Impact Assessment of BEE's Standard & Labeling Program in India

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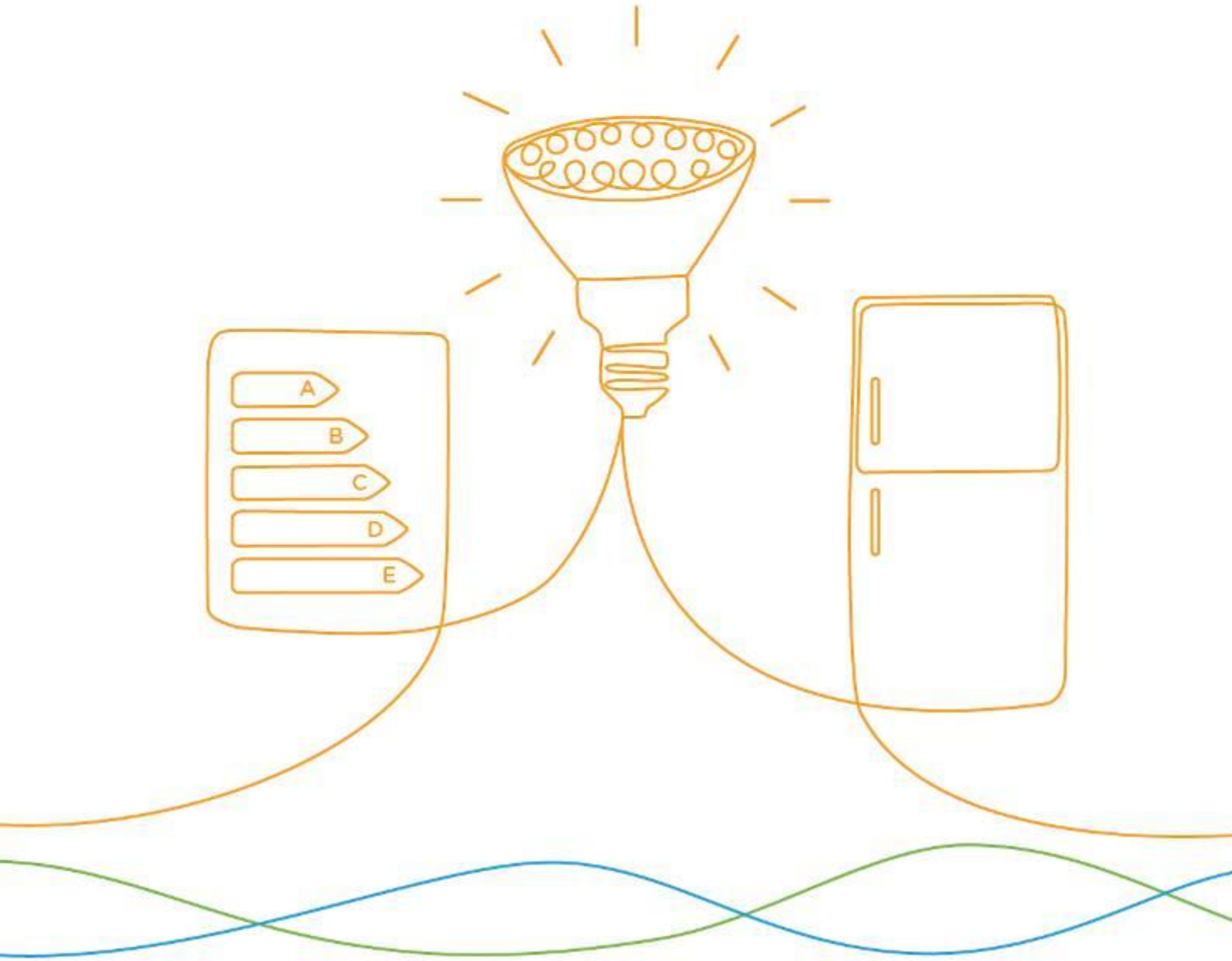

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List of Abbreviations

Abbreviations commonly used in this report are:

AC	Air Conditioner
AHAM	Association of Home Appliance Manufacturers
APEC	Asia Pacific Economic Cooperation
APP	Asia Pacific Partnership
AS/NZS	Australia and New Zealand Standards
BEE	Bureau of Energy Efficiency
BIS	Bureau of Indian Standards
CCE	Cost of Conserved Energy
CEA	Central Electricity Authority
CO_2	Carbon Dioxide
CTV	Color Television
CWE	Chief Wage Earner
DCR	Direct Cool Refrigerators
DSM	Demand Side Management
EC Act	Energy Conservation Act, 2001
EE	Energy Efficiency
EE Labels	Energy Efficiency Labels
EER	Energy Efficiency Ratio
EIA	Energy Information Administration (of the US Govt.)
FFR	Frost Free (No Frost) Refrigerators
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GHG	Green House Gases
Hr	Hour
IDI	In-Depth Interviews
INR	Indian Rupee
ISO	International Organization for Standardization
kWh	Kilo Watt hours (unit of energy)
LPG	Liquefied Petroleum Gas
MEPS	Minimum Energy Performance Standards
MOP	Ministry of Power
MT	Million Tons of CO_2 equivalent (unit for quantifying GHG emissions)
MTEE	Market Transformation for Energy Efficiency
MW	Mega Watt (unit of power)
MWh	Mega Watt hours (unit of energy)

POS	Point of Sale
QUAL	Qualitative
QUANT	Quantitative
REEEP	Renewable Energy and Energy Efficiency Partnership
S&L	Standards and Labeling
SEC	Socio Economic Classification
SSI	Semi-structured interview
T&D	Transmission and Distribution
TERI	The Energy and Resources Institute
TFL	Tubular Florescent Lamp
TG	Target Group
WOM	Word of Mouth

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Executive Summary

Energy efficiency in home appliances is emerging as a useful tool in addressing the issue of energy demand. A large number of countries, both developed and developing, have already introduced initiatives around appliance energy efficiency and many others are expected to follow. The success of such initiatives is critically dependent on awareness and acceptability of energy efficient (EE) products by consumers. To ensure efficient use of energy through usage of EE products, the Government of India enacted the Energy Conservation Act 2001 (EC Act) in August 2001 and established the Bureau of Energy Efficiency (BEE), a statutory body to implement the EC Act in March 2002. The Act identifies Standards & Labeling (S&L) as one of the major thrust areas for improving energy efficiency in residential, commercial, and public sectors. BEE launched the S&L program in May 2006 and as of the writing of this report it covers a total of 18 products. In 2010, four appliances: air conditioners (ACs), tubular fluorescent lamps (TFLs), frost free refrigerators (FFRs), and distribution transformers were brought under the purview of mandatory labeling.

This report on the market assessment of BEE's labeling program includes products under both the mandatory and voluntary phase. The report includes collection and analysis of data from a comprehensive survey of stakeholders to cover the following:

- Awareness of BEE's labeling program;
- Efficacy of communication of the labeling program;
- Impact of BEE's star label on the attitudes of stakeholders towards labeled products and energy efficiency, as well as; and,
- The impact on sales and usage of labeled products by manufacturers and consumers respectively.

The labeling program market survey was conducted across India, with both urban and rural areas represented. The survey targeted the following stakeholders:

- Consumers (general public, recent purchasers and intenders)
- Retailers
- Manufacturers
- Associations and Utilities.

Secondary data was also used to supplement information gathered from primary sources. The report also considers the degree of market transformation as analyzed by shifts in sales data and models registered with BEE.

The study reveals that the S&L program has made significant progress over the last few years. Consumer awareness of the star labeled products has significantly improved rising to 63% in 2014

from 33% in 2010. However, this trend is more amongst urban consumers and has yet to reach a critical mass. A significant percentage of consumers, especially those that belong to lower socio-economic groups and those in rural areas, remain unaware of energy efficiency and its associated benefits. The study shows that recent purchasers are more aware about EE products than those that intend to buy in the near future.

The study's findings clearly indicate that the purchase of EE product is critically dependent on the level of awareness. Consumers are more likely to buy EE appliances, if proper information is provided to them at the point of sale. The penetration of EE product will be higher when consumers are educated about the star label and are able to relate the use of domestic appliances with energy consumption, lower energy bills, and wider issues such as climate change.

Even amongst aware consumers, energy efficiency is still not a top priority as compared to other factors such as product life, brand name, reputation, and the latest models using advanced technology in certain categories.

Product-wise, it is observed that the priority given to energy efficiency by consumers varies from one product to another. In the case of ACs, refrigerators, and electric water geysers, energy efficiency is amongst the top consideration factor. For televisions (TVs), washing machines, and ceiling fans, energy efficiency holds a lower priority.

The report also reveals that a large number of consumers are willing to pay a premium for improved EE products, but not more than 10 percent.

Therefore, an increased level of consumer awareness, availability of EE products, and the consumer's willingness to pay has contributed to an increase in the penetration of technologically advanced EE products. This is substantiated by the estimated energy savings resulting from the use of EE home appliances. The total energy saving for 2012 alone was estimated at over 5,954 Gigawatt Hour (GWh) leading to a total avoided capacity of 4,847 megawatts (MW) and a greenhouse gas (GHG) reduction of 5.5 million tons of carbon dioxide (CO_2) from eight product categories.

The study shows that positive developments are also taking place on the supply side. It indicates that many manufacturers and retailers are willing to gradually, but steadily, shift to labeled products. However, some manufacturers mentioned that there is a high investment and a low return on investment (RoI) for these EE products.

The study's retailer survey also reflected that though energy efficiency has started attracting consumers, it is not a top priority. This is seen when comparing energy efficiency to other factors such as product life, brand name, reputation, and latest models using advanced technology in certain categories. Most of the retailers held the view that the actual product cost is the most obvious factor influencing consumer purchasing decisions.

Therefore, the factors that favor EE products are increased awareness, willingness to pay a slightly higher price, and availability in certain high energy consuming product categories such as air conditioners and geysers. Detracting factors are lack of awareness amongst the lower socio-economic classes, manufacturers' reluctance to produce EE products due to price sensitive markets, and higher MRP of these products.

Stakeholders believe specific measures can overcome these limitations and threats. More than two-thirds of consumers report that a cost/price reduction and/or subsidization of EE products can significantly contribute to the removal of these barriers. There is also a need for outreach programs that center around operational issues that focus on consumers, retailers, and manufacturers. In addition, stakeholders also suggest providing simple saving calculations on labels and exchange rebates for old appliances. These initiatives, however, need to be coupled with others that increase awareness and require various stakeholders' active engagement and cooperation.

Overall, generating awareness amongst lower socio-economic classes and making EE products more affordable to consumers are two important measures for increasing the market penetration of these products. Additionally, incentivizing consumers for EE product usage, and communicating EE's value proposition, will enhance the program's impacts.

1 Introduction: Study Background

1.1 Energy Efficiency: The need and Importance

In India, a high rate of development has resulted in increased demand for energy to operate a large number of electrical appliances and equipment. Further, the ongoing growth and development of the country is facilitating enhanced income generating opportunities for better living standards, both in rural and urban geographies. Thus, aspirations of owning household appliances are increasing year by year with the increased capacity for expenditure on these appliances.

Household energy consumption is much higher than the other demand sectors. Currently, lighting accounts for approximately 18 to 20% of total residential electricity use; followed by refrigerators, fans, electric water heaters, TVs, and other appliances. Approximately 4 percent of total residential electricity is used for standby power. Appliance penetration, particularly of refrigerators, washing machines, microwave ovens, and air conditioning units, is expected to be the main driver of growth in residential energy demand by 2020[1].

In this context, efficient use of energy and energy conservation are of paramount importance. It is estimated that nearly 25,000 MW can be saved by implementing end-use energy efficiency and demand side management measures in India. Efficient use of energy and its conservation assumes even greater importance in view of the fact that one unit of energy saved at the consumption level reduces the need for fresh capacity creation by 2 to 2.5 times[2].

Further, such saving through efficient use of energy can be achieved at less than one-fifth the cost of fresh capacity creation.[3] Energy efficiency would, therefore, significantly supplement the Indian Government's effort to meet growing power requirements.

India currently ranks sixth in the world as far as total energy consumption is concerned.[4] However, it still needs much more energy to meet the increasing demand. That is why an integrated approach to enhance both supply and demand side energy efficiency should be adopted.

The Indian Government understands that there is a need to shift from solely "energy conservation" to "energy efficiency" and from investing huge capital to increase "energy inputs" to "effectiveness of energy use".

The Government of India introduced the Energy Conservation (EC) Act in 2001 and created the Bureau of Energy Efficiency (BEE) as a statutory body, in March, 2002.

[1]www.mahaurja.com/PDF/needec.pdf
[2]www.mahaurja.com/PDF/needec.pdf
[3]www.mahaurja.com/PDF/needec.pdf
[4]www.mahaurja.com/PDF/needec.pdf

1.2 Standard and Labeling Program in India

The BEE's Standard and Labeling (S&L) Program was launched in May 2006. The S&L Program aims to provide information on energy performance so that consumers are able to make informed decisions while purchasing appliances. This further leads to technological innovation, as consumers become more informed, demand for efficient appliances increases, and manufacturers compete to deliver more efficient appliances.

In addition, the S&L program leads to cost savings, reduces capital investment in energy supply infrastructure, enhances product quality, reduces carbon emissions, and helps meet climate change goals. It is further aimed at creating the appropriate legal and regulatory environment for energy efficient end use products.

S&L activities in India are carried out by BEE through the consultative process of various stakeholders drawn from the industry, industry associations, consumer organizations, non-government organizations (NGOs), and others..

1.3 Energy Labels in India

Energy-efficiency Labels are informative labels affixed on ready to use finished products to describe the product's energy performance (usually in the form of energy saved, energy use, energy losses or efficiency etc.). These Labels guide consumers to make informed choices at the time of purchase. Labels are based on a 1 (least efficient) to 5 (most efficient) star rating system, and are revised every few years in a step-like scheme, where the 1 star efficiency level is eliminated, and a new, more efficient level is added at the 5 star level.

BEE currently uses two types of labels for its S&L scheme, namely:

- Endorsement label and
- Comparative label

Endorsement Label

Comparative Label

Figure 1: Endorsement and Comparative label

1. Endorsement Labels: define products as efficient when they meet minimum energy performance criteria specified in the respective product schedule

2. Comparative Labels: allow consumers to compare efficiency of all the models of a product in order to make an informed choice at the time of purchase. It shows the relative energy use of a product compared to other models available in the market.

The effectiveness of energy labels is heavily dependent on how they present information to the consumer and on how they are supported by information campaigns, financial incentives, and other related programs.

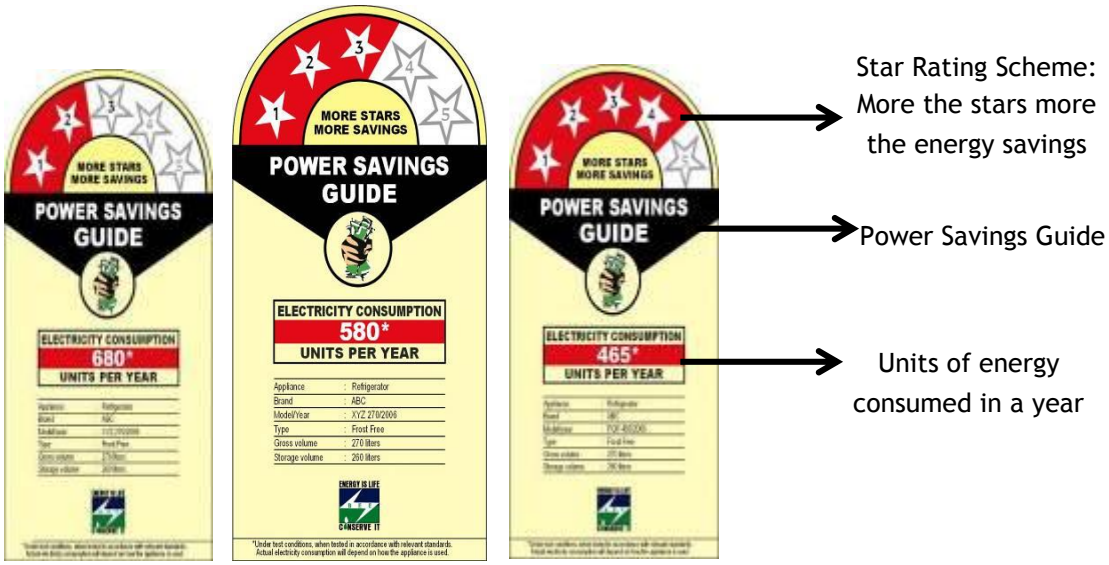


Figure 2: Comparative Labels for Refrigerators with different Star Ratings

1.4 The Journey So Far

Globally, energy efficiency standards focus upstream in the product distribution chain and labels focuses downstream on the consumer and retailer. The case is the same in India.

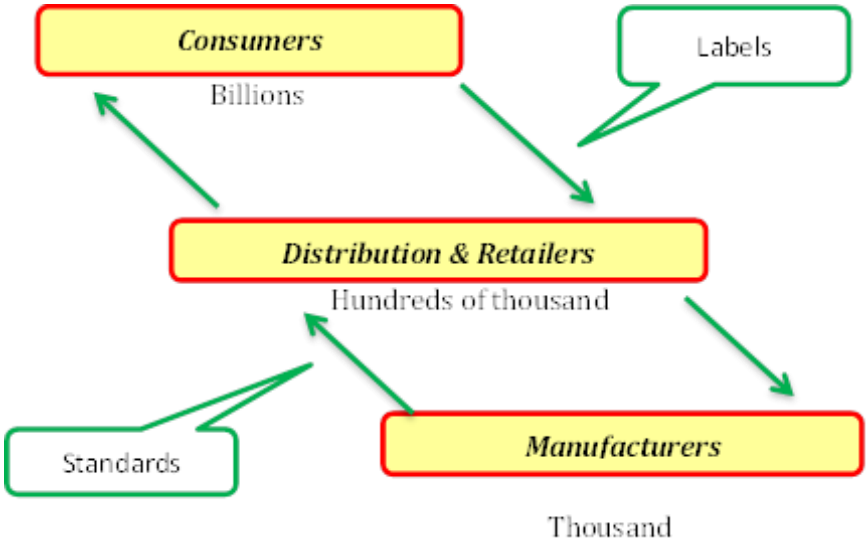


Figure 3: Upstream vs downstream distribution

Since its launch in 2006, 18 products have been brought under BEE's S&L scheme viz., ACs, Tubular fluorescent lamps (TFL), Frost Free Refrigerators (FFR), Distribution Transformers, Induction Motors, Direct Cool Refrigerators, Electric Geysers, Ceiling fans, Color Televisions (TVs), Agricultural pump sets, Diesel engine driven moonset pumps for agricultural purposes LPG stoves, Ballasts, Washing machines, Computers (laptop and notebook), and Office Equipment, of which the first 4 have been notified under mandatory labeling on 7 January 2010. The other appliances are presently under voluntary labeling phase. Labeling programs for inverter ACs and LEDs are under development.

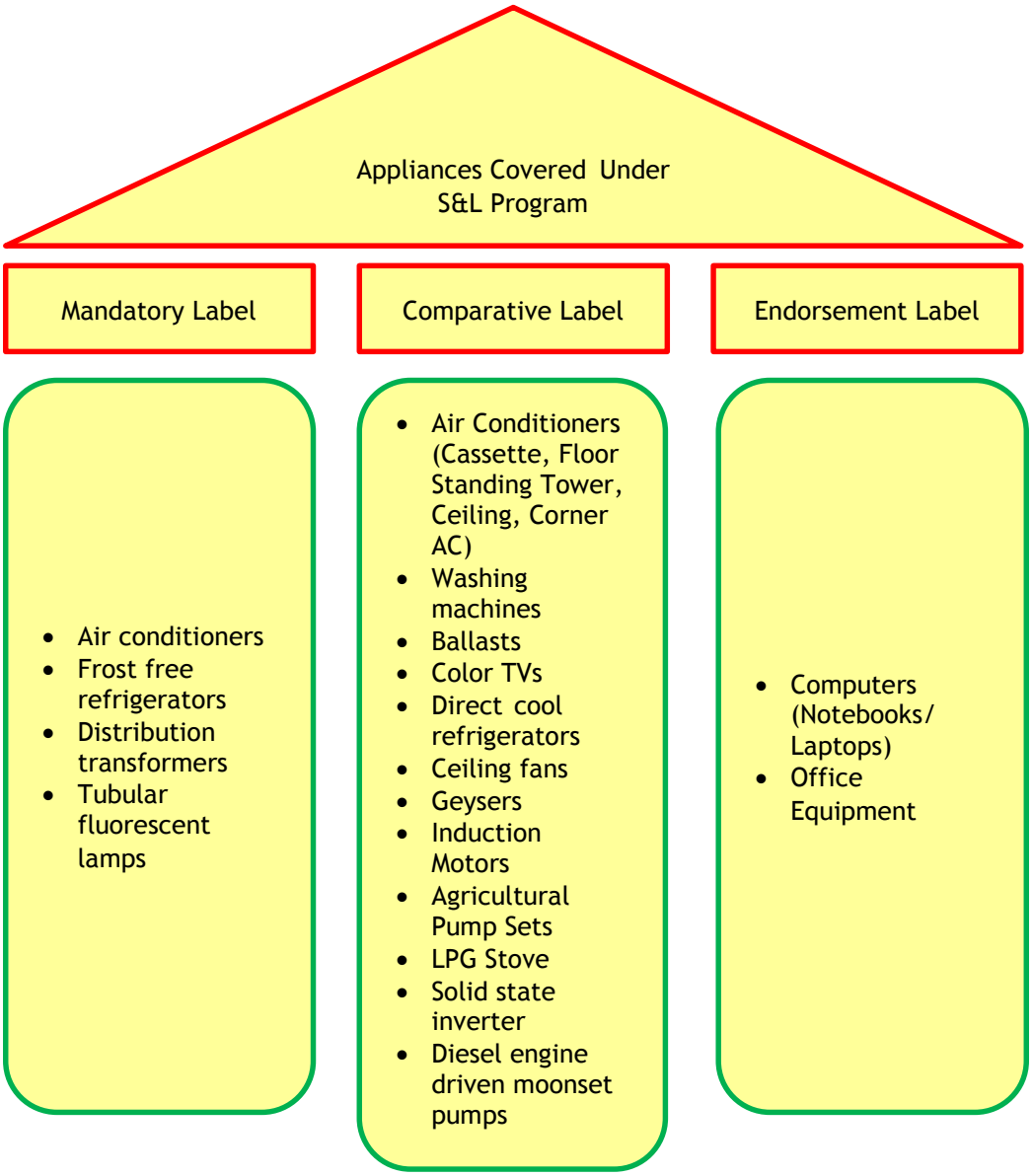


Figure 4: Appliances Covered Under S&L Scheme

In March 2011, BEE introduced a voluntary endorsement label for laptops/notebooks, and recently announced a voluntary endorsement program for office equipment that includes all types of imaging equipment such as printers, copiers, fax machine, scanners, and multi-function devices.

02 Study Objectives

This research intends to identify and measure the impact that BEE's labeling program has had on consumers, retailers, and manufacturers. A secondary and more holistic goal of the study is to observe the trend in consumer awareness and a shift in preferences for labeled products as an outcome of the labeling program.

The survey aims at mapping the following aspects:

- Understand consumer awareness, behavior, practices, and disposition towards the S&L program;
- Identify consumers' primary sources of information;
- Map market penetration of labeled appliances and their current uptake;
- Map transformation of the market for labeled appliances; and,
- Estimate the resultant energy savings and map GHG emissions abatement.

03 Study Approach & Methodology

3.1 Study Approach

In order to achieve the study objectives, a holistic and integrated approach was adopted by using both qualitative and quantitative research methods to cover the following within the S&L program:

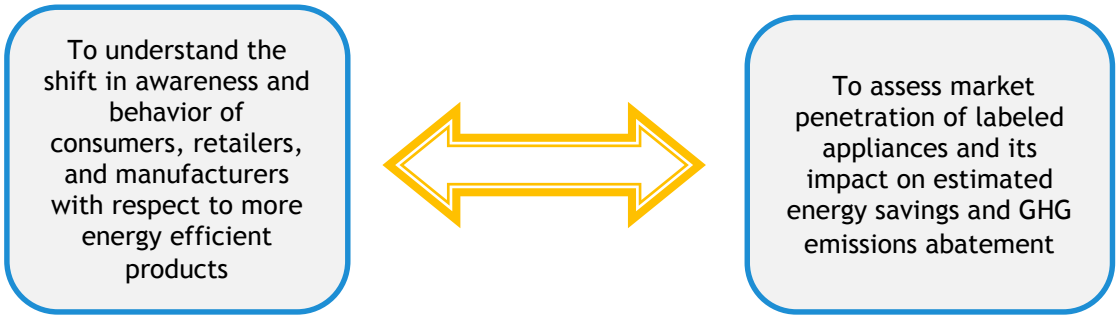


Figure 5: Approach of the study

3.2 Methodology

In order to meet the above two intents, a three-pronged approach was followed.

1. **Desk research to build a strong foundation**

   The aim of the desk research was to build an understanding on the existing scenario of the industry. Information was collated from various secondary sources such as published reports, relevant industry associations, articles from leading trade journals, literature review, past reports etc., including review of industry database and reports.

2. **Primary Research:** A pan-India survey was conducted amongst consumers, retailers, manufacturers, policymakers, and energy consultants to meet the first intent.

   Qualitative research was conducted with Consumers, Manufacturers and Industry Experts to gauge the shift in awareness and behavior with respect to more energy efficient products.

   A mix of **FGDs (Focus Group Discussions)** and **DI's (Depth Interviews)** were conducted with the target respondents. The survey included three different modules for various stakeholders, specifically:

a) **Module 1. Consumers Survey and Assessment:** Qualitative focus group discussions (FGDs) were carried out in order to explore the consumer's knowledge and attitude, and measure the shift in behavior with respect to EE products and labels. The approach entailed

understanding consumer profile, influence of labels on purchase intention and resultant action, assessment of awareness and understanding of the label and outreach programs. The change in consumers' sensitivity to environmental issues was also assessed.

b) **Module 2. Manufacturers Survey and Assessment:** The manufacturer study was conducted to understand the awareness and perceptions of manufacturers about the BEE's S&L program and energy labels. The study also assessed manufacturers' investment in standards and labels in terms of technology and resources, as well as current shift in production of energy efficient products

c) **Module 3. Industry Experts Survey and Assessment:** In depth interviews (IDIs) with industry experts were undertaken to understand the shift brought about by the S&L program in India and its future prospects.

Quantitative Interviews were conducted with consumers spread across Urban and Rural regions and retailers to verify the findings obtained through the qualitative phase and assign value to the information set.

a) **Consumers:** Key trends and findings of the qualitative FGDs were verified further with a larger number of consumers through face-to-face structured interviews. It brought out trends across regions and market types.

b) **Retailers:** Structured interviews were conducted to explore the retail space, both in urban and rural geographies. The retailer survey mainly focused on the awareness and perceptions of retailers about BEE's energy efficiency labeling and its impact on sales

3. Methodology for Estimating Energy Savings and GHG Emission Reduction

To quantify energy savings, the initial requirement is to determine baseline energy consumption on the basis of which savings can be calculated. For the purpose of this study, the baseline energy consumption of a particular product is the amount of energy consumed by the model with a one star label, except for a few products where a three star label has been taken as the baseline. It is also essential to observe the trend in average energy savings obtained from the particular product that has different star ratings. The energy savings is then calculated from the power savings based on the usage pattern (which is subject to some assumptions).

Reduction in electricity consumed (energy savings) results in reduction in GHG emissions. GHG emissions in electricity consumption is equal to the product of energy savings (units of electricity saved) and the equivalent GHG emissions factor. GHG emitted from the production of electricity depends on the type of power plant that is producing electricity. The mix and merit order of electric power stations is considered when accounting for the emission rate.

Other Technical Impact Evaluation Metrics

Along with non-energy benefits (environmental impact), the following factors were also analyzed:

Product availability	Number of EE products manufactured, number of models registered in each star category

Energy savings	Energy consumption of each category of product based on the products registered and the number of hours of use
GHG Mitigation	Obtaining emission factors from the Central Electricity Authority (CEA) reports
Avoided capacity	Reduction in capacity & setups due to decrease in energy consumption owing to the use of star labeled appliances

04 Information Areas

The information areas for all respondent groups (consumers, retailers, manufacturers, and stakeholders) were designed to build a holistic understanding of awareness and attitude towards EE appliances. Questions were also crafted so that inferences could be drawn. Specifically, inferences on the degree to which the presence of label influences manufacturing and purchasing decisions in favor of efficient appliances, and the level of understanding people have of energy label.

4.1 Impact on Consumers

The survey with consumers focused on following issues:

- Level of awareness of the energy label and advertisements regarding labeled products;
- Importance given to the energy label in the case of home appliances covered under the S&L program;
- Consumers' understanding of the label;
- Consumers' perception of label usefulness;
- Factors that increase trust in the label;
- Energy efficiency's importance in the buyer's choice of the appliance and
- Consumers' purchase priorities.

The consumer survey included both qualitative and quantitative discussions and addressed the following key elements.

Table 1: Key elements covered by consumers' survey

Qualitative	Quantitative

The consumer discussion guide addressed the following elements:
• Demographic details of the consumers
• Current ownership of appliances
• Purchase behavior
  ○ Key considerations set, i.e., how it has evolved/changed as compared to the last purchase
  ○ What priority does energy occupy in the consideration set and reasons for the same
• Usage behavior (attitude towards usage of EE appliances)
• Expected life of products
• Consumer perception associated with operating/running cost (electricity bills)
  • Awareness and attitude towards EE products and labels (both comparative and endorsement)
• Understanding of labels (information provided, calculations given on labels, etc.)
	The quantitative research instrument covered the following key elements:
	• Demographic profiling
	• Factors considered for target product purchase with emphasis on electricity savings
	• Awareness of the star label
	• Channels through which the consumer obtains information about EE products
	• Appliance ownership and replacement trends
	• Disposition towards the labeled equipment
	• Willingness to pay premium
	• Understanding of the program and trust in the endorsing agency
	• Future intent

4.2 Impact on Retailers

The impact of the S&L program on retailers was assessed by addressing the following issues:

- Type of market – focus of retailers on high margin, product elements that retailers highlight while selling such as efficient models, or focus on volume and low-end products;
- Challenges in the market-price competition and other factors;
- The range or variety available provides enough/not enough choice to consumers;
- Retailers' perceptions and opinions about the S&L program;
- Retailer recommendations of such products;
- Their training and orientation;
- Impact of Star label on consumer behavior at the point of product sales, as reported by the retailers (i.e., the preference of consumers for any particular star label as reported by retailers);
- Overall Impact of the S&L program on business, and
- Suggestions from retailers.

The retailers' survey included quantitative discussions and addressed following key elements:

Table 2: Key elements covered by retailers' survey

Quantitative
The questionnaire covered the following aspects: • **Market transformation in terms of star labeled product sales, attitudes, and awareness** • **Market dynamics what sells, why, and how?** • **Factors considered by the consumer while purchasing different product categories** • **The extent of influence the retailer has on consumers** • **Market challenges** • **Range or variety of labeled products providing enough/not enough choice to consumers** • **Impact of labeled products on their business and do they embrace the same**, and • **Suggestive cues for meaningful outcomes**

4.3 Impact on Manufacturers

The impact of the S&L program on manufacturers was assessed by examining the following issues:

- Outlook towards the environment and conservation of energy
- Perception and opinion about the BEE's standard and labeling program
- Motivations and barriers towards the program
- Impact of the program on production process and investments
- Impact of the program on sales and margins
- Main benefits of the program
- Current issues and future expectations
- Views on BEE's communication campaign.

The manufacturers' survey included quantitative discussions and addressed the following key elements:

Table 3: Key elements covered by manufacturers' survey

Qualitative
• Market transformation effect because of the labeling program • Investments made on account of the S&L program and gains accrued from it • Willingness to participate in other such initiatives in future • Key barriers experienced and ways to overcome them • Cost burden on account of performance audits etc. • Awareness and views on current promotional campaigns and program progression

4.4 Stakeholder's Views

Stakeholders such as policymakers, power utilities, consumers, retailers, and manufacturers associations, were interviewed as their engagement is critical component of Standard & Labeling program. The following areas of information were probed from this set:

- View on the program progression
- Key issues related to program
- Directional cues to make program more impactful.

The stakeholders' discussion included quantitative discussions and addressed following key elements:

Table 4: Key elements covered by stakeholders' discussion

Qualitative
• Obtaining information on current scenario and cues to improvise the program for better outcomes • Their assessment of the program's Returns on Investment • The way forward – How should the program be taken forward, which product categories can be included under the Mandatory Program • Suggestions for better outcomes – Consumer interventions, change in standards and thresholds etc.

05 Research Design

5.1 Coverage

There is huge variation in India's climate. The northern part is dry and extreme whereas the southern region is wet and moderate. This climatic variation impacts region-wide usage of appliances. For instance, certain cities have high usage of cooling appliances, whereas in other cities, there is a greater requirement for heating appliances. Thus, appliance usage varies across the five climatic zones in India.

Keeping the above in mind, the survey locations (cities) were selected on the basis of different ***Climatic Zones*** in the country.

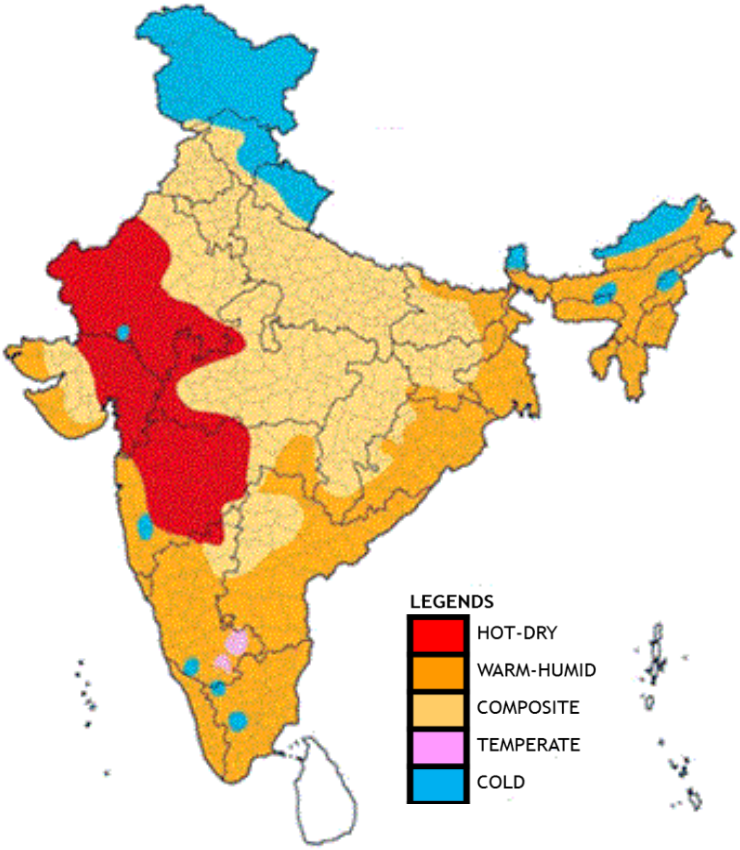


Figure 6: Different Climatic Zones

Selected Study Locations

Table 5: Distribution of Cities Based on Climatic Conditions

Zone	Warm & Humid	Composite	Temperate	Hot and dry	Cold	Total
North	**-**	**5**	**-**	**-**	**-**	**5**
South	**3**	**1**	**1**			**5**
West	**2**	**1**	**-**	**2**	**-**	**5**
East	**2**	**1**	**-**	**-**	**1**	**4**

Cities covered under each climatic zone:

Table 6: List of Cities Based on Climatic Regions

Zone	No of cities	List of cities	City Type
North	5	New Delhi	Composite
		Amritsar	Composite
		Lucknow	Composite
		Hisar	Composite
		Dehradun	Composite
South	5	Bangalore	Temperate
		Hyderabad	Composite
		Chennai	Warm & Humid
		Vishakhapatnam	Warm & Humid
		Trivandrum	Warm & Humid
West	4	Mumbai	Warm & Humid
		Ahmedabad	Hot & Dry
		Surat	Hot & Dry
		Indore	Composite
East	4	Kolkata	Warm & Humid
		Bhubaneswar	Warm & Humid
		Raipur	Composite
		Guwahati	Cold

Rural clusters, comprising of four villages, located adjacent to the cities surveyed were covered to give a fair representation to the rural population.

5.2 Sample Coverage and Design: Quantitative Module

The quantitative module involved structured interviews with only consumers and retailers.

Consumers

A total sample of 5000 consumers was covered at a confidence level of 95% and an interval of 1.4.[5] The sample size proposed was robust enough at the all-India level, as well as at regional and city level. The sample included smaller cities and rural areas for wide coverage. Different types and sizes of cities were selected to make a fair representation of consumers and retailers.

In order to arrive at the sample of consumers, two steps were followed:

1. Random listing exercise with the general public, where a representative sample was selected across various cities. Systematic Random Sampling procedure was followed to select the sample for the consumer survey.
2. In each city, the first 20 starting addresses were selected randomly from Census Enumeration Blocks or from the sampling frames developed by Market Xcel. Through a series of questions, the interviewer determined if the respondent was a recent buyer or an intender of the appliances that were the focus of the survey.

The final interviews were conducted with recent purchasers and intending buyers of the selected consumer appliances derived out of the drawn out sample.

Retailers

A total of 642 interviews were conducted with retailers (a break down is given in the sample grid). High growth and emerging cities were treated as one unit. The following retail segments were covered under the purview of the study.

Table 7: Retailer Types

Types	Details
Consumer Durable Retailers	Retailers selling consumer durables like refrigerators/TVs/ACs/washing machines
Electronic Retailers	Retailers selling electronic appliances like ceiling fans/water geysers/TFLs
Equipment Sellers	Retailers selling induction motors etc.

In order to draw the sample of retailers, first the areas were selected using judgmental sampling, ensuring that the samples selected were spread across cities. Second, only those retailers selling labeled product categories were covered in the study. Thereafter, the main market areas in each

[5] *Thus, 95% confidence level means, one can be 95% sure about the stated responses. The confidence interval is the margin of error, i.e., the plus or minus figure that has to be kept in mind while doing a sample survey. For instance, if the confidence interval is 5 and 60% of surveyed population picks an answer, one can be sure (or safely deduce) that if the entire population was asked the same question, then between 55% (60-5) and 65% (60+5) would opt for that answer.*

city were selected and interviews were conducted in those areas. By maintaining a proportion between market size and existing units, a geographical spread was ensured within the city.

Finally interviews were conducted with two sets of respondents, who were dealing with consumers or acting as interface to the consumer.

1. Shop owners
2. The prime sales team representative

Table 8: Quantitative Sample Design

Category & Sub Category	Overall Sample Construct-Consumers																							
	NORTH						EAST					WEST					SOUTH							
	Delhi	Lucknow	Hisar	Amritsar	Dehradun	Tier-4 cities	Kolkata	Bhubaneswar	Guwahati	Raipur	Tier-4 cities	Mumbai	Ahmedabad	Surat	Indore	Tier-4 cities	Bangalore	Chennai	Hyderabad	Vishakhapatnam	Trivandrum	Tier-4 cities
Consumer Durables	150	125	125	125	125	100	150	125	125	125	100	150	125	125	125	100	150	150	150	125	125	125
TFL, ballast, geyser. LPG stoves	75	40	40	40	40	50	75	40	40	40	50	75	40	40	40	50	75	75	75	40	40	40
Pumps and other equip	75	35	35	35	35	50	75	35	35	35	50	75	35	35	35	50	75	75	75	35	35	35
Total 5000 consumer face to face interviews																						

Category & Sub Category	Overall Sample Construct- Retailers																							
	NORTH						EAST				WEST						SOUTH							
	Delhi	Lucknow	Hisar	Amritsar	Dehradun	Tier-4 cities	Kolkata	Bhubaneswar	Raipur	Tier-4 cities	Mumbai	Ahmedabad	Pune	Surat	Indore	Tier-4 cities	Bangalore	Chennai	Hyderabad	Vishakhapatnam	Trivandrum	Tier-4 cities
Retailer																						
Consumer durables	25	25	25	25	25	10	20		10	10	20	15		10		5	25	25	25		15	5
Electric appliances(TFLs, Geysers, Ceiling fans)	15	15	15	15	15	10	3		3	5	15	10		5		5	15	15	15		10	5
Equipment like pumps etc.	10	5	10	5	10	10	3		3	5	5	5		5		10	10	10	10		5	10
Total 642 retailer's interaction																						

Thus, quantitative survey covered 5000 consumers and 642 retailers across four zones.

Clusters:

Rural clusters, comprising of four villages, located adjacent to the cities surveyed were covered to give a fair representation to the rural population.

