kerosene, Special Boiling Point Spirit (SBPS), Mineral Turpentine Oil (MTO) High speed diesel, light diesel oil, furnace oil, LSHS, bitumen, Natural Rubber Modified Bitumen, aromatic products like Benzene & Toluene and petrochemical like Poly isobutene.

Some of their Energy saving measures successfully adopted by BPCL - Kochi Refinery on a financially attractive and technologically feasible basis are:

- Replacement of Naphtha stabilizer re-boiler with a steam re-boiler and old low efficiency fired heater replaced with a high efficiency steam re-boiler
- Optimization of excess air in boiler through automatic air fuel ratio based combustion control scheme
- Conversion of metallic blades to FRP blades for air fin fans
- Waste heat recovery through steam generation in Biturox unit.
- Replacement of mineral wool insulation with Perlite.
- The implementation of above mentioned measures has brought down the specific energy requirement of the refinery.

#### ➤ **Veega Holidays and Parks Pvt. Ltd, Kochi**

Veega Holidays and Parks Pvt. Ltd also popularly known as "Veega Land" is a facility of amusement and outdoors entertainment from the house of famous V-Guard brand, which started its operations on 3rd April 2000. The facility is today one of the most exciting amusement parks in India.

The measures taken by the management of Veega Land in order to achieve the energy conservation as best performance practice are:

- Use of Renewable Energy for lighting and other requirements
- Time scheduling of rides / equipments based on the number of guests or utility
- Re-designing of Blowers and Duct in Wave pool area
- Installed Motion sensors for lighting
- Installed Energy Saver and there by voltage optimized to 210 V
- Periodical audit and reviews of maintenance schedule.
- Increased the usage of natural light by providing translucent roofing
- Up-gradation and optimization of old Equipments with Energy efficient Equipments

#### ➤ **Energy Conservation (ENCON) in Malabar Milk Union (MILMA)**

- The Malabar Cooperative Milk Producers' Union, head quartered at Kozhikode (Calicut) in Kerala, was started in 1991. It has the 6 Northern Districts of Kerala as its area of operation and an average milk procurement of 4 lakh litres per day. The Union operates 5 Dairy plants and 2 Milk Chilling Centers. It has a Milk Products Dairy too. The network of Bulk Milk Coolers is in fast expansion. Currently a BMC capacity of 2 lakh litres is in place with 75 BMCs installed in the

villages. The products comprise Market milk (4 lakh litres per day), curd (40, 000 Kg /Day), Ghee (150 MT per month), Ice-cream (1500 Litres per day), Peda (10 MT per month), Butter milk, Milk Lollies, Sterilized flavored milk etc. The Union sells its products under the Milma brand, a common brand for the Kerala Cooperative Milk Marketing Federation, which has two more Milk Unions under it at Ernakulam (Kochi) and Thiruvananthapuram (Trivandrum).

- The Union has an Energy Management Team at each dairy plant, comprising of the Unit Manager, Heads of Production, Engineering, and Quality Control departments and Senior Technicians from Refrigeration, Electrical and Boiler sections. Energy audits in Malabar Union were done through the Petroleum Conservation & Research Agency (P C R A) in 2004 & 2008. The Union had implemented all major recommendations. The Energy Management Committees at dairies carry out regular monitoring of ENCON efforts. These efforts need training to all levels of staff, especially to engineers & technicians, which are regularly arranged. Awareness programmes on conservation of Water, Energy etc are also conducted for other workmen and staff.

The efforts have been recognized through the awards by Kerala State Pollution Control Board comprising Energy Conservation award for Kannur Dairy in 2006-07, Kasaragod Dairy in 2008-09 and Pollution Control Award for both Kasaragod and Wayanad dairies in 2009-10.

## 4.6 POLICIES AND DIRECTIVES IN VOGUE

### ➤ *Energy Conservation Awards*

The energy management centre of Kerala has started energy conservation awards which are awarded to the units and personnel for their contribution towards energy conservation in the State. This has led to greater awareness among the energy consuming and related community of the state on the issues of energy conservation. The success stories mentioned in the previous section are based on application documents submitted for these awards. The awards were first given in the year 2000 and have been an annual event since. They are given to the applicants in the following categories:

- Category 1:** Large scale energy consumers (Including large scale industries, hotels, hospitals, etc. ? those consumers with a total annual energy bill of over Rs 150 Lakhs including fuel and electricity, wherever applicable or with a fixed assets of more than Rs. 10 Crores)
- Category 2:** Medium scale energy consumers (Including medium scale industries, hotels, hospitals, etc. ? those consumers with a total annual energy bill within Rs 30 Lakhs to Rs 150 Lakhs including fuel and electricity, wherever applicable or with a fixed assets in the range of Rs 1-10 Crores)

- **Category 3:** Channels and Media (include all print-audio-visual media for their efforts in propagating/promoting the Energy Efficiency and conservation including awareness campaign having certified/proven impact)
- **Category 4:** Small scale energy consumers (Including small-scale industries, hotels, hospitals, etc. ? those enterprises with a total annual energy bill of less than Rs 30 Lakhs including fuel and electricity, wherever applicable or with a fixed assets of less than Rs. 1 Crore)
- **Category 5:** Non-profit organizations (Including Local Bodies, NGOs and organizations involved in promotional efforts in energy conservation)
- **Category 6:** Research & Innovation (Organizations and Individuals involved in Research & Innovation efforts in energy conservation, efficiency improvement, fuel savings etc. are eligible to apply)
- **Category 7:** Individuals (Journalists, media persons, Writers, etc., who contributed in the field of energy conservation through a media)
- **Category 8:** Buildings (Buildings including building complex of public organisations/ institutions, etc., who have implemented energy conservation/ efficiency programs)
- **Category 9:** Manufacturers/traders & dealers of energy efficient equipments (This includes the BEE Star labeled equipments, energy efficient retrofits/controls suitably proven and certified by competent /accredited labs/institutions)

### Special Category

- **Category 10:** Energy Efficient and Eco friendly building Designer/developer (Individuals and Institutions who has designed and/or developed such buildings/campus with proven/certified Energy Efficiency and conservation including Green/Eco friendly considerations)
- **Category 11:** Energy Clinic volunteers (Volunteers worked under the programme? Energy Clinic? of Energy Management Centre having Energy Clinic volunteer identity card)
- **Category 12:** Fleet Operators Individuals or Institutions operating as part of their normal business activities more than five petroleum fuel powered vehicles for transport of men and/or material e.g: KSRTC, ISRO, KTC, tour operators, bus owners, lorry/truck/cargo operators etc.

- **Category 13:** Certified Energy Managers  
Any individual possessing the qualification of a certified Energy manager as prescribed by Bureau of Energy Efficiency (or as stipulated in EC Act 2001).
- **Category 14:** Certified Energy Auditors  
Any individual possessing the qualification of a certified Energy Auditor as prescribed by Bureau of Energy Efficiency or as stipulated in EC Act 2001.
- **Category 15:** Educational Institutions Schools / colleges / it is / ITCs / Polytechnics / Engineering Colleges, for their efforts in promotion of energy efficiency and conservation activities; this includes Energy Conservation Clubs, Science Clubs, Energy & Environment conservation clubs and similar forums/clubs in the educational institutions
- **Category 16:** Best Suggestion for Energy Conservation/Energy Efficiency. Individual who shall be a permanent resident of Kerala, who will provide best practical/implementable suggestion on energy efficiency/energy conservation practices or programme in any sector, equipment or system.

#### ➔ **Awareness / Painting Competition**

The BEE's painting competition is held in the State of Kerala and thus helps in spreading awareness among the school children and other audience on the importance of energy conservation.

#### ➔ **Star Labeling of household appliances**

The star labeling scheme of the Bureau of Energy Efficiency (BEE) is also being implemented in the State of Kerala. Many household appliance manufacturers have become a part of this scheme and are selling star-labeled products in the state. The major products are air-conditioners, refrigerators, tubelights and distribution transformers.