5.3 Sample Coverage and Design: Qualitative

Consumers

Qualitative FGDs were carried out with recent buyers and intending buyers of home appliances and office equipment covered under the BEE labeling program. A total of 16 FGDs were conducted across four climatic zones.

Selected Cities and Group Composition for Focus Group Discussions

Table 9: Selected Cities and Group Composition for FGDs

Zone	Group No.	Age	SEC	Consumer Group	Location	Date of FGD
North	1	21 - 35	A	Young Couples	Delhi	7.1.2014
	2	36 - 55	B2/C	Men	Delhi	8.1.2014
	3	21 - 35	B2/C	Men	Lucknow	14.1.2014
	4	36 - 55	D	Women	Lucknow	14.1.2014
	5	36 - 55	B1	Men	Hisar	16.1.2014
East	6	36 - 55	D	Women	Kolkata	17.1.2014
	7	21 - 35	A	Men	Raipur	18.1.2014
	8	36 - 55	B2/C	Men	Bhubaneshwar	15.2.2014
	9	21 - 35	B2/C	Young Couples	Guwahati	18.2.104
West	10	21 - 35	D	Men	Mumbai	10.1.2014
	11	36 - 55	A	Men	Mumbai	10.1.2014
	12	36 - 55	B1	Young Couples	Ahmedabad	18.2.2014
South	13	21 - 35	B1	Women	Bangalore	17.1.2014
	14	21 - 35	C	Men	Chennai	18.2.2014
	15	21 - 35	A	Men	Hyderabad	25.2.2014
	16	36 - 55	B2/C	Men	Trivandrum	25.2.2014

Consumer Selection Procedure

Consumers were selected by resorting to a structured recruitment questionnaire/screener. The group composition and criteria were pre-defined and selections were made in accordance with this. The selection process started one week prior to the actual date. To ensure a minimum participation of eight respondents, Market Xcel selected 12 consumers per group.

For IDIs, a database of experts was generated with the help of CLASP and appointments were sought over the telephone. Most of the interviewing sessions were conducted through face-to-face interactions, while a few interviews were also conducted over phone.

Recruitment strategy for FGDs: The following criteria's were used to filter respondents for the qualitative module.

1. **Gender:** Both males and females were included in the group discussions. Group discussions were undertaken with married couple participants, only female participants and only male participants. The rationale for including couples is on account of the increasing say of the female counterparts in the purchase of durables. Each couple interview had four pairs of husbands and wives.

2. **Age:** Consumers in the age group of 21-55 years were invited for the group discussions

3. **Age & Socio-economic Classification (SEC):** Consumers belonging to different socio-economic classifications from SEC A1+ to SEC C were included

4. **Ownership:** Both owners and intenders were selected to reflect the mindsets and experiences of the two groups. Further, owners of one category of products were assumed to be intenders for some other category.

5. **Location:** Conducting research in all states was neither necessary nor cost effective. Therefore, the locations chosen largely represent the different tier structures. The selected locations ensured a good geographical spread and a fair sample representation.

Manufacturers Survey

In total 45 manufacturers were covered across verticals.

Table 10: Manufacturers Survey

Organization Name	FFR	TFL	AC	Ballast	Fan	Geyser	LPG Stove	DCR	CTV	Office Equip.	Washing Machine
Haier Appliances (India) Pvt. Limited	■					■		■			
LG Electronics India Pvt. Ltd.	■							■			■
Sharp India Ltd.	■		■								
Dell India Pvt. Ltd										■	
Gupta Electric Corporation						■					
Bajaj Electricals Ltd		■				■	■				
Philips Electronics India Ltd		■		■							
Samsung India Electronics Pvt. Ltd.	■							■			■
Swastik Pumps Pvt. Ltd.											
Mak Pump Industries											
Reliance Digital	■										
Havells					■						
Whirlpool of India Limited	■		■					■			
Daikin Airconditioning Service Plaza	■		■								
Johnson Controls			■								
Wipro Limited										■	
orient Electricals	■				■			■			
HS Enterprises						■					
Crompton Greaves Ltd				■							
Hewlett Packard India Sales Pvt. Ltd										■	
HCL Infosystems Limited										■	
Acer India Pvt. Ltd.										■	

Panasonic AVC Networks Co. Ltd.									■		
Delta Electricals											
Osram India Pvt. Ltd.		■									
Ram Ratna Electricals Limited		■									
Stovekraft (Pigeon Kitchen Appliances							■				
Butterfly Home Appliances							■				
BSH Household Appliances	■										
Oasis Appliances						■					
Rachna Electricals Pvt. Ltd						■					
Siemens Ltd											
Surya Roshini Limited		■									
Finolex Cables Limited		■									
Nova Group of Companies	■		■								

Stakeholders Survey

The stakeholders mentioned below were interviewed during the course of study:

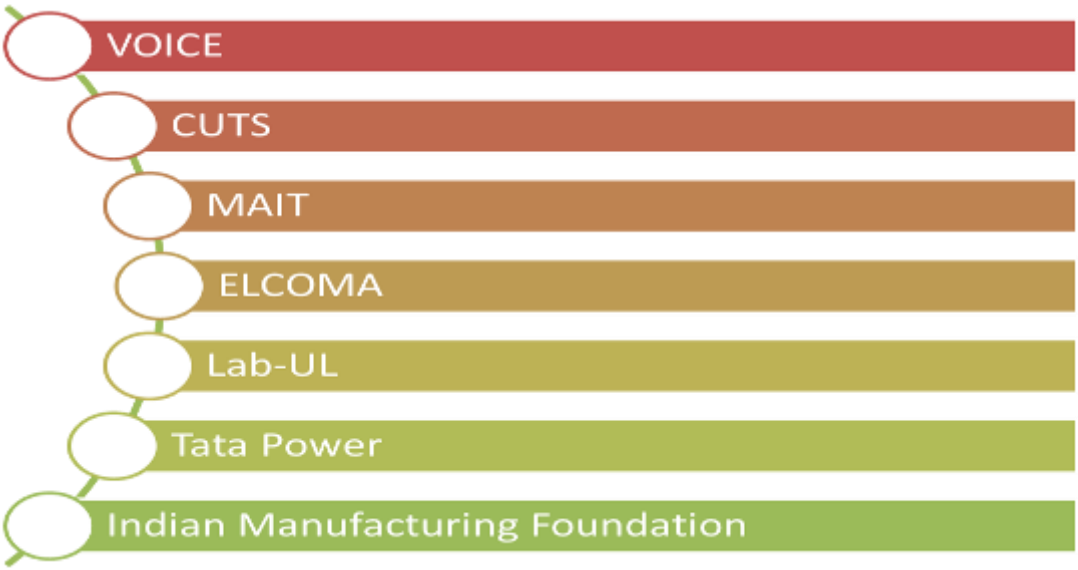


Figure 7: Stakeholders Survey

The Research Process

1. The tools for both quantitative and qualitative modules were prepared and finalized in consultation with CLASP & BEE, taking into account the identified issues that needed to be covered.
2. A pilot exercise of pre-testing (especially the quantitative tool) the questionnaire was carried out to eliminate inconsistencies and enable uniformity in execution. This also helped to observe interviewers and gauge their understanding of the instrument. Before the pilot exercise was carried out, the interviewers were briefed and mock-sessions were conducted. The pilot exercise gave insights on how the instrument was working with the target group and their responses.
3. Minor corrections were made in the framing of questions to make it easier for the respondents to comprehend.
4. Finally the edited tool was taken to the field to collect the required information.

06 Research Findings: Impact on Consumers

6.1 Consumer Profiling:

This section is compiled on the basis of qualitative and quantitative information obtained from consumers.

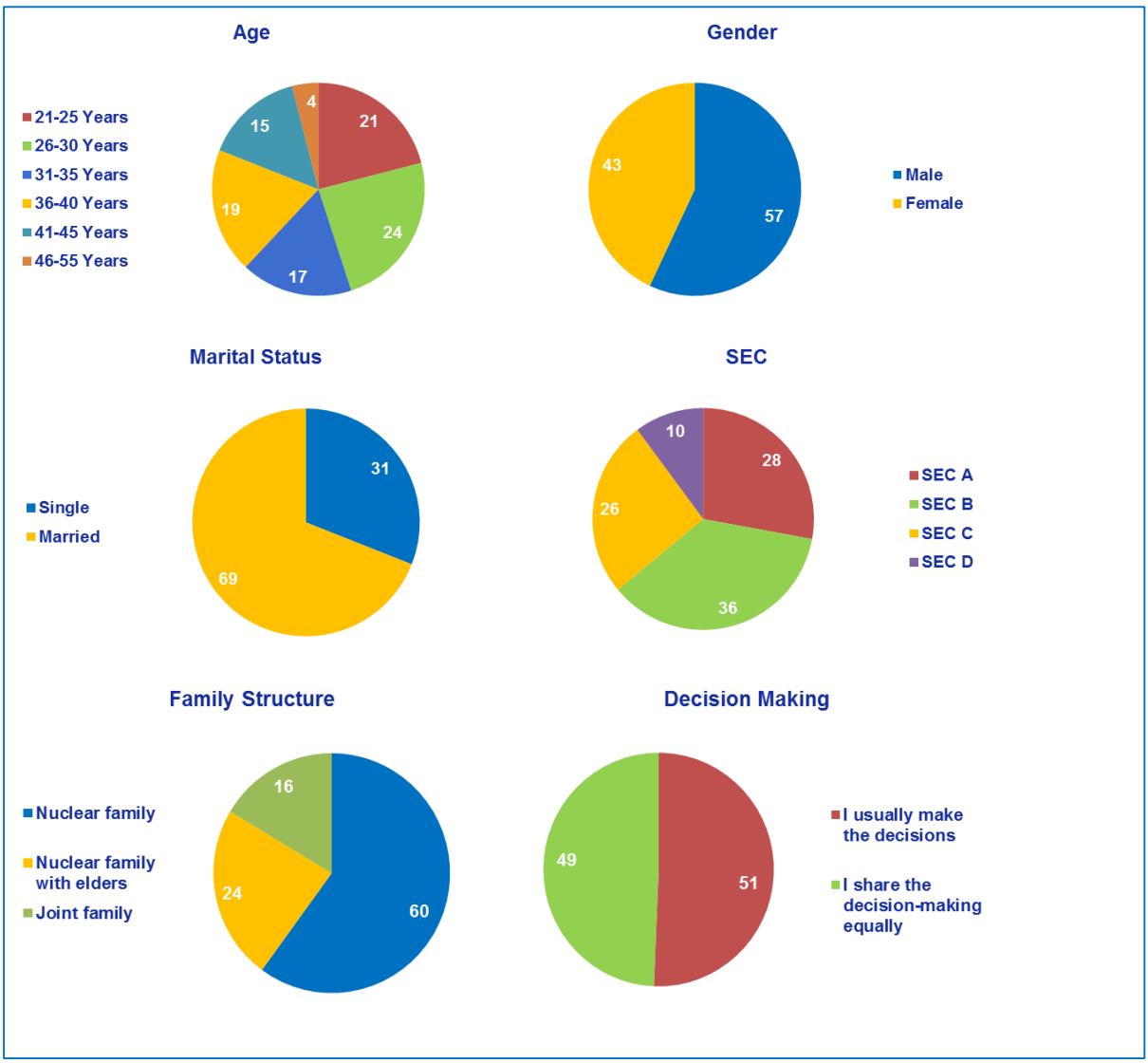
General Profile of Consumers

Looking at the data across subgroups of 21-55 year olds, the decision to purchase durables and appliances vests largely with those 26-30 years old, followed by 21-25 year olds.

In urban settings, the shift towards nuclear families plays a significant role in purchasing decisions, whereas in rural areas, it is the knowledge level of youngsters that plays significant role. The current findings are evidence of continuing societal change, wherein women have a relatively higher say in the purchase of durables and appliance.

SEC B with the highest number of respondents represents the middle class population. The significantly lower representation of SEC D respondents is on account of low product penetration and low intention to own the discussed appliances. We found that this is directly proportionate to lower economic means.

Data presented in %



Graph 1: Consumer Profile

6.2 Attitude Towards Environment

Men and women in the higher SECs (A&B) expressed a greater concern towards the environment, but in practice, very few of them opt for EE appliances with advanced environmentally friendly technologies.

Although representatives of SEC C and D are aware of various environmental issues, they are unable to interpret its importance and the relevance of adopting these into practice. This is due to lack of understanding and financial constraints.

Factors relating to consumers' attitude include:

- Sensitivity to environmental issues, which can make them well-disposed towards EE models

- Desire for brands and trusted products that may (or may not) be particularly energy efficient
- Focus on purchase price that is more important than any other attribute.

The penetration of efficient models is greater when consumers are aware of the label and relate it to reduced energy consumption, lower energy bills and wider issues such as climate change.

6.3 Appliances: Decision Making

A typical modern consumer is interested and inclined towards gadget use. Over the years, the consumer's views with regard to appliances and technology have changed.

The purchase decision process in relation to different appliances is different. For instance, a television purchase decision is fundamentally different from a refrigerator or computer purchase in a number of ways.

Consumers engage in a two stage buying process for appliances. In the first stage, they assess a number of aspects of an appliance such as capacity, size, features, design, color, etc. After shortlisting two or three appliances, consumers compare price, value, performance, running costs etc. of the product.

Environmentally conscious consumers would look for EE/labeled appliances in addition to following this selection process.

Steps involved in the purchase of any product vary, depending on the consumer's perception of the product, their functional need and other factors. They search for this information in diverse ways, ranging from discussions with family and friends, looking at advertisements and informative articles in the newspaper and magazines, the internet, visiting the retail showroom, talking to trade people etc.

When it comes to energy efficiency, most consumers segment the appliances into two broad groups:

- High energy consumption appliances with high impact on electricity bills
- Low energy consumption appliances with low impact on electricity bills

Table 11: Energy Consumption of Different Appliances

Appliances contributing to high electricity bills	Appliances contributing to low electricity bills
Air Conditioner	Ceiling Fan
Refrigerator	Color TV
Washing Machine	TFL
Geyser	

6.4 Key Purchase Consideration Sets: (All Appliances)

The data is captured at two levels - qualitatively through group discussions and quantitatively by getting decision makers to fill in questionnaires. The qualitative information is directional, while the quantitative figures in percentages indicate factors that influence consumers in their purchase decisions.

6.4.1 Television:

With competition and availability of an ever increasing number of reliable brands, consumers purchasing televisions treat brand name as an inherent factor and instead, look for product longevity. Advanced technology emerges as the next important consideration followed by price. However, except in rural areas and the east zone that are comparatively more price sensitive societies, product running cost and energy efficiency follows.

Table 12: Key Attributes: Television

Base=5000 Data presented in %

Quantitative Inputs		Type		Zone			
Key Attributes	Overall	Urban	Rural	North	East	West	South
Long Life	19	19	20	19	19	20	19
Advanced technology	15	15	14	14	13	16	16
Price of product	14	13	20	14	20	14	11
Energy efficiency/Running cost	12	12	15	12	17	12	9
Looks & design	7	8	5	6	5	9	9
Trouble free performance	7	7	5	5	6	7	9
Brand name	6	7	4	6	10	5	5
Resale value	5	5	3	6	2	6	6
Offer/Discount available	3	3	3	4	1	4	4
After sales service	3	3	4	5	2	3	2
Others	9	8	7	9	5	4	10

6.4.2 Refrigerator:

The top factor determining the purchase of a refrigerator is product longevity, followed by its running cost/energy efficiency as consumers feel that refrigerators run all the time, i.e., throughout the day and night. Price consideration falls to the third place.

Other factors influencing a consumer's choice of refrigerator are its features, aesthetics, performance, and the power consumed by the appliance. With changing lifestyles and the need to preserve more food products, people are fast replacing the appliances in order to have the most advanced technology with high storage space.

Table 13: Key Attributes: Refrigerator

Base=5000 Data presented in %

Quantitative Inputs		Type		Zone			
Key Attributes	Overall	Urban	Rural	North	East	West	South
Long Life	15	14	18	14	16	14	15
Energy efficiency/Running costs	15	15	12	16	14	14	17
Price of product	12	12	18	11	18	11	11
Brand name	11	11	12	10	17	14	8
Looks & design	7	7	7	6	5	9	9
Trouble free performance	7	7	7	7	6	7	9
Resale value	7	7	6	8	3	6	9
Advanced technology	7	7	4	6	9	7	5
After sales service	4	4	5	6	4	2	3
Offer/Discount available	4	4	2	3	2	5	4
Others	11	12	9	13	16	11	10

6.4.3 Air Conditioner:

The air conditioner is clearly one product category that is considered to be the biggest energy guzzler within the household framework. Power consumption, therefore, is an important factor that influences air conditioner purchase because the need to save on running costs and electricity bills is paramount in an average Indian household. Therefore, the most important attribute that the consumer would look for while making his purchase decision is energy efficiency. The other important parameters that influence the choice of the purchase is product longevity, followed by the price of the appliance. The consumer is now knowledgeable about advanced technology and according to the survey; this is the fourth consideration that influences his purchase decision. Brand reputation is another important factor as consumers feel it is prudent to opt for an established name. After sales service is a higher concern in rural markets because service and maintenance of the product post its purchase, impacts the overall investment on the product.

Table 14: Key Attributes: Air Conditioner

Base=2138 Data presented in %

Quantitative Inputs		Type		Zone			
Key Attributes	Overall	Urban	Rural	North	East	West	South
Energy efficiency/Running costs	18	19	8	21	10	19	20
Long Life	14	14	13	15	15	13	14
Price of product	13	13	16	11	16	14	12
Advanced technology	11	10	15	8	15	12	9
Brand name	8	8	13	6	15	6	5
Trouble free performance	7	7	2	6	5	10	8
Looks & Design	6	6	4	5	6	9	6

Resale value	6	6	17	8	2	5	6
After sales service	4	4	8	6	3	1	4
Offer/Discount available	4	3	8	2	4	3	5
Others	9	10	0	12	9	8	11

6.4.4 Washing Machine:

The factors that matter most to consumers while purchasing washing machines are the brand name, followed by durability of the appliance. The third most important factor influencing washing machine purchase decisions is advanced product technology. Energy efficiency/running costs features only at the sixth place, while after sales service appears to be the least important attribute for consumers except for those in rural areas.

Table 15: Key Attributes: Washing Machine

Base=3089 Data presented in %

Quantitative Inputs		Type		Zone			
Key Attributes	Overall	Urban	Rural	North	East	West	South
Brand Name	17	17	15	19	15	12	17
Long Life	16	15	17	16	19	15	15
Advanced technology	12	12	11	10	22	9	12
Trouble free performance	11	11	14	11	16	17	7
Looks & Design	8	8	2	6	4	11	10
Energy efficiency/Running costs	7	8	6	6	4	10	9
Resale value	6	6	7	6	4	5	8
Price of Product	5	5	6	6	5	6	5
Offer/ Discount available	4	4	4	4	4	5	4
After sales service	4	3	9	5	3	2	3
Others	10	11	9	11	4	8	10

6.4.5 Ceiling Fan:

Ceiling fans are a low price involvement category. Here, looks and design are the topmost determining features for purchase decisions. Brand reputation is an important consideration for consumers. The less affluent and rural consumers are price-sensitive and seek high value for their investment, though this factor is not observed to be a major consideration among the well to do. Advanced technology, which enhances the functionality of the product, in this case air flow, also influences purchase decision. Surprisingly, energy efficiency comes in sixth place because of the appliance's lower power consumption.

Table 16: Key Attributes: Ceiling Fan

Base=5000 Data presented in %

		Type		Zone			
Key Attributes	Overall	Urban	Rural	North	East	West	South
Looks & Design	17	17	15	16	15	17	17
Brand Name	16	16	20	16	18	17	15
Advanced technology - Air Flow	14	13	19	13	19	13	13
Price	10	9	15	8	14	12	8
Trouble free performance	7	8	5	7	5	8	9
Energy efficiency/ Running costs	7	8	4	6	5	8	9
Long Life	7	7	9	7	9	4	6
Resale value	5	5	7	7	3	5	5
Offer/ Discount available	4	4	3	3	2	4	5
After sales service	3	3	3	6	2	3	2
Others	10	10	0	11	8	9	11

6.4.6 Electric Geyser:

For the consumer, the most important attribute that influences his purchase decision of an electric geyser is energy efficiency. The other important concerns are "trouble free performance," "price," and "product longevity." Safety comes at the sixth place, because consumers revealed during qualitative conversations that safety is considered to be an integral part of the product. Moreover, according to consumers, the attribute of "Trouble free performance" also includes safety.

Table 17: Key Attributes: Electric Geyser

Base=1309 Data presented in %

		Type		Zone			
Key Attributes	Overall	Urban	Rural	North	East	West	South
Energy efficiency/Running costs	20	20	22	22	21	16	17
Trouble free performance	14	14	11	15	17	10	14
Price of product	12	12	14	12	25	7	13
Long Life	10	10	6	9	4	12	11
Advanced technology	10	10	6	8	12	15	8
Safety	8	8	16	5	2	13	8
Looks & design	7	7	17	9	2	4	8
Brand name	6	6	11	4	8	10	6
Offer/ Discount available	4	4	11	4	3	6	4
After sales service	2	2		3	2	2	1
Others	7	7	-	9	4	5	10

6.4.7 TFL:

As a product, TFLs feature in the mandatory regime of the BEE labeling program. Yet, it is observed that energy efficiency is not consumers' prime consideration. They presume that the TFL will consume much less energy than other appliances. However, if one takes into account the high usage

of the product, it collectively amounts to high energy consumption. Therefore, there is a huge potential in saving energy from the appliance that clearly the consumers do not foresee.

Table 18: Key Attributes: TFL

Base= 4882 Data presented in %

		Type		Zone			
Key Attributes	Overall	Urban	Rural	North	East	West	South
Long Life	17	16	19	16	16	20	15
Price of product	13	12	18	12	18	13	11
Energy efficiency/Running costs	12	13	9	9	12	10	13
Brand name	11	11	13	10	10	13	5
Trouble free performance	8	9	7	6	5	10	9
Looks & Design	9	9	8	4	6	10	8
Advanced technology	7	8	6	7	8	6	9
Is the market leader	5	5	4	7	9	3	5
Offer/Discount available	3	3	2	3	4	3	3
Has premium features	3	2	3	4	3	1	3
Others	12	12	11	22	9	11	19

6.4.8 Computer: For computers, brand reputation is the key element that drives purchasing decisions. Advanced technology, price, and configurations are prime concerns also influencing the consumer. Qualitative insights reveal that thus far, endorsement labels have not yet significantly gained acceptability in India. Product energy efficiency is not a priority for the consumer as he is not yet educated about it.

Table 19: Key Attributes: Computer

Base=2289 Data presented in %

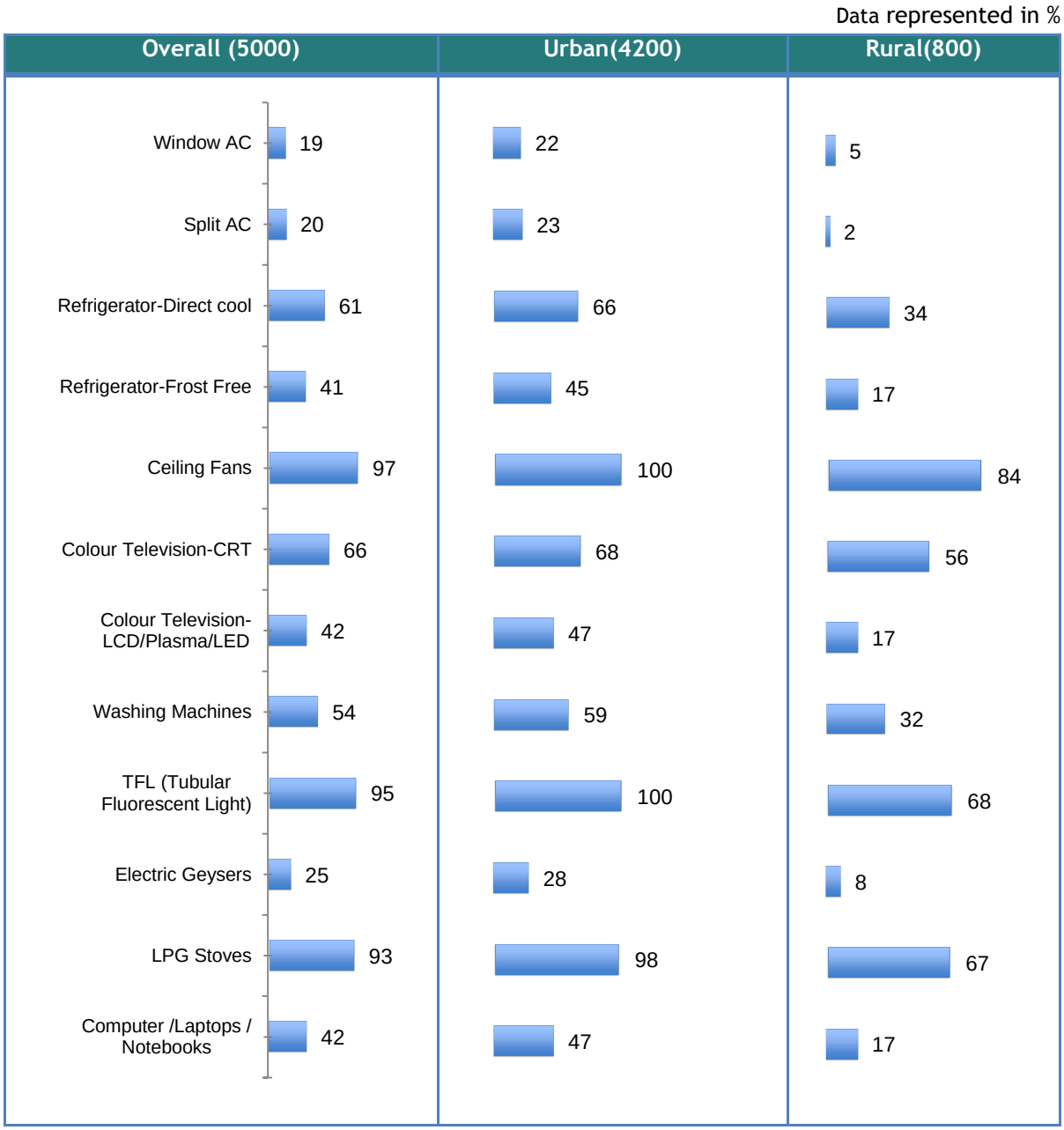
		Type		Zone			
Key Attributes	Overall	Urban	Rural	North	East	West	South
Brand name	16	16	15	16	14	13	18
Advanced technology	16	16	12	13	16	16	12
Price of product	12	12	14	10	22	9	10
Configurations	10	10	7	10	9	7	12
Trouble free performance	7	7	10	6	7	10	7
Looks & Design	7	7	2	8	4	10	7
Long Life	7	7	7	5	10	9	5
Resale value	6	6	2	6	3	5	9
Energy efficiency/Running costs	6	6	2	8	2	6	7
Offer/ Discount available	4	4	6	3	3	7	4
Others	9	9	23	15	10	8	9

6.5 Appliances: Ownership & Usage Pattern

6.5.1 Product Ownership

New technological innovations make work easier and faster for the consumer and enhance his social status. LED televisions, laptops, smart phones, tablets, and digital cameras are no longer considered a luxury, but are becoming necessities. Ceiling fans, TFLs, and TVs have emerged as products with almost cent percent penetration.

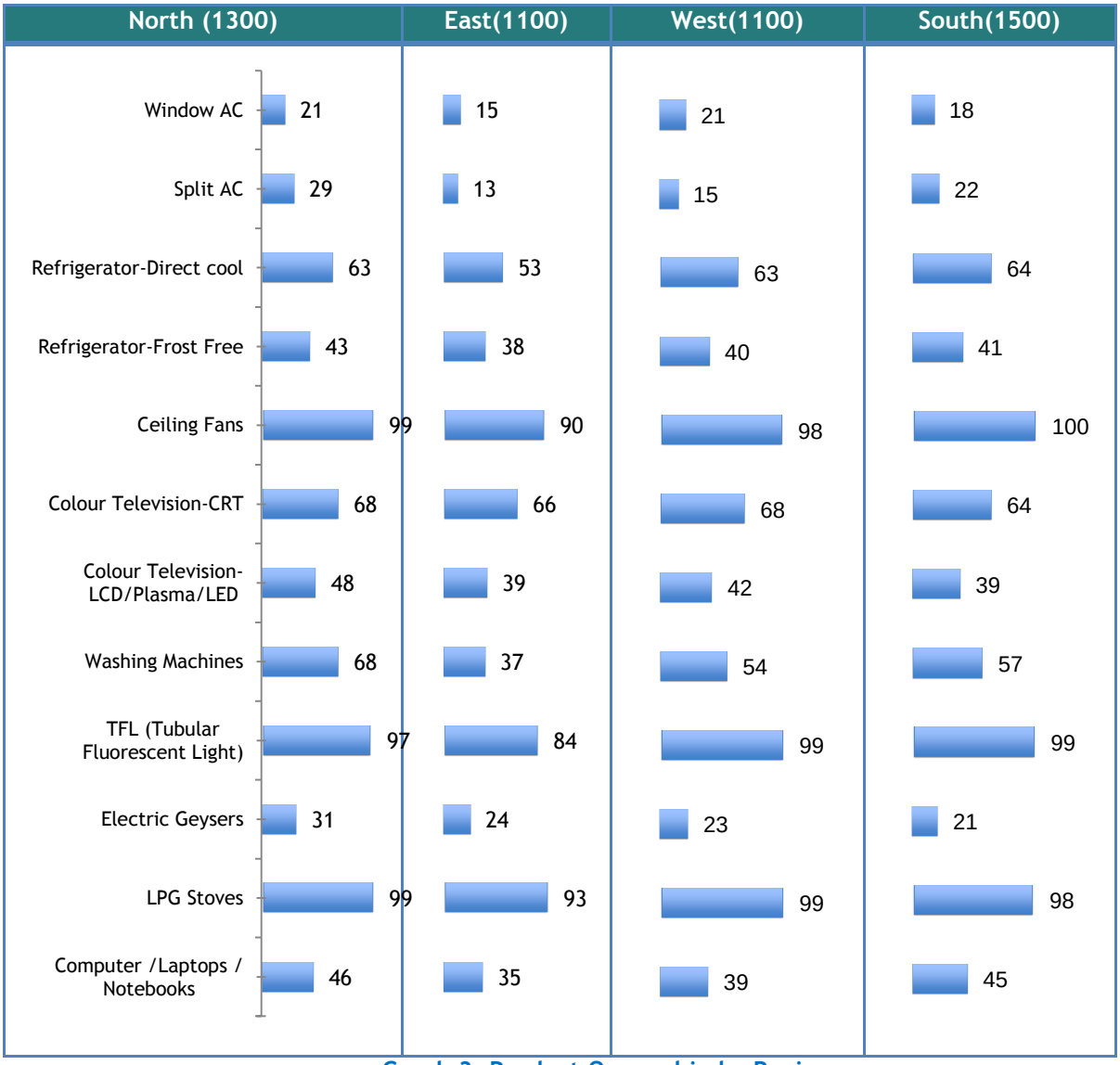
Certain categories of products like fans, LPG stoves, refrigerators, washing machines, and microwave ovens have found high penetration across geographies and even in rural locations. In many cases, penetration of products like TVs and refrigerators has surpassed the single ownership norm.



Graph 2: Product Ownership by Market Type

Though appliance ownership is constantly on the rise, some variation is observed by product categories within zones. Products like ACs are slowly making inroads in all zones. Incidence of ownership is low for washing machines and computers in the East Zone.

Data presented in %



Graph 3: Product Ownership by Region

Income has a direct relationship with ownership of appliances. Thus, with rising incomes and improved economic conditions, the demand for such goods is rising at a fast pace, including in the lower spectrum of society.

Table 20: Product Ownership by Socio - economic Class

Data presented in %

	SEC A	SEC B	SEC C	SEC D
Base	**1400**	**1800**	**1300**	**500**
Window AC	35	20	7	3
Split AC	40	21	5	3
Refrigerator-Direct cool	59	68	60	40
Refrigerator-Frost Free	55	37	37	22
Ceiling Fans	100	100	95	87
Color Television-CRT	57	63	78	72
Color Television-LCD/Plasma/LED	62	45	26	19
Washing Machines	87	58	31	13
TFL (Tubular Fluorescent Light)	100	99	94	74
Electric Geysers	45	26	10	7
LPG stoves	100	100	85	73
Computer - Laptops/Notebooks	81	45	10	8

Appliances which are considered necessities are owned by the majority. However, ownership of luxurious and expensive appliances is limited to higher SECs.

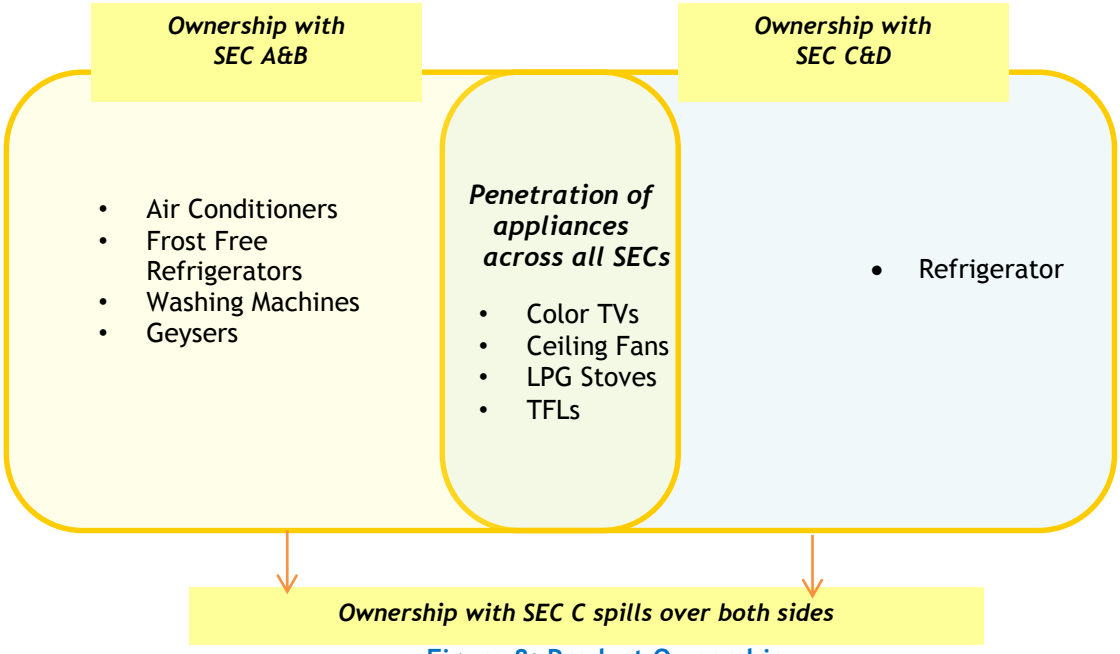


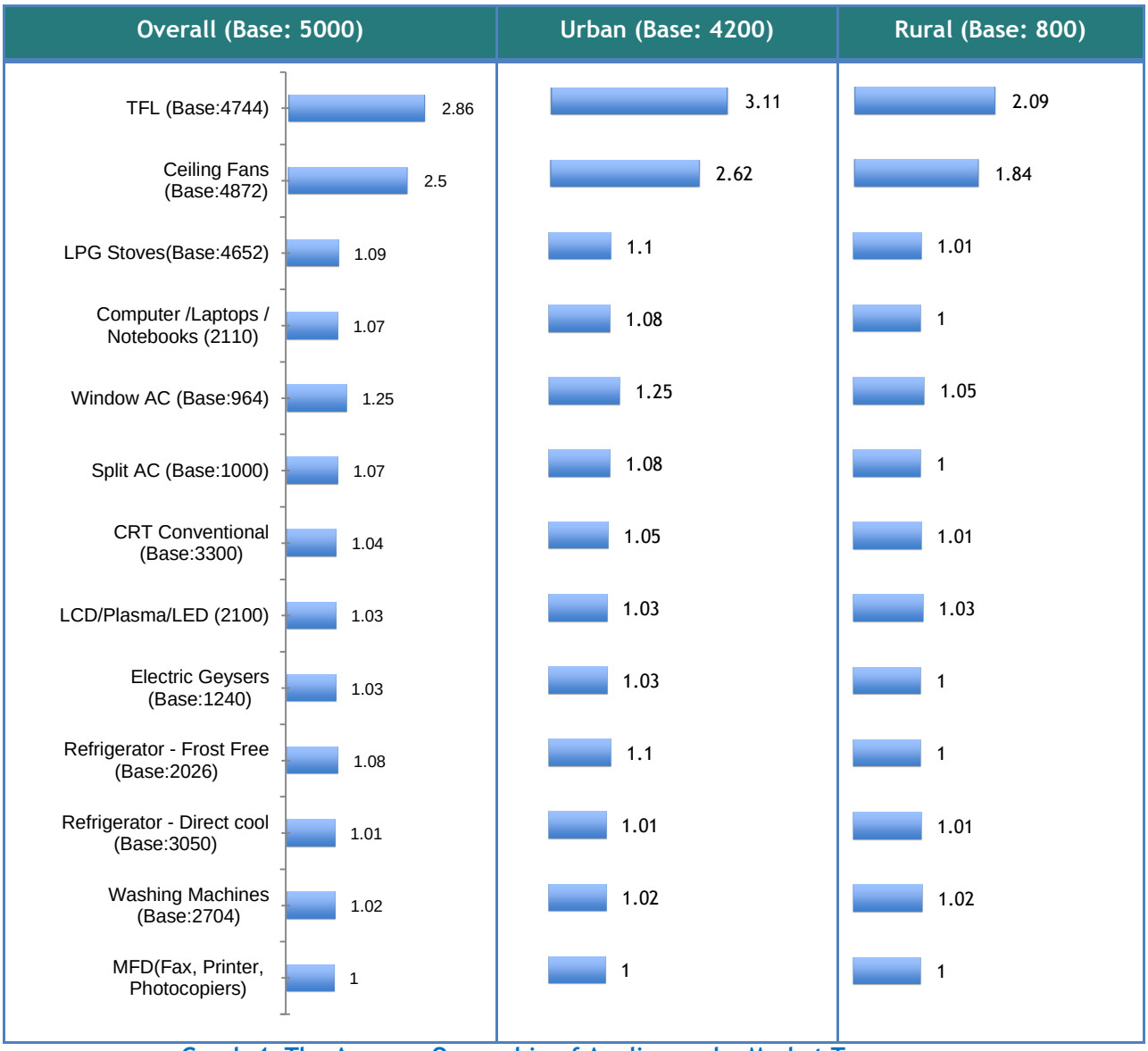
Figure 8: Product Ownership

With changing times, more women entering the workforce, and emergence of nuclear family structures, appliances have become an important aspect of a consumer's life. They are perceived as having great functional value in terms of saving time, leading to a more comfortable lifestyle.

6.5.2 Average Ownership of Appliances

The average number of each appliance that has penetrated per household exceeds one in a majority of cases. With lifestyle changes creeping in and consumer's inclination for comfort, the demand will further increase and products like ACs, refrigerators, TVs, fans, and TFLs among others will have significantly higher average penetration levels. This will lead to parity in appliance ownership in rural and urban households.

Data presented in Mean



Graph 4: The Average Ownership of Appliances by Market Types

6.6 Energy Conservation Practices

Consumers across SECs and locations expressed awareness about energy efficiency. They use products that consume high energy more consciously.

Key energy conservation practices:

- Respondents in SEC C and D state that they do not use more than one high power consuming appliance at the same time. However, respondents in SEC A and B switch off their fans while using ACs, and when the room size was big, they use two fans instead of AC.
- Although respondents across SECs are conscious of switching off appliances when they are not in use, most do not put the appliances on standby modes when not in use.
- To reduce energy consumption, most respondents say they use thermostat timers with an auto cut function in appliances such as ACs and geysers to avoid wasting power and energy.

Most consumers practiced energy conservation to control mounting electricity bills and not to conserve energy and save the environment.

6.6.1 Air Conditioner

Consumers who own ACs are conscious about using them efficiently. However, the key reason as stated above was to reduce their electricity bills rather than conserve energy.

As stated above, most respondents state they use the auto switch off timer function during the night. Respondents in Delhi and Lucknow say they use coolers to minimize their use of ACs and reduce electricity bills.

6.6.2 Refrigerator

Consumers did not show a high degree of concern about the electricity consumed by usage of refrigerators. In some regions, respondents said they switched off their refrigerators for four to five hours during winters as they perceived it would add to the longevity of the appliance.

6.6.3 Washing Machine

Respondents did not follow any particular practice of energy conservation in the usage of washing machines. The prime concerns were convenience, followed by water saving.

Only a few respondents said they used washing machines on alternate days in order to save electricity.

6.6.4 Color TV

In India, television is the main source of entertainment across all zones, all income groups, and in urban as well as rural areas. Consumers across cities did not practice putting their TV sets as well as their set top boxes on standby mode in order to save electricity.

6.6.5 Ceiling Fan

Respondents across all locations said that they switched off fans, when there were no occupants in the room in order to reduce their electricity bills.

6.6.6 Electric Geysers

Most consumers across locations used thermostat controls in their geysers to avoid high electricity bills. Consumers in Delhi, Lucknow, Bangalore, and Kolkata used geysers in their kitchens during winters. Respondents who owned water heaters without auto cut off timers said they used the appliance cautiously in order to avoid wasting electricity.

6.7 Energy Efficiency Labels: Awareness and Knowledge

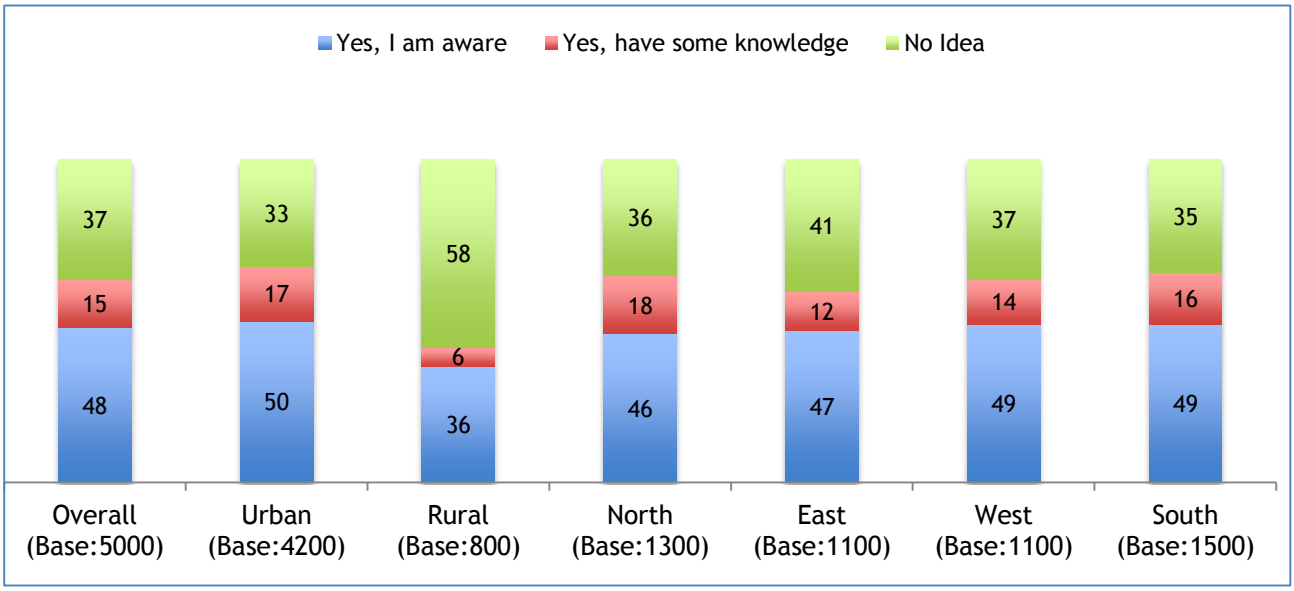
6.7.1 Awareness: Label Recognition

In all FGDs, participants were asked to describe the various factors they take into account while purchasing household appliances. Practical factors, such as availability of space, brand reputation, advanced technology, capacity, price, reliability, after-sales service, etc., were uppermost in the consumer's mind. However, consumers in all groups also showed awareness and consideration towards energy efficiency and/or the 'star rating' in buying appliances. Most respondents were concerned about the running cost of the appliance. In Delhi, Mumbai, Bangalore, Kolkata, and Lucknow consumers across SECs were aware of star labels on appliances and could recognize them. In Hisar, however, the level of awareness was low and only handful people in groups could recognize the labels. Consumers across locations and SECs were unaware of endorsement labels.

6.7.2 Awareness of Comparative Label

At an unaided level, 63%, of all respondents are aware of the energy labeling. This is much higher than the figure of the impact assessment of 2010 (33%). The urban population has greater exposure as they have better access to media and communication. Thus, a greater number of respondents in the urban population are aware of the benefits of comparative labels than the rural respondents.

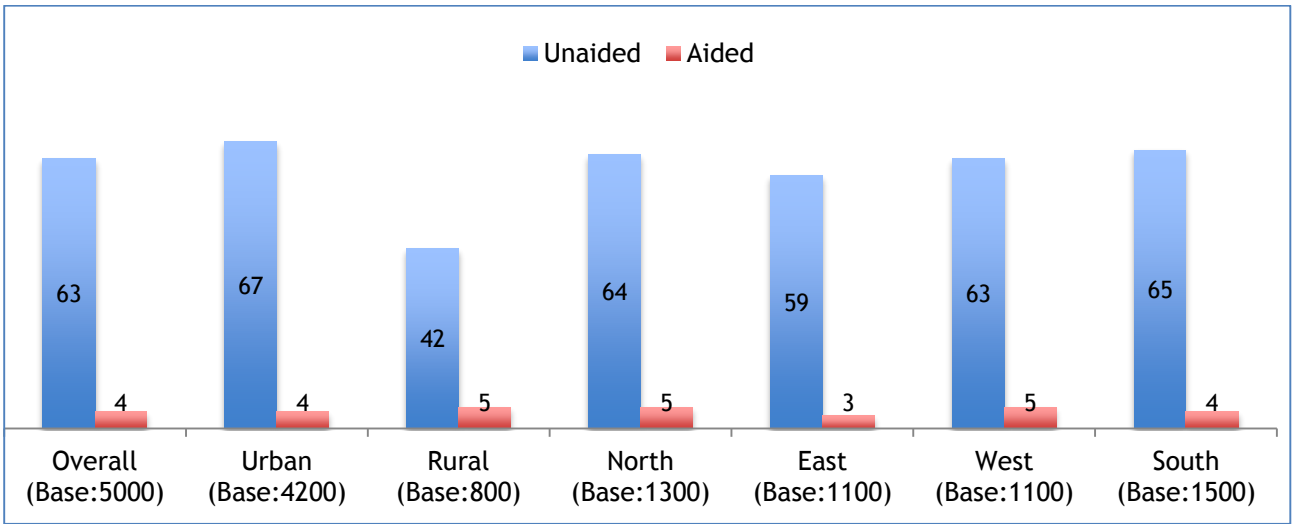
Base: N=5000 (All respondents) Data presented in %



Graph 5: Awareness of Comparative Label on Energy Conservation

Comparative label awareness at 67% among the unaided level for urban consumers is encouraging. However, it is significantly lower for rural consumers. Aided awareness is comparable for urban and rural respondents.

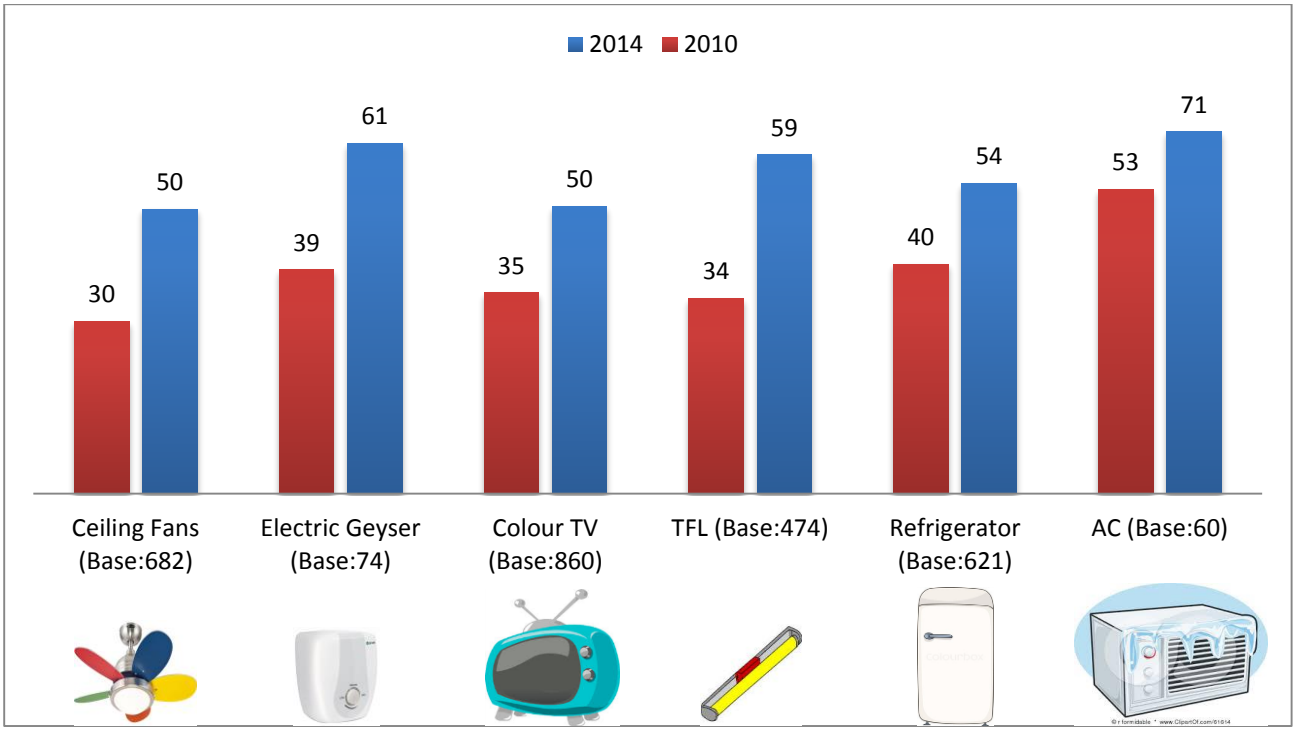
Base: N=5000 (All respondents) Data presented in %



Graph 6: Total Awareness of BEE Labeling Program (Spontaneous + Aided), All Products

Recent buyers show a higher awareness of the star label across products when benchmarked to awareness levels in 2010. ACs, followed by electric geysers and TFLs feature as the top three appliances that consumers associate with the labeling program.

Base: N=5000 (All respondents) Data presented in %

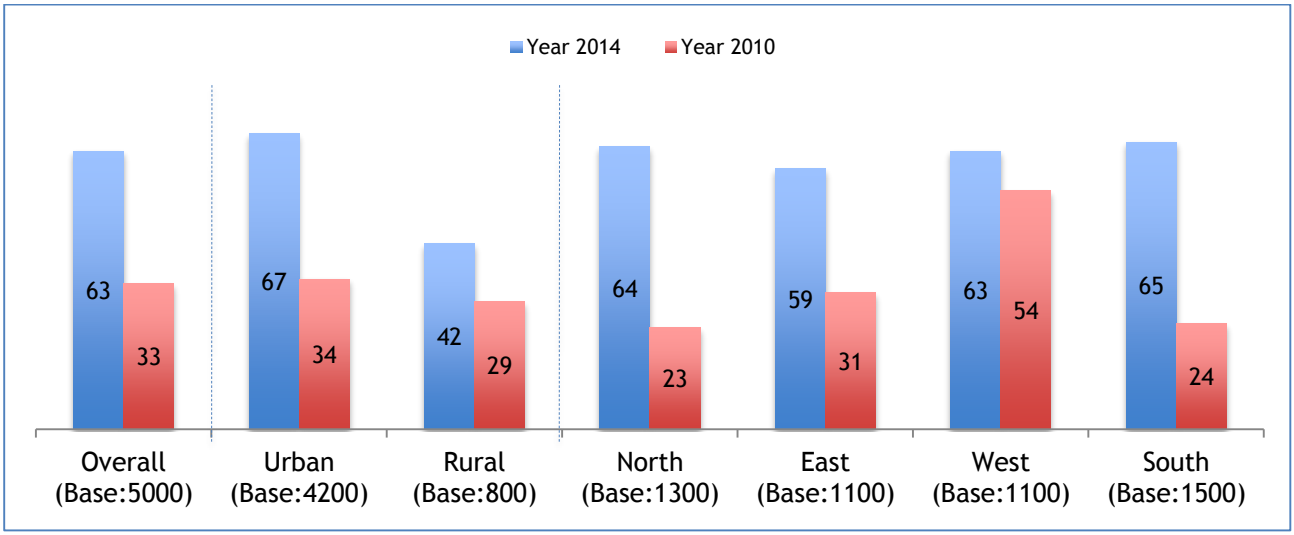


Graph 7: BEE Labeling Program Awareness by Product Categories - Recent Purchasers

6.7.3 Awareness of the BEE Labeling Program

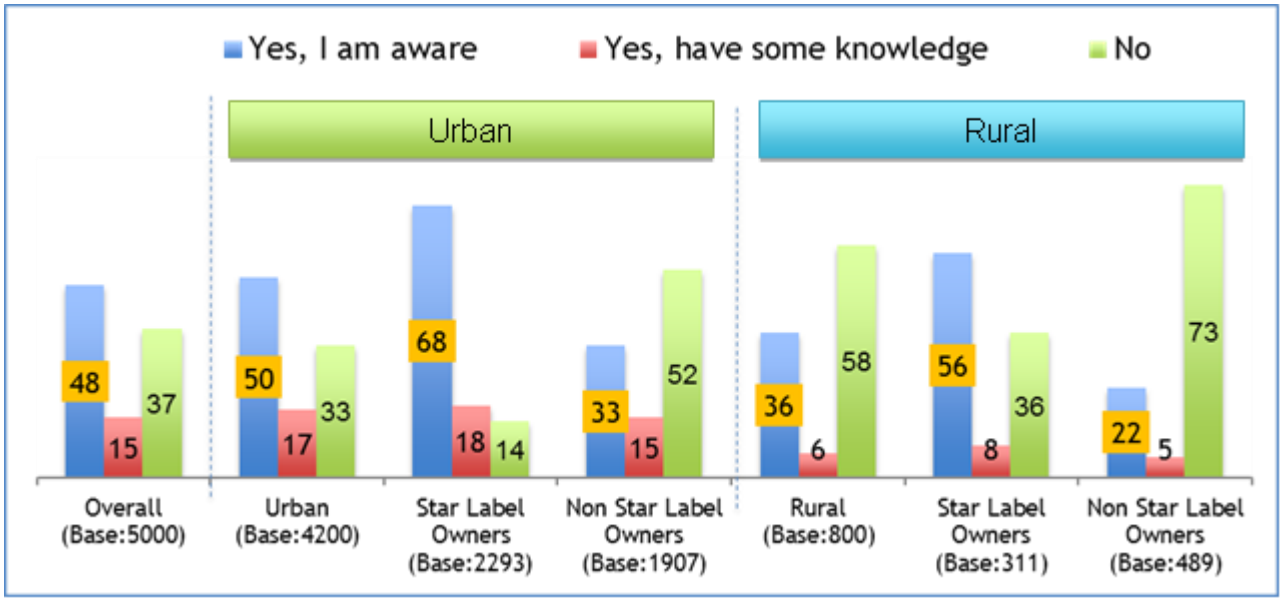
Awareness levels have almost doubled as compared to the previous impact assessment study conducted in 2010. The program can achieve further success with regular communication and educational programs coupled with some incentives.

Base: N=3150 Data presented in %



Graph 8: Awareness of the BEE Labeling Program

Consumer Awareness: Labeled vs Unlabeled Product Owners



Graph 9: Awareness of the BEE Labeling Program by Labeled vs Unlabeled Product

Awareness about the BEE labeling program is noticeably higher among both urban and rural respondents who own products with star labels. A very high percentage of non-star label products owners in both urban and rural areas displayed poor or no knowledge of star labels including how usage of labeled products could affect power consumption.

Impact Measurement Matrix –

Awareness

Following the earlier guidelines and benchmark to evaluate the success and impact of the program, a matrix was generated to compare results.

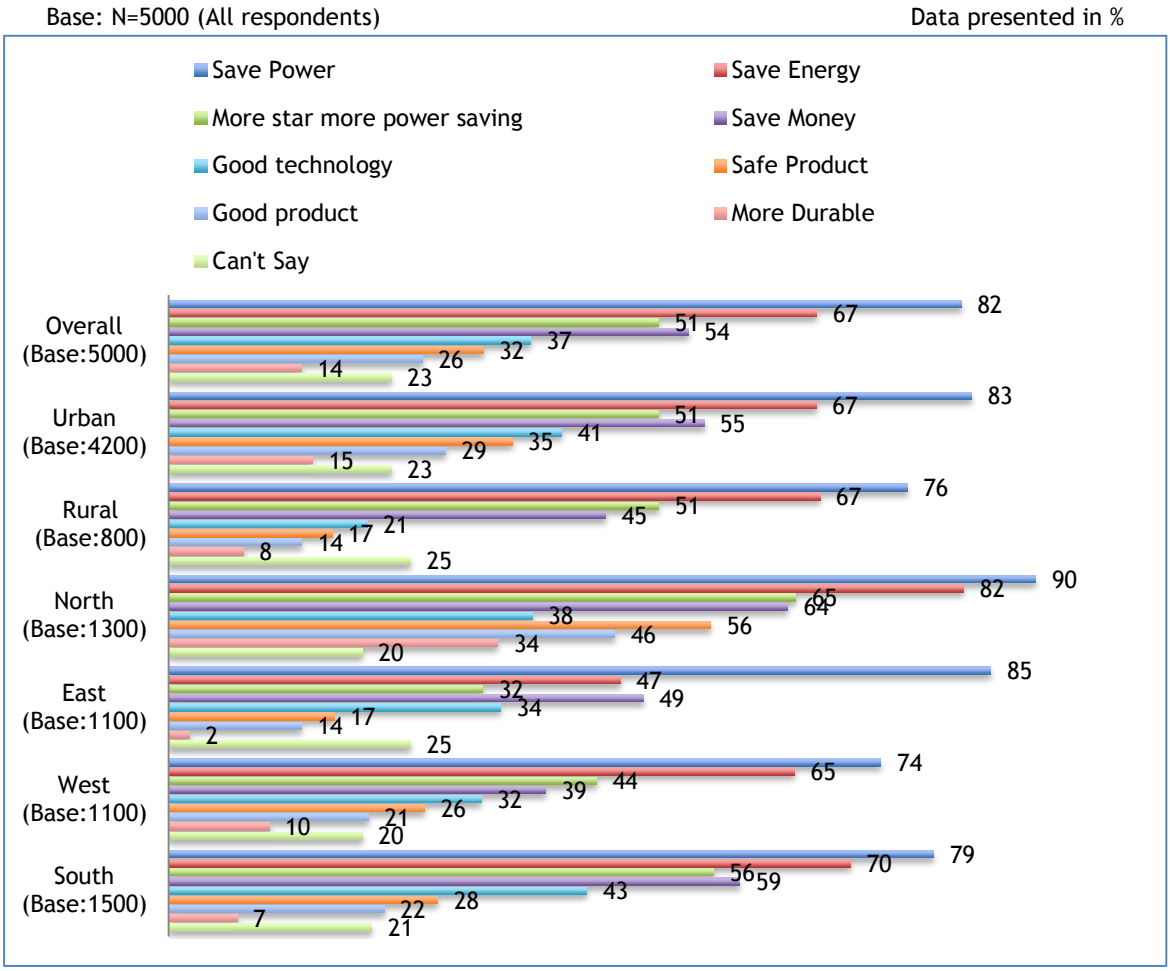
Table 21:

Awareness - Scale Band	Interpretation
0% to 20%	Low
21% to 50%	Moderate
51% to 70%	Good
71% to 100%	Excellent

The total awareness levels observed within the current study framework is *Good* at 63%. This is significantly higher than the previous impact study undertaken, where the awareness levels were *Moderate* at 33%. The change represents an increase of 100% from the survey conducted in 2010. Awareness levels are understandably higher in urban regions than in rural. There is not much differentiation observed between zones.

6.7.4 Knowledge about BEE's S&L Program

Findings obtained from previous surveys show that the Indian consumer is more sensitive about power savings than energy conservation. However, their responses in the categories of "More stars more savings" and "Save Money" indicate that people are beginning to understand the program proposition and equate higher stars with more savings.



Graph 10: Understanding of BEE's S&L Program by Regions

Compared to 2010 impact assessment findings, in 2014, most attributes were understood by a higher number of people.

Table 22: Knowledge about BEE's S&L Program

Base: N=5000 (All respondents) Data presented in %

	All		Urban		Rural		North		East		West		South	
	2010	2014	2010	2014	2010	2014	2010	2014	2010	2014	2010	2014	2010	2014
Save Power	65	82	66	83	55	76	92	90	54	85	59	74	67	79
Save Energy	61	67	62	67	54	67	70	77	60	54	56	65	66	70
More Stars More Power Saving	55	51	57	51	43	51	71	65	38	32	57	44	60	56
Save Money	47	54	47	55	48	45	51	64	33	49	58	39	37	59
Good Technology	38	37	38	41	42	21	37	38	25	34	46	32	39	43
Safe Product	30	32	31	35	22	17	33	56	15	17	33	26	38	28
Good Product	21	26	22	29	14	14	33	46	14	14	18	21	24	22
More Durability	16	14	17	15	14	8	28	34	15	2	15	10	12	7

In a short span of time, increased awareness of the S&L program, has led to the increased usage of EE products. Data gathered through field surveys show some of the major developments that have taken place.

- Consumers now have become more conscious about the need for energy efficiency in the products they use, which would lead to energy conservation.
- Growing consciousness is based on increased awareness.
- The program has been tested, and it has scored high on the following:
  - People foresee clearly the benefits of the labels and the program
  - Benefits are seen to outweigh the costs

6.7.6 Knowledge: Label Comprehension

People understand that BEE star labels are related to energy efficiency or power conservation. They tend to associate the star ratings with the catchphrase "the more stars the better" or "more the stars, the more energy efficient."

The general perception is that these labels prove little more than a guide as to which appliance is more energy efficient and/or better for the environment. To some people, any additional piece of information on the label simply serves to detract from the clarity of the star rating concept. The overall credibility or authority of the appliance labeling program seems now to have been well established.

Respondents who are aware of comparative labels exhibited a partial understanding of the information on the labels. Consumers across various income groups comprehend the comparative label as more the stars, more efficiency, which further leads to more saving.

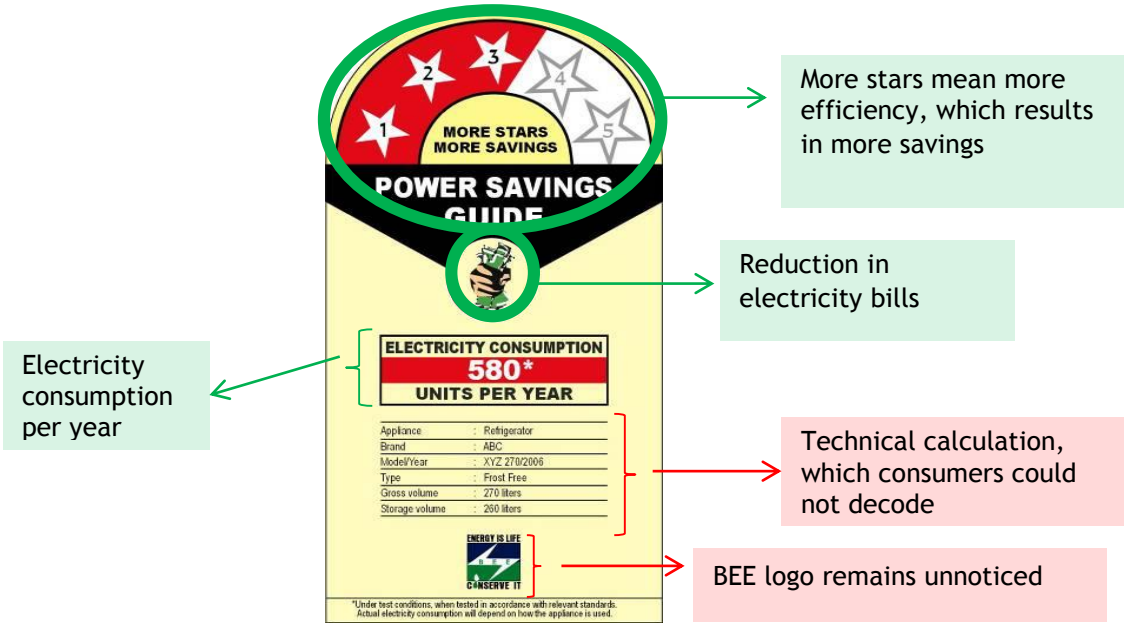


Figure 9: Label Comprehension

None of the respondents could decode the energy performance values printed on the comparative label. Further, consumers across locations said that they noticed the mentioned information only at the time of purchase and never tried to understand the performance values as it was too technical for them to understand.

Also, there is low awareness among consumers that BEE runs the S&L program in India. There is a general perception that leading brands or some government organization runs the program.

For domestic consumers, saving money is the most compelling reason to make improvements in products to make them energy efficient.

Energy improvements are not top-of-mind issues for most homeowners, however, they are of the opinion that the information should be presented in a way that it draws the consumer's attention, raises their awareness level, and then help them to make an informed decision.

Additional information such as unit cost of electricity, star rating calculation should be easily accessible at the point of purchase, but should not be specified on the label, according to consumers.

6.7.7 Influence of Energy Efficient Labels

The comparative labels have influenced the consumer's decision making process in the last few years. Saving on energy bills and the desire to use high quality and technologically advanced products are the reasons for consumers to opt for labeled products.

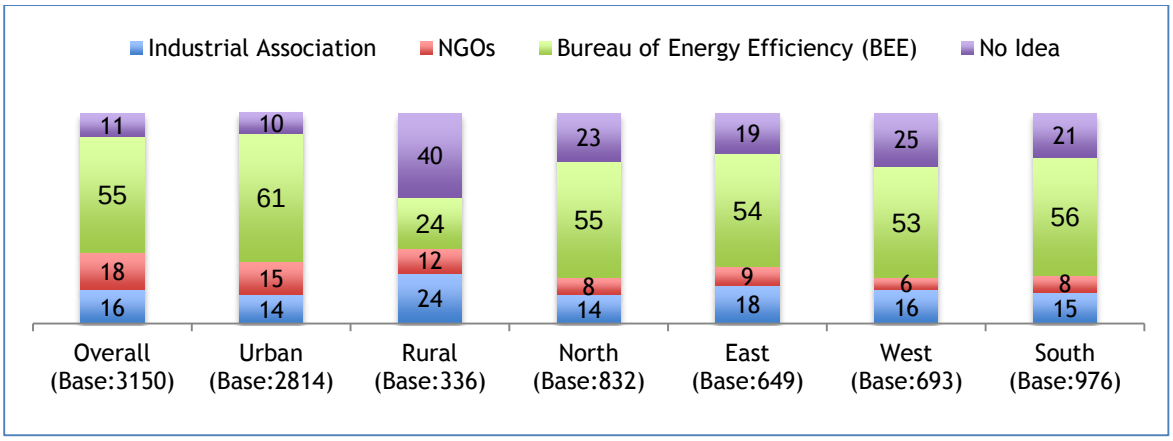
In the case of ACs, refrigerators and washing machines, which are high power consumption appliances, labels serve as a guide for the energy efficiency of the product. Labels are also highly desired in geysers as along with energy efficiency, consumers perceive that it gives them an assurance of safety and quality.

Only a few consumers in SEC C & D said that they would go in for an unlabeled product, which could even be an assembled or a second hand product since there is a general perception among these consumers that energy (electricity) could be saved by effective usage and it is not necessary to own expensive EE products.

6.7.8 Implementing Agency of the S&L Program

Many consumers are confused about who is behind the "star labels". Most believe that it is issued by the Government. Others perceive it to be an initiative of manufacturers to provide the latest technology to consumers. However, all respondents found labels trustworthy.
In urban centers, the majority, i.e. 61% clearly associate the program to be implemented by BEE. The majority (40%) of the respondents in rural centers did not have any idea about the implementing agency, and only 24% respondents associate the label with BEE. Thus, it is imperative for BEE to establish itself as the implementing agency.

Base: N=3150 Data presented in %



Graph 11: Awareness of the Comparative Label Implementing Agency

6.7.9 Satisfaction with EE Labels

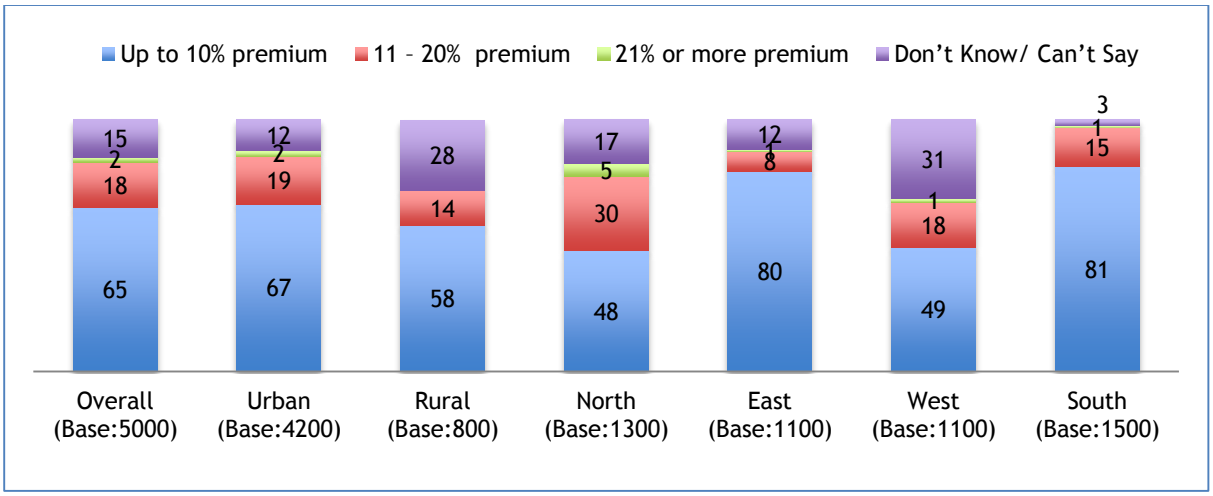
Consumers of SEC A, B and C show a high level of satisfaction with the EE appliances. Though consumers perceive that usage of EE appliances reduces their electricity bills, they are unable to evaluate the impact of the same on their bills. Mainly two reasons are attributed to the above mentioned behavior, one being multiple appliance usage and second being the growing numbers by the day.

6.7.10 Willingness to Pay Premium for Star Labels

Most consumers of SEC A and B express willingness to pay extra for an efficiency level of three stars, however they consider four and five stars to be too expensive.

Those who have the ability to pay a premium opt for five stars as they place energy/power saving and quality above price. However, this behavior is limited to ACs and geysers. For other products, three stars is the most preferred efficiency level by all and consumers are willing to pay a premium of around 10%.

Base: N=5000 (All respondents) Data presented in %



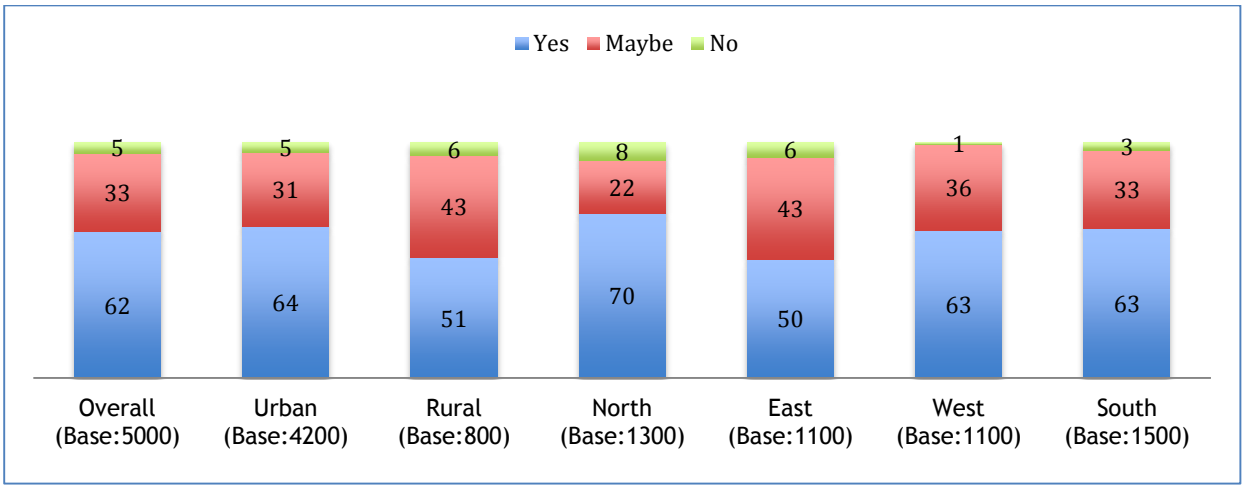
Graph 12: Willingness to Pay Premium for Star Rated Appliances

It is observed that the majority of consumers in every group are disposed to pay some premium for BEE labeled appliances. It is presumed that as customers become more and more aware of the benefits they will be more willing to pay the premium.

6.7.11(A) Savings or Lower Electricity Bill

Out of all the consumers surveyed, 62% respondents relate savings on their electricity bills as benefits connected with star labels. However, at the same time, 33% respondents still seem unsure, and only a meager 5% deny that there is any relation between monetary benefit in power consumption bills and EE star labels. The findings are encouraging and reveal the shift in behavior and understanding which the labeling program has generated among consumers.

Base: N=5000 (All respondents) Data presented in %

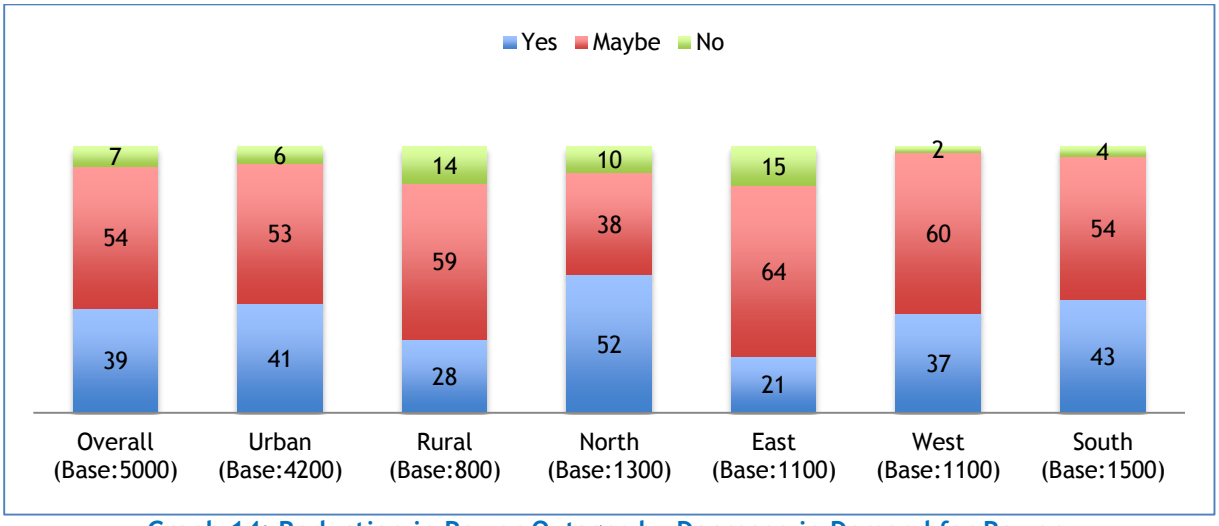


Graph 13: Savings on Lower Electricity Bill

6.7.11(B) Reduction in Outages - An Outcome of the S&L Program

In India, many factors account for power supply interruptions. Moreover, as it has no set pattern, consumers do not associate reductions in outages to their usage of improved EE products that help decreasing e power demand. If consumers are educated that this is a consequence of the S&L Program certainly many consumers will opt for a technologically advanced product.

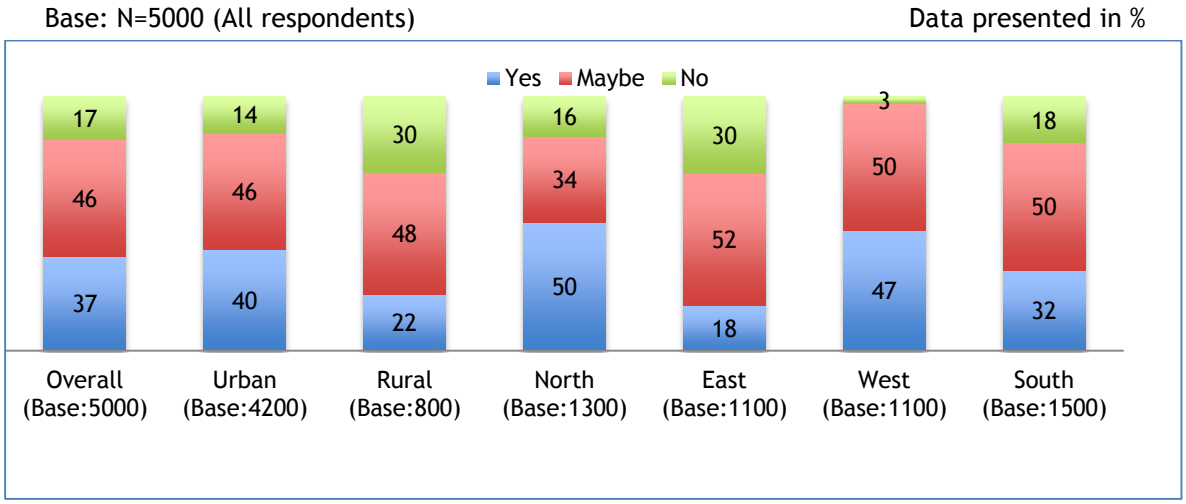
Base: N=5000 (All respondents) Data presented in %



Graph 14: Reduction in Power Outages by Decrease in Demand for Power

6.7.11(C) Reduction in Air Pollution – An Outcome of the Program

At this juncture, consumers are unable to see the wider impacts of the S&L program, as they are still concerned about the direct and more visible benefits that they see from it, mainly in the form of lower power consumption bills. However, increased awareness will lead to a more mature consumer, who will understand the impact of energy conservation and consequent mitigation of GHG emissions on the environment.



Graph 15: Reduction in Air Pollution

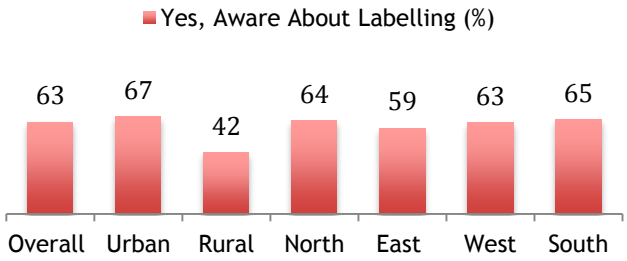
6.8 Awareness through Media

In India, across SECs and genders, TV viewing is enjoyed the most. Most consumers across cities say that TV is the key source of information about new products and TV commercials impact the final purchase decision.

In SECs A and B across various regions, social media seems to be one of the favorite options not only to stay connected with peers, but also because it provides information and enhances awareness in urban consumers, helping them to make an informed choice.

Though print media can be confined to educated consumers, newspapers are the largest source of information across all locations. Consumers of SECs C & D read newspapers in regional languages.