#### ➔ **Kerala State Energy Conservation Fund**

The State of Kerala has also floated an energy conservation fund for giving impetus to energy conservation in the State.

#### ➔ **Energy Clinic**

Energy Clinic is an awareness programme on energy conservation activities in domestic sector through women change agents. For this purpose, volunteers are selected from various organisations from all the 14 districts. The selected volunteers are given one day extensive training for the successful conduct of the Energy Clinic. Each volunteer has to conduct 10 clinics in 5 panchayats. All the panchayats concerned are given information with regard to the cooperation for conducting clinics. The selected volunteers were supplied with identity cards, list of panchayats

selected, procedures for conducting clinics with last date for completing it, energy kits, pamphlets etc. The energy kit contains the following energy efficient equipment:

- CFL
- Electronic Ballast
- Pressure Cooker
- Nutan Stove
- Thapabharani

The programme was launched on 19 Aug.1998, and is being successfully continued.

### **Training for Engineers**

The Centre designs and organizes a number of training Programmes, Seminars and Workshops since its inception, as a part of its efforts to increase the skill and capability of energy professional in the State. Experts from different fields present technical papers and participate in the discussion. Based on requests from many industries, EMC also organizes specific training for their executives and awareness programme for their staff/colony residents. Topics usually covered include:

- Accelerated Power Development & Reforms
- Adjustable speed electric drives
- Air compression
- Biomass application
- Boilers & Steam System
- Cogeneration
- Demand side management
- DG sets
- Electrical energy saving opportunities
- Electrical Safety
- Energy Conservation Act 2001
- Energy Management & Energy Audit
- Environmentally sound energy technologies
- Furnaces & Kilns
- HRD aspects of energy management
- Instrumentation & Control
- IT based energy monitoring
- Monitoring and Targeting
- Power quality issues
- Pumps, Blowers & Fans
- Refrigeration & Air conditioning

### ➤ **Energy Conservation Clubs (ECC) in schools**

Program objectives

To inculcate among school children, the habit of energy conservation through activities at the energy conservation clubs set up in high schools all over the State.

The Centre, through the efforts of the Energy Conservation Society, sets up energy Conservation Clubs in schools all over the State a NGO functioning in Kerala and the Ministry of Power, Government of India. Clubs are formed in 246 schools in the State each having not less than 50 members.

Different activities are conducted in such clubs to create awareness among school students. The Centre provides necessary technical and partial financial support to the ECCs for conducting different activities like Dance, Drama, Painting, Clay modelling, Elocution, Domestic energy surveys, etc., aimed at creating awareness among the public utilising the services of its members and also educating the members on the need and techniques of energy conservation.

A publication of the Centre titled 'Oorja Samrakshanam - Ippol Thudangaam, Ivide Thudangaam' (Energy conservation - start now, start here) is made available free of cost to all the club members by the Centre. The programs of energy conservation clubs are linked up with the activities of the Science clubs for better outcome. Soon, all the schools in Kerala would be having such clubs and the same would be extended to the Colleges in the State as well.

## 4.7 ENERGY SAVING POTENTIAL

### ➤ **Energy Saving Potential In Agricultural Sector**

The annual electricity supply to the agriculture sector is 0.24 Billion Units (BU). The major energy consumption lies with running of agricultural pumps. The population of agricultural pump sets is around 4.3 Lakhs, accounting for a connected load of 2,155 MW and annual consumption of 0.24 BU. Based on several studies carried out on agricultural pump set efficiency, it has been observed that the pump efficiency varies in the comparatively lower segment of 25-35% due to various factors. By adopting BEE star labelled agricultural pump sets, the pumping efficiency can be enhanced up to 50-52%. It is estimated that, by replacement of existing pumps with the BEE star labeled pumps, the achievable saving potential is 30-40% and sectoral saving potential works out to be 0.07 BU per year.

### ➤ **Energy Saving Potential In Commercial Sector**

The annual electricity supply to commercial sector is 1.9 BU and accounts for 15.7 % of the total electricity sold. The commercial sector constitutes Government and Private establishments, hospitals, hotels, restaurants, educational institutions, malls

etc. The energy saving potential is assessed based on those buildings with over 500 kW (or 600 KVA) connected load have been considered.

There are 45 commercial buildings in the State accounting for annual energy consumption of 506 MU which works out to about 26.4% of the sectoral consumption. The break up of energy consumption category wise is shown in the following Figure 12.

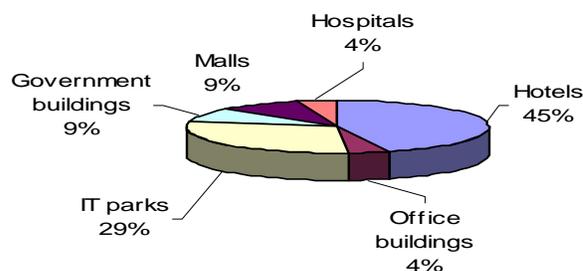


Figure 12: *Sectoral Energy Consumption (%)*

Various studies reveal that energy savings potential in commercial buildings varies from 20-30%. The annual energy savings potential for 45 commercial buildings is assessed to be 0.102 BU.

### ➤ **Energy Saving Potential In Municipalities**

The annual electricity supply to public lighting and public water works and sewage works out to 0.569 BU. For major 53 Municipalities and 5 Municipal Corporations in Kerala under consideration, the annual electricity consumption for street lighting is 0.02 BU and annual consumption for water and sewage pumping is 0.01 BU.

Based on sample studies, the energy savings potential for street lighting in municipalities and corporations is assessed to be 25% and works out to 0.005 BU per annum. While, the energy savings potential for water works and sewage in municipalities & corporations is assessed to be 20% and works out to 0.002 BU per annum. The aggregate sectoral saving potential among the above works out to 0.007 BU.

### ➤ **Energy Saving Potential In SME Clusters**

Four energy intensive SME clusters have been identified in Kerala namely, Rice Mills, Steel Re-rolling, Seafood Processing, and Crumb rubber processing for high specific energy consumption and potential energy savings assessment as mentioned in Table 8 below.

Table 8: *Energy Saving Potential in SME Cluster*

Cluster Location	Cluster type	Total Units listed (nos.)	Estimated Total Energy Consumption	% Savings potential assessed	Annul energy saving Potential assessed
Kaladi	Rice Mills	41	23616 TOE	15	3542.4 TOE
			29.7 MU	15	4.45 MU
Kanjikode	Rerolling	54	34992 TOE	20	6998.4 TOE
			825 MU	15	123.75 MU
Aroor	Seafood Processing	31	31.1 MU	20	6.22 MU
Kottayam	Crumb rubber	52	9934 TOE	15	1490.1 TOE
			38.3 MU	10	3.83 MU
<b>Total</b>					<b>138.255 (MU) 12030.9 (TOE)</b>

In addition to the above, BEE has been implementing National Schemes for promoting energy efficiency in household sector and Industrial sector. While in the household sector, replacement of inefficient lights and appliances are the key thrust areas, industrial energy efficiency is being mandated under section 14 of the Act as well as promoted through the National Energy Conservation Awards.

### ➤ *Energy Saving Potential In Domestic Sector*

In Kerala, the annual electricity sale to domestic sector is 5.6 BU which accounts for 46.3% of the total electricity sold. The domestic sector electricity consumption varies with respect to rural and urban segments and climatic seasonal variations. In the rural segment major use of electricity is towards usage of electrical energy in lights and fans. In the urban segment the typical energy consumption pattern is provided in Table 9 placed below.

Table 9: *End Energy Usage Pattern in Household*

S. No.	Appliances	Energy Consumption (%)
1	AC & Refrigeration	56 %
2	Lights & Fans	26 %
3	Water Heaters, TV, Washing Machines, etc	14 %
4	Others	4 %

The energy use in air conditioners also varies significantly with seasons and climatic conditions.