6.8.1 Awareness about labeling



Graph 16: Awareness about Labeling

Sources of awareness are varied. Different people refer to various sources to gain knowledge and awareness. Television as a source of information is at the top of the table. That clearly indicates the mass appeal it has for audiences in both urban and rural areas. This is consistent with findings of the impact assessment of 2010. Other prominent information sources are word of mouth (WOM) followed by the newspaper. Consumers say that in recent times, communication about BEE labeling has been low though many brands and media articles have highlighted the importance of labels. These findings show that both direct communication on the benefits of labeled products, indirect communication, write-ups by brands, and others will heighten awareness in consumers and in turn, the demand for EE products

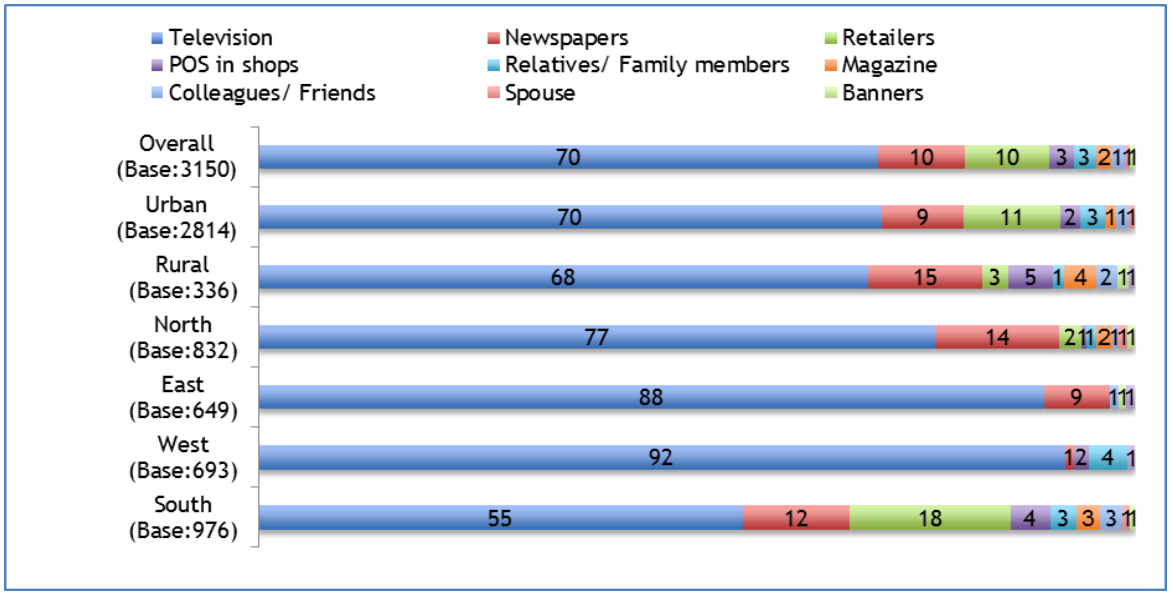
Table 23: Comparison of Awareness Sources for BEE Star Labels

Base: N=3150(Year 2014) Data presented in %

Sources of Awareness by Region														
	All		Urban		Rural		North		East		West		South	
	2010	2014	2010	2014	2010	2014	2010	2014	2010	2014	2010	2014	2010	2014
Television	81	76	82	76	73	77	86	61	86	60	74	83	75	87
Retail	45	30	47	32	27	19	10	22	35	31	61	24	34	26
Word of mouth - Friends, relatives etc.	51	53	54	58	52	28	-	69	43	24	34	21	8	65
Print/Magazines	19	14	20	14	11	15	8	9	25	6	18	1	15	25
POS in shops	14	12	15	10	4	23	7	8	10	6	24	11	2	17
Newspapers	13	47	14	49	7	33	6	39	17	29	15	26	8	65
Banners	5	9	6	9	1	9	1	16	5	24	9	1	2	4
Radio	3	12	4	13	1	7	2	15	7	2	-	5	5	16
Cinema/theaters	-	2	-	1	-	9	-	1	-	2	-	-	-	4
Websites/Online	-	8	-	9	-	5	-	8	-	6	-	9	-	10

The primary or the major source of awareness is TV, followed by the newspaper and the retailer.

Base: N=3150 Data presented in %



Graph 17: Primary Sources of Awareness

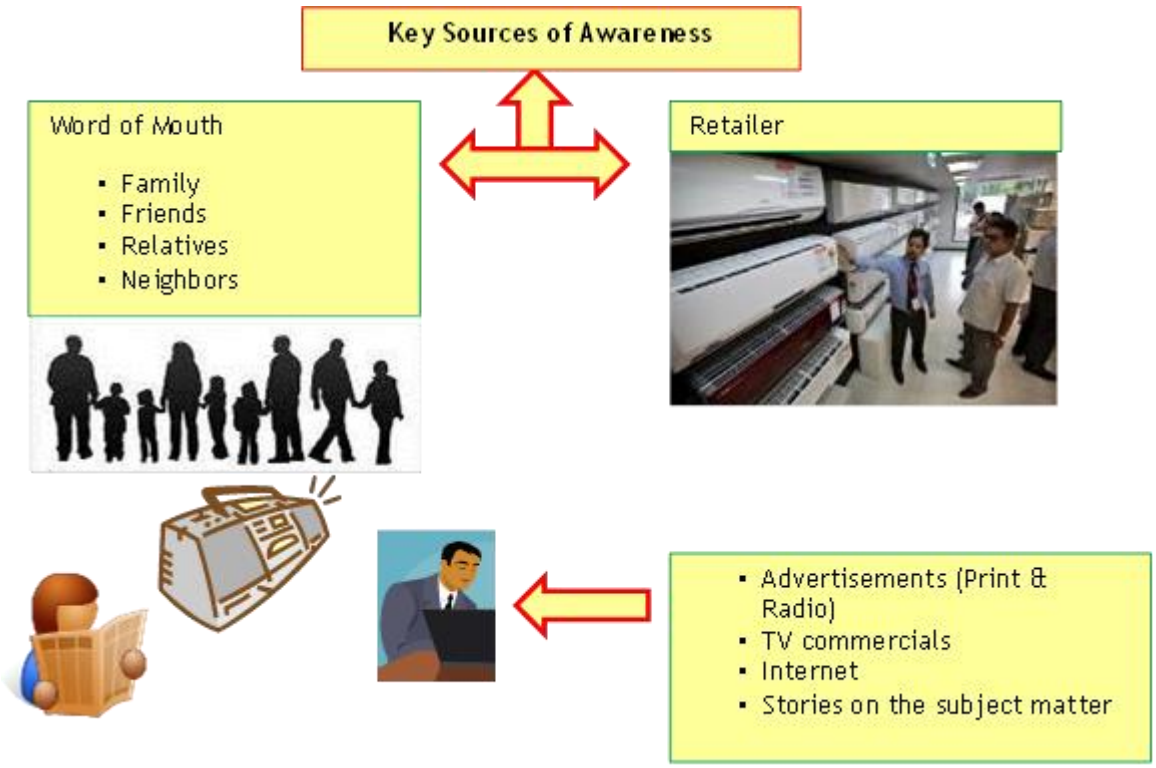


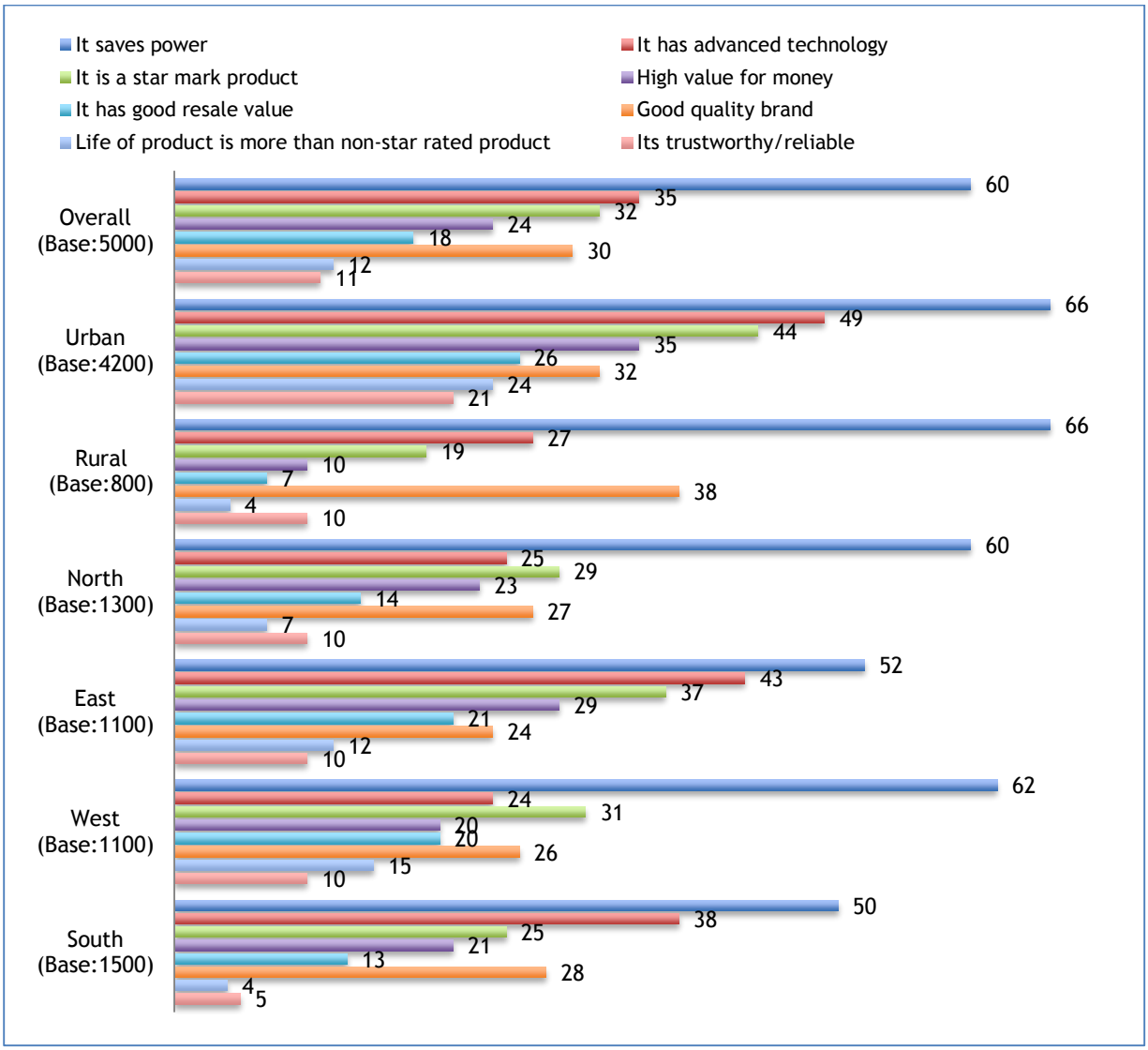
Figure 10: Key Sources of Awareness

WOM by friends, relatives, and retailers act as key sources of awareness. Other sources of awareness include electricity bills, print ads, articles, TV and radio advertisements. However, only very few consumers recall print ads of EE Labels, and none could recall any TV commercial.

6.8.2 Advantages of Star Labeling

The most important message that people take from the BEE labeling program is that it saves power, followed by the message that the BEE labeled products are technologically advanced. The catchphrase "It is a star mark product" indicates that people have started attaching credibility to the star mark on products. Credibility attached to the symbol is a great sign that the program is moving in the right direction.

Base: N=5000 (All respondents) Data presented in %

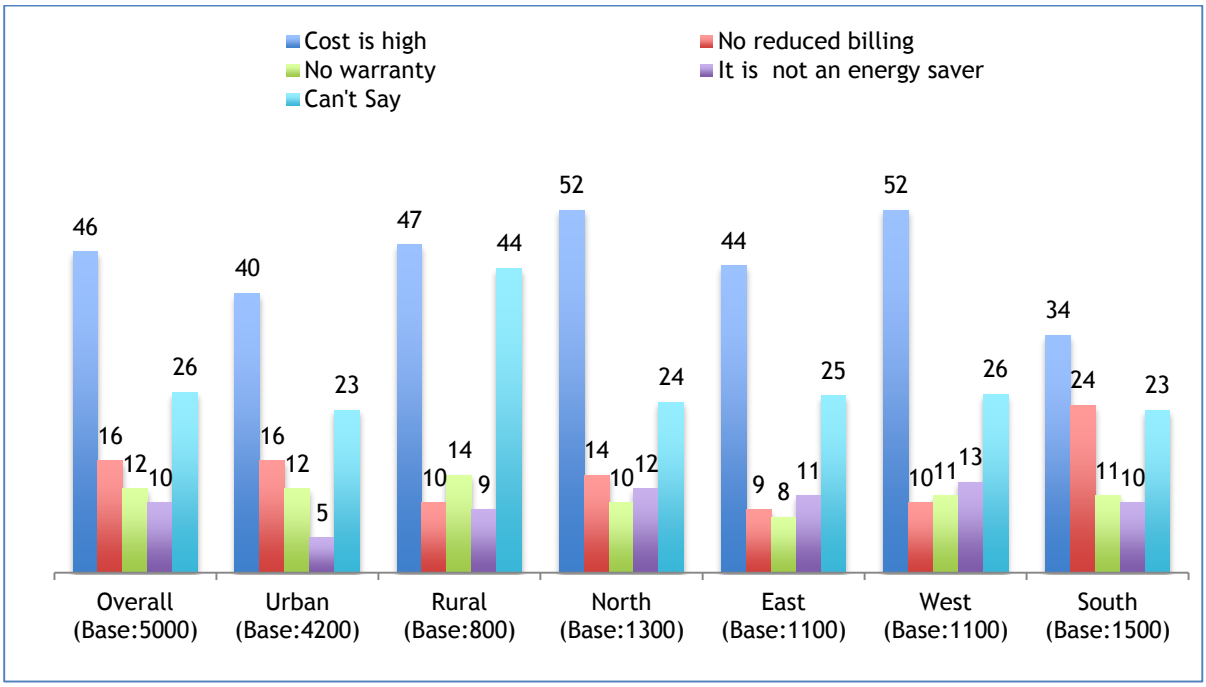


Graph 18: Advantages of Star Labeling

6.8.3 Disadvantages of Star Labeling

The biggest disadvantage of star labeling is cost escalation of the product. The Indian market is price sensitive; hence, this is one challenge that needs to be overcome. Overall, 26% feel there are no real benefits in terms of money or energy savings from the labeling program. It needs to be demonstrated to the consumer that a star label on a product is endorsement of its energy efficiency which will translate to energy savings and reduced electricity bills in the future, in addition to contributing to a green environment.

Base: N=5000 (All respondents) Data presented in %

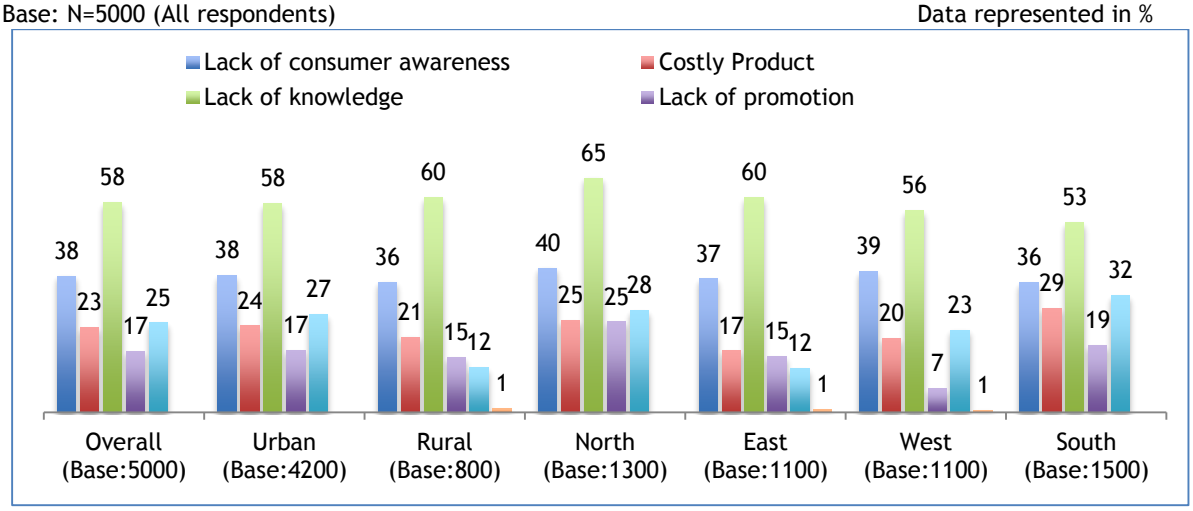


Graph 19: Disadvantages of Star Labeling

6.8.4 Barriers in Accepting Energy Efficient Products

When asked to state factors that are seen as hindrances towards adoption of EE products, the majority indicate the inadequate awareness and understanding of the benefits from these products are the key barriers. This indicates the role and importance of an outreach program to communicate effectively the message of the star label on a product, which the consumer can engage with. The other factors that act as barriers in accepting EE products are price escalation, lack of incentives or replacement/exchange programs for products without star labels.

Base: N=5000 (All respondents) Data represented in %

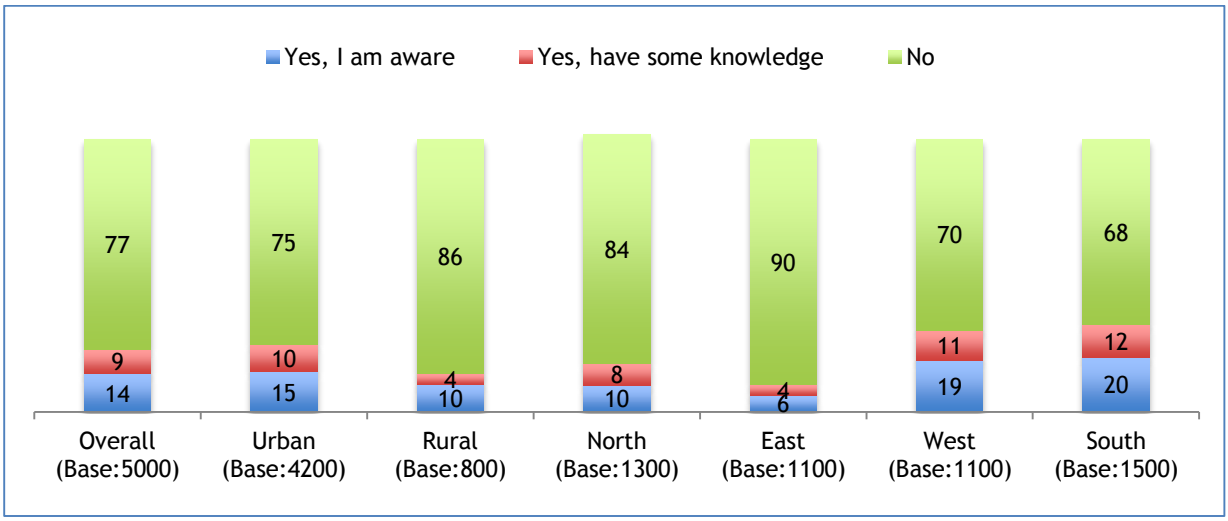


Graph 20: Barriers in Accepting Energy Efficient Products

6.9 Awareness of Voluntary and Mandatory Labels of BEE

The majority of the people are unable to distinguish between mandatory vs voluntary labels. A lot needs to be done to educate the consumers on this front.

Base: N=5000 (All respondents) Data presented in %

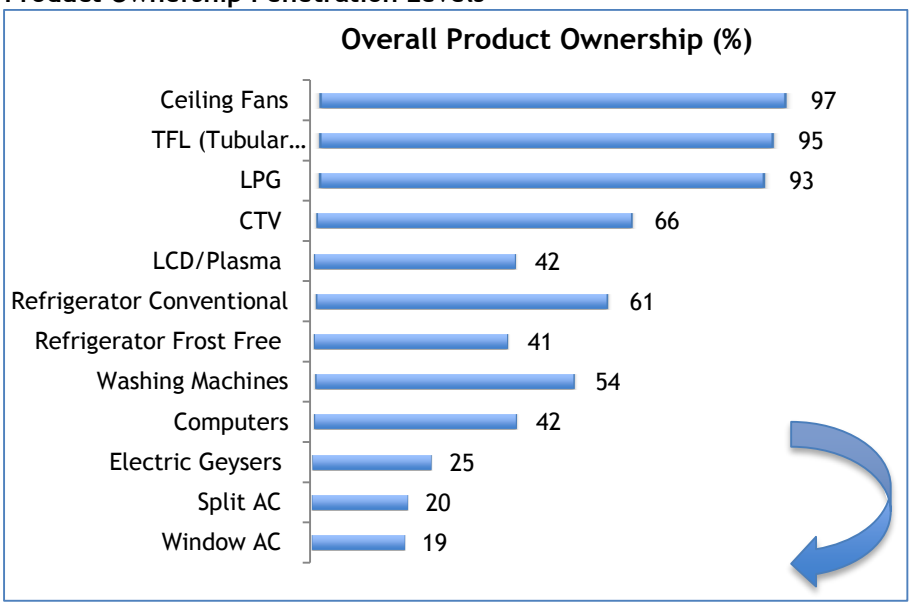


Graph 21: Awareness of Voluntary and Mandatory Labels of BEE

6.9.1 Product Ownership

Overall

Product Ownership Penetration Levels



Graph 22: Overall Product Ownership

Product Ownership with BEE Label

From amongst the products owned, it is found that the consumer's requirement of star labels is different for different products. Consumers now expect products such as ACs, refrigerators, and TFLs, i.e., categories that come under the mandatory program and those that they have replaced in the near past to have star labels on them. Awareness generated with respect to energy savings from labeled products has fuelled the demand for labeled appliances even in the case of products in the voluntary category.

Table 23: Product Ownership with BEE Label by Market Type

Data presented in %

Star Rated Appliances		Overall		Urban		Rural	
	Total Product Ownership	Star Rated	Base	Star Rated	Base	Star Rated	Base
Ceiling Fans	4872	3	139	3	126	2	13
TFL (Tubular Fluorescent Light)	4744	33	1579	35	1470	20	109
CTV	3300	7	235	7	200	8	35
Refrigerator Conventional	3050	49	1497	48	1333	60	163
Washing Machines	2704	8	216	8	150	3	66
Computers	2110	5	99	5	99	-	
LCD/Plasma	2100	22	467	21	412	40	54

Refrigerator Frost Free	2026	59	1199	60	1134	48	65
Electric Geysers	1240	7	82	7	82	-	
Split AC	1000	70	699	71	699	-	
Window AC	964	44	423	43	397	63	25

6.9.2 Product Ownership of Star Rated Appliances - Zone wise

The findings at the zone level are reflective of overall findings. Ownership of star labeled appliances, especially of refrigerators and washing machines, is high in the east zone. This indicates a higher number of recent buyers in the region.

Table 24: Product Ownership of Star Rated Appliance - Zone Wise

Data presented in %

Star Rated Appliances	North	East	West	South
Split AC	62	69	79	54
Window AC	41	47	42	50
Ceiling Fans	3	3	3	2
TFL (Tubular Fluorescent Light)	32	44	35	27
CTV	6	9	7	7
Refrigerator Conventional	46	59	54	42
Washing Machines	5	11	10	9
Computers	3	7	6	4
LCD/Plasma	26	31	19	14
Refrigerator Frost Free	54	68	55	59
Electric Geysers	4	13	9	9
Pumps	8	7	10	5

6.9.4 Presence of Star Labels on Appliances

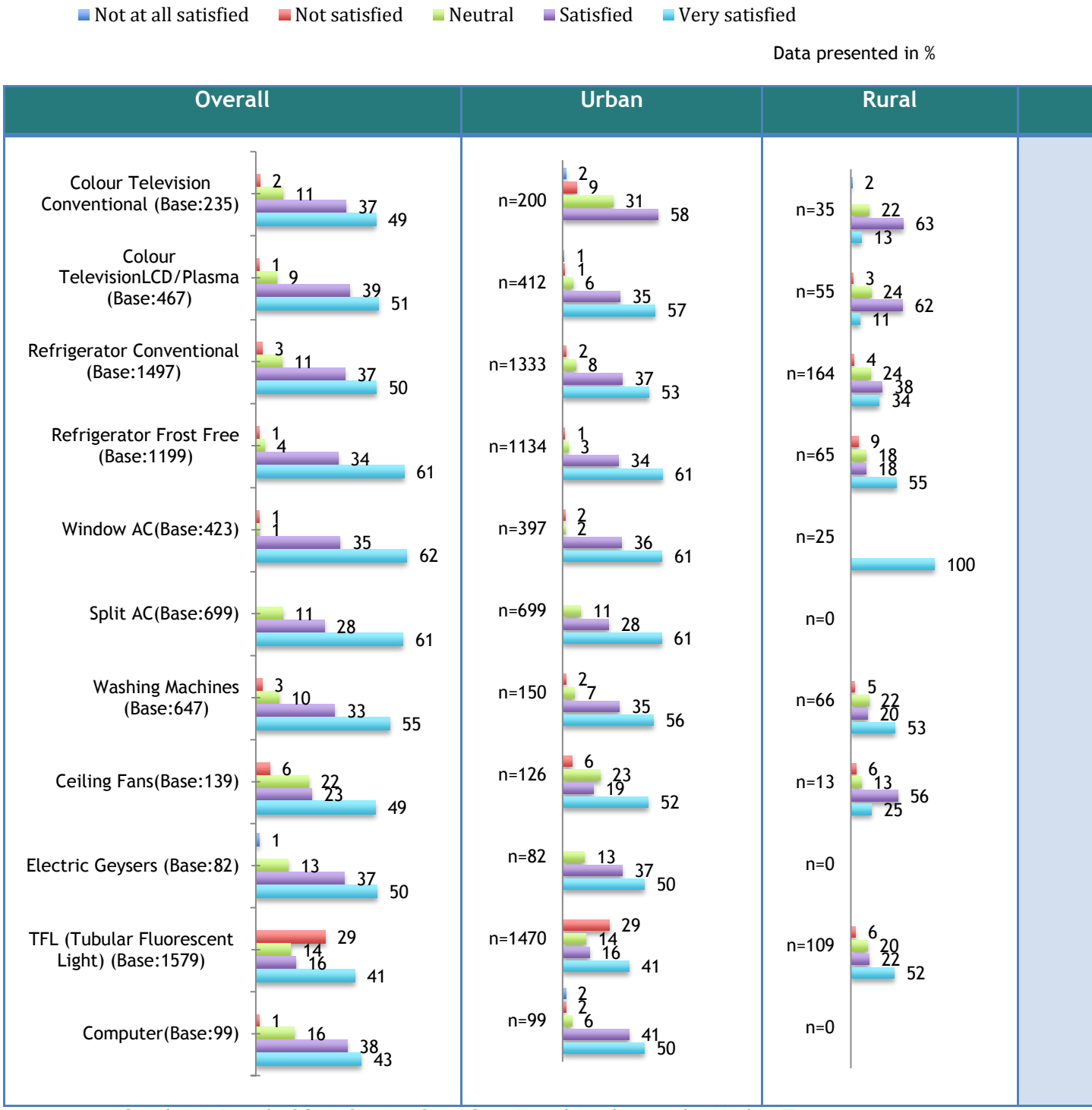
Of the star labeled appliances owned at the household level, 50% respondents claim to have five star labeled refrigerators. However, in the case of ACs, the majority of the respondents have appliances with three star labels. The TFL market also shows a high presence of three star rated products.

Data presented in %

Graph 23: Presence of Star Labels on Appliances

6.9.5 Level of Satisfaction from Labeled Appliances

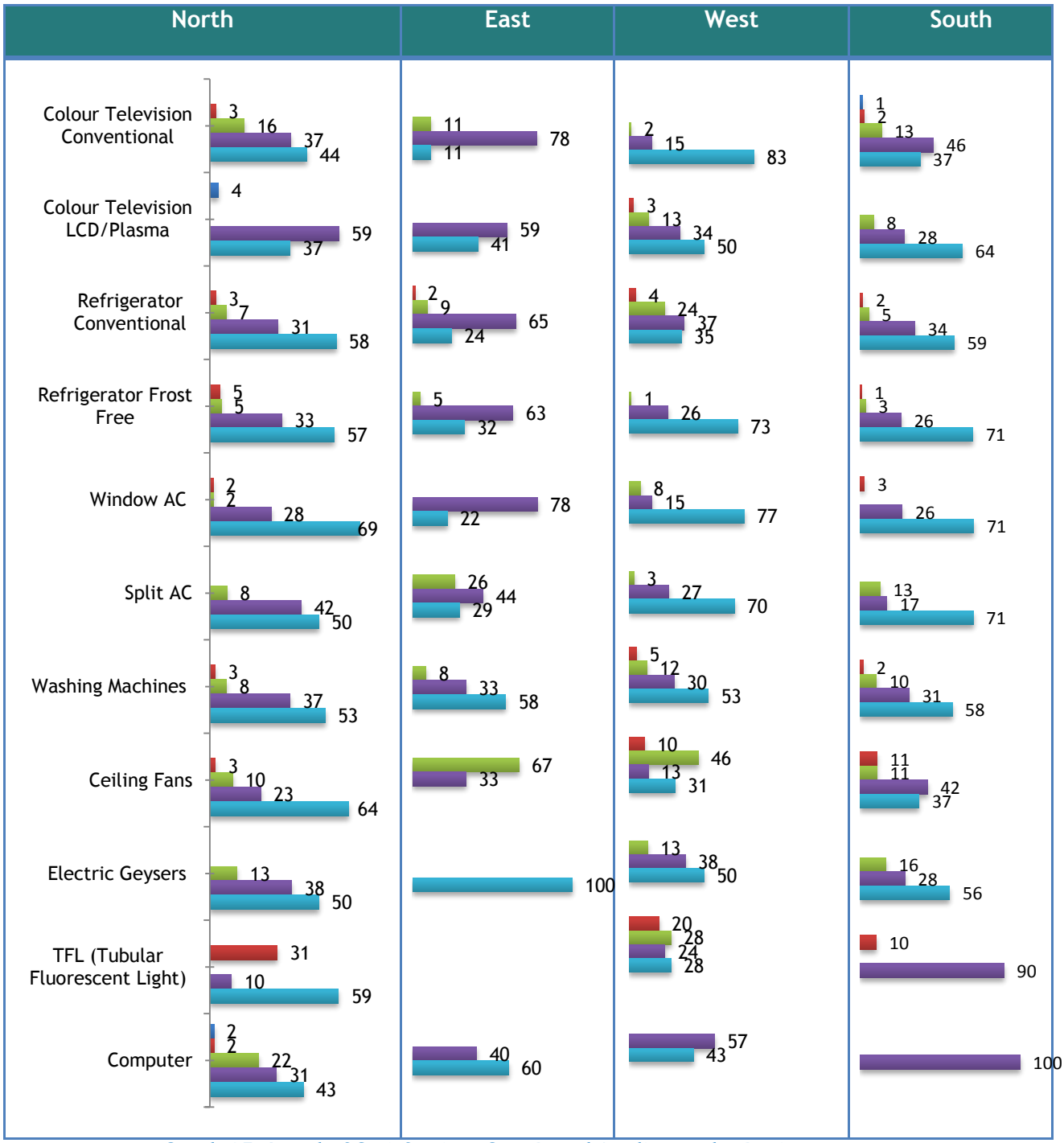
Respondents expressed a high level of satisfaction by using star labeled appliances except for TFLs in rural areas where some people expressed dissatisfaction as they believed there were no resultant savings.



Graph 24: Level of Satisfaction from Star Rated Appliances by Market Types

Only respondents in the North Zone express dissatisfaction from the usage of TFLs. Respondents in all other zones express satisfaction.

Data represented in %

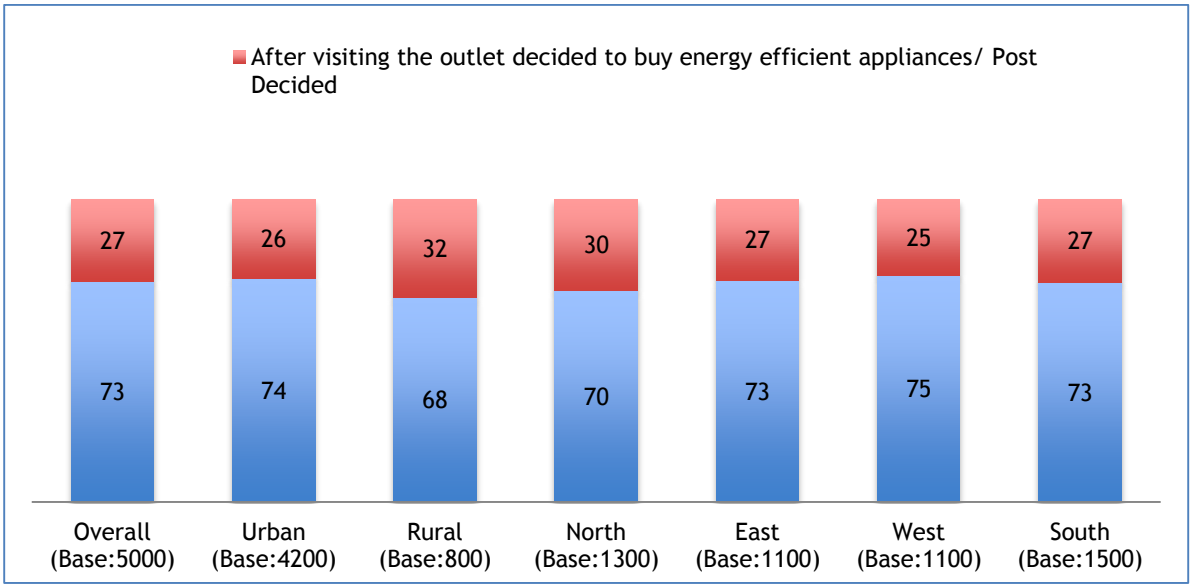


Graph 25: Level of Satisfaction- Star Rated Appliances by Regions

6.9.6 Importance of Retailers in Purchase of Energy Efficient Appliance

The majority of consumers say they are pre-disposed to buying EE appliances. However, a significant number of respondents, both in rural and urban areas and in all zones, state their decision to buy star labeled EE appliances is influenced by the retailer of the goods. The retailer, thus, has a responsible role in influencing the consumer to opt for EE appliances.

Base: N=5000 (All respondents) Data presented in %



Graph 26: Importance of Retailers in Purchase Energy Efficient Appliances

Important Factors for Buying Energy Efficient Appliances

The reasons given below clearly bring out the fact that consumers are increasingly being influenced to buy EE appliances as they see merit in investing in such products.

Table 25: Important Factors for Buying Energy Efficient Appliances

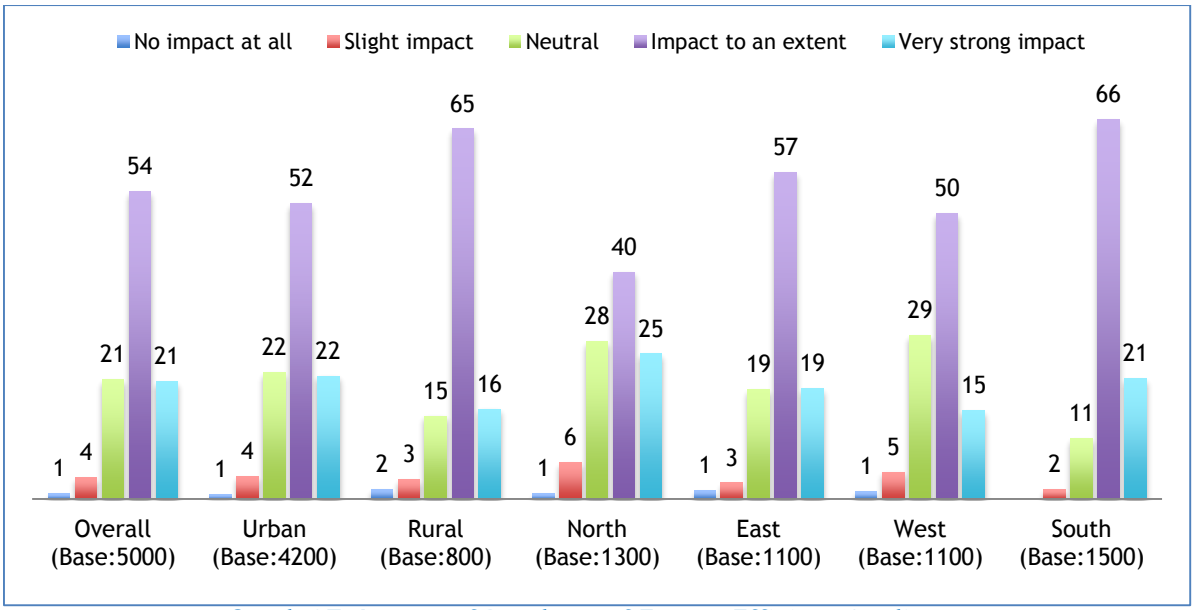
Base: N=1447 (All respondents) Data presented in %

	Overall	Urban	Rural	North	East	West	South
Factors (Top responses)	**1350**	**1091**	**259**	**380**	**290**	**273**	**407**
I was convinced that the appliance will consume low energy	24	35	20	11	14	22	30
I saw value for money	19	34	1	29	5	18	25
Cost benefits of owning such appliances	16	6	5	30	33	19	2
Recommended by salesman	5	1	22	-	1	6	2
Recommended by friends/relatives/ family	4	2	5	3	8	4	4

6.9.7 Impact of Purchase of Energy Efficient Appliance

It is encouraging to note that consumers have started feeling the impact of the program. The impact may not be very visible as yet due to the rebound effect where people have started using appliances for longer durations. Moreover, with lifestyle changes, greater economic power and the proliferation of products in the market, the tendency to own more and bigger appliances is gaining ground, eventually leading to no real reductions in bills.

Base: N=5000 (All respondents) Data presented in %

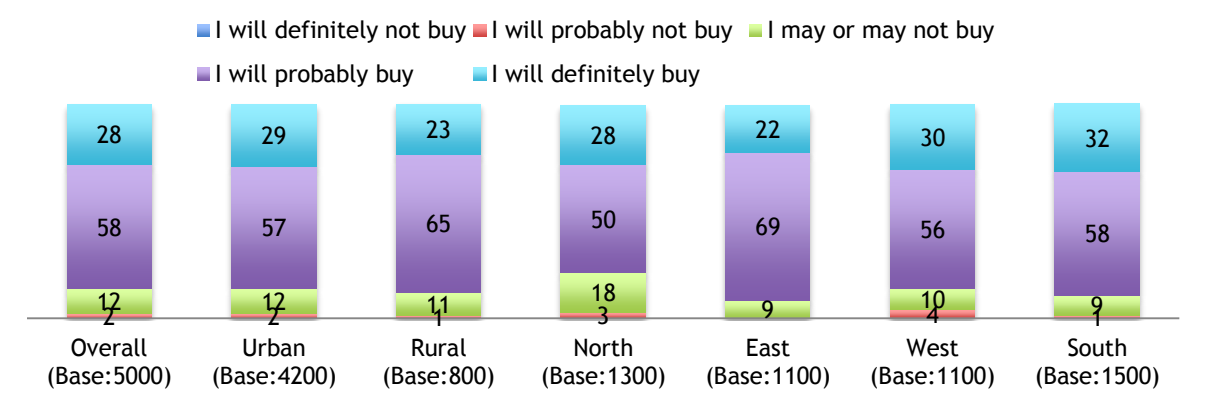


Graph 27: Impact of Purchase of Energy Efficient Appliance

6.9.8 Inclination Towards Star Rated Appliances

Out of all the respondents who polled in favor of considering/buying a star rated appliance, it is encouraging to note that 58% clearly state that they would probably buy the appliance. That is almost double the number of respondents who stated with certainty that they wouldn't invest in the product.

Base: N=5000 (All respondents) Data presented in %



Graph 28: Inclination Towards Star Rated Appliances

6.9.9 Understanding of EE Appliances

Consumers have begun to understand that EE appliances save power/electricity, which translates to saving money. The consumer needs to understand that the message "save electricity/power" does not only mean saving money immediately in the form of lower electricity bills, but has long reaching effects of saving energy for future generations, saving power to reduce bills, saving power to reduce power outages, etc.

Table 26: Understanding of Energy Efficient Appliances

Data presented in %

	Over all	Urban	Rural	North	East	West	South
Base (Top responses)	**5000**	**4200**	**800**	**1300**	**1100**	**1100**	**1500**
Saves electricity	27	26	30	39	23	23	21
Saves power	28	29	23	18	22	25	43
Low power consumption /It consumes less electricity	19	19	21	13	29	17	18
Saves money	9	8	19	4	10	8	15
Good quality product	6	6	3	6		17	1
Low electricity bill/reduces electricity bill	5	5	4	3	6	6	5

6.9.10 Identification of Energy Efficient Appliances

The labeling program uses the symbol of the star to convey the message of energy saving to the consumer. The greater the number of stars awarded to a product, the greater the energy efficiency. Besides the star label, other elements that help the consumer to identify an EE appliance are: the power saving guide label, the BEE logo, the retailer who helps the consumer make an informed choice, and TV commercials.