The major avenues for energy savings in rural domestic sector include:

1. Replacement of GLS bulbs with CFLs
2. Adoption of BEE star labelled domestic appliances like ceiling fans, refrigerators, AC units, tube lights etc

3. The savings potential in rural segment by adopting CFLs and BEE star rated products is 40-50%.
4. The savings potential in urban segment by adopting BEE star rated products is 15-20%.

On the whole, the energy savings potential in domestic sector is estimated 20-25% which accordingly works out to 1.12 BU per annum.

### ➤ **Energy Saving Potential In Industries**

The annual electricity sales to the industry sector including low and medium voltage consumers (SME) and high voltage consumers (large industries) is 3.534 BU and works out to 29.1 % of the total electricity sold. The larger industries segment is covered for energy efficiency under the mandates of EC Act as Designated Consumers, while SME segment is being addressed for energy efficiency through cluster based initiatives by Bureau of Energy Efficiency.

Based on several studies and energy audits, the electrical energy saving potential in industry sector varies from 7-10%. The energy savings potential for the sector is assessed to be 0.247 BU.

### ➤ **Total Energy Saving Potential In Kerala**

The end energy usage saving potential in the State of Kerala is summarized in Table 10 and pictorially represented in Figure 13 mentioned below. It is estimated that the saving potential around 1.558 BU of Electricity and 12030 TOE of Oil is prevailing.

Table 10: *Energy Saving Potential – Sector wise*

No.	Sector Reference	Estimated annual Saving Potential (BU)	Tonnes of Oil Equivalent
1	Agricultural	0.072	
2	Commercial	0.102	
3.	Municipalities	0.007	
4.	SME Clusters	*	12030.9
5.	Domestic	1.13	
6.	Industries	0.247	
<b>TOTAL</b>		<b>1.558</b>	<b>12030.9</b>

\* SME clusters electrical energy savings potential is already included in Industrial sector.

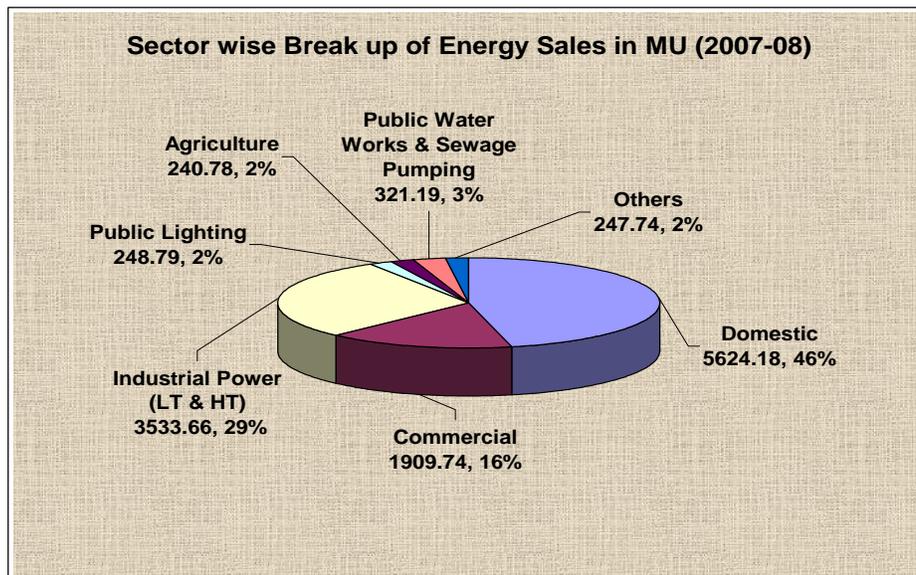


Figure 13: *Energy Saving Potential – Sector wise*

The total energy saving potential for the state among the above sectors is 1.558 BU representing 12.8 % of the annual energy consumption, which is represented in the Figure 14 mentioned below.

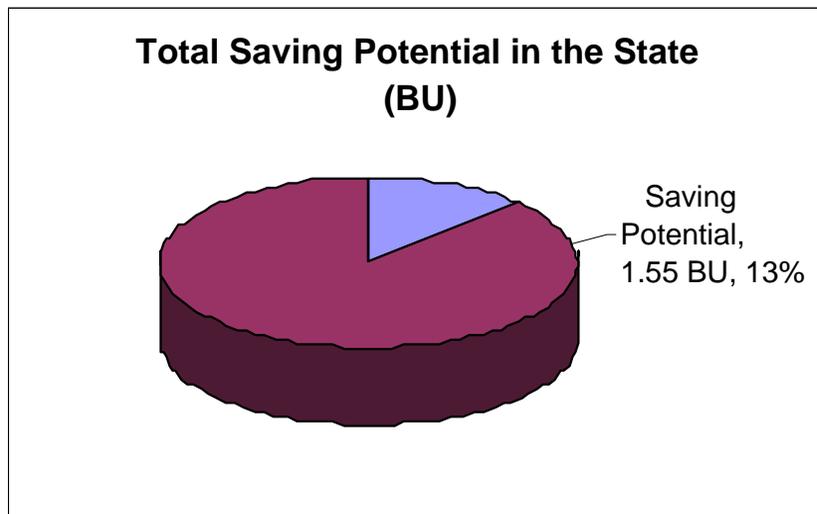


Figure 14: *Energy Saving Potential – Sector wise*

## 4.8 KEY INDICATORS

The per capita energy consumption in the State of Kerala is *about 424 units per year\** ([http://www.inrnews.com/realestateproperty/india/infrastructure/per\\_capita\\_power\\_consumption\\_i.html](http://www.inrnews.com/realestateproperty/india/infrastructure/per_capita_power_consumption_i.html) accessed on 30 Sep 2010), whereas, India as a whole the per capita consumption is *about 613 units/year*.

Of the total energy sales amounting to 12.0 BU in the year 2007-08, Commercial, Industrial and Municipal account for about 50%. The GHG emission from the power usage in Kerala works out about 26 mt<sub>CO2</sub>. The scenario in terms of actual energy usage is given in Table 11 below:

Table 11: *Energy Scenario*

Power scenario of Kerala for 2007-08	
Installed Capacity	3492.1 MW
Total Energy Sales	12120 MU
Peak Demand	2918 MW
Peak Met	2730 MW
Peak Deficit / Surplus	-188 MW (-6.4 %)
Energy Deficit / Surplus	-379 MU (-2.4%)

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## Action Points for EMC

The EC Act came into existence in 2001 and has been implemented since 2002. The energy conservation act has given powers to both the central level authority (The Bureau of Energy Efficiency – BEE) and the state level State Designated Agencies (SDAs) to implement the act. Various powers thus have been ascribed to both these agencies working in tandem with each other. The following analysis covers the possibilities for the Kerala SDA – the Energy Management Center (EMC), Thiruvananthapuram to act upon the provisions laid out in the act for the benefit of the state and the nation.