Table 27: Energy Efficient Appliance Identification

Data presented in %

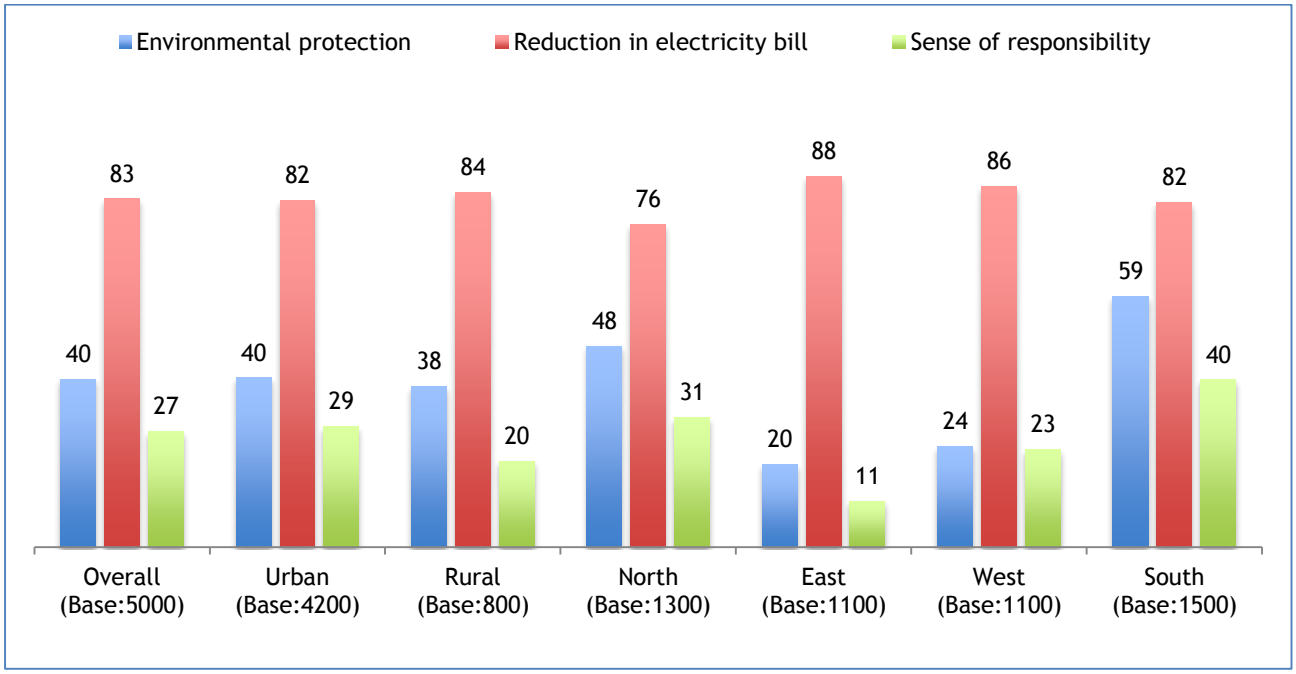
	Over all	Urban	Rural	North	East	West	South
Base (Top responses)	**5000**	**4200**	**800**	**1300**	**1100**	**1100**	**1500**
Star label on appliance	31	32	21	37	40	11	32
Stars shown on appliance	13	12	15	17	32	3	2
Power saving guide label	10	11	5	11	7	15	9
BEE Logo	9	10	8	12	10	11	3
Through retailer	10	11	15	11	7	11	8
Information from TV advertisements	3	3	1	1	2	1	6

6.9.11 Motivation for Buying Energy Efficient Products

Though the majority of the respondents state that the key motivating factor for them to own EE appliances is reduction in electricity bills, a significant number (which is increasingly growing) of respondents have also started buying these appliances in the wider interest of a green environment.

Overall, about 27% of the respondents believe they opt for EE products out of a sense of responsibility.

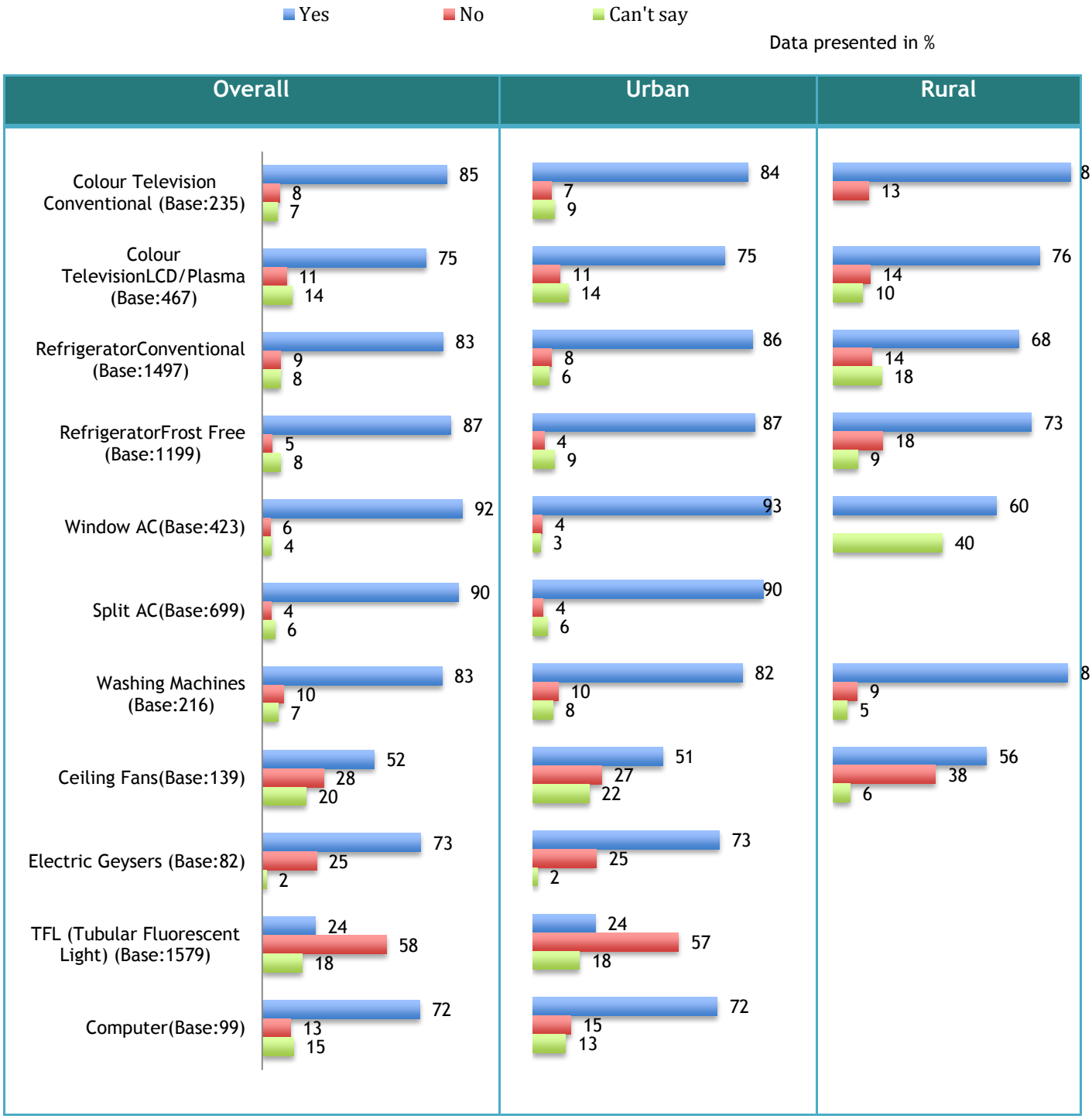
Base: N=5000 (All respondents) Data presented in %



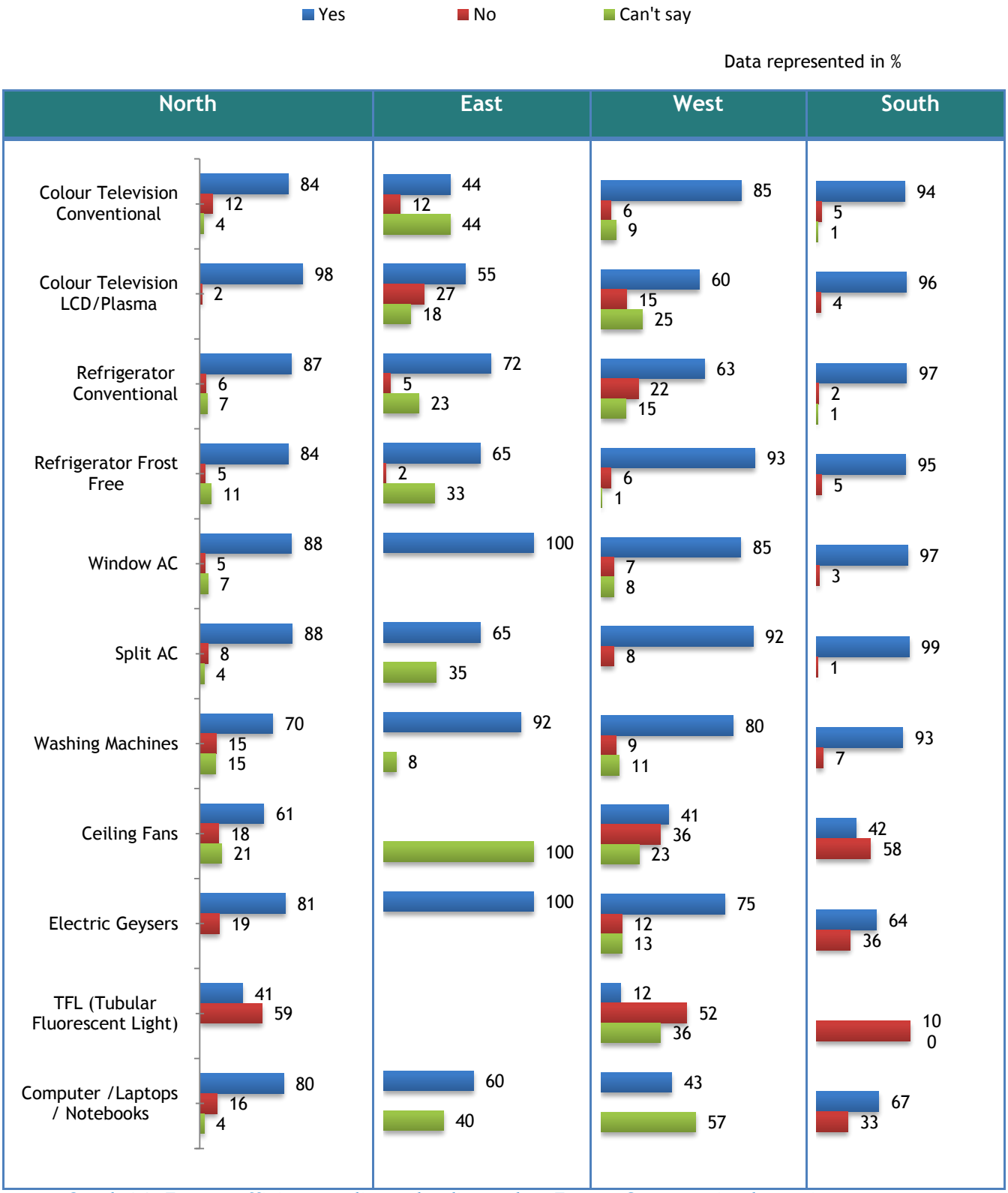
Graph 29: Motivation for Buying Energy Efficient Products

6.9.12 Energy Efficient Appliances Leading to Low Energy Consumption

The majority of consumers believe that reduced energy consumption claims on appliances with star labels are true. Few respondents are unable to see the benefits clearly, while a small number believe that the star labeled appliances do not save energy/power consumption.



Graph 30: Energy efficient appliance leading to low Energy Consumption by market

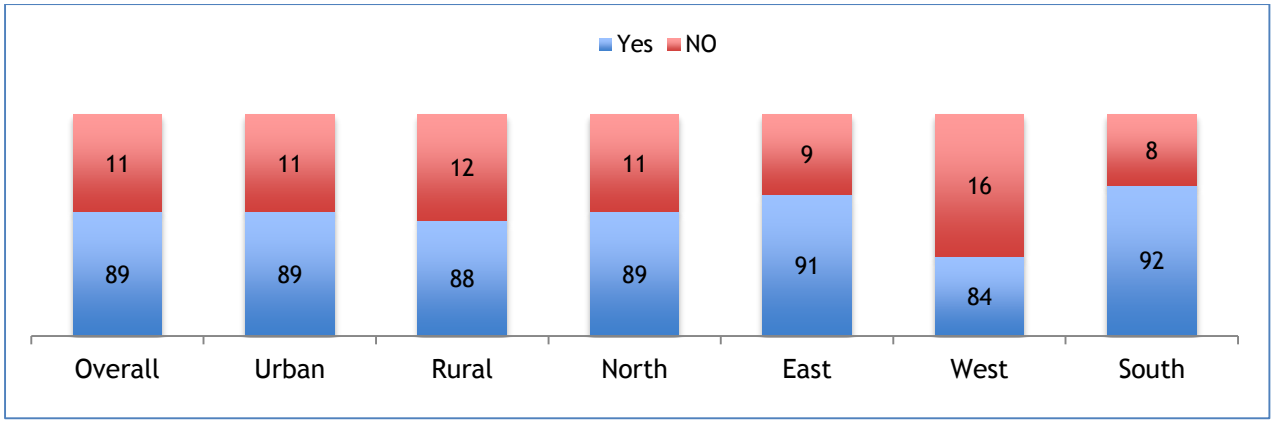


Graph 31: Energy efficient appliance leading to low Energy Consumption by regions

6.9.13 Impact of Labeled Appliances on Electricity Bill

Out of the respondents who own EE appliances, 89% see merit in owning such products and have experienced reduction in their power consumption bills even though the actual billing might remain the same on account of the rebound effect caused by an increase in the number of appliances in the household.

Base: N=2174 Data presented in %

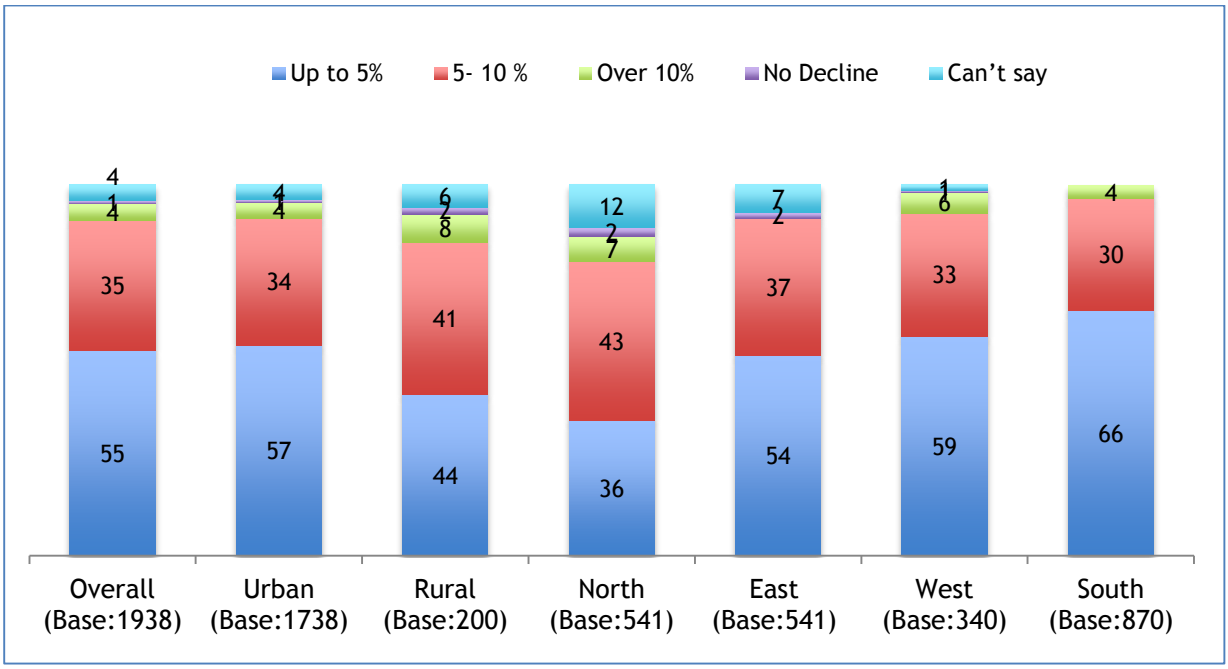


Graph 32: Perceived Reduction in Electricity Bills from Labeled Appliances

6.9.14 Perceived Reduction in Electricity by Usage of Energy Efficient Appliances

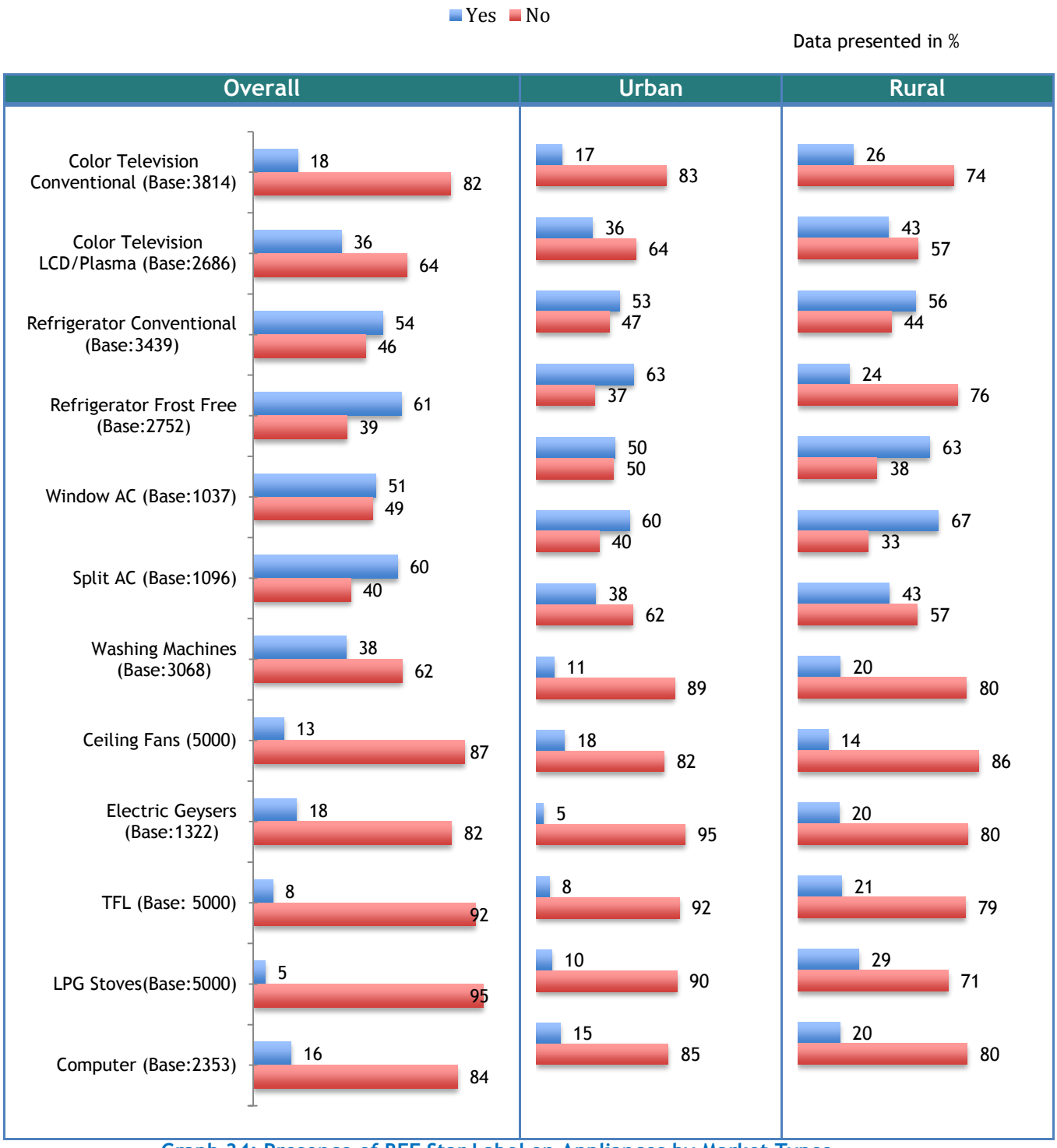
Consumers who own one or more star labeled appliances have no way to assess reductions in their bills. Most respondents say they estimate savings to the tune of 5%, while some perceive the savings to be up to 10%.

Base: N=1938 Data presented in %

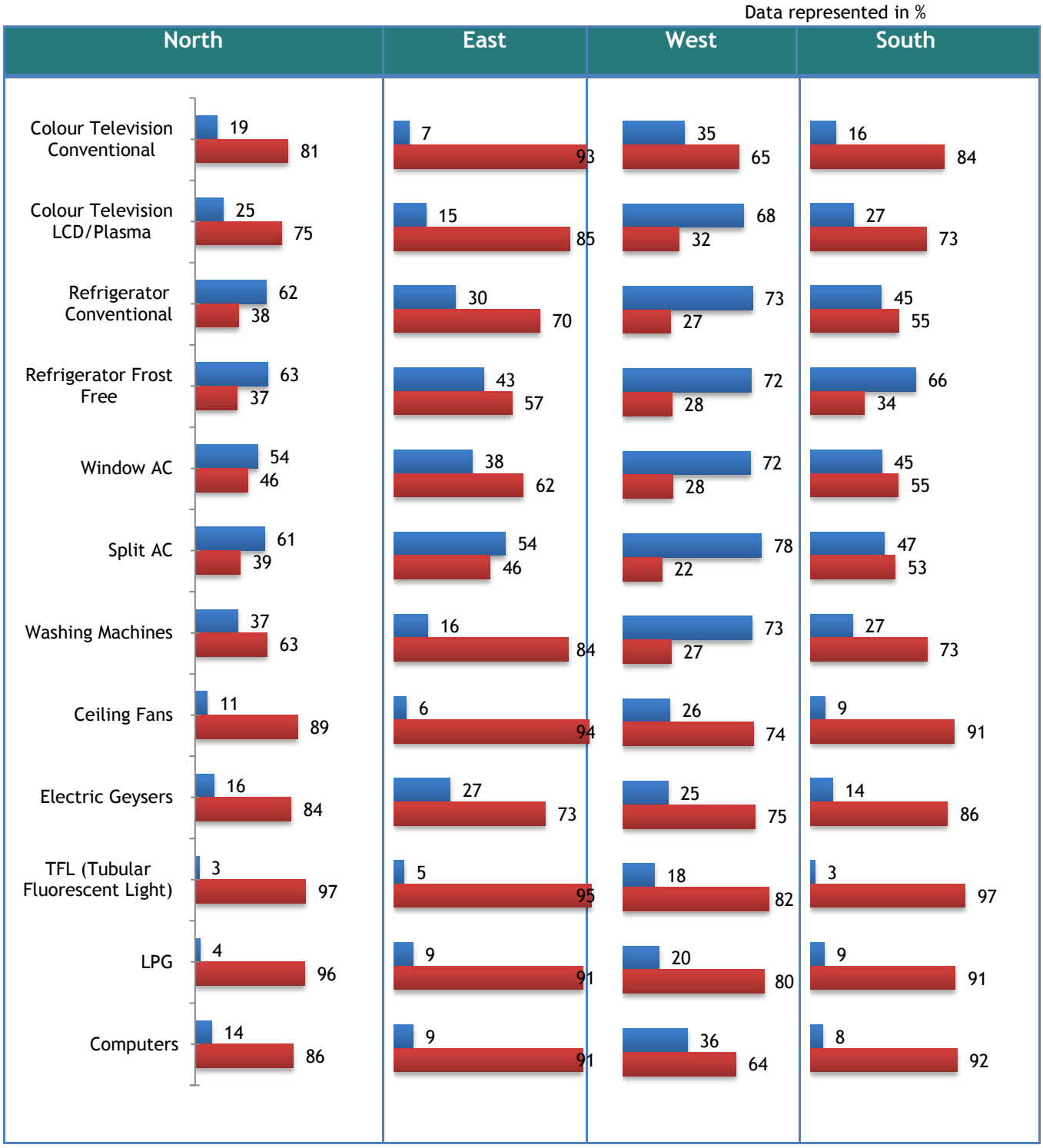


Graph 33: Perceived Reduction in Electricity by Usage of Energy Efficient Appliances

6.9.15 Presence of BEE Star Label on Appliances



Graph 34: Presence of BEE Star Label on Appliances by Market Types

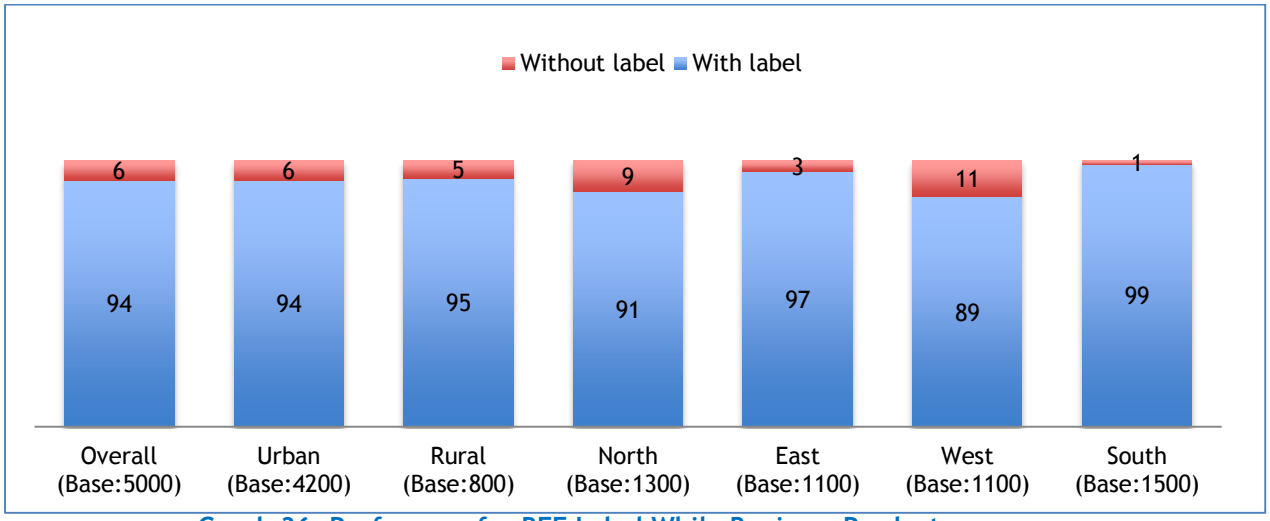


Graph 35: Presence of BEE Star Label on Appliances by Regions

6.9.16 Preference for BEE Label while Buying a Product

Post their exposure to the star label program for EE products, 94% consumers claim that they would buy labeled appliances in future. This indicates the importance of communication to the masses.

Base: N=5000 (All respondents) Data presented in %

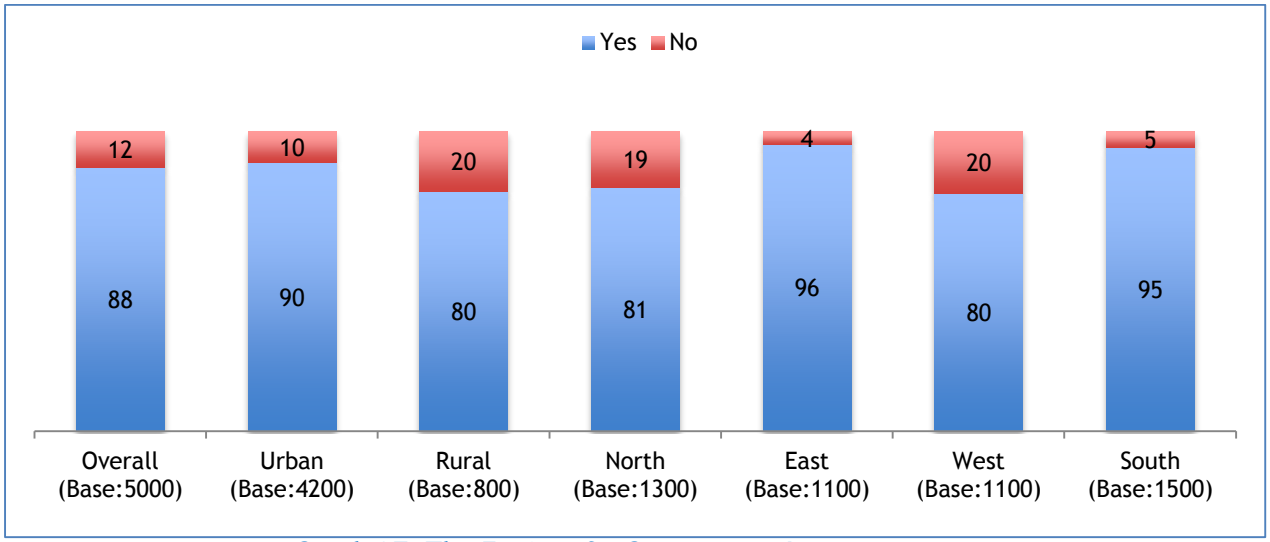


Graph 36: Preference for BEE Label While Buying a Product

6.9.17 The Equity of a Government Logo

Across locations, 88% consumers think that the Government of India should endorse EE products.

Base: N=5000 (All respondents) Data presented in %

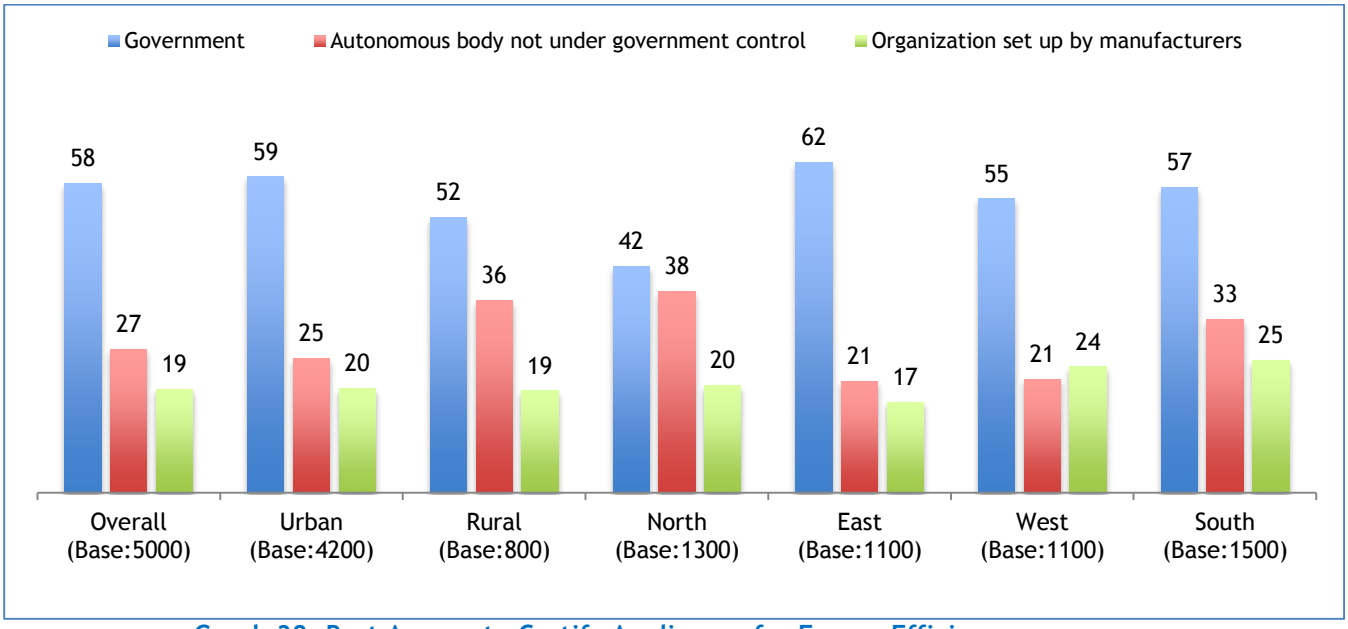


Graph 37: The Equity of a Government Logo

6.9.18 Best Agency to Certify Appliances for Energy Efficiency

The government lends credibility and endorsement by the government. A government logo on a product is seen as a hallmark of trust. Very few people are of the opinion that the labels should be certified/endorsed by private bodies and/or manufacturer's associations.

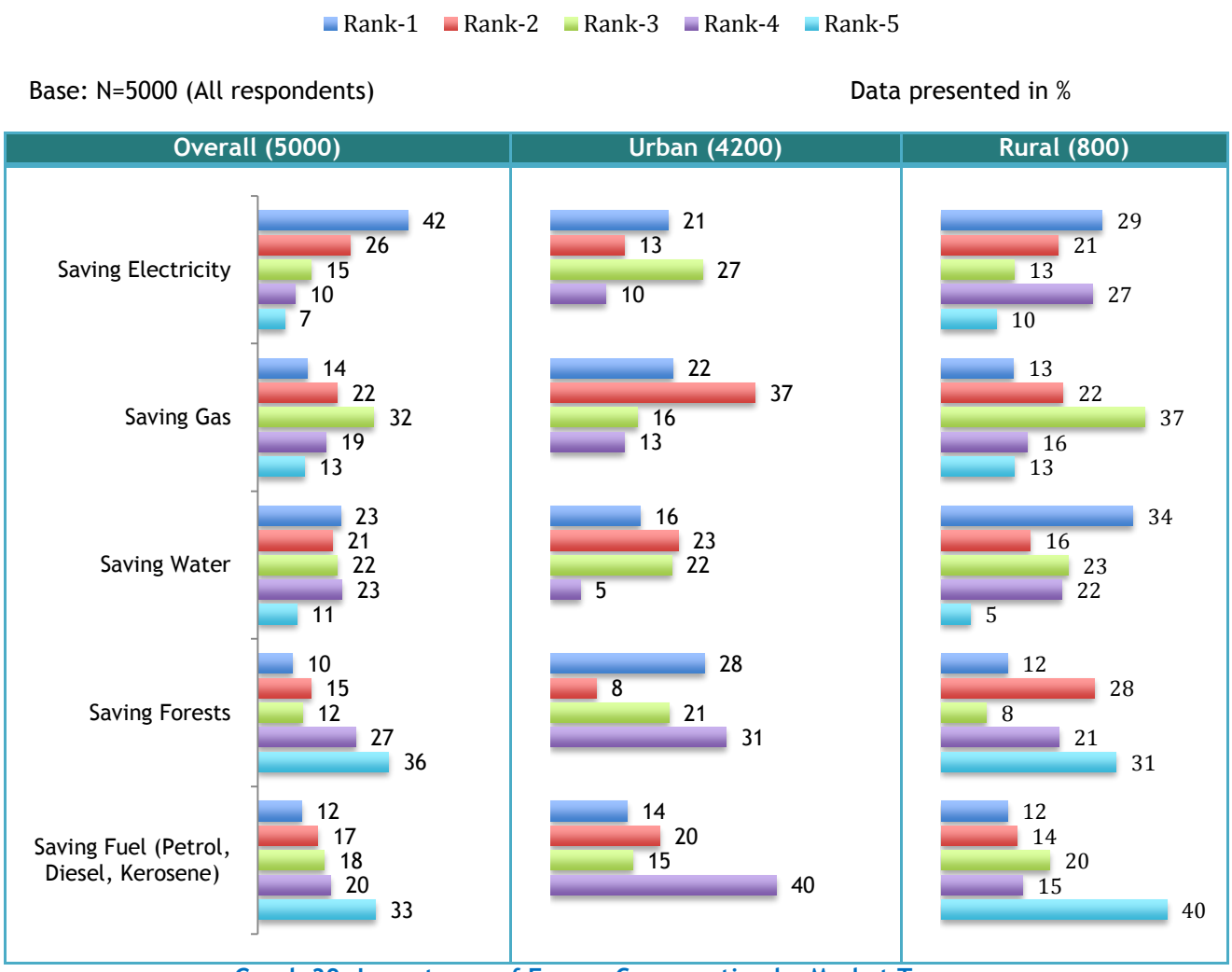
Base: N=5000 (All respondents) Data presented in %



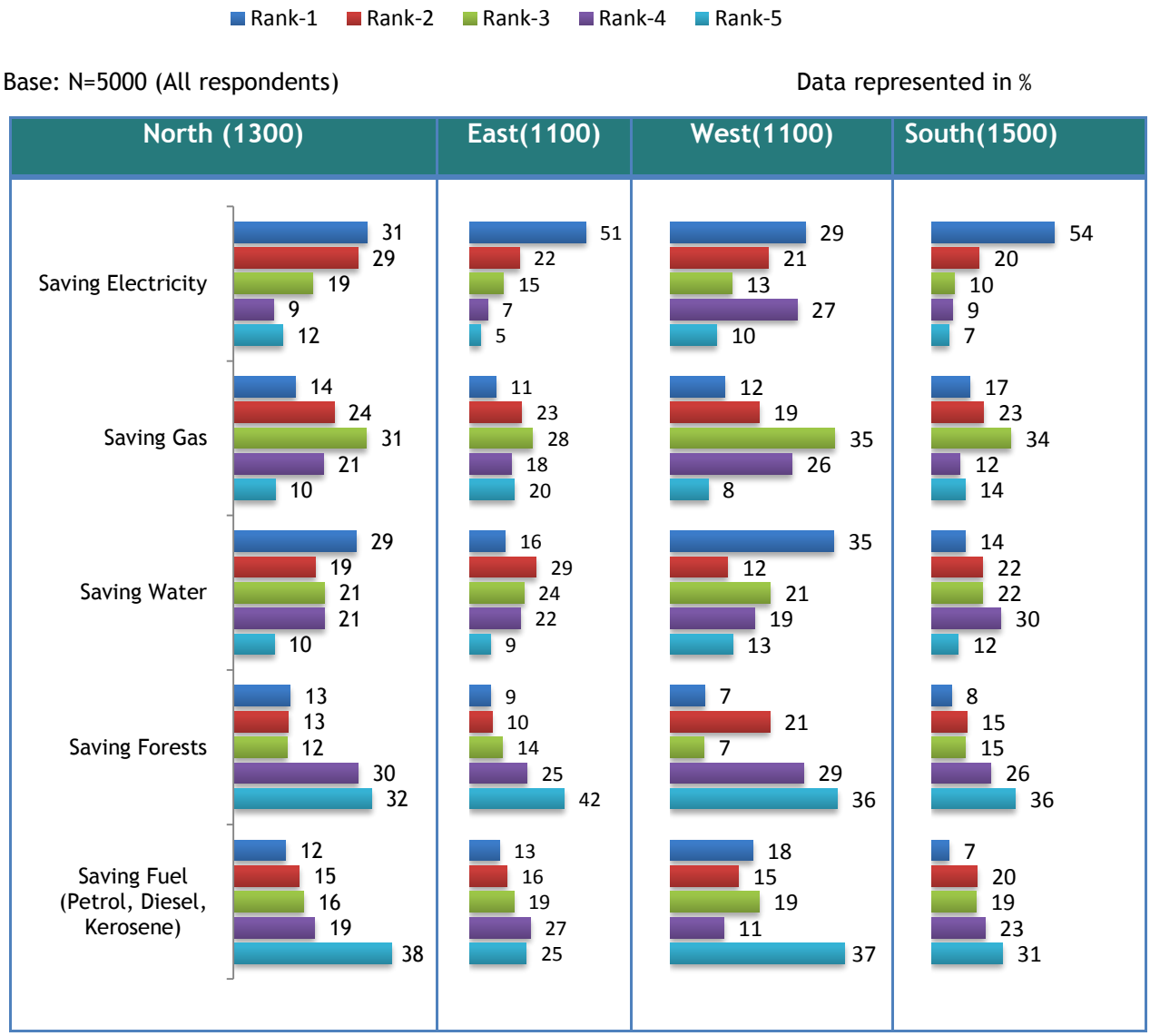
Graph 38: Best Agency to Certify Appliances for Energy Efficiency

6.9.19 Importance of Energy Conservation

In a spate of communication messages, the importance of energy conservation communication is highest for the consumer followed by saving water.



Graph 39: Importance of Energy Conservation by Market Type

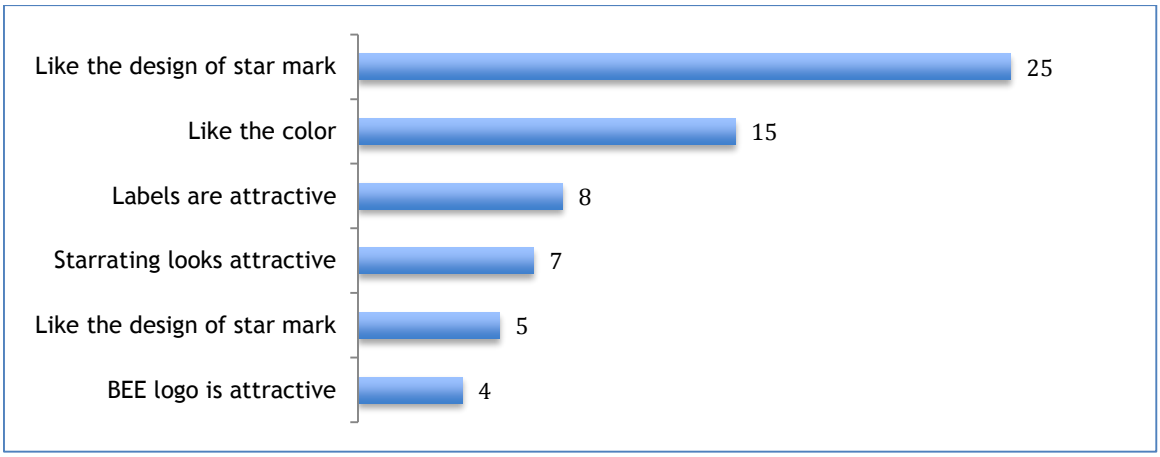


Graph 40: Importance of Energy Conservation by Regions

6.9.20 Key Factors Appreciated about Star Labels

Visual elements score high with consumers who have appreciated the design and color of the label.

Base: N=5000 (All respondents) Data presented in %

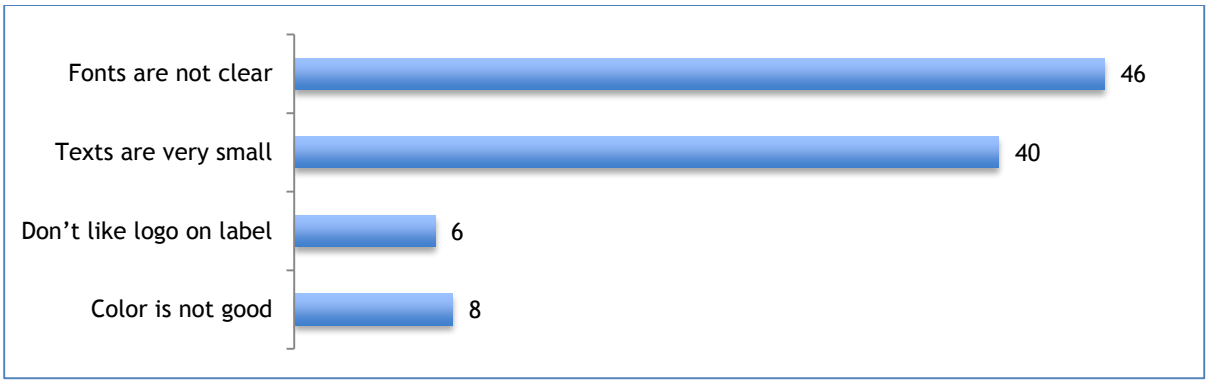


Graph 41: Key Factors Appreciated about Star Labels

6.9.21 Key Dislikes About Labels

Respondents find technical details on the label too complex. For 40% of the respondents, the textual matter is in a font that is too small and not clearly visible while 8% did not find the logo to be visually appealing.

Base: N=5000 (All respondents) Data presented in %

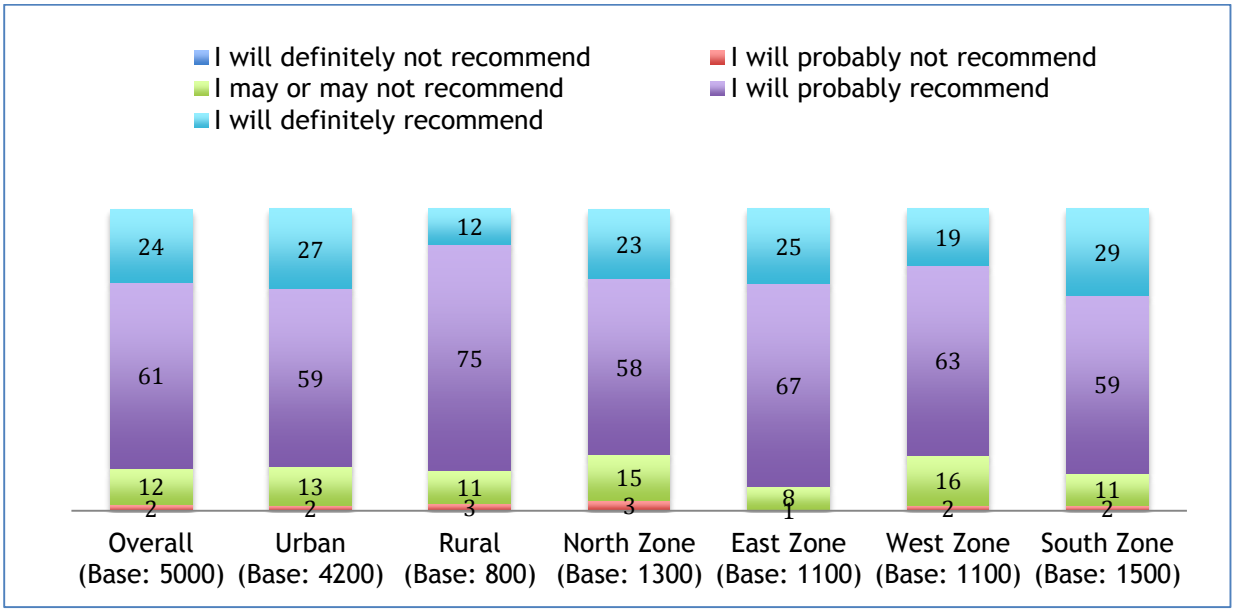


Graph 42: Key Dislikes about Labels

6.9.22 Recommendation for Labeled Products

As consumers discover the value in the program, they are likely to recommend it to others and provide impetus to the program by word of mouth.

Base: N=5000 (All respondents) Data presented in %



Graph 43: Recommendation of Labeled Products

6.10 Suggestions and Recommendations from Consumers

Key suggestions and recommendations from consumers:

- Simpler saving calculations on labels so that consumers can understand them
- Rebates on the exchange of old appliances
- Discount coupons on the purchase of EE appliances that consumers can use while paying off their electricity bills
- Utilities could have a point system. On the purchase of a labeled product, points may be provided, which consumers can redeem while paying their electricity bills
- Street plays to make people aware, especially for those who do not have access to print media. This should be encouraged more in smaller towns and in places where there are greater numbers in the lower SECs
- Communication with consumers across classes
- Communication in vernacular would have a larger impact
- Communication of the exact value proposition to the consumer and point out the cost benefit in simple terms
- Lower spectrum of society needs more education and understanding on the importance of labels, as had it not been mandatory, some would have opted for unlabeled products.

07 Research Findings: Impact on Retailers & Manufacturers

7.1 Impact on Retailers

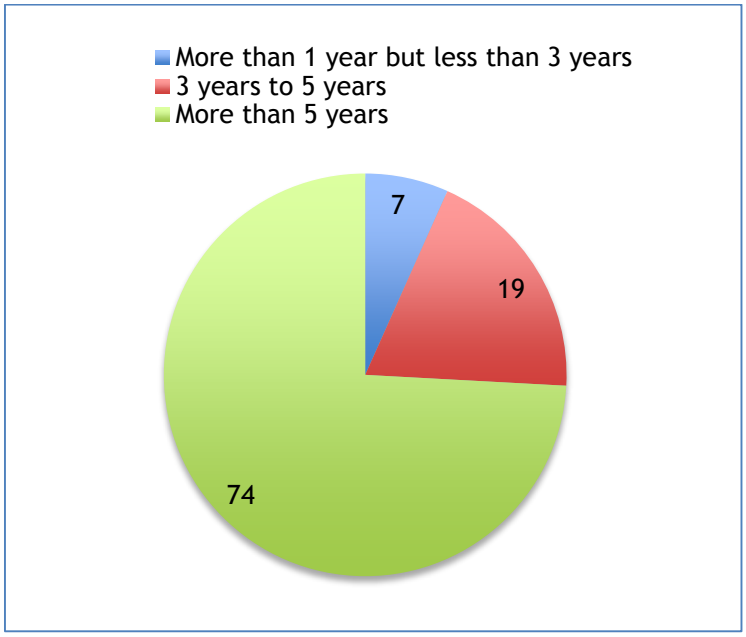
General Profile and Insights

Retailers play a major role in influencing appliance purchasing decisions. For the retailer interviews, all the major product markets under consideration were selected, which included different outlets of durable goods, electrical appliance stores, etc.

7.1.1 Profiling - Number of Years in Trade

The majority of targeted retailers have been associated with the trade for over five years. This ensured better perspective and understanding on how attitudes, behaviors, and the market for labeled appliances have evolved over time.

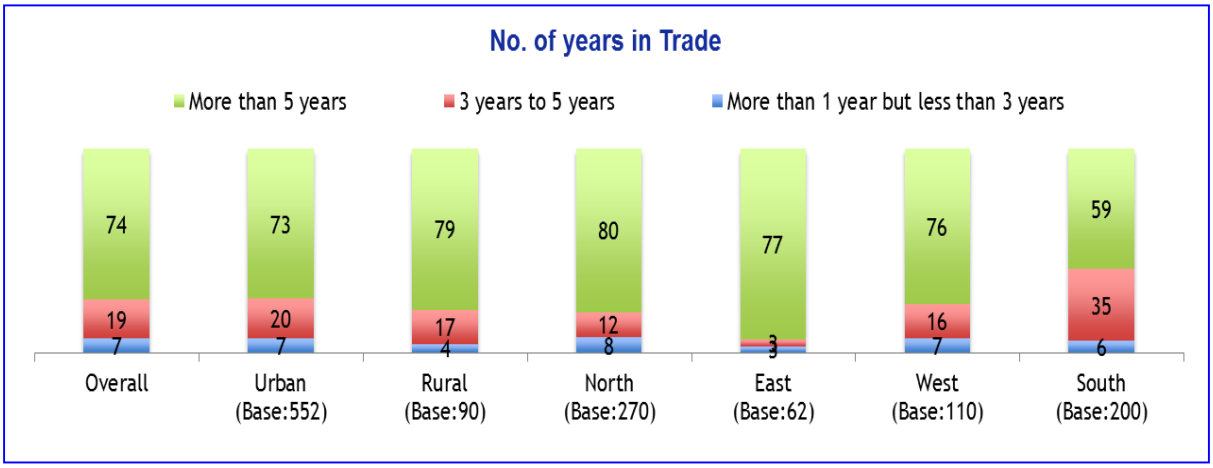
Base: N=642 Data presented in %



Graph 44: Profiling - Number of Years in Trade

Overall, there is parity in findings across urban and rural locations and the four zones, regarding the number of years in the trade.

Base: N=642 Data represented in %

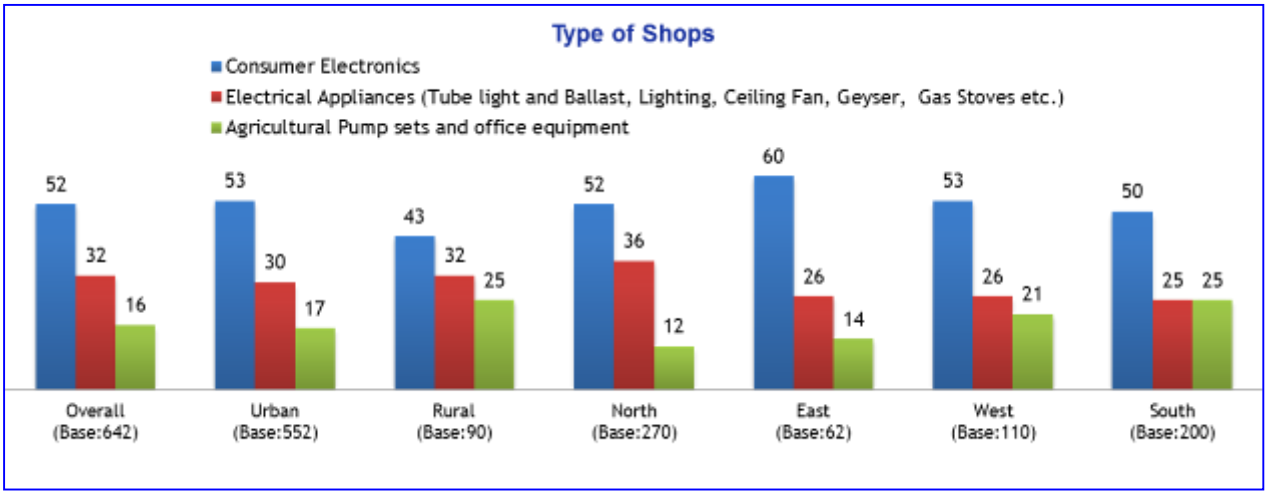


Graph 43: Profiling- Number of Years in Trade by Market Types & Zones

7.1.2 Types of Shops

Within the retail sample, there is a variety of products being sold by different categories of retailers. Retailers of consumer electronic goods have the major market share on account of the importance of the category within the S&L framework.

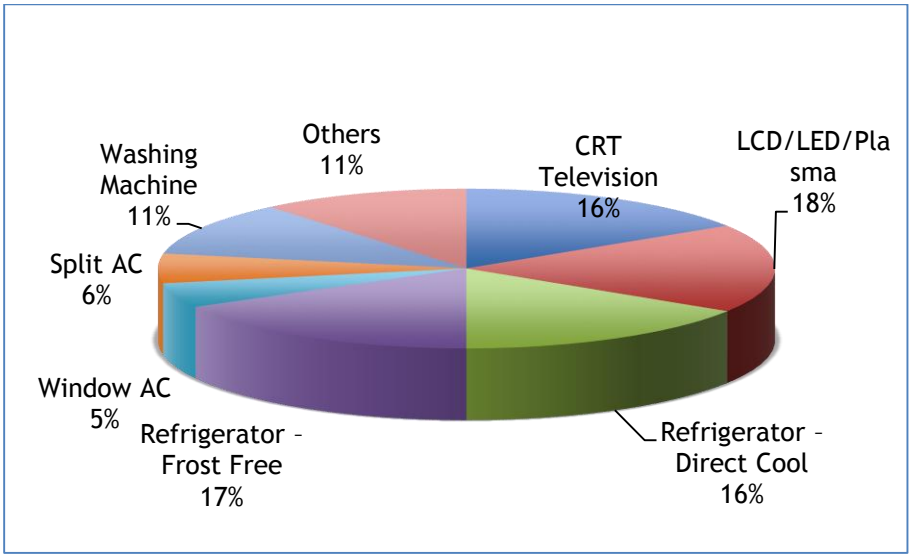
Base: N=642 Data represented in %



Graph 44: Types of Shops 1

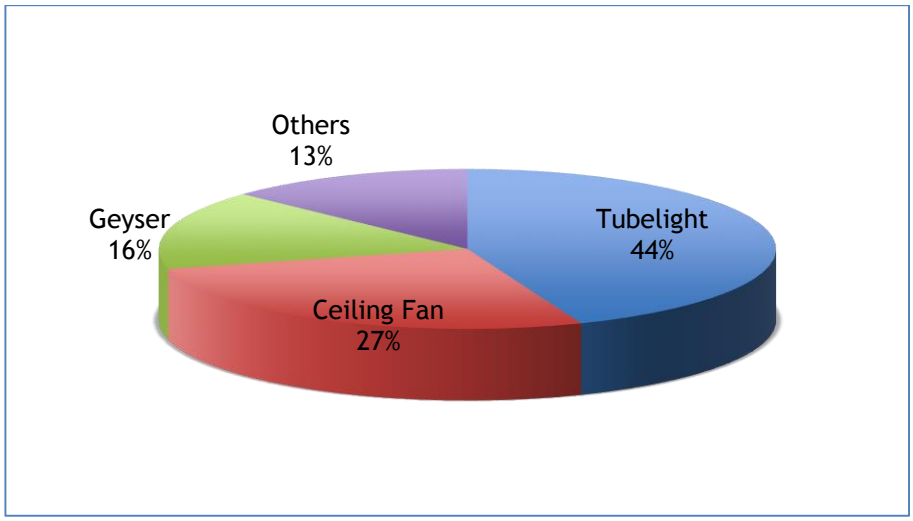
7.1.3 Approximate Share of Each in Total Sales

Retailer Type 1: For sellers of durable goods, TVs and refrigerators dominate as the main categories. Within the two product categories, there is not much difference in sales between CRT and LED TVs. The same is true for frost free and direct cool refrigerators. Within outlet type and location, however, sales vary between the categories.



Graph 45: Retailer Type 1

Retailer Type 2: Within retailers selling small appliances, tube lights form the major proportion of sales followed by ceiling fans, electric geysers, and subsequently, other small appliances.



Graph 46: Retailer Type 2

7.1.4 Factors Influencing Sale of Products

The sale is largely influenced and triggered by festivities, finance options, exchange offers, and weather conditions. Offers bring in more customers to stores. This indicates that if effective offers and exchange programs are designed towards replacing inefficient appliances with efficient ones, it could have a huge impact on the sales.

Table 28: Factors Influencing Sale of Products

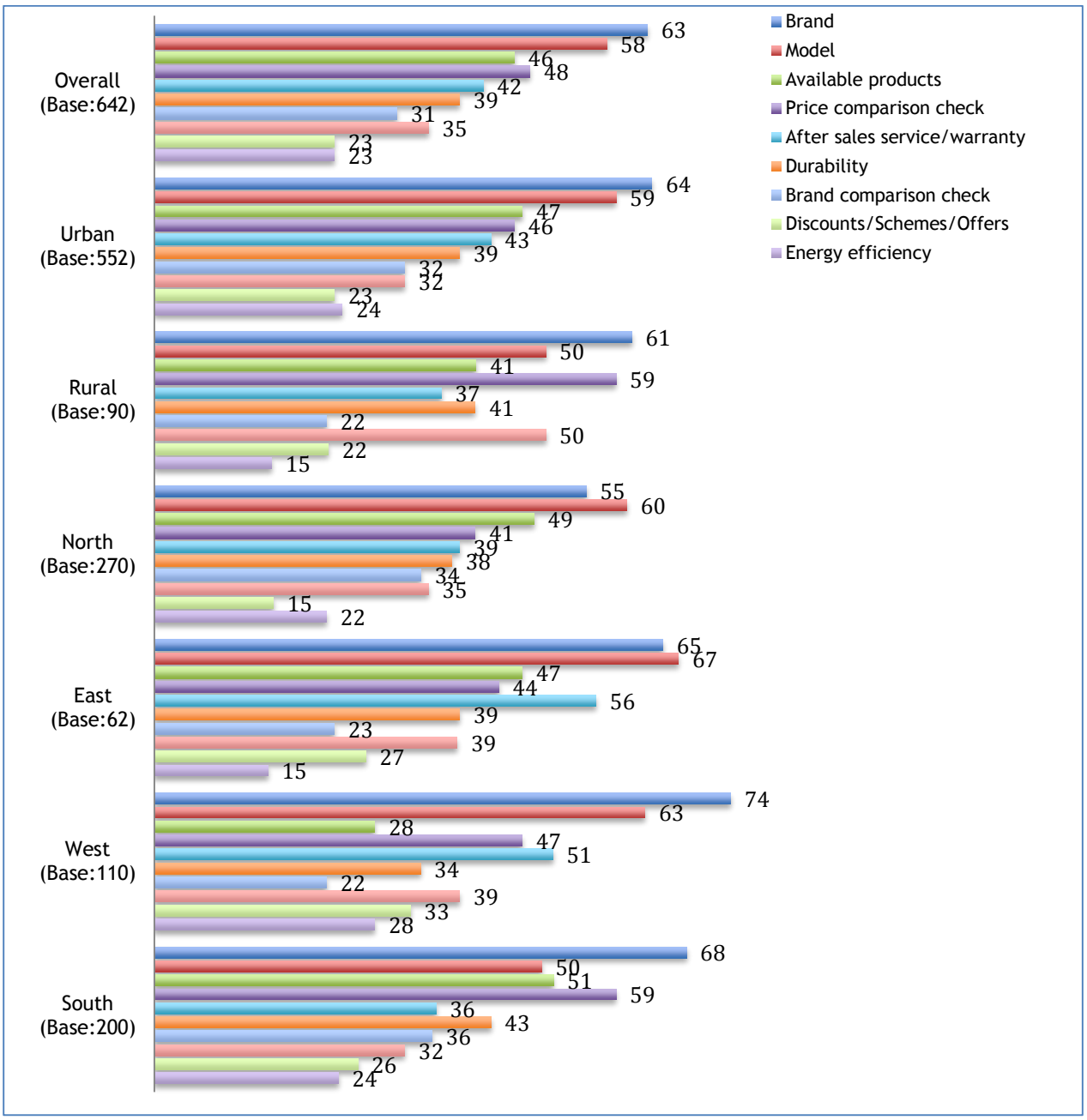
Data presented in %

		Type		Zone			
	All	Urban	Rural	North	East	West	South
Base: All respondents	**642**	**552**	**90**	**270**	**62**	**110**	**200**
Festive offers	28	28	30	28	25	27	31
Festivals	18	18	17	18	20	17	18
Easy finance	17	18	9	19	15	18	15
Exchange offers	14	14	12	11	14	15	16
Good monsoon	11	8	30	14	11	8	8
Economic performance	10	11	3	12	7	8	9
Others	6	5	9	8	3	7	5

7.1.5 Unaided Purchase Drivers

Retailers report factors affecting demand in the industry include brands, latest models, durability, availability of products, discount, after sales service etc.

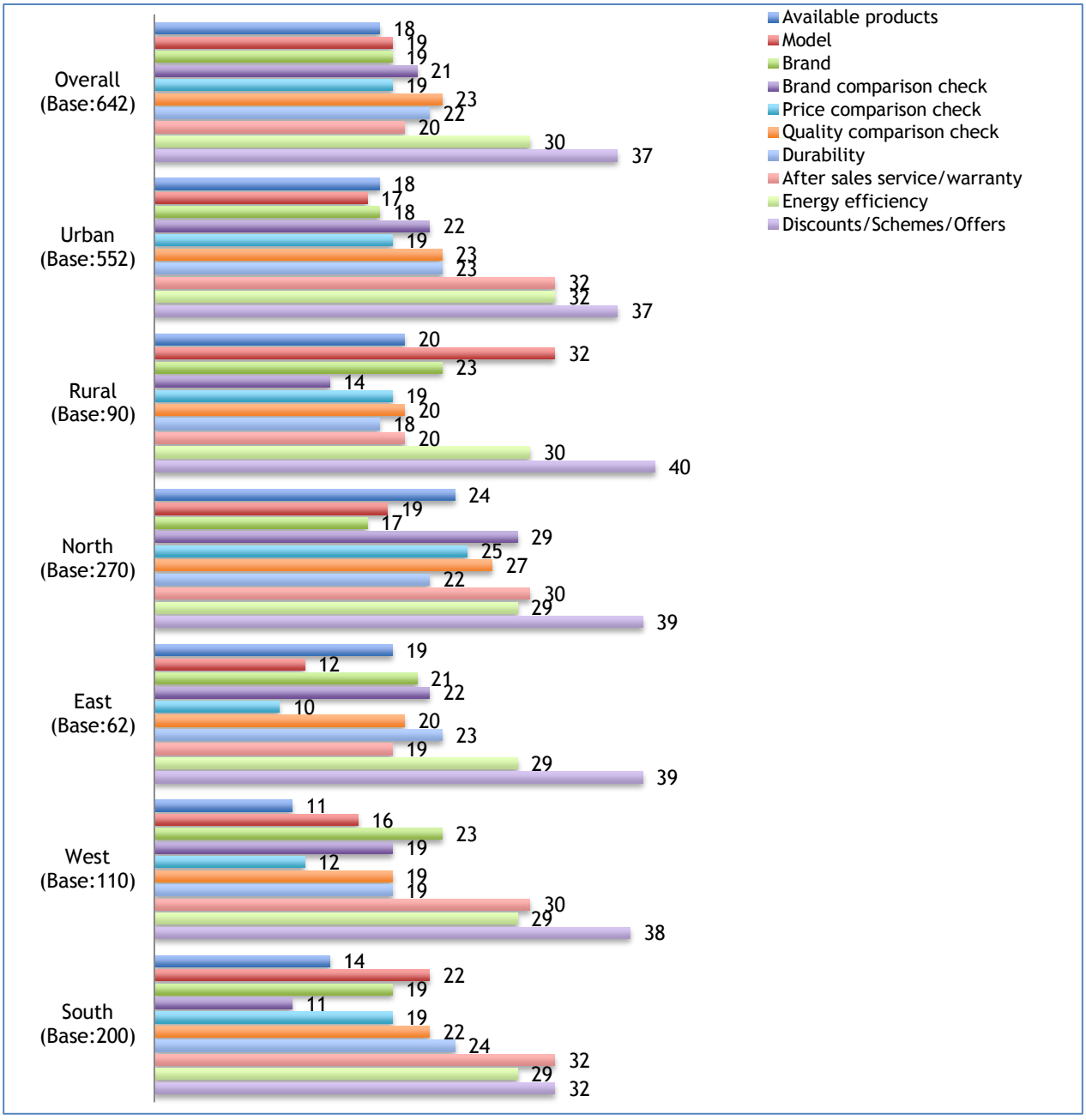
Base: N=642 Data represented in %



Graph 47: Unaided Purchase Drivers

7.1.6 Aided Purchase Drivers

Base: N=642 Data represented in %



Graph 48: Aided Purchase Drivers

7.2 Key Attributes

7.2.1 Color TV

Indian consumers are price sensitive and consequently, consider long lasting products. As per retailers, post price, consumers attach importance to running cost. The main difference between consumer findings and retailer findings is that the consumer does not acknowledge that he is price conscious. Retailers reveal that while buying TV sets, consumers give great importance to price and durability of the product.

Table 29: Color TV

Base: N=642 Data presented in %

		Type		Zone			
Key Attributes (Top responses)	Overall	Urban	Rural	North	East	West	South
Long Life/ Durability	17	17	20	15	23	22	14
Price of product	14	14	16	6	22	18	20
Energy efficiency/Running cost	11	11	7	5	13	13	17
Looks & design	9	9	10	7	8	8	15
Advance technology	8	9	5	7	9	8	9
Trouble free performance	6	6	2	7	3	5	7
Brand name	5	4	8	8	2	3	2
Resale value	4	4	5	6	6	1	2

7.2.2 Refrigerator

In a price conscious society, the top factor that influence the purchase of a refrigerator is its price. Long life/durability is the next most important factor because consumers intend to use refrigerators for a long time. Running cost/energy efficiency, technical aspects etc., are other consumer considerations revealed by retailers.

Table 30: Refrigerator

Base: N=642 Data presented in %

		Type		Zone			
Key Attributes (Top responses)	Overall	Urban	Rural	North	East	West	South
Price	15	15	18	12	18	17	17
Long life	11	11	13	17	13	5	6
Technical specifications (capacity, size, type, rating etc.)	9	9	9	8	7	13	8
Energy efficiency/ running costs	10	11	10	6	16	13	12
Color, look & style	10	10	11	9	13	13	9
Advanced technology	10	10	9	4	21	15	9
Trouble free performance	9	10	3	17	3	12	1
After sales service	10	9	11	10	4	6	13

7.2.3 Air Conditioner

Retailers and consumers agree on the top three factors that concern consumers in AC purchasing decisions. Consumers are conscious and concerned about energy efficiency/running cost, followed by price, and long life of the product, in that order.

Table 31: Air Conditioner

Base: N=642 Data presented in %

		Type		Zone			
Key Attributes (Top responses)	Overall	Urban	Rural	North	East	West	South
Energy efficiency	15	15	18	12	18	17	17
Price	11	11	13	17	13	5	6
Long life	10	10	9	4	21	15	9
Trouble free performance	10	11	10	6	16	13	12
Advanced technology	10	10	11	9	13	13	9
Brand name	10	9	11	10	4	6	13
After sales service	9	9	9	8	7	13	8
Resale value	9	10	3	17	3	12	1

7.2.4 Washing Machine

The consumer's prime consideration for washing machine is price, followed by other significant concerns such as brand name, features, and product functionality. Unlike other product categories, the consumer is not unduly concerned about its running cost as its usage is restricted only to a few hours every week and that too on certain days in a week. Product energy efficiency, thus, falls as the last priority.

Table 32: Washing Machine

Base: N=642 Data presented in %

		Type		Zone			
Key Attributes (Top responses)	Overall	Urban	Rural	North	East	West	South
Price	14	11	18	22	13	14	15
Features	12	7	17	14	14	12	13
Technical specifications (capacity, size, type, rating etc.)	11	6	15	15	12	10	15
Durability	10	6	7	11	16	10	10
Style and looks	9	11	9	8	8	9	10
Advanced technology	9	10	11	8	8	10	7
Color	7	7	5	6	7	7	-
Energy efficiency	7	6	-	6	11	6	10

7.2.5 Ceiling Fan

At an unaided level, the top priority attached to ceiling fans is looks and design, followed by brand name. Energy efficiency is of some concern as fans run for longer hours and largely throughout the year.

Table 33: Ceiling Fan

Base: N=642 Data presented in %

	Type			Zone			
Key Attributes (Top responses)	Overall	Urban	Rural	North	East	West	South
Style and looks	17	22	21	16	21	21	17
Brand name	13	17	17	12	17	5	15
Price	11	15	8	9	8	16	18
Energy efficiency	10	11	11	10	11	17	6
Advance technology	9	7	5	10	5	11	11
Advertisement	8	11	22	4	22	11	9
Dealer/ salesman recommendation	7	6	3	5	3	9	9
Color	6	9	3	7	3	7	4

7.2.6 Electric Geyser

As in ACs, energy efficiency is a prime consideration factor for geysers because these appliances consume a lot of energy. Other important attributes include the life of the product, the price, and whether it will give the consumer "trouble free performance." The findings largely corroborate the consumer's viewpoint and behavior.

Table 34: Electric Geyser

Base: N=642 Data presented in %

	Type			Zone			
Key Attributes (Top responses)	Overall	Urban	Rural	North	East	West	South
Energy efficiency/ running costs	15	15	16	12	21	22	18
Long Life	12	12	13	10	5	17	16
Price of product	9	8	10	8	18	11	6
Trouble free performance	9	8	12	12	5	10	1
Advanced technology	9	10	6	8	8	4	15
Looks & design	8	8	7	8	-	8	7
Safety	7	7	7	4	15	14	9
Brand name	7	6	10	8	10	1	6

7.2.7 TFL

According to retailers, the main attributes consumers are concerned about in this category include product price and energy efficiency/running cost. Consumers also give preference to brand name. However, consumer citations vary because they do not refer to efficiency as a consideration factor.

Table 35: TFL

Base: N=642 Data presented in %

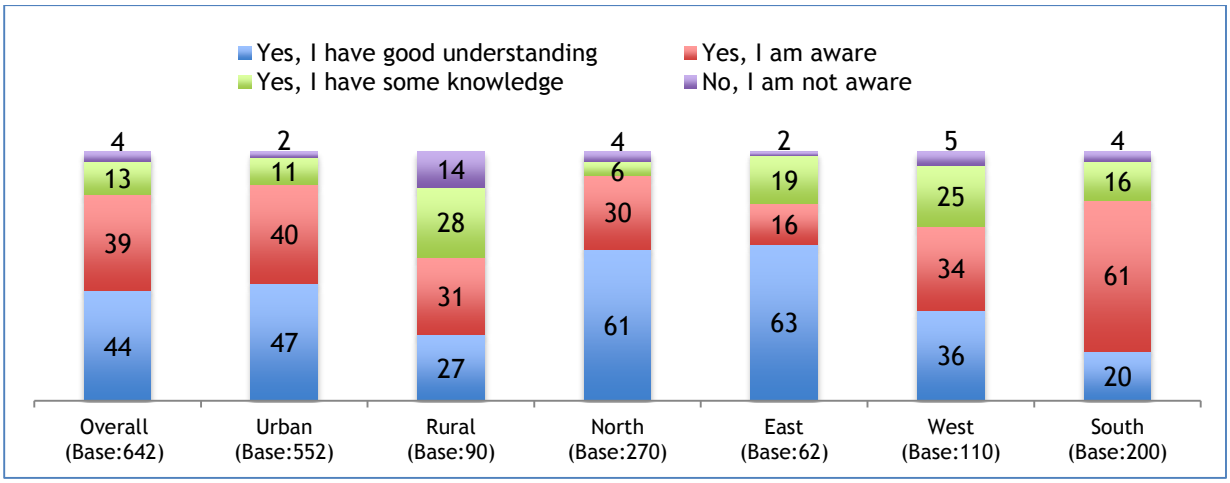
	Type			Zone			
Key Attributes (Top responses)	Overall	Urban	Rural	North	East	West	South
Price of product	17	22	21	16	21	21	17
Energy efficiency/ running costs	13	17	17	12	17	5	15
Brand name	11	15	8	9	8	16	18
Advanced technology	10	11	11	10	11	17	6
Market leader	9	7	5	10	5	11	11
Long life	8	11	22	4	22	11	9
Looks & design	7	6	3	5	3	9	9
Trouble free performance	7	2	-	7	-	4	9

7.3 Awareness of the BEE Star Labeling Program

7.3.1 Awareness of BEE Star Labeling Program

Barring a few retailers in rural areas, retailers generally exhibit a high degree of familiarity and understanding about the BEE labeling program. Retailers unfamiliar with the BEE labeling program were largely sellers of small appliances rather than sellers of durable goods.

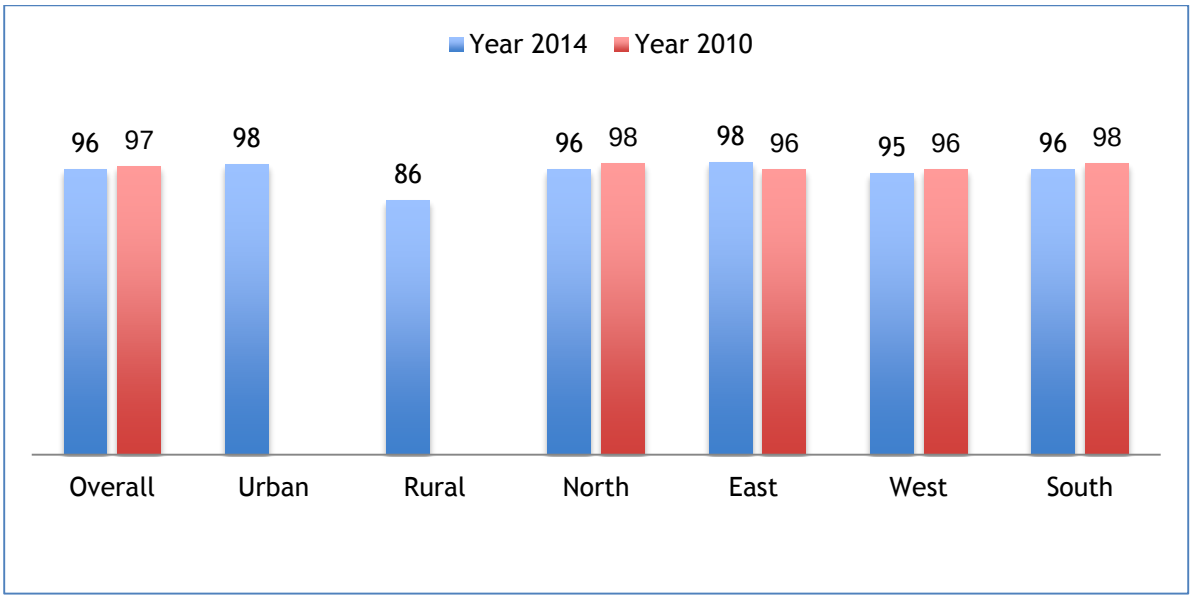
Base: N=642 Data presented in %



Graphs 49: Awareness of the BEE Star Labeling Program

Retailers currently have healthy awareness levels of the BEE star labeling program but there was not significant improvement in their awareness levels between the years 2010 and 2014. In some regions, the awareness level of retailers, though adequate, is slightly lower than in the previous year. It could be attributed to the fact that not all retailers sell appliances that fall under the mandatory labeling category.

Base: N=642 Data presented in %



Graphs 50: Awareness of the BEE Star Labeling Program (Benchmarking)

7.3.2 Connotations of Star Labeling of Energy Efficient Appliances

Most retailers find the star labeling program useful as it highlights the energy efficiency of products. Retailers associate energy efficiency with energy saving, which for them is the number one priority, followed by monetary savings and reduction in electricity bills in that order. It is interesting to note that unlike consumers, most retailers use the word energy instead of power. Retailers' perception of energy saving is associated with the stars on the BEE label. Saving Energy is not restricted to saving power alone but has the connotation of saving energy for the common good.

Table 36: Connotations of Star Labeling of Energy Efficient Appliances

Data presented in %

	2010	2014	Urban	Rural	North	East	West	South
Base: All Respondents	**-**	**642**	**552**	**90**	**270**	**62**	**110**	**200**
Energy saving	**86**	**66**	65	64	49	71	59	89
Money saving	**-**	**23**	24	17	25	20	21	22
Reduction in electricity bill	**-**	**21**	20	35	31	19	10	16
More stars more savings	**66**	**14**	13	17	24	21	1	4
Good Quality of product	**47**	**4**	5	-	5	6	4	3

Less consumption of power	-	4	4	3	1	11	5	4
Increases retailers sales	-	3	1	20	2	3	2	2
Long lasting product	-	2	2	3	1	5	3	2
Star labeling is useful for saving electricity	87	-	-	-	-	-	-	-
It has more advanced technology	41	-	-	-	-	-	-	-
It depends upon the number of stars in it	23	-	-	-	-	-	-	-
They told about power saving with star label products	7	-	-	-	-	-	-	-

7.3.3 Basis of Product Promotion

According to the findings,, price is the most important factor that influences consumers regardless of the type of appliance. Retailers believe that most consumers are predisposed to certain brands, even when brand name is not consciously identified by consumers. Within these shortlisted brands, consumers evaluate the parameters that concern them the most, which vary slightly according to the product.

Table 37: Basis of Product Promotion

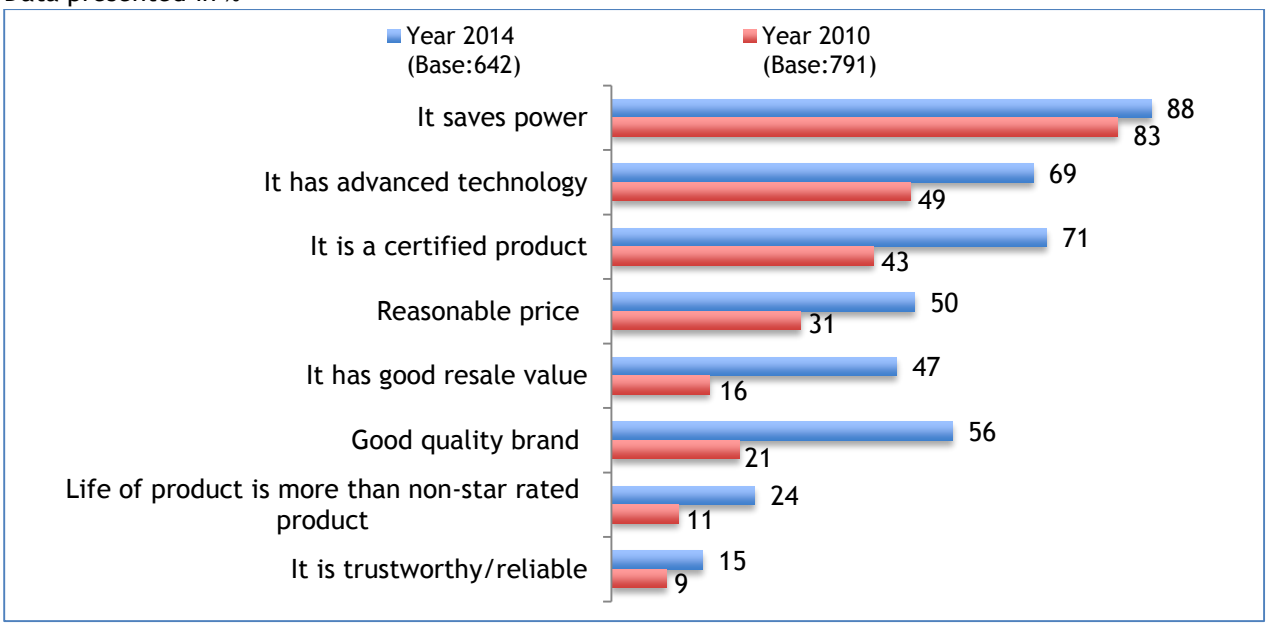
Base: N=642 Data presented in %

(Top responses)	Over all	Urban	Rural	North	East	West	South
Base: All Respondents	**642**	**552**	**90**	**270**	**62**	**110**	**200**
Good price	**35**	37	45	38	45	33	40
Brand	**23**	24	17	25	20	21	22
Quality	**21**	20	35	31	19	10	16
Energy saving	**19**	19	22	20	25	16	16
Margin/product offer/discount	**13**	16	1	20	15	17	3
Features of product/technology	**12**	12	10	14	10	11	11
Durability of the product	**6**	6	2	11	5	3	-
After sales service	**3**	3	4	-	31	2	-
Premium	**3**	3	2	1	5	3	6

7.3.4 Perceived Advantages of Star Labeled Appliances

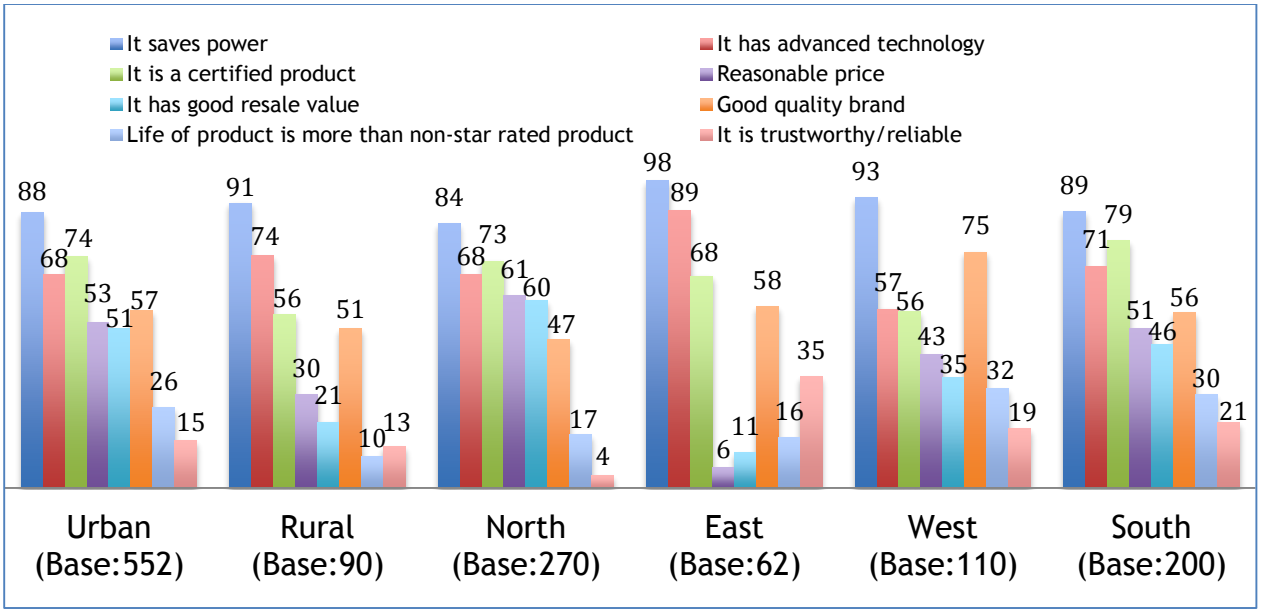
Retailers perceive many benefits of the BEE star labeling program. The most important benefit is that products endorsed by BEE are energy efficient and save power. Being a BEE star certified product ensures it has advanced technology. An important factor that emerges in North and South zone is that labeled products have a high resale value. Compared with the findings of the impact assessment of 2010, we can see that the impact of the BEE star label program has successfully percolated through to the retailers who perceive the benefits of endorsed products and can educate consumers accordingly.