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
8	<b>Constitution of Advisory Committees and other committees</b>		
(1)	Subject to any regulations made in this behalf, the Bureau shall, within six months from the date of commencement of this Act, constitute Advisory Committees for the efficient discharge of its functions.	Not relevant	Not EMCs responsibility
(2)	Each Advisory Committee shall consist of a Chairperson and such other members as may be determined by regulations.	Not relevant	Not EMCs responsibility
(3)	Without prejudice to the powers contained in sub-section (1), the Bureau may constitute, such number of technical committees of experts for the formulation of energy consumption standards or norms in respect of equipment or processes, as it considers necessary.	Too early to comment	EMC may want to participate in the technical committees
13	<b>Powers and functions of Bureau</b>		
(1)	The Bureau shall, effectively co-ordinate with designated consumers, designated agencies and other agencies, recognise and utilise the existing resources and infrastructure, in performing the functions assigned to it by or under this Act	General provision	EMC has been one of the leading SDA for the EC Act.
(2)	The Bureau may perform such functions and exercise such powers as may be assigned to it by or under this Act and in particular, such functions and powers include the function and power to -	Not relevant	Not EMC's responsibility
(a)	Recommend to the Central Government the norms for processes and energy consumption standards required to be notified under clause (a) of section 14 ;	Not yet defined by the BEE	EMC should restrict action till the norms are defined since defining the norms by EMC will lead to duplication of efforts
(b)	Recommend to the Central Government the particulars required to be displayed on label on equipment or on appliances and manner of their display under clause (d) of section 14;	Defined by the BEE	The EMC should initiate listing of such equipments, and study the market penetration at regular intervals
(c)	Recommend to the Central Government for notifying any user or class of users of energy as a designated consumer under clause (e) of section 14;	Defined by the BEE	Not within EMCs domain

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(d)	<b>Take suitable steps to prescribe guidelines for energy conservation building codes under clause (p) of section 14;</b>	ECBC has been defined	Keeping in mind the climatic conditions of Kerala EMC can fine tune the ECBC as per its own study.
(e)	<b>Take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation;</b>	The ECBC has been published for general consumption by the BEE	EMC should create awareness about the ECBC. EMC should continue its general participatory awareness campaigns like SAVE
(f)	<b>Arrange and organize training of personnel and specialists in the techniques for efficient use of energy and its conservation;</b>	Already being done by BEE	EMCs own technical programs are being conducted. This should be continued
(g)	Strengthen consultancy services in the field of energy conservation;	The BEE is already doing this by having assignments under various schemes	The EMC has been partnering with the BEE in the development of consultancy services. The audit of 22 governmental buildings in this regard is a good example of the same.
(h)	<b>Promote research and development in the field of energy conservation;</b>	R&D in this field is very limited	EMC should scan for energy conservation research including the international best and build cases for technology transfer and dissemination
(i)	Develop testing and certification procedure and promote testing facilities for certification and testing for energy consumption of equipment and appliances;	For certain equipments such testing and certification centers exist.	The EMC should partner with BEE and other SDAs in order to have more numbers of such centers for different equipment without duplication of efforts. It should also try to facilitate more number of NABL accredited labs in the State.
(j)	Formulate and facilitate implementation of pilot projects and demonstration projects for promotion of efficient use of energy and its conservation;	BEE and EMC in partnership have been working to identify demonstration projects	EMC should undertake these demonstration efforts with speed.
(k)	<b>Promote use of energy efficient processes, equipment, devices and systems;</b>	BEE S&L program has been playing a good and effective role in order to popularize energy efficient equipments	Although not a prime responsibility of the EMC, it should create awareness about the EE equipments in the State of Kerala by having advertisements which promote such equipment. The EMC may also produce pamphlets and brochures for the same.

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(l)	Promote innovative financing of energy efficiency projects;	The BEE has already got a platform for financing of energy efficiency	The EMC should interact with the financial institutions which are a part of the energy efficiency platform like SIDBI, HSBC etc to find out how financial instruments can be used to promote energy efficiency
(m)	Give financial assistance to institutions for promoting efficient use of energy and its conservation;	The State energy conservation fund is already in place	EMC should find suitable partners who have commitment towards energy efficiency and provide them with funds. These partners could include developers of energy efficient solutions and vendors
(n)	Levy fee, as may be determined by regulations, for services provided for promoting efficient use of energy and its conservation;	This has still not been done	The EMC should seek inputs from the relevant State ministry. This can also serve as financial incentive/ disincentive for practicing energy efficiency
(o)	Maintain a list of accredited energy auditors as may be specified by regulations;	The accreditation of energy auditors by BEE at this point of time is suspended	The EMC may come out with its own list in order to give a boost to energy efficiency
(p)	<b>Specify, by regulations, qualifications for the accredited energy auditors;</b>	The accreditation of energy auditors by BEE at this point of time is suspended	The EMC may come out with its own list in order to give a boost to energy efficiency
(q)	<b>Specify, by regulations, the manner and intervals of time in which the energy audit shall be conducted ;</b>	The energy audit format and periodicity have not been defined at the central level	EMC should come up with suitable formats for energy audits and define the periodicity for the same
(r)	Specify, by regulations, certification procedures for energy managers to be designated or appointed by designated consumers;	Notification in place, certificate awaited	Though the number of DCS in Kerala is small it is better to wait for such certification to happen at the central level in order to reduce duplication
(s)	Prepare educational curriculum on efficient use of energy and its conservation for educational institutions, boards, universities or autonomous bodies and coordinate with them for inclusion of such curriculum in their syllabus;	Some of the schools of engineering have energy efficiency (EE) module while other institutions (like the University Of Trivandrum) do not have EE module	The EMC should work towards inclusion of the energy efficiency in the curriculum for the state as a whole. The announcements by the center on having uniform curriculum for all the universities has been made. EMC could work in tandem with the relevant ministry/ies for inclusion of the same.

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(t)	Implement international co-operation programmes relating to efficient use of energy and its conservation as may be assigned to it by the Central Government;	BEE has many project running with help from WB, UNIDO, GEF etc	The EMC should identify where such projects could be undertaken in Kerala and influence further program to include these spots
(u)	Perform such other functions as may be prescribed.	Other functions still to be identified	Other functions may be identified
15	<b>Power of State Government to enforce certain provisions for efficient use of energy and its conservation</b>		
(a)	Amend the energy conservation building codes to suit the regional and local climatic conditions and may, by rules made by it, specify and notify energy conservation building codes with respect to use of energy in the buildings;	No modifications proposed yet	The first step is to ascertain the status of energy efficiency in buildings and then modify ECBC as per the climatic conditions of Kerala
(b)	Direct every owner or occupier of a building or building complex being a designated consumer to comply with the provisions of the energy conservation building codes;	No action taken	The EMCs drive using the SAVE program is oriented towards this goal.
(c)	Direct, if considered necessary for efficient use of energy and its conservation, any designated consumer referred to in clause (b) to get energy audit conducted by an accredited energy auditor in such manner and at such intervals of time as may be specified by regulations;	No action taken	Instead the DCs should be first be asked to conduct energy audits and report the same to EMC/BEE
(d)	Designate any agency as designated agency to coordinate, regulate and enforce provisions of this Act within the State;	EMC is the designated agency	EMC is the State Designated Agency
(e)	Take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation;	Many information dissemination activities conducted	EMC should endeavor to enlarge its area of awareness creation. In the rural areas and in the households the spread of this information is limited. EMC should try to enhance this.
(f)	Arrange and organise training of personnel and specialists in the techniques for efficient use of energy and its conservation;	Activities like energy clinics etc done	The activities should be made wider. There are currently some programs initiated by the BEE in partnership with SDAs. EMC should participate in these as well as have its officers trained in these programmes.
(g)	Take steps to encourage preferential treatment for use of energy efficient equipment or appliances;	S&L program of BEE has done well in the State	Govt procurement should consider life cycle costs

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(h)	Direct, any designated consumer to furnish to the designated agency, in such form and manner and within such period as may be specified by rules made by it, information with regard to the energy consumed by such consumer;	The rules are not yet made	The rules should be framed as soon as possible
(i)	Specify the matters to be included for the purposes of inspection under sub-section (2) of section 17;	SDA is yet to specify such matters	Most states have not done this keeping in mind the evolution of the implementation of the act
16	<b>Establishment of Fund by State Government</b>		
(1)	<b>The State Government shall constitute a Fund to be called the State Energy Conservation Fund for the purposes of promotion of efficient use of energy and its conservation within the State.</b>	The notification has been issued	EMC should follow up and activate the fund.
(2)	To the Fund shall be credited all grants and loans that may be made by the State Government or, Central Government or any other organization or individual for the purposes of this Act.	Will happen in due course	
(3)	The Fund shall be applied for meeting the expenses incurred for implementing the provisions of this Act.	Will happen in due course	
(4)	The Fund created under sub-section (1) shall be administered by such persons or any authority and in such manner as may be specified in the rules made by the State Government.	Will happen in due course	
17	<b>Power of inspection</b>		
(1)	The designated agency may appoint, after the expiry of five years from the date of commencement of this Act, as many inspecting officers as may be necessary for the purpose of ensuring compliance with energy consumption standard specified under clause (a) of section 14 or ensure display of particulars on label on equipment or appliances specified under clause (b) of section 14 or for the purpose of performing such other functions as may be assigned to them.	Not happened yet	this has not happened in any state, the EMC should take the lead and identify both the industries and the parameters for labeling
(2)	Subject to any rules made under this Act, an inspecting officer shall have power to -		

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(a)	Inspect any operation carried on or in connection with the equipment or appliance specified under clause (b) of section 14 or in respect of which energy standards under clause (a) of section 14 have been specified;	Too early to comment	
(b)	Enter any place of designated consumer at which the energy is used for any activity and may require any proprietor, employee, director, manager or secretary or any other person who may be attending in any manner to or helping in, carrying on any activity with the help of energy -	Too early to comment	
(i)	To afford him necessary facility to inspect -	Too early to comment	
(A)	Any equipment or appliance as he may require and which may be available at such place;	Too early to comment	EMC should try to build the capacity of such persons in the State to undertake the task when they are proposed
(B)	Any production process to ascertain the energy consumption norms and standards;	Too early to comment	EMC should try to build the capacity of such persons in the State to undertake the task when they are proposed
(ii)	To make an inventory of stock of any equipment or appliance checked or verified by him;	Too early to comment	EMC should try to build the capacity of such persons in the State to undertake the task when they are proposed
(iii)	to record the statement of any person which may be useful for, or relevant to, for efficient use of energy and its conservation under this Act.	Too early to comment	EMC should try to build the capacity of such persons in the State to undertake the task when they are proposed
(3)	An inspecting officer may enter any place of designated consumer -		
(a)	where any activity with the help of energy is carried on; and	Too early to comment	
(b)	Where any equipment or appliance notified under clause (b) of section 14 has been kept, during the hours at which such places is open for production or conduct of business connected therewith.	Too early to comment	

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(4)	An inspecting officer acting under this section shall, on no account, remove or cause to be removed from the place wherein he has entered, any equipment or appliance or books of accounts or other documents.	Too early to comment	
18	<b>Power of Central Government or State Government to issue directions</b>		
	The Central Government or the State Government may, in the exercise of its powers and performance of its functions under this Act and for efficient use of energy and its conservation, issue such directions in writing as it deems fit for the purposes of this Act to any person, officer, authority or any designated consumer and such person, officer or authority or any designated consumer shall be bound to comply with such directions.		
	Explanation – For the avoidance of doubts, it is hereby declared that the power to issue directions under this section includes the power to direct –		
(a)	<b>Regulation of norms for process and energy consumption standards in any industry or building or building complex;</b> or	No norms developed	EMC should develop the norms for commercial buildings as these seem to be important energy users in the State of Kerala. Norms for industry may be adopted from the BEE norms when they come up.
(b)	Regulation of the energy consumption standards for equipment and appliances.	No standards laid out by State or central government. Currently only norms are those laid out by BEE under S&L program	Standards should be developed by EMC in consultation with BEE. The current S&L program also offers consumption standards
56	<b>Power of Central Government to make rules.</b>	<b>Status</b>	<b>Further suggested action for EMC</b>
	The Central Government may give directions to a State Government or the Bureau as to carrying out into execution of this Act in the State		
(1)	The Central Government may, by notification, make rules for carrying out the provisions of this Act.	Only regulations pertaining to the size of DCs have been made	

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(2)	In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:-		
(a)	Such number of persons to be appointed as members by the Central Government under clauses (o), (p) and (q) of sub-section (2) of section 4;	Too early to comment	
(b)	The fee and allowances to be paid to the members under sub-section (5) of section 4;		
(c)	The salary and allowances payable to the Director-General and other terms and conditions of his service and other terms and conditions of service of the Secretary of the Bureau under sub-section (4) of section 9;	Too early to comment	
(d)	The terms and conditions of service of officer and other employees of the Bureau under sub-section (2) of section 10;	Too early to comment	
(e)	Performing such other functions by the Bureau, as may be prescribed, under clause(u) of sub-section (2) or section 13;	Too early to comment	
(f)	The energy consumption norms and standards for designated consumers under clause (g) of section 14;	Partially laid out in the form of regulations for identification as DCs	
(g)	Prescribing the different norms and standards for different designated consumers under the proviso to clause (g) of section 14;	Done by BEE	
(h)	The form and manner and the time within which information with regard to energy consumed and the action taken on the recommendations of the accredited energy auditor be furnished under clause (k) of section 14;	Energy audits done in various units by EMC	The EMC should seek the status of implementation by the units where energy audits have been done.
(i)	The form and manner in which the status of energy consumption be submitted under clause (l) of section 14;	DCs are supposed to e-file their energy returns with the BEE	The EMC should seek the status of implementation by the units where energy audits have been done.
(j)	The minimum qualification for energy managers under clause (m) of section 14;	At present the Energy Managers are appointed by the DCs	EMC should continue with the current status

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(k)	The form and manner for preparation of scheme and its implementation under clause (o) of section 14;	EMC has developed many schemes like the SAVE	These schemes are progressing well and have done a lot to make people aware of the energy conservation issues
(l)	The energy conservation building codes under clause (p) of section 14;	ECBC has been laid out by the BEE	EMC should prescribe that new buildings (larger than 500 kW load) should follow the ECBC mandatorily
(m)	The matters relating to inspection under sub-section (2) of section 17;	Inspection activities have not yet started	
(n)	The form in which, and the time at which, the Bureau shall prepare its budget under section 22;	Not relevant	
(o)	The form in which, and the time at which, the Bureau shall prepare its annual report under section 23;	Not relevant	
(p)	The form in which the accounts of the Bureau shall be maintained under section 25;	Not relevant	
(q)	The manner of holding inquiry under sub-section (l) of section 27;	Not relevant	
(r)	The form of and fee for filing such appeal under sub-section (2) of section 31;	Not relevant	
(s)	The salary and allowances payable to and other terms and conditions of service of the Chairperson of the Appellate Tribunal and Member of the Appellate Tribunal under section 35;	Not relevant	
(t)	The salary and allowances and other conditions of service of the officers and other employees of the Appellate Tribunal under sub-section (3) of section 39;	Not relevant	
(u)	The additional matters in respect of which the Appellate Tribunal may exercise the powers of a civil court under clause (i) of sub-section (2) of section 40;	Not relevant	
(v)	Any other matters which is to be, or may be, prescribed, or in respect of which provision is to be made, or may be made by rules.		
57	<b>Power of State Government to make rules</b>	<b>Status</b>	<b>Further suggested action</b>

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(1)	The State Government may, by notification, makes rules for carrying out the provisions of this Act and not inconsistent with the rules, if any, made by the Central Government.	No rules have been developed	EMC should make rules in consultation with BEE
(2)	In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely: -		
(a)	energy conservation building codes under clause (a) of section 15;	Currently ECBC is in vogue	EMC should ensure compliance with BEE
(b)	The form, the manner and the period within which information with regard to energy consumption shall be furnished under clause (h) of section 15;	BEE has initiated e-filing of energy returns	EMC should help DCs in the e-filing of returns
(c)	The person or any authority who shall administer the Fund and the manner in which the Fund shall be administered under sub-section (4) of section 16;	Too early to comment	
(d)	The matters to be included for the purposes of inspection under sub-section (2) of section 17	Too early to comment	
(e)	Any other matter which is to be, or may be, prescribed, or in respect of which provision is to be made, or may be made, by rules.	Too early to comment	
58	<b>Power of Bureau to make regulations</b>	<b>Status</b>	<b>Further suggested action</b>
(1)	The Bureau may, with the previous approval of the Central Government and subject to the condition of previous publication, by notification, make regulations not inconsistent with the provisions of this Act and the rules made thereunder to carry out the purposes of this Act.	Only regulations regarding the size of energy use by DCs is out	EMC should work towards getting the DCs under its area to file energy returns and practice energy conservation
(2)	In particular, and without prejudice to the generality of the foregoing power, such regulations may provide for all or any of the following matters, namely:-		
(a)	The times and places of the meetings of the Governing Council and the procedure to be followed at such meetings under sub-section (1) of section 5;	Not relevant	