Data presented in %



Graph 51: Advantages of Star Labeled Appliances

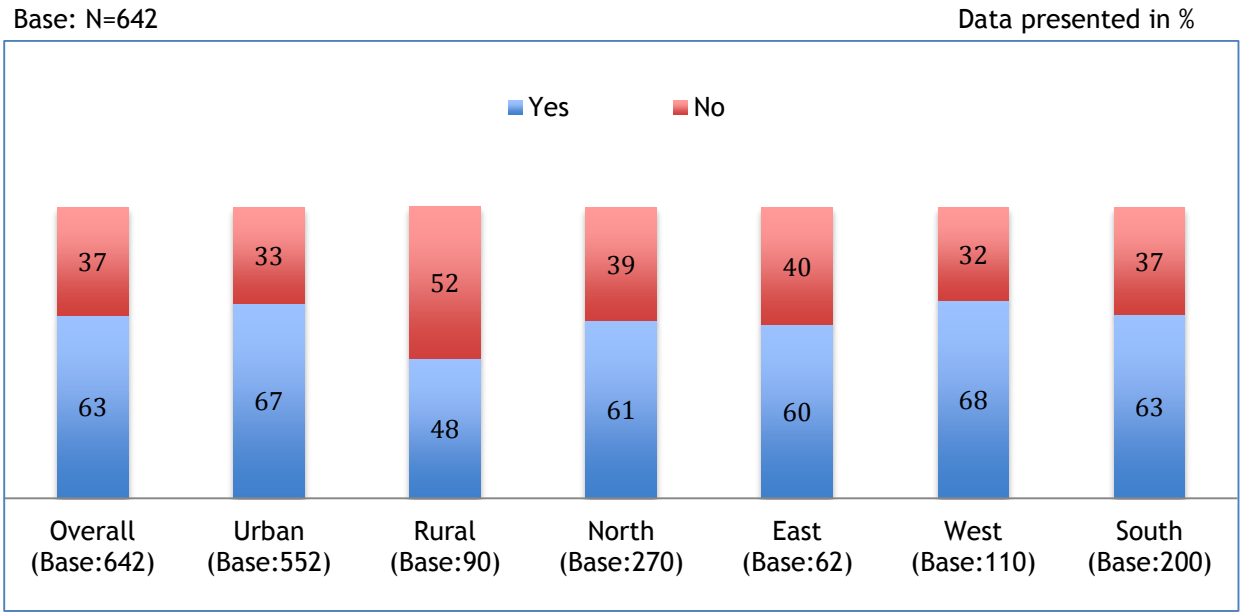
Base: N=642 Data presented in %



Graph 52: Advantages of Star Labeled Appliances by Market Types & Zones

7.3.5 Market Transformation - Growth in Demand for Labeled Appliances

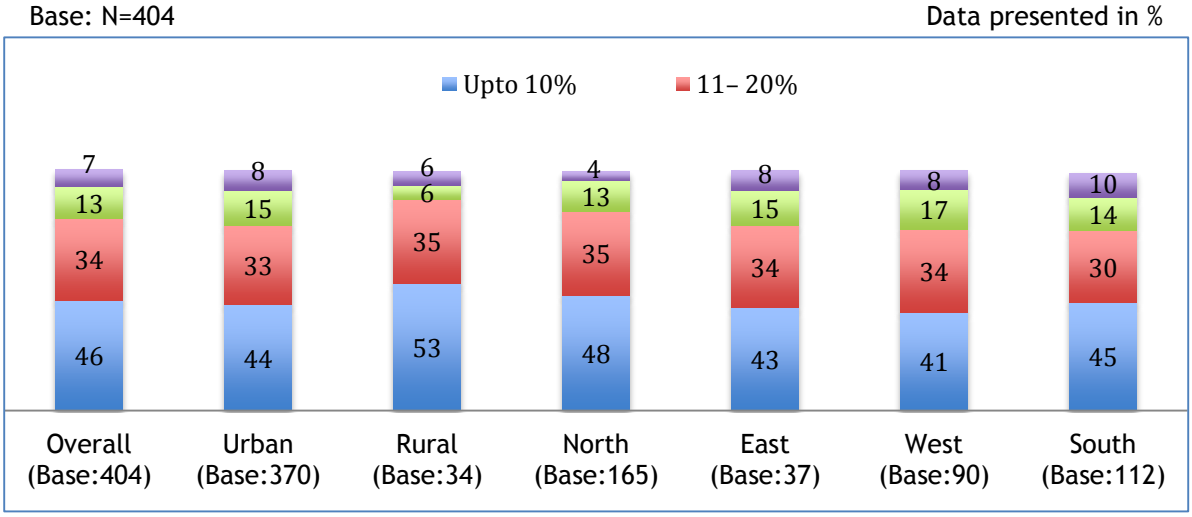
Findings reveal the majority of consumers are increasingly seeking a star label in case of mandatory appliances. Retailers report increased sales of star rated appliances, which is an indication of market transformation and a higher demand for EE appliances endorsed by BEE star labels.



Graph 53: Market Transformation - Growth in Demand for Labeled Appliances

7.3.6 Percentage Increase in Demand for Labeled Appliances

Across zones and regions, retailers claim the sale of labeled appliances and products are on the rise. There are some variations between urban and rural markets and among the four zones.



Graph 54: Percentage Increase in Demand for Labeled Appliances

7.3.7 Retailer Stocking Pattern of Star Labeled Appliances

The table depicts sales trends across appliances and products as mentioned by the retail community, indicating better uptake for five star products for certain appliances as compared to appliances with fewer stars. It shows the program has succeeded in breaking the price barrier with certain consumer categories.

Table 38: Retailer Stocking Pattern of Star Labeled Appliances

Base: N=404 Data presented in %

Product Category	No Star	1 Star	2 Star	3 Star	4 Star	5 Star
Color television - CRT	60			5	15	20
Color television - LCD/LED/ plasma	31					69
Refrigerator - direct cool	25		4	17	23	31
Refrigerator - frost free			2	19	33	48
Window AC		26	37	27	5	5
Split AC		4	27	37	7	25
Washing machines	96				1	3
Ceiling fans	74			3	5	18
Electric geysers	12	2	8	6	30	42
Tubelight and choke	84		4	8	1	3
LPG stove	100					
Agricultural pump sets	51	1	6	10	9	23

7.3.8 Reasons Attributed to Higher Sale of Low Category Star Labeled Products

Window/split AC dealers report selling more one to two star appliances over three to five star appliances. Retailers attribute the high sale of low category products to the price sensitive market. Retailers note that consumers lack awareness of the benefits of buying a high star rated appliances. Thus, if consumers are better educated on the merits of buying a high star appliance they may be more likely to make such a decision. .

Table 39: Reasons Attributed to Higher Sale of Low Category Star Labeled Products

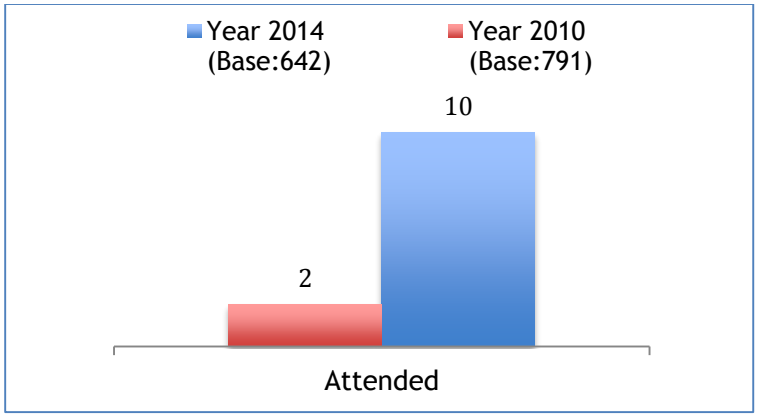
Base: N=85 Data presented in %

	Overall	Urban	Rural	North	East	West	South
Base: All Respondents	85	75	10	22	15	23	25
Low price of appliance	34	34	30	31	34	37	33
Low awareness	18	18	20	23	19	9	23
Perceived high value for money	18	18	22	19	18	19	18
No real difference perceived in energy consumption/saving	17	17	20	17	19	18	17
Availability of 1-2 star product	9	8	20	10	9	9	10

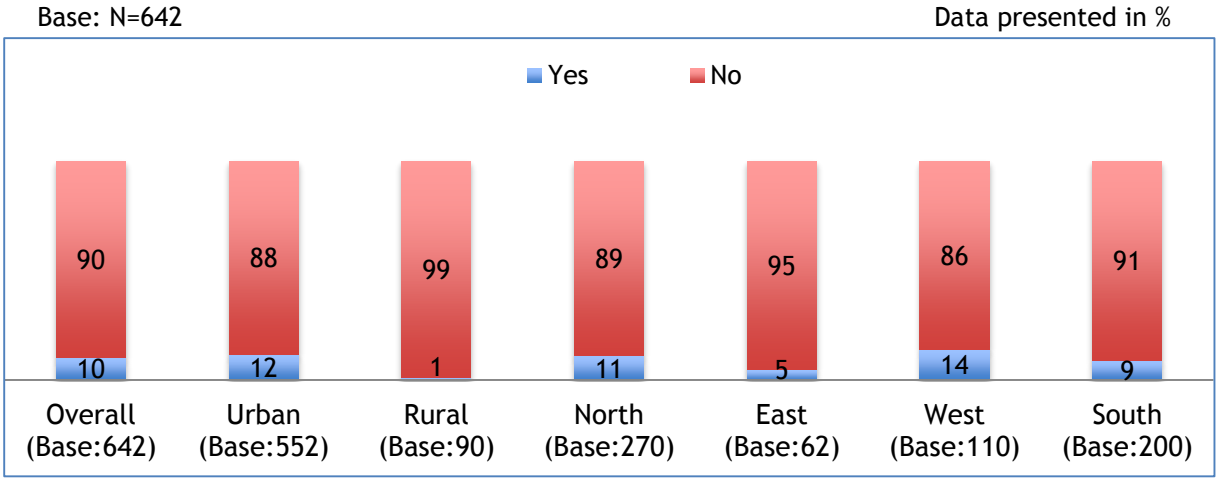
7.3.9 Training Undertaken Under the Program

Retailers claim that no formal training has been imparted to them. Communication flow from manufacturers, spurt in advertising and communication campaigns undertaken by BEE and other manufacturers has given retailers the required orientation to be able to enlighten and educate

customers about the advantages of BEE endorsed products. Compared to the study findings of 2010, it becomes clear that training has been imparted to a greater number of retailers in 2014.

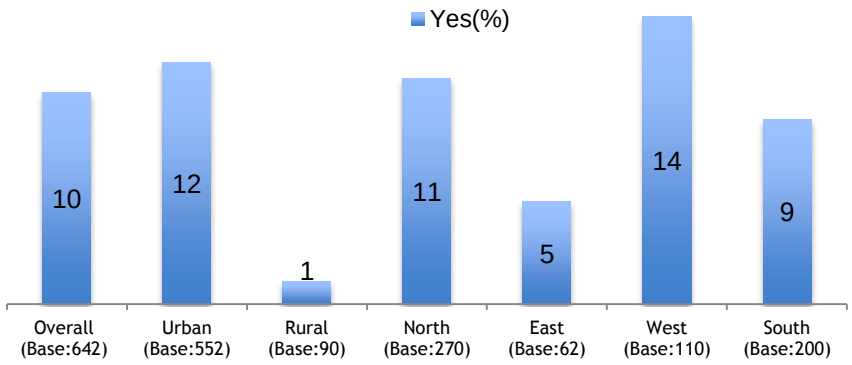


Graph 55: Benchmarking Training Undertaken in 2010 and 2014



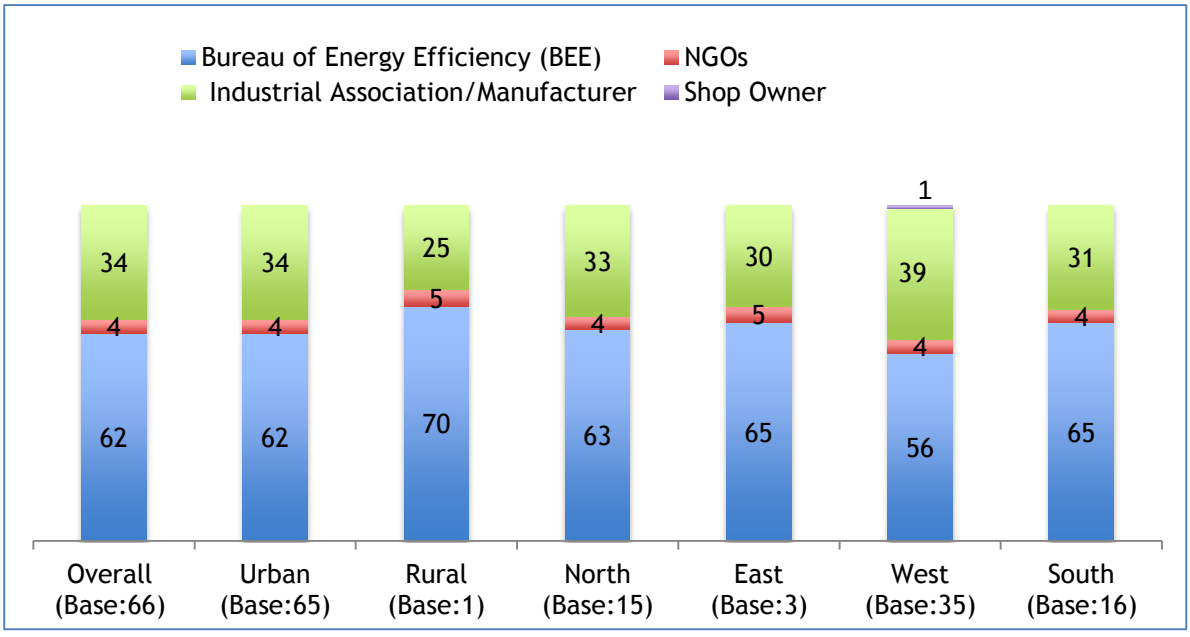
Graph 56: Training Undertaken - by Market Type and Zone

7.3.10 Who Provided the Training - BEE



Close to 10% of all retailers claim to have received some formal training on the BEE star labeling program, but are unaware of the agency that provided the training. Retailers largely associate the training to have been imparted by BEE or some other government organization. The low numbers indicate that there is huge scope for engaging with retailers and improving the prospects of the program.

Base: N=66 Data presented in %



Graph 57: Who Provided the Training

7.3.1 1 Key Essence/Elements of Training

Training should focus on creating awareness among customers. Other key training elements include interpretation and usage of star labels with regard to the energy efficiency of the product, its lifecycle cost, and the cost benefits of owning such appliances.

Table 40: Key Essence/ Elements of Training

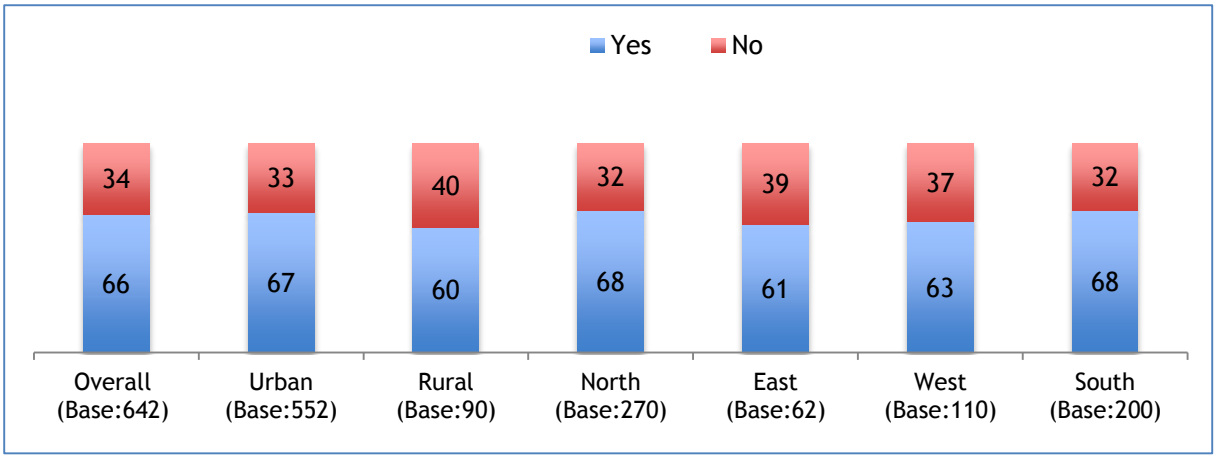
Base: N=66 Data presented in %

	Overall	Urban	Rural	North	East	West	South
Base: All Respondents	**66**	**65**	**1**	**15**	**3**	**35**	**16**
How to use labels	35	36	-	60	100	35	13
How to create awareness towards EE products among customers	19	19	100	12	100	24	13
Concept of lifecycle cost	9	9	-	20	75	3	13
Cost benefits of owning such appliances	8	8	-	-	-	9	13
How to reduce electricity bill by using these	6	6	-	-	-	6	13

7.3.12 Recommendation of Star Labeled/ Energy Efficient Products

Close to 60% of retailers said they encourage sales of labeled products. However, a substantial 40% said they still do not consciously encourage the sale of labeled products. The underlying reason is that retailers believe if they recommend star labeled appliances/products, the consumer may think they are being sold an overpriced product to benefit retailers. Apprehension of adverse publicity and subsequent loss of business makes retailers skeptical of pushing labeled products even though they are superior in quality compared to non-star labeled appliances.

Base: N=642 Data presented in %



Graph 58: Recommendation of Star Labeled/Energy Efficient Products

7.3.13 Basis of Recommendation

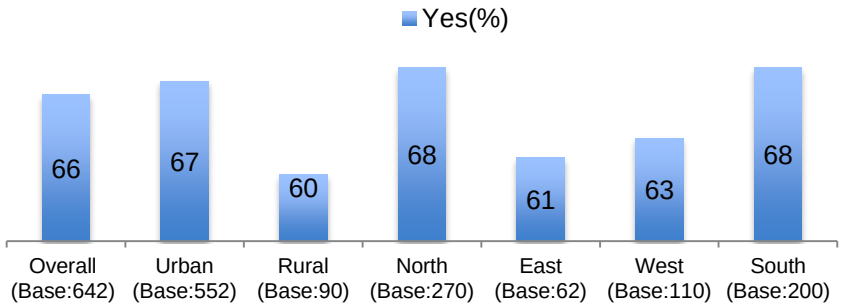


Table 41: Basis of Recommendation

Base: N=424 Data presented in %

	Overall	Urban	Rural	North	East	West	South
Base: All Respondents	**424**	**364**	**59**	**178**	**41**	**73**	**132**
Power saving	46	48	38	29	57	44	58
Money saving	21	21	19	15	32	16	24
More stars more savings	14	15	12	15	14	14	15
Good quality product	7	5	23	15	14	3	1
Long lasting product	4	5	-	-	-	13	5
Brand Name	4	4	-	4	-	6	4
Advanced technology	3	3	-	4	-	-	3

Retailers who recommend labeled products, base their recommendations on power saving to communicate monetary savings to consumers.

7.3.14 Key Barriers Encountered

Barriers associated with labeled appliances include the high cost of such products and lack of consumer awareness. An awareness program can help overcome both these barriers.

Table 42: Key Barriers Encountered

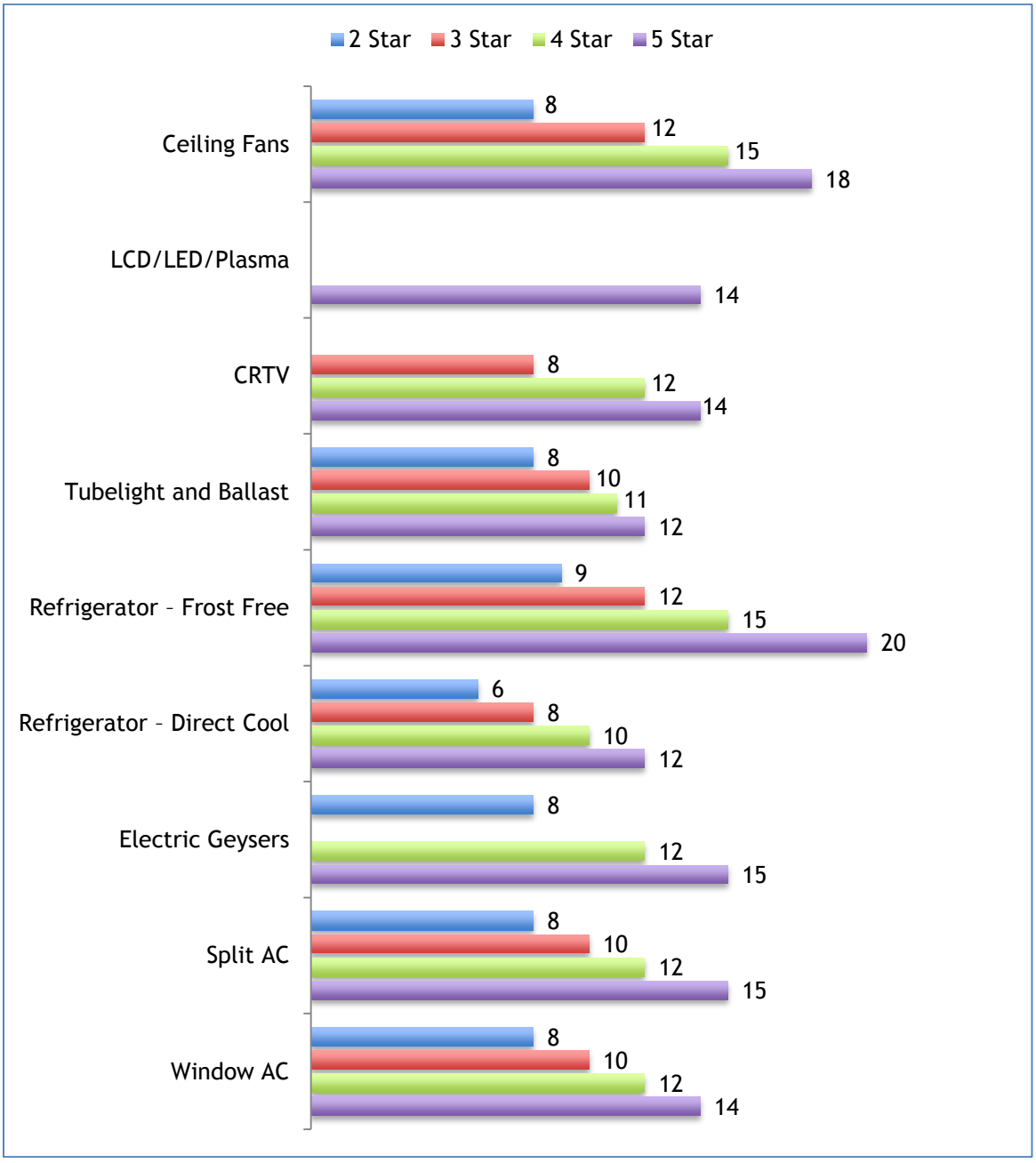
Base: N=642 Data presented in %

	Overall	Urban	Rural	North	East	West	South
Base: All Respondents	**642**	**552**	**90**	**270**	**62**	**110**	**200**
Price barrier	11	12	4	24	-	2	1
Lack of consumer knowledge	**13**	16	1	20	15	17	3
Consumers don't understand the benefits of labeled appliance	**10**	11	10	12	11	12	9
Disbelief by consumers	5	4	10	2	26	7	1
Unspecified	48	46	61	40	45	45	68

7.3.15 Perceived Incremental Cost for Labeled Products by Star Category

Retailers say they see about an 8% increase in price from a non-star labelled product to a two star labelled product. The findings are largely consistent across appliances. Similarly, from an unlabeled product to a three star product, there is an 8-12% change in price. For a five star appliance, the cost of a frost free refrigerator would escalate by 20%. For ceiling fans, the incremental cost is believed to be 18%.

Base: N=642 Data presented in %

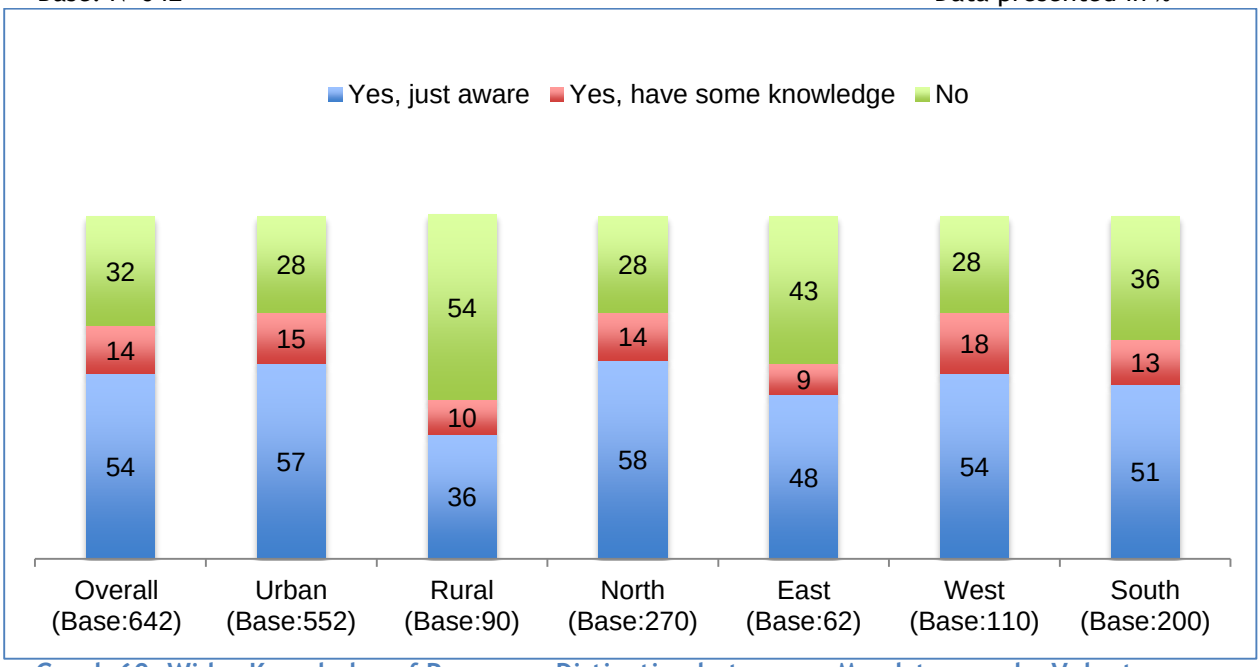


Graph 59: Perceived Incremental Cost for Labeled Products by Star Category

7.3.16 Wider Knowledge of Program – Distinction between a Mandatory Program and a Voluntary Program

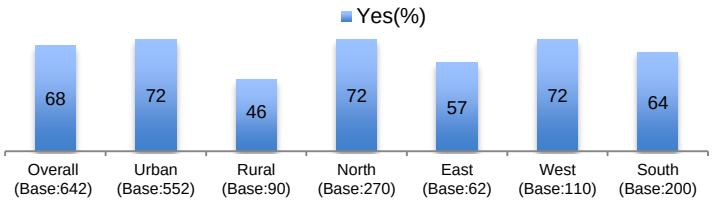
Data reveals that half the retail population is aware of the mandatory and voluntary program. Whereas 10-15% of the population only has cursory knowledge of the distinction between mandatory and voluntary labeling. The majority of the respondents are able to identify product categories in the case of ACs and refrigerators, whereas for LPG gas stoves, pumps and laptops, more than 60% of the population is found to be unaware.

Base: N=642 Data presented in %



Graph 60: Wider Knowledge of Program – Distinction between a Mandatory and a Voluntary Program

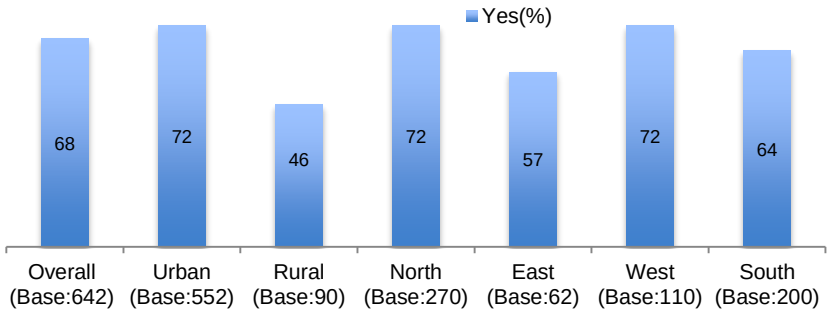
7.3.17 Appliances Associated with Mandatory Labels



Graph 61: Appliances Associated with Mandatory Labels by Market Types

7.3.18 Understanding Mandatory Labels

Overall, 68% of retailers understand the meaning of mandatory labels. Within the three sub categories of retailers (durable sellers, appliance seller and equipment seller), durable sellers are able to decode the products associated with mandatory labels. However the other two categories of sellers are unable to do the same.



Graph 62: Understanding Mandatory Labels

Table 43: Understanding of mandatory labels

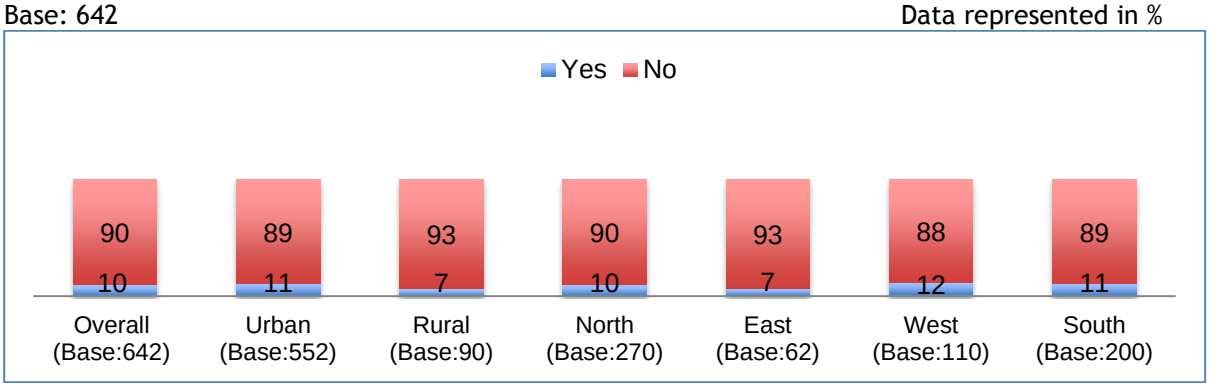
Base: N=642 Data presented in %

	Over all	Urban	Rural	North	East	West	South
Base: All Respondents	266	250	16	79	35	64	120
Labels are compulsory	30	32	7	30	28	25	26
In some appliances manufacturer should have star rating	23	24	10	17	37	27	15
Appliance efficiency is determined by labeling	16	16	21	18	16	11	13
Appliances that cannot be sold without labels	14	13	25	18	11	2	14
Can't say	17	15	37	17	8	35	32

7.3.19 Incentives on Sale of Energy Efficient Appliances

Almost all retailers denied receiving any incentives on the sale of EE products.

Base: 642 Data represented in %



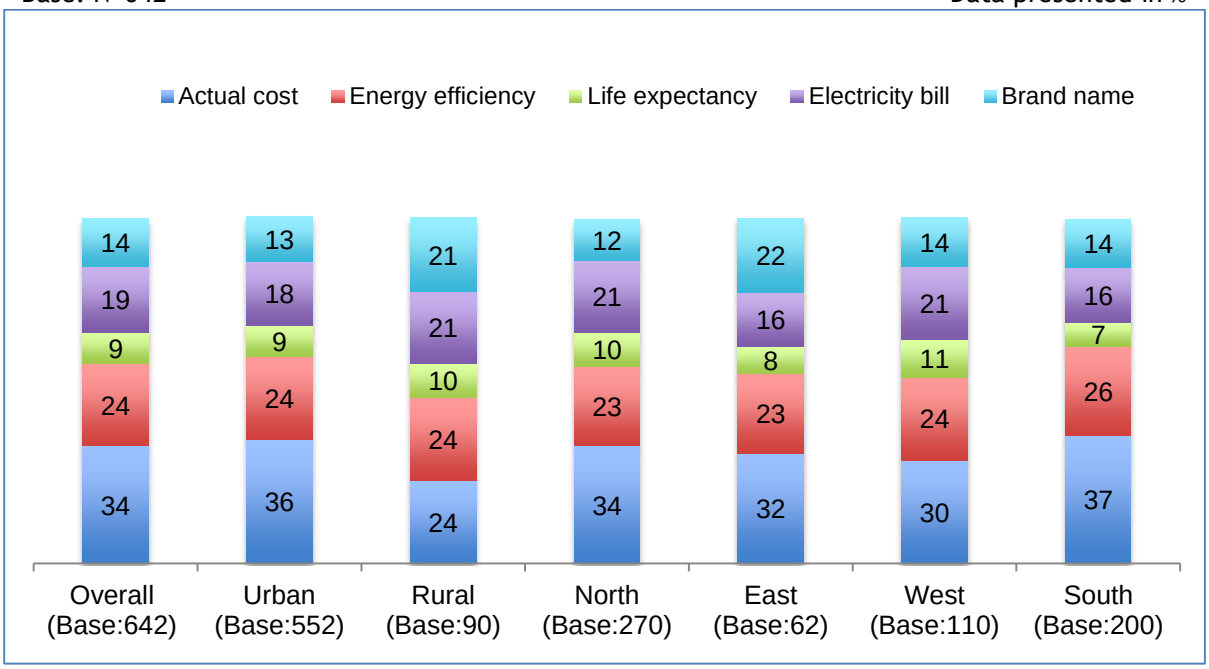
Graph 63: Incentives on Sale of Energy Efficient Products

Of the 10% retailers who say they receive incentives, most believe that incentives are provided by manufacturers.

7.3.20 Importance Attached by Consumer while Buying Energy Efficient Appliances

According to retailers, consumers give actual cost of an EE appliance as the most importance, followed by energy efficiency, and savings on electricity bills. Retailers say that consumers attach less overt importance to brand name and life expectancy while buying EE products because the labels visible on the product communicates the quality, efficacy, and longevity of the product.

Base: N=642 Data presented in %



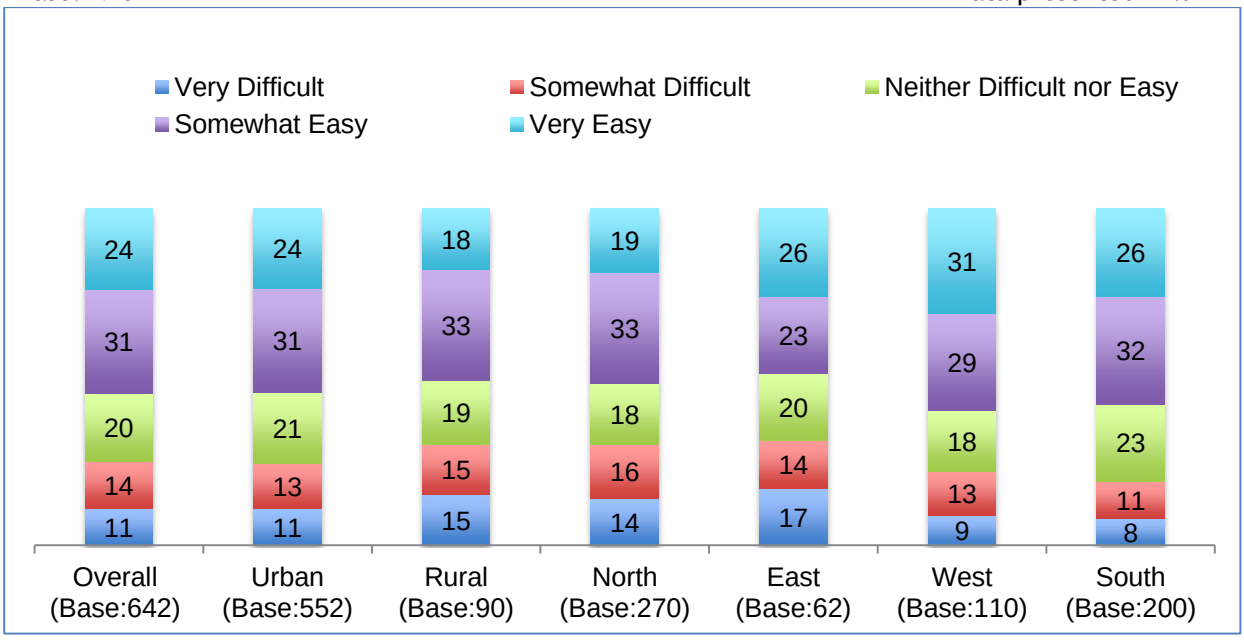
Graph 64: Importance Attached by Consumer while Buying Energy Efficient Appliances

7.3.21 Decoding Labels – Ease of Understanding Technical Details

Retailers and consumers were asked about their understanding of technical details mentioned on energy labels. According to the survey results, retailers are more at ease with the comprehension of technical details as compared to consumers. The overall level of understanding amongst both groups is inadequate.