Clause No.	THE ENERGY CONSERVATION ACT, 2001	Status	Further Suggested Action for EMC
(b)	The members of advisory committees constituted under sub-section (2) of section 8;	Not relevant	
(c)	The powers and duties that maybe exercised and discharged by the Director-General of the Bureau under sub-section (6) of section 9;	Not relevant	
(d)	The levy of fee for services provided for promoting efficient use of energy and its conservation under clause (n) of sub-section (2) of section 13;	Not relevant	
(e)	The list of accredited energy auditors under clause (o) of sub-section (2) of section 13;	The provisional accredited energy auditor list is no more valid	the EMC should (a) design its own accredited energy auditor list , and (b) advise the BEE on accreditation of the energy auditors
(f)	The qualifications for accredited energy auditors under clause (p) of sub-section (2) of section 13;	The provisional accredited energy auditor list is no more valid	EMC should design its own accreditation criteria until the BEE comes up with a fresh accredited energy auditor list
(g)	The manner and the intervals or time in which the energy audit shall be conducted under clause (q) of sub-section (2) of section 13;	The periodicity for energy audits is not yet defined by the BEE	the EMC should decide the periodicity of energy auditors
(h)	Certification procedure for energy managers under clause (r) of sub-section (2) of section (13);	Certification procedure for the energy managers is decided by the BEE	EMC should follow the BEE certification procedure
(i)	Particulars required to be displayed on label and the manner of their display under clause (d) of section 14;	This is decided by the BEE	EMC need not duplicate the effort
(j)	<b>The manner and the intervals of time for conduct of energy audit under clause (h) or clause (s) of section 14;</b>	The periodicity for energy audits is not yet defined by the BEE	EMC should decide the periodicity under its own area
(k)	<b>The manner and the intervals of time for conducting energy audit by an accredited energy auditor under clause (c) of section 15;</b>	The periodicity for energy audits is not yet defined by the BEE	EMC should decide the periodicity under its own area
(l)	Any other matter which is required to be, or may be, specified.		

## KPIs and Salient Points arising out of Discussions

The Key Performance Indices for the survey were varied and different for many stakeholders in the survey.

Socio economic impact, energy security, investment grade energy audits etc were considered for discussions with various stakeholder. In the State of Kerala the BLY (Bachat Lamp Yojana) of the BEE has done very well. The power licensees have distributed two CFL lamps in return for two 60 W lamps in the State. This has obviously lowered the per capita energy consumption in the State.

Investment grade energy audits have been conducted by the EMC in order to lay the ground for taking up energy conservation projects. Twenty-two such audits have been conducted in the State of Kerala in Government buildings in order to achieve this. These audits have been conducted with the help of the BEE.

An analysis of the IGEAs was done with the help of material provided by the EMC. In general it was found that there is a lot of potential to save electricity in these building through both air-conditioning and lighting loads.

The model developed for the implementation of the IGEAs is through ESCOs.

However in the discussions many people have voiced concern over the application of the reports. Because the implementation has to be done through the ESCO mode the reports have to include various financial parameters as well which has not been included as of now.

Many a times both the building owners and the ESCOs shy away from implementing projects that have not been proven on ground. In order to overcome this barrier the EMC should take up demonstration projects for the new technologies suggested in the IGEAs.

However it appears that the IGEAs while technically sound did not have ample financial details to make a project financially convincing. This makes the implementation more difficult especially through the ESCO route. However these are expected when such exercises are being carried out for the first time in the State. It was also conveyed that the suitability of technological solutions at this point of time is also not adequate to address the issues. Thus the major problem is that convincing solutions are not yet demonstrated in the field. Among the examples it was cited that in a hospital the amount of critical load that can be subjected to energy conservation is limited. The hospital machinery cannot be subjected to energy conservation measures being very critical to the operation of the hospital. This leaves only the lighting and air-conditioning loads available to implement energy conservation.

In the state planning sums have also been provided to the local self government in order to build and maintain application for energy efficiency, micro-hydel projects and other resource management.

Agencies like Technopark also pointed out that any new construction in the Technopark are being designed keeping the ECBC in mind and they are trying to have a design load of 110 kWh/sqm/year for the new buildings. Initiatives such as these are welcome since they provide a ground for better energy efficiency in the buildings.

Most of the agencies covered had been trained by the EMC training programme, however not many of them have held internal training programmes for their employees.

S. No.	KPI	Relevance	Expected Behaviour
1	Carbon Foot Print	CDM projects will reduce carbon footprint Carbon footprint studies will help gauge energy efficiency in operations	Providing a number to carbon-footprints will help people / organizations realize the environmental impact of their operations and thus help in bringing awareness to reduce the carbon footprint
2	Instances (number) of successful energy efficiency project implemented	Demo projects help in convincing people to adopt new technologies by showing the way to energy efficiency	More demo project should come up
3	Green Buildings (number of), ECBC compliance in building Sector	Building and commercial sectors have a high proportion of electricity consumption	New buildings should be ECBC compliant The BEE has also come out with Green Buildings award
4	Specific Energy Norms in Industrial, Commercial, Agricultural etc.	Currently there are no specified norms. Norms need to be developed for industries, commercial and agricultural sector.	Norms should tend to go down
5	Energy Savings achieved – absolute and Year-over-Year	Energy Savings need to be calculated for various sectors	This figure should increase year over year
6	Number of Awareness Programmes by SDA, NGOS, Institutions etc.	Awareness program have to reach out to more people	People participation in the awareness program should increase
7	Reduction of greenhouse gas (Amount of)	GHG emissions are directly linked to energy usage	GHG emissions should reduce

It is suggested that EMC should take up an independent study to identify the baseline KPI figures and check the figures at regular intervals (annually) in order to see the impact of the energy conservation act.

## Conclusions

The general conclusions drawn from the survey vis-à-vis the EC Act are as follows:

1. The information about the EC Act is known and well understood by designated consumers, industries and commercial players. Designated consumers had already appointed Energy Managers to comply with the provisions of the EC Act.
2. The energy auditors in general understand the EC Act very well, but are still looking at the BEE / SDA to give more visibility to the EC Act in order to get them some business.
3. Common people and households are not much aware about the Act, however, mostly people perceive the Act as a mandatory Act without knowing the provisions of the Act. The voluntary nature of many of the provisions is not known by the people. It is assumed that all provisions of the Act are mandatory.

### 7.1 SUGGESTIONS

1. The EMC needs to inform the stakeholders about its role under the EC Act, and the benefits of the EC Act through posters and energy conservation / efficiency tips.
2. The industrial and commercial users need to be educated about the benefits of energy conservation and energy efficiency.
3. The salesman in appliance stores need to be informed about the star label scheme and need to be trained in the concept of energy efficiency and energy conservation.

### 7.2 SPECIFIC FEEDBACK FROM ENERGY AUDITORS AND ENERGY MANAGERS

Feedback from BEE Certified energy auditors and energy managers on impact of EC Act 2001 on key stake holders has been taken through the instrument – Questionnaire. The Questionnaire has been sent to about 20 Energy Auditors and Energy Managers of different sectors in Kerala. About eight BEE certified Energy Auditors responded with feed back. Comments and suggestions received from the BEE certified Energy Auditors and Energy Managers are summarized as below.

- As the EC Act - 2001 is not enforced seriously by the government no body is taking measures as mandatory.
- The units are serious enough to implement energy conservation measures suggested by auditing firms through energy audits
- Government has to encouraging the key stakeholders in the state to conduct energy audits either by giving the incentives or penalties.

- To enhance the awareness of EC Act 2001 among key stakeholders, following measures are to be taken
  - ↳ SDA shall focus more on Industrial Sector
  - ↳ Focus more on awareness creation and policy making level
  - ↳ More co-ordinated efforts needed through proper net working with different stakeholders
  - ↳ More efforts to utilizing expertise locally available
  - ↳ Shall provide useful resources through web and other means
  - ↳ Incentivizing / subsidizing energy saving measures
  - ↳ EMC shall act as a clearing house for information on energy efficiency matters
- Out of eight Energy Auditors interviewed, seven of them carried out following activities apart from energy audit for promoting Energy Conservation
  - ↳ Awareness raising events/programs
  - ↳ Capacity building & training programs
  - ↳ Seminars/conferences/workshops
- Energy Conservation Act to be made mandatory
- Preferential investment for EC measures

### 7.3 OTHER RECOMMENDATIONS

The other recommendations and valuable suggestion that came out during the interview with various stakeholders during survey conducted in the State of Kerala are summarized below:

- The recommendations for EMC are:
  - ↳ More follow-up activities by EMC
  - ↳ Multidisciplinary resource pool to be developed at EMC
  - ↳ The present energy conservation award criteria for industries to be revamped
- The subject “Energy Conservation” has already been included in the school curriculum. However not much emphasis is given to it in the undergraduate curriculum and inferred from discussions in the universities. EMC should attempt to get energy conservation included in the undergraduate syllabi as well.
- More involvement/utilization of NGOs working in the energy sector
- Brochures and flyers of EMC, KPSC, and PCRA have been distributed
- The State Government is active in promoting energy efficiency in Kerala and made Energy Audit compulsory since 1992.

EMC is in the process of floating a new company to implement energy efficiency in the state. It is relevant here to note that a similar effort has been undertaken at the central level by the BEE with the floating of the EESL ([www.eesl.co.in](http://www.eesl.co.in)). It is highly recommended that to give a business angle to energy saving in order to make it financially and economically sustainable such an effort should be undertaken as soon as possible.

## MODEL QUESTIONNAIRE FOR CITIZENS

1. Name of the person :
2. Gender: Male/Female :
3. Age:
4. Educational Qualification:
5. Occupation:
6. Address- State HQ / District HQ / Mandal HQ / Village (tick mark appropriate option)
7. Are you aware of Energy Conservation Act – 2001 (Yes/No)? :
8. Whether the EC Act-2001 - Voluntary or Mandatory?
9. What are all the sectors covered under the Act?
10. Whether Govt. is interested/ pro-active in implementing the Act?
11. What is the difference between energy conservation & energy efficiency?
12. Are you doing anything for conserving energy?
13. If yes, how?
14. What are the energy efficient technologies you are using?
15. Are you aware of standards & labeling of various products?
16. Are you aware of star rating of products?
17. How do you identify energy efficient products in shops / markets?
18. What are the products for which star rating is available?
19. Through what media, you were exposed to EC?

### Extended Questions to Household

20. What is your bimonthly electricity bill in Rs?
21. What is your bi-monthly electricity consumption in units (kWh)  
(If answer is don't know write it as 'don't know')
22. Are you using own transport to work place; Yes/no:
23. If yes, type of vehicle used, Car/Two wheeler

24. Monthly fuel expenses for your vehicle Rs:
25. Monthly fuel consumption for vehicles Lrs
26. Fuel used for cooking (LPG/Kerosene stove/Wood stove ordinary/ Wood stove improved/ Electric heater)
27. If wood stove is used, are you purchasing fuel wood Yes/No?
28. If yes quantity of wood purchased per month Kg.
29. Are you using any of the following devices at home Improved chulla, biogas plant, Thermal cooker, pressure cooker, Electronic chokes for tube lights, electronic regulators for ceiling fan
30. Are you using energy star labeled products such as Fridge, ceiling Fan, Tube lights?
31. In case you are not using Energy star labeled products do you prefer to purchase such products in future?

## MODEL QUESTIONNAIRE FOR COMMERCIAL & INDUSTRIES SECTOR

1. Name of the person:
2. Gender: Male/Female:
3. Age:
4. Educational Qualification:
5. Occupation/designation:
6. Name of Industry:
7. Are you aware of Energy Conservation Act – 2001 (Yes/No) and how do you benefited?
8. Whether the EC Act-2001 - Voluntary or Mandatory?
9. What are all the sectors covered under the Act?
10. Whether Govt. is interested/ pro-active in implementing the Act?
11. What is specific thermal energy consumption?
12. Are you aware about DC in EC Act 2001?
13. Is EC measures and savings implemented?
14. Have you applied for any EC awards?
15. Any expectations from SDA  
Training, Awareness programs etc.
16. Any new employment generated on account of EC Act 2001/EE measures?
17. Have you undertaken any energy audits? Have you implemented the recommendations?

## MODEL QUESTIONNAIRE FOR NGOS

1. Name of the NGO & Contact person :
2. Gender: Male/Female: Male
3. Age: 38
4. Educational Qualification:
5. Occupation/designation:
6. Are you aware of Energy Conservation Act – 2001 (Yes/No) and how do you benefited?
7. Whether the EC Act-2001 - Voluntary or Mandatory?
8. What are all the sectors covered under the Act?
9. Whether Govt. is interested/ pro-active in implementing the Act?
10. Have you got any assistance from state govt for undertaking energy efficiency?
11. Have you undertaken any activities related to energy efficiency?
12. Have you applied for any EC awards?
13. Any expectations from SDA

## MODEL QUESTIONNAIRE - 4 FOR DESIGNATED CONSUMERS (DCs)

1. Name of the person:
2. Gender: Male/Female:
3. Age:
4. Educational Qualification:
5. Occupation/designation:
6. Name of Industry:
7. Are you aware of Energy Conservation Act – 2001 (Yes/No) and how do you Benefitted?
8. Whether the EC Act-2001 - Voluntary or Mandatory?
9. What are all the sectors covered under the Act?
10. Whether Govt. is interested/ pro-active in implementing the Act?
11. What is specific thermal energy consumption?
12. Are you aware about DC in EC Act 2001?
13. Do you have a certified energy manager as stipulated by the EC Act 2001?
14. Is EC measures and savings implemented?
15. Have you applied for any EC awards?
16. Any expectations from SDA
17. Any new employment generated on account of EC Act 2001

## MODEL QUESTIONNAIRE FOR ENERGY MANAGER AND ENERGY AUDITOR

1. Name & Contact Address
2. Please specify whether Energy Auditor or Energy Manager
3. Please specify the no. of years you are in energy conservation business
4. Please indicate the number of energy audits conducted by you/your organization in sector wise in each year.

S. No	Sectors	2004-05	2005-06	2008-09	2009-10
1	Thermal power stations				
2	Pulp & paper				
3	Iron & steel				
4	Chlor alkali				
5	Aluminum				
6	Cement				
7	Fertilizer				
8	Textile				
9	Railways				
10	Others				
11	Commercial buildings				
12	Municipal/public utilities				
13	Schools				
14	Others				

5. Whether the units are serious enough to implement energy conservation measures suggested by auditing firms through energy audits? If not what are the reasons for not implementing the measures?
6. Besides energy audits, please indicate the activities carried out by you for promoting energy conservation in the State.

- Awareness raising events/programs
  - Capacity building & training programs --
  - Seminars/conferences/workshops --
  - Printing & distribution of newsletters/flyers/brochures --
  - Please specify others if any --
7. Whether the EC Act has made the desired impact on energy conservation in the key sectors in the State?
  8. If not, please describe reasons for failure or slowdown on impact
  9. Whether the State Government is active in promoting energy efficiency in the State?
  10. Is the State Government successful so far in reaching out to the people about the EC Act and the need / benefits of energy conservation
  11. According to you, what is the role being played by EMC in implementing EC Act 2001 in the State?
  12. What are your recommendations / suggestions to enhance the awareness of EC Act 2001 among key stakeholders?
  13. Any other information you would like to share

**Thank you for your valuable time & inputs**

**Winrock International India (WII) Team  
On behalf of AMC**

## SAMPLE QUESTIONNAIRE FOR ANERT & KSPC

1. Name and address of the organization:
2. Name of contact Person:
3. Gender: Male/Female:
4. Age:
5. Educational Qualification:
6. Occupation/designation:
7. What are the Key focus areas of your organization?
8. Are you aware of Energy Conservation Act – 2001 (Yes/No?)
9. What are the activities you are carrying out to conserve energy?
10. Whether Govt. is interested/ pro-active in implementing the Act?
11. What are the specific sectors you are focusing to conserve energy?
12. Are you satisfactory with the progress achieved so far by the government efforts to foster energy conservation in Kerala? If not what are the reasons?
13. Have you got any assistance (financial or from State Government for undertaking energy conservation activities?
14. What are your expectations from State Designated agency for Energy Conservation act, Energy Management Centre, Kerala?
15. What are your specific achievements in energy conservation?
16. What do you think, the SDA, Government should further do for accelerated promotion of energy conservation in Kerala?
17. Any other suggestions

## SECTOR-WISE DETAILS OF THE INDUSTRIES

S. No.	Name of Industry	Type of Industry	Sector	Product/Activities
1	Autokast Ltd.	A Government Of Kerala Undertaking	Engineering	Gray Iron, SG Iron, Steel
2	Forest Industries (Travancore) Ltd.	A Government Of Kerala Undertaking	Forest	Wooden Furniture, Joineries
3	Handicrafts Development Corporation (Kerala) Ltd.	A Government Of Kerala Undertaking	Handloom & Handicraft	Promotion of clusters for the development of handicraft products
4	The Kerala State Handloom Weavers Co-operative Society Ltd. (HANTEX)	A Government Of Kerala Undertaking	Textiles	Handcrafted fabrics, garments, furnishing, made-ups, sarees, traditional wears
5	Keltron Component Complex Ltd.	A Government Of Kerala Undertaking	Electronics	Aluminium Electrolytic Capacitors
6	Keltron Crystals Ltd.	A Government Of Kerala Undertaking	Electronics	Precision piezo electric Quartz Crystals, Lead Tabs for Aluminium Capacitors
7	Keltron Electro Ceramics Limited	State PSU under Industries Dept, Govt of Kerala	Electronics	Ceramic capacitors, NTC thermistors, Piezo Ceramic, Buzzers, Metal oxide varistors, Surge protectors, Transducers
8	Keltron Magnetics Limited	State PSU under Industries Dept, Govt of Kerala	Electronics	MPP capacitors, SCVS, UPS
9	Forest Industries (Travancore) Ltd.	A Government Of Kerala Undertaking	Forest	Wooden Furniture, Joineries

S. No.	Name of Industry	Type of Industry	Sector	Product/Activities
10	Kerala Automobiles Ltd	Public Sector Under Kerala Govt.	Engineering	Three wheeler vehicles, Autoricashaw, Pick up Van, Delivery Van, Auto chassis, Hydraulic Tipper
11	Kerala Clays & Ceramics Products Ltd	A Government Of Kerala Undertaking	Mining	Mining & purification of Chinaclay, manufacturing of Refractory/Wirecut Bricks
12	Kerala Electrical and Allied Engineering Company Ltd	A Government Of Kerala Undertaking	Industry	Manufacture of Distribution Transformers, HRC fuses, Galvanised Structures, Steel Structures, Cast Iron specials, Electric Motors, Alternators (Train Lighting), Electrical & Wiring Accessories, Alternators (General Purpose) & DG sets
13	Kerala Sate Bamboo Corporation Ltd	A Government Of Kerala Undertaking	Forest	Extraction of reeds from forest, distribution of reeds to traditional Bamboo Workers, Procurement of Bamboomats from them, marketing of these bamboomats, production and marketing of bambooply boards
14	Kerala State Drugs & Pharmaceuticals Ltd	A Government Of Kerala Undertaking	Drugs, Chemicals & Pharmacueticals	Manufacture of Drugs & Pharmaceuticals
15	Kerala State Electronics Development Corporation Limited (KELTRON)	A Government Of Kerala Undertaking	Electronics	Electronic Components, Video Surveillance and Security System, High capacity Uninterrupted Power Supply System (UPS)
16	Kerala State Handloom Development Corporation Ltd (HANVEEV)	support of State and Central Govts., Kerala State Handloom Development Corporation Ltd (KSHDC)	Handloom & Handicraft	Handloom production, Sale of handloom fabrics
17	Forest Industries (Travancore) Ltd.	A Government Of Kerala Undertaking	Forest	Wooden Furniture, Joineries

S. No.	Name of Industry	Type of Industry	Sector	Product/Activities
18	Kerala State Textile Corporation Limited	A Government Of Kerala Undertaking	Textiles	Manufacture and marketing of cotton yarn
19	Malabar Cements Limited	A Government Of Kerala Undertaking	Cement	Manufacture and sale of cement
20	Sitaram Textiles Ltd	State-owned textile mill in India	Textiles	Manufacturing cotton yarn
21	Steel and Industrial Forgings Ltd	A Government Of Kerala Undertaking	Engineering	Manufacture and sale of steel forgings
22	Steel Complex Ltd	A Government Of Kerala Undertaking	Engineering	Producing and marketing of steel billets and constructional steel items
23	Steel Industrial Kerala Ltd (SILK)	A Government Of Kerala Undertaking	Engineering	Fabrication of steel structurals, generation of ferrous scrap by breaking ships, sophisticated fabrication works, production of cast iron specials, turnkey execution of mini/micro hydel projects, marketing of DG sets, pumps
24	The Cannannore Co-operative Spinning Mills Ltd	A Government Of Kerala Undertaking	Textiles	Textile Product
25	The Kerala Ceramics Ltd	fully owned Government of Kerala Undertaking	Industry	Engaged in production of refined clay
26	The Kerala Minerals & Metals Ltd	A Government Of Kerala Undertaking	Mining	Manufacturing Titanium Dioxide pigment and mineral separation
27	The Malappuram Co-op Spinning Mills Limited	A Government Of Kerala Undertaking	Textiles	Synthetic Yarn
28	The Metal Industries Ltd	A Government Of Kerala Undertaking	Engineering	Manufacturing and marketing of agricultural implements and tools

S. No.	Name of Industry	Type of Industry	Sector	Product/Activities
29	The Quilon Co-operative Spinning Mills Ltd	A Government Of Kerala Undertaking	Textiles	Carded cotton yarn
30	The Travancore Cements Ltd	Public Sector Under Kerala Govt.	Cement	Manufacture and sale of White Cement, Wall Putty and Cement Paint
31	The Travancore Cochin Chemicals Ltd	Kerala State Public Sector undertaking	Drugs, Chemicals & Pharmacueticals	Manufacturer of heavy chemicals, including caustic soda, chlorine and other chemicals
32	The Trichur Co-operative Spinning Mills Ltd	A Government Of Kerala Undertaking	Textiles	High Quality Cotton Yarn
33	Traco Cable Company Ltd	A Kerala Govt. Company	Industry	Manufacturing and supply of various kinds of electrical and telephone cables
34	Transformers and Electricals Kerala Ltd	Joint Venture Company of Govt of Kerala and NTPC Ltd	Industry	Manufacturing and supply of transformers, circuit breakers, reactors, IPBs
35	Travancore Titanium products Ltd	A Government Of Kerala Undertaking	Drugs, Chemicals & Pharmacueticals	Manufacture of Anatase and Rutile Grade Titanium Dioxide
36	United Electricals Industries Ltd.	A Kerala Govt. Company	Industry	Manufacturing energy meters, motor starters (PSC Poles), galvanised components