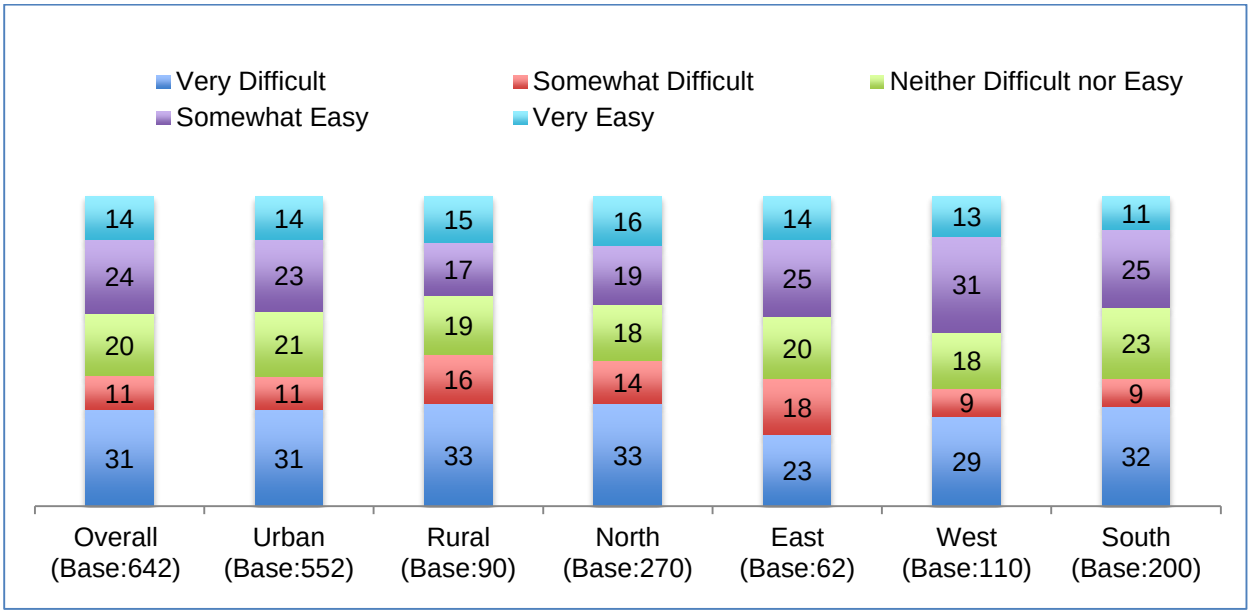
A. Self

Base: N=642 Data presented in %



Graph 65: Decoding Label – Ease of Understanding Technical Details

B. Consumer



Graph 66: Decoding Label – Ease of Understanding Technical Details

7.3.22 Suggestions from Retailers

Retailers have several suggestions to promote uptake of labeled products. They recommend regular communication via print and visual media, reduction in incremental cost of labeled products, introduction of exchange/replacement programs and increasing retail participation through incentives, workshops, awards etc., to promote uptake of labeled products.

Base: N=642 Data presented in %

Table 44: Suggestions from Retailers

	Overall	Urban	Rural	North	East	West	South
Base: All Respondents	**642**	**552**	**90**	**270**	**62**	**110**	**200**
Communication through media -TV/newspaper	16	16	13	18	13	13	13
Reduction in cost of labeled products	14	14	15	12	18	14	16
Below the Line (BTL) advertising material at the shop	13	13	11	14	11	12	12
Exchange program schemes	13	14	10	15	12	15	11
Incentives to retailers	12	13	9	16	6	14	9
Knowledge about the star program	16	16	15	18	17	12	15
Workshops	3	3	4	1	10	5	3
Retailer award to one who sells the maximum number of high star rated products in his area	5	5	5	1	5	8	9
Unspecified	8	6	18	5	8	7	12

B. Perspective of Manufacturer

The following aspects are studied with manufacturers:-

a) Outlook of manufacturers towards energy conservation
b) View on S&L program
c) Motivators and barriers
d) Impact of the program on investments
e) Impact of the program on sales
f) Current issues and future expectations
g) Other suggestions

a) Outlook of Manufacturers Towards Energy Conservation

Discussions with manufacturers initiated on their outlook towards the need and importance of the efficient use of energy. Manufacturers across verticals show a high level of concern towards

environmental issues and energy conservation. Most manufacturers narrate it to be a part of their philosophy and corporate social responsibility.

b) View on S&L program

Manufacturers express a high level of awareness and participation. They express full support and commitment towards the program.

c) Motivators and Barriers

Key Motivators: Demand push and technological advancements are the key motivators for manufacturers to adopt BEE's S&L program. Further, multinational brands also view the BEE star label as differentiator that separates technologically advanced and more efficient products from low quality, inefficient products. As many of them are a part of the global conglomerate, they are committed to produce the best quality products that score high on energy efficiency.

Key Barriers: Manufacturers believe price sensitivity is the key barrier for the consumer. For manufacturers, high investments and low ROI is the barrier towards producing more efficient products. Also, those who have their manufacturing setup outside India, face quality issues as the imported products are reopened in order to put 'star labels' on them. Additionally, there are a limited number of testing labs and frequent revision in the efficiency thresholds which act as unnecessary operational hazards for the manufacturers. In IT products, low consumer awareness is the key barrier.

d) Impact of the Program on Investments

Manufacturers give mixed reaction when asked about the investments required to produce EE products. Most manufacturers of IT products believe that their products are already energy efficient. Manufacturers of ACs express high concern about the additional investments required to produce EE products. A suggestion from the category is that the BEE should reduce it's per label fee. Also, almost express dissatisfaction on BEE's frequent changes of efficiency slabs, which involve frequent investment on the manufacturer's part.

e) Impact of the Program on Sales

Manufacturer sales have increased due to the S&L program, which is the biggest motivator for developing efficient products. In urban areas, people are largely aware and shifting towards star labeled products. There is no additional margin on labeled products. The demand for labeled products has increased, which has benefited the manufacturer. The uptake of efficient products and fast changing preferences lead to quicker replacement cycles which work in the interest of the manufacturer.

f) Current Issues and Future Expectations

Manufacturers see the process of registration as lengthy full of documentation which makes it tedious and cumbersome for them. Manufacturers expect the government to provide subsidy and tax benefits for producing EE appliances. They suggest that documentation should be made

simpler and user friendly. Regional manufacturers also suggest that BEE should have regional offices so that approvals may be expedited.

g) Other Suggestions:

Some manufacturers also suggest that TV, direct cool refrigerators and washing machines should be moved from voluntary to mandatory labeling. All manufacturers are in favour of the program and many believe that there is synergy between the core business philosophy and the intended program outcomes. However, they wish to see a more manufacturer-friendly registration and operational process that saves them effort and time. Hence, manufacturers suggest better operational mechanics. They also want authorities to be more receptive to the problems faced by manufacturers.

08 Industry Stakeholder's View

The group of industry experts comprises of representatives from consumer organizations, manufacturer associations, energy consultants, power utilities, domain associations, etc. The discussion sessions with industry experts highlights their view on the shift brought in by the S&L labels. The discussion is around their role in the industry and covers the following information areas:

- Impact of the S&L program in terms of:
  - Market transformation
  - Consumer awareness and behavior
- Associated advantages of the S&L program
- Key expectations of experts from policy makers
- Areas of further improvement with respect to implementation of the S&L program in India

Table 45: Organizations

Voice	Bharat Test Lab
MAIT	Lab – UL
TAIT	Tata Power
ELCOMA	Indian Manufacturing Foundation

8.1 Impact of the S&L program

The stakeholders believe that the BEE's S&L program resulted in impressive augmentation of EE products in Indian markets. Labels have created their own space in the consumers' consideration while purchasing any home appliances.

Awareness-raising campaigns have had immense impact. The Indian population is more aware of star labels. However, due to better exposure and economic power, awareness is much higher in urban areas, as compared to rural areas.

Industry experts say the program has achieved the objective of promoting EE appliance sales to reduce energy consumption and to reduce emission of GHG. An important development, resulting from the progress made by the S&L program is that the contribution of five-star labeled products is increasing at a relatively faster pace, although three-star labeled products have the largest share of the market. Another important development is that the contribution of one and two-star-labeled products is negligible in all product categories, except for air conditioners.

8.2 Market Transformation

There are indications that the Indian home appliance market is transforming for some products. This ongoing transformation further helps consumers to go in for greener products through a chain reaction (i.e. one purchase leading to another purchase). In the last few years, production of five-star labeled models has increased, thus resulting in a market shift towards more efficient appliances. Energy efficiency has become a critical consideration while purchasing products, especially ACs and refrigerators.

A sustained S&L program and the potential to increase the number of products in the scheme can make a significant contribution in both energy saving and reduction of emission of carbon dioxide and other harmful gases.

Consumers as well as the manufacturers have realized the importance of EE products. Manufacturers are trying to produce better machines. In turn, consumers are supporting it by paying a premium for it. However, the willingness to pay extra for EE products varies among consumers. Moreover, this behavior is limited to certain products/appliances. This shows that the entire market has not yet accepted the rationale of the star label program.

Manufacturers see labeled products as a way of capitalizing their market share as well as hikes in the prices of products. In the current scenario, the premium associated with labeled products is holding back consumers to adopt labeled products although consumers in urban areas are more willing to pay premium for star labeled products.

8.3 Impact of S&L program on Consumers

In the last few years, customers have accepted BEE star labels as a means of identifying EE products. In the majority of cases, consumers are influenced by the star rating, although other factors, such as brand, product price, availability, and looks continue to have a great impact.

As compared to other product categories, when buying ACs, refrigerators, washing machines and lighting products, consumers are more aware of energy efficiency. BEE labels can be highly influential when consumer make purchase decisions. It indicates that there is an increasing awareness and penetration in the market, provided the relative payback or other incentives are big enough.

In cases where consumers are not influenced by the energy rating, it is often because they are either not aware of it, or they don't understand the complete connotation of the energy label. In other cases, consumers opine that the energy savings are not adequate compensation for the price of a product with a higher rating. This suggests the requirement of better communication and energy awareness training in order to create a positive impact in the market.

As per experts, consumers are more likely to be influenced by the star rating than by information on running costs. It is difficult for consumers to calculate the anticipated savings on running costs and its impact on their electricity bills. This also reveals that consumers use the star rating not just to indicate running costs alone but also for product quality and to judge their environmental impact.

8.4 Impact of S&L program on Manufacturers

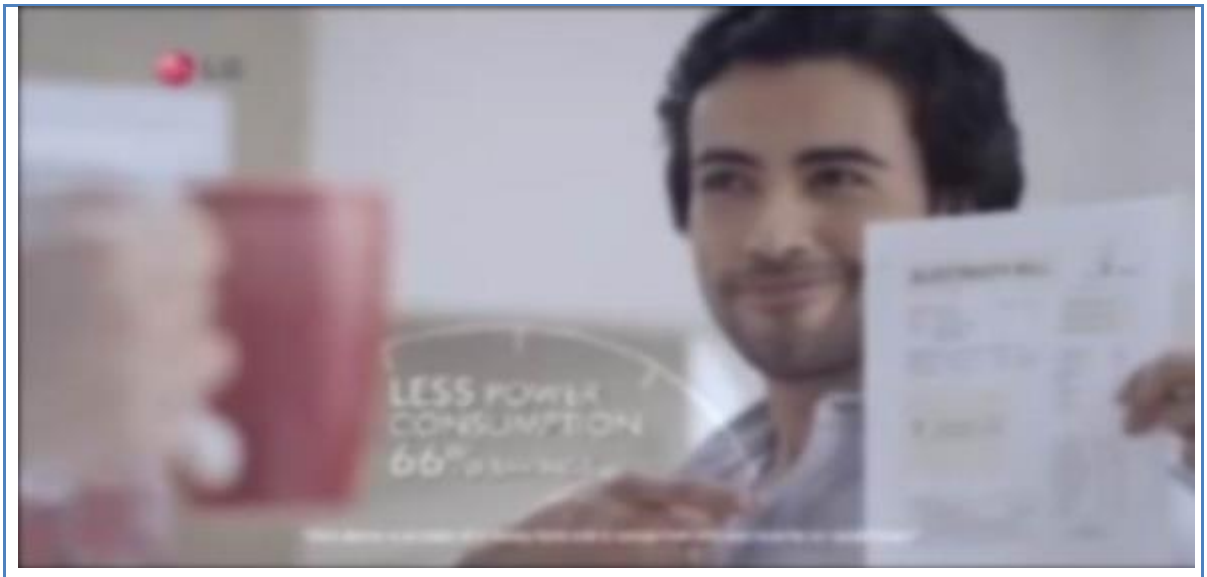
Since 2006, there has been a huge change in the attitude of manufacturers with respect to the EE products. Manufacturers across product categories are encouraged by government initiatives to increase the outreach of EE products.

Over the last few years, corporate initiatives for energy efficiency have become more streamlined. Encouraged by government initiatives and consumers' positive responses, manufacturers are now giving significant importance to the production of EE products. This is revealed by the growing sales and popularity of EE products throughout the country.

Across product categories, manufacturers are producing and promoting EE products that will help consumers join in the effort to increase energy efficiency and reduce emissions of greenhouse gases.

The process of product up-gradation has started in India in a big way. Consumers have now started thinking of replacing their old non-EE products with those that are technologically advanced and energy efficient. Indian consumers started upgrading to EE air conditioners to save on mounting electricity bills after the government made it mandatory for appliances to be rated on energy efficiency.

Further, manufacturers are investing in R&D to develop newer technologies which can reduce carbon dioxide emissions by developing innovative products like ***air conditioners with inverter technology***.



Manufacturers are also in the process of rolling out a product-recycling initiative and reducing the use of hazardous materials and components in their manufacturing process. Such initiatives have the potential to further transform consumer consciousness towards environment-friendly products in India, especially in the urban markets. It will also help expand their market, as consumers are now increasingly becoming eco-friendly and energy-conscious.

8.5 Impact of S&L Program on Power Utilities

Power utilities have been at the forefront of propagating energy conservation and efficiency in the country. Several innovative and attractive schemes have been launched for residential as well as commercial customers. Further, power utilities show a conscious attitude towards saving energy by investing in consumer engagement.

8.6 Impact of S&L Program on Lighting Industry

Although TFL is part of mandatory S&L program but consumers are not seen consciously opting for high star rated products in the category. Thus the lighting industry sees less conscious opting of high efficiency star labeled products.

8.7 Impact of S&L Program on Refrigerator Industry

In India, S&L was made mandatory for frost-free refrigerators. Energy labeling for direct-cool refrigerators has also been implemented. Due to the encouraging response from manufacturers, most of the brands manufactured in India are now covered under the labeling program of BEE. Like products in other categories, refrigerators in five star and three star categories have a high off take.

8.8 Impact of S&L Program on Air Conditioning Industry

In the Indian AC industry, split ACs, with a 70% market share, enjoy the most coveted place. As the consumer's awareness levels – with respect to price, quality and value – increase, generally, there is the desire to move higher up in the value chain. This is reflected in the purchase decisions taken for better quality products (which are not only superior in quality but also consume less resources). ACs with inverter technology are being manufactured that score high on energy efficiency parameters.

However, the industry has been stagnant for the last three years due to a slowdown of the economy and delay in real estate projects. Manufacturers are under pressure because of declining margins of profit. EE Labels are further adding to the cost that is borne by the consumer. With an increased level of efficiency, the cost of an AC is escalated by INR 2000 – INR 3000.

8.9 Impact of S&L Program on IT Industry

The S&L program is still in its nascent stage with respect to IT products. As per experts, the IT industry is now ready to support the BEE label program. On the part of consumers, however, there is still not adequate awareness. The IT industry is expecting BEE and other stakeholders to implement EE Labels for IT products.

7.10 Key Issues and Challenges (according to experts)

Over the past few years, the S&L program has done very well, especially in a few product categories like ACs and refrigerators. Most of the manufacturers are making efforts to produce EE products and the market for EE products is gearing up. Consumers are willing to pay higher prices for higher efficiency. However, the program is facing the following challenges:

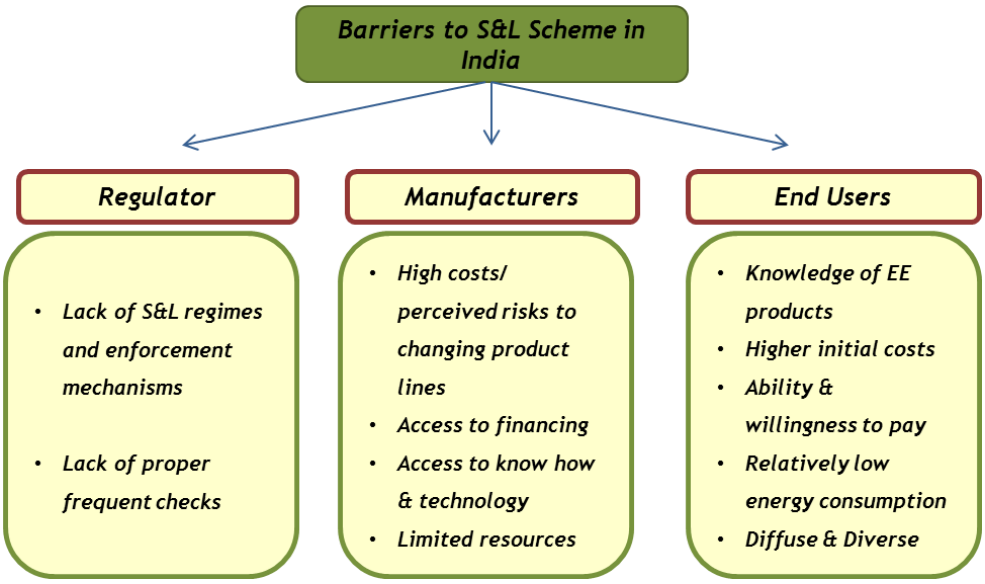


Figure 11: Key Issues and Challenges 1

- High price of EE products
- Limited capacity of manufacturers
  - Competitive market, economic slowdown restricts manufacturer to invest in R&D
  - Technological enhancement involves huge investments which are passed to the consumer making the product expensive for him
- Limited number of national testing laboratories for various appliances and equipment
- Frequent revision in the efficiency label leading to frequent investment for the manufacturer
- Partial understanding of star labels and lack of awareness amongst consumers (though it is not much of an issue now) about BEE
- Lack of guidance in the disposal of old products
- Lack of S&L regimes and enforcement mechanisms

8.11 Suggestions for Higher Impact of S&L Program

The following ways were suggested to widen the impact of the S&L program.

- Incentives for consumers by making EE products tax free
- Rewards incentive on the usage of EE products
- Greater advertising
- Training of shop sales personnel
- Expanding mandatory labeling to a wider range of products
- Exchange scheme for the purchase of EE products

09 Impact of BEE's Communication Campaign

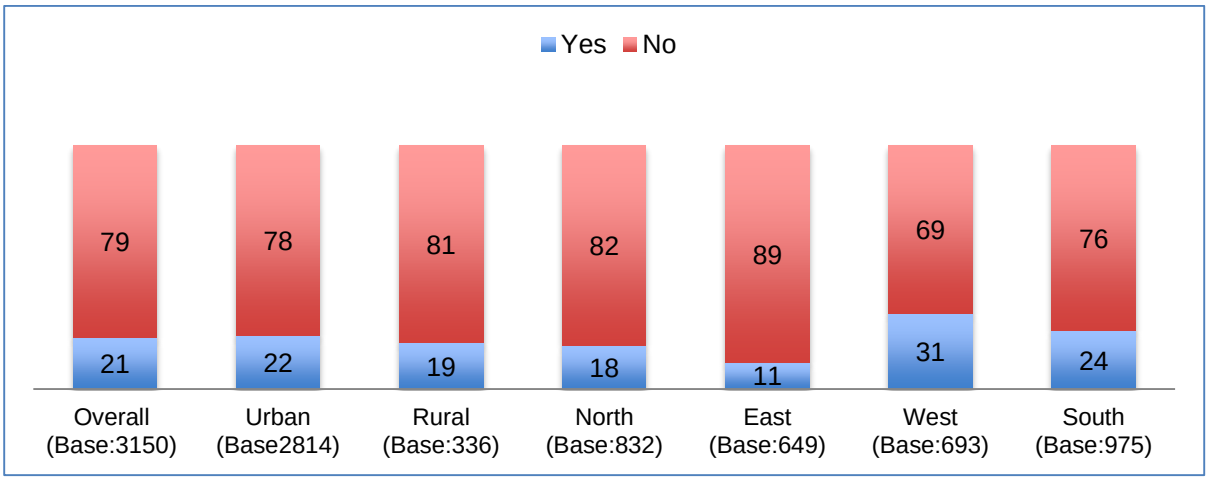
In 2006, BEE's campaigns were done on a large scale through print and electronic media. Painting competitions were also organized with the main thrust being awareness and benefits of EE products. The total budget was divided into appropriate ratios for each medium. The electronic media had the highest share of around 70%. The campaign proved successful and created awareness among consumers. Due to this campaign, "Star Labels" became a brand in itself.

Over the last few years, only the print media is creating publicity to promote the BEE program. The campaign budget is 10 crores for this five year plan. In the next phase of the campaign, BEE proposed targeting the entire internet population by going online. Further, BEE plans to invest on the training of salesmen. These measures will pave the right way for program outcomes.

9.1 Advertisement of BEE's S&L Program

Of the consumers interviewed, 79% affirmed that they have seen the BEE advertisement. The other source of awareness about the S&L program included retail avenues and the manufacturer's websites. Some also claimed having read articles on EE products. Others remembered having seen the advertisement in the past. This mandates continuous connection with consumers.

Base: N=3150 Data presented in %

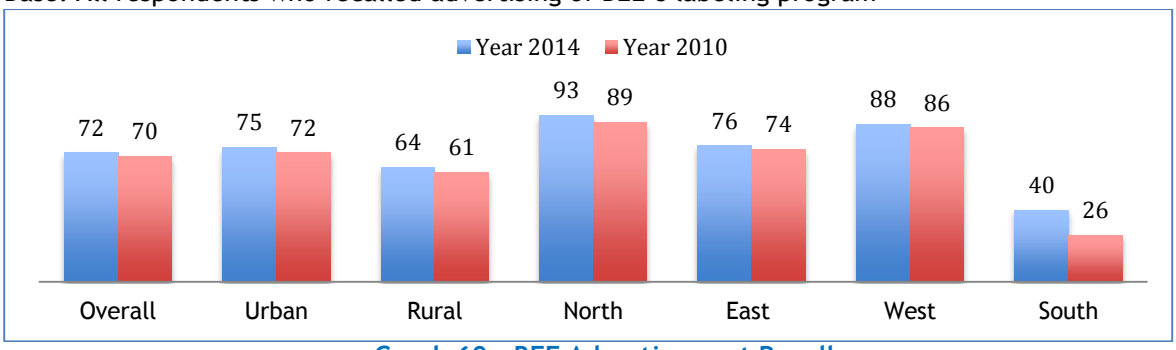


Graph 68: Advertisement of BEE's Star Rating & Labeling Program

9.2 Unaided Recall of Advertising and Feedback

Consumers aware of the BEE's labeling program were asked if they recalled any advertising for the program. The following chart shows the extent of recall of any advertising for the program among those who said they are aware of the program. The findings, when benchmarked with the previous impact study, do not show much deviation. Lack of advertising seems to have been compensated by uptake of mandatory appliances, more knowledge on the part of the retailer and a spate of communication centered on the feature undertaken by the manufacturer. To generate high recall, a spurt of communication will have to be undertaken. The feature should emerge as top of the mind citation to really influence purchase.

Base: All respondents who recalled advertising of BEE's labeling program



Graph 69: BEE Advertisement Recall

Centered on a range of products and businesses, the spate of recent communication is promising and bound to have a positive impact on its targets. However, to have more far reaching effects, the same should be channelized in a way such that it generates impact on the lower spectrum of consumers and in wider regions.

Thus, awareness of S&L program is not dependent on one medium rather it is the combined exposure from retail shops, websites and articles n media. Although the overall recall of BEE labeling program has increased from the past but it could be much higher if the exposure on electronic media would have been higher. Moreover the message would have reached to the rural audience too.

10 Market Transformation Effect for the targeted products

10.1 Our Understanding of Market Transformation

The term market transformation is the strategic process of intervening in a market to create lasting change in market behavior by removing identified barriers and creating opportunities to accelerate the adoption of all cost-effective energy efficiency as a matter of standard practice.

10.2 Market Transformation: Energy Efficient Products

Market transformation in EE products typically describes technology development from initial research and development to marketplace introduction to widespread adoption. EE programs help EE technologies gain market share and increase its adoption. Codes and standards ensure that a minimum level of EE technology is being used.

The primary objective of this program is to change the way in which energy efficiency markets operate (e.g., how manufacturers, distributors, retailers, consumers, and others sell and buy energy-related products and services), which results in more indirect energy savings. Education and training (E&T) programs and programs that support the development of and compliance with codes and standards (C&S) are examples of market transformation activities. To a large extent, all programs can be considered market transformation programs in that they involve a change in the way energy efficiency activities take place in the marketplace.

However, it is not only changing technology adoption but also **the general population's attitudes, knowledge, and awareness (AKA)** that comes under market transformation.

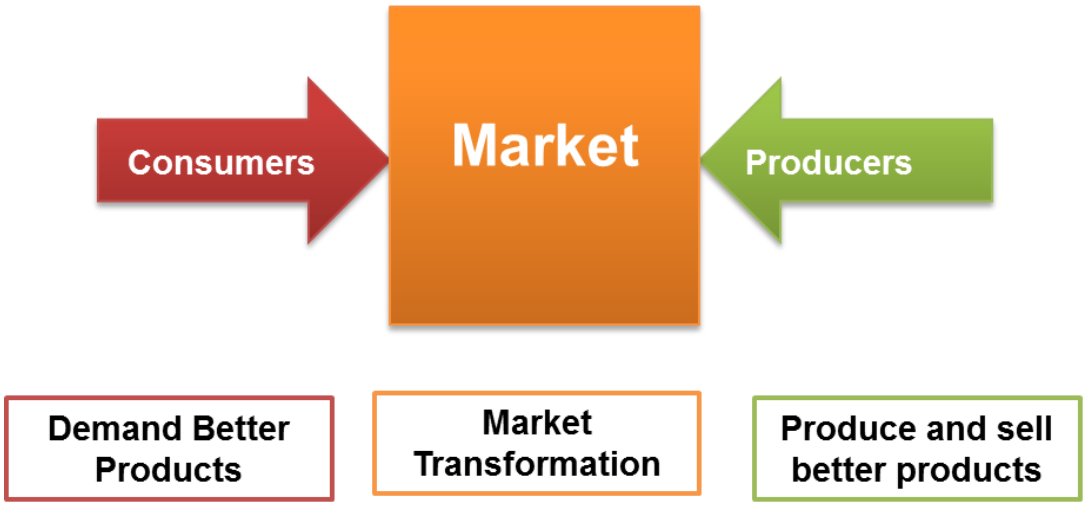


Figure 12: Market Transformation by Consumers and Producers

The broad parameters outlined under market transformation effects are –

- Market penetration
- Growth trends
- Sales pattern and
- Segmentation

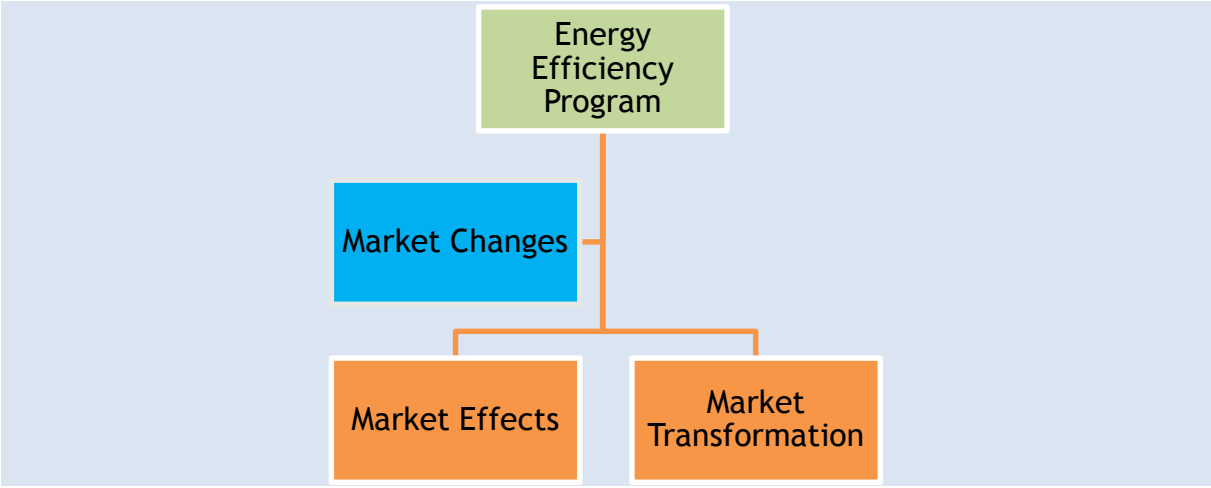


Figure 13: Market Effects and Market Transformation

10.3 Market Effects

Market effects: A change in the structure of a market or the behavior of market participants that reflects an increase in the adoption of EE products, services or practices that are causally related to market intervention. Examples of market effects include increased levels of awareness of EE technologies among customers and suppliers, increased availability of efficient technologies through retail channels, reduced prices for efficient models, build-out of efficient model lines, and — the end goal — increased market share for EE goods, services, and design practices.

10.4 Market Effects Evaluation

Market effects evaluation entails consideration of several levels or stages, with the ultimate goal generally understood to be the increased adoption of EE goods and services in the general market leading to energy savings. Energy savings are the ultimate goal of programs seeking to cause market effects (i.e., the intended long-term outcome).

The following list suggests a hierarchy of precursors to that goal:

Early Acceptance: proliferation of models and manufacturers, purchase by frontrunners and enthusiasts

Take-off Phase: customer awareness, visibility on shelves and in inventories, perceptible levels of the market share in supply channels

Maturity: all major competitors offer EE models; codes and standards include EE models

Energy Savings: energy savings attributable to the program are associated with acceleration of these developments.

It has been seen that there are many new innovative EE technologies (such as inverter technology in ACs) are being introduced in the market and becoming available for consumers and gradually gaining popularity. Manufacturers also support the change and are now differentiating themselves by offering EE products. Also, there are new developments in the supply side as manufacturers are training dedicated staff to sell EE products.

Role of various actors in shaping market transformation:

Table 46: Role of Various Actors in Market Transformation

Market Actor/Stakeholders	Transforming market by promoting EE products	Project outcome - Rating
Manufacturers	• Support market introduction of new high efficiency products • Provide independent, objective marketing of products • Increase demand for innovative products	+++
Retailers	• Identify best products to optimize range of products • Increase sales of EE products • Position self as being competent in energy efficiency and quality	++
Consumers	• Identify most efficient products and access incentives (e.g., by electrical utilities) by user-friendly interface • Should be informed on total life-cycle cost (purchase price plus energy bill). Benefits of efficient products for climate protection should be conveyed to consumers	++
Large buyers & procurement Officers	• Support formulation of procurement specifications • Reduce operating costs to enhance competitiveness	++
Policy makers	• Provide real-time market data on the "best" products, with energy efficiency as a key criterion • Pave the way for new and more stringent S&L specifications and minimal energy performance standards (MEPS)	++
Utilities	• Continuously identify the highest efficiency products • Provide benchmark for rebate programs • Include products for which standards/labels are not yet available	+
Media	• Serve as credible, independent source of information	+

+ Low Impact, ++ Moderate Impact, +++High Impact

We conclude that various actors have shown varying degrees of interest and participation towards market transformation. Hence, a concerted effort by these actors will surely lend high impetus to the whole program, making it more meaningful.

Market transformation indicators	Data types and sources
a) No. of labeled products sold/manufactured annually **b)** No. of labeled products produced annually in different star rating categories **c)** No. of products sold in each star band	• Sales and production data from BEE and other stakeholders

10.5 Market Transformation Impact: Impact of S&L Program on Sales of Energy Efficient Appliances

Objective:

The objective of this section is to evaluate the extent to which the evidence supports market transformation for the specified products such as, direct cool refrigerators, frost free refrigerators, air conditioners, color televisions, TFLs, electric geysers, pumps and ceiling fans.

Methodology:

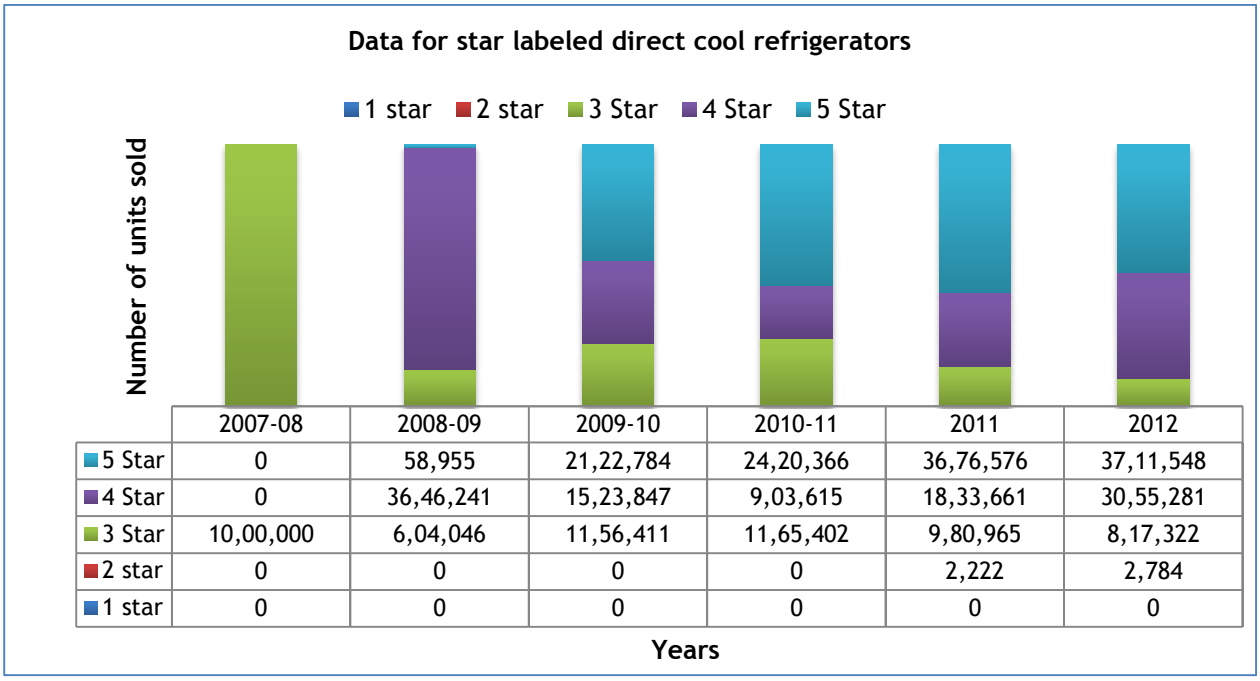
In order to thoroughly understand the impact on the market, it is important that the impact of the S&L program on production and sales of EE appliances is captured.

This study analyzed market transformation using a trend-analysis of the number of units produced. It was used as an indicator to identify market penetration. The data is extended to the year 2011-2012 and benchmarked with the previous year's data to capture the most relevant information.

Analyzing the trend

The graphical representation shows the number of units sold under the star labeling program from 2007-08 until financial year 2011-2012. The analysis has been shown for the following products under study refrigerators, ACs, color TVs, tubular fluorescent lamps, geysers, ceiling fans, distribution transformers, and pumps.

Direct cool refrigerators

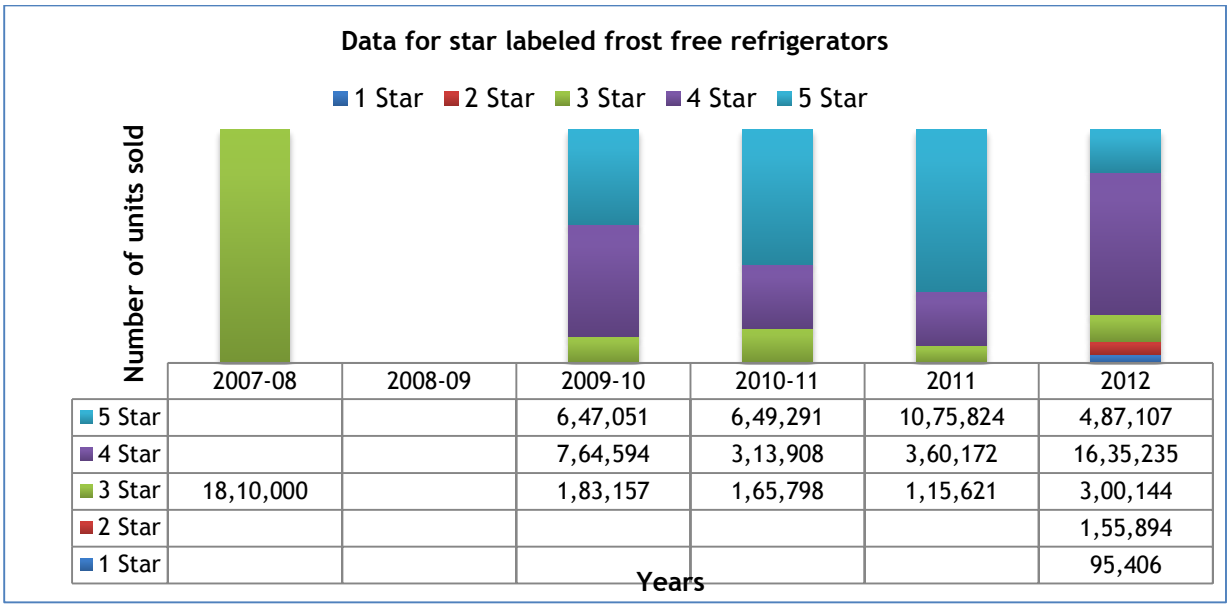


	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star	0	58,955	21,22,784	24,20,366	36,76,576	37,11,548
4 Star	0	36,46,241	15,23,847	9,03,615	18,33,661	30,55,281
3 Star	10,00,000	6,04,046	11,56,411	11,65,402	9,80,965	8,17,322
2 star	0	0	0	0	2,222	2,784
1 star	0	0	0	0	0	0

Graph 70: Data for Labeled Direct Cool Refrigerators

The graph clearly shows that maximum numbers of products registered & approved with BEE in 2011 are of 5 star category. There is drastic increase in production of **5 star category from 2009 onwards.** The same trend is seen in subsequent years. However in 2012 the share said category has marginally decreased in proportion to other star rating bands but the sales numbers are higher compared to previous years.

Frost free refrigerators

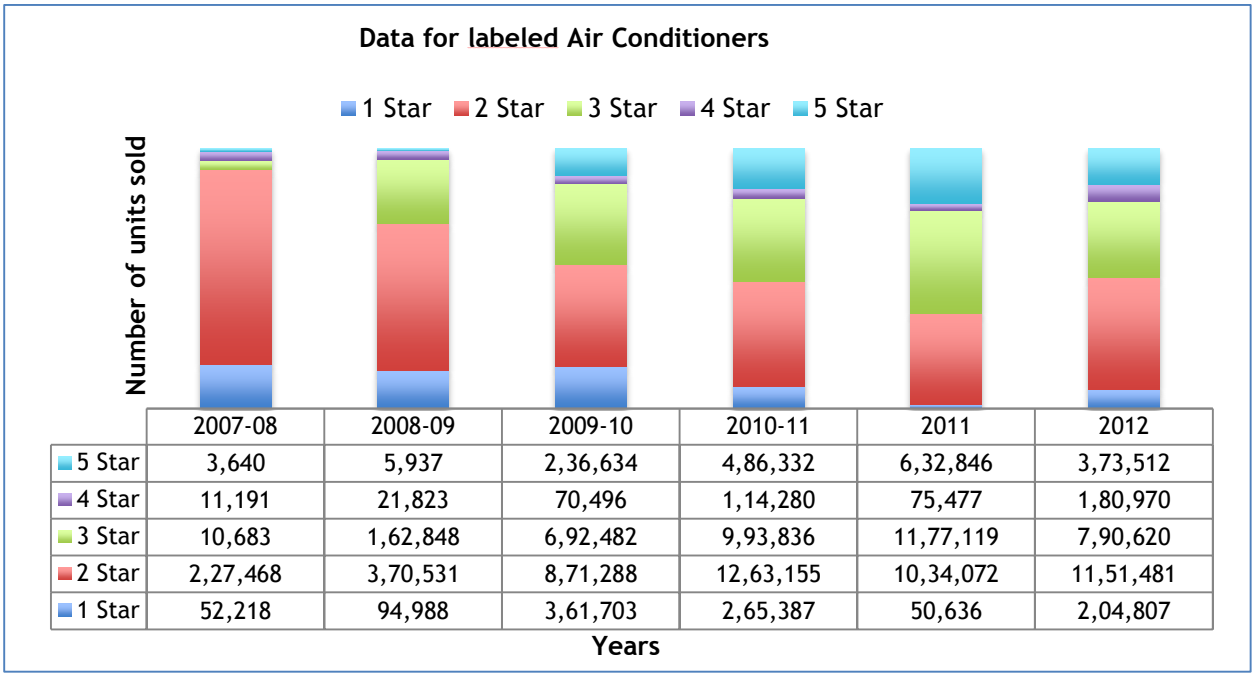


	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star			6,47,051	6,49,291	10,75,824	4,87,107
4 Star			7,64,594	3,13,908	3,60,172	16,35,235
3 Star	18,10,000		1,83,157	1,65,798	1,15,621	3,00,144
2 Star						1,55,894
1 Star						95,406

Graph 71: Data for labeled Frost Free Refrigerators

Following the same trend as in DCR, the pie for 5 star rated products has increased from 2009-11. Data indicates that the sales of 5 star refrigerators have increased more than 40% in 2011 when compared to previous years. However in 2012, the share of 5 star categories was largely over taken by 4 star.

Air Conditioners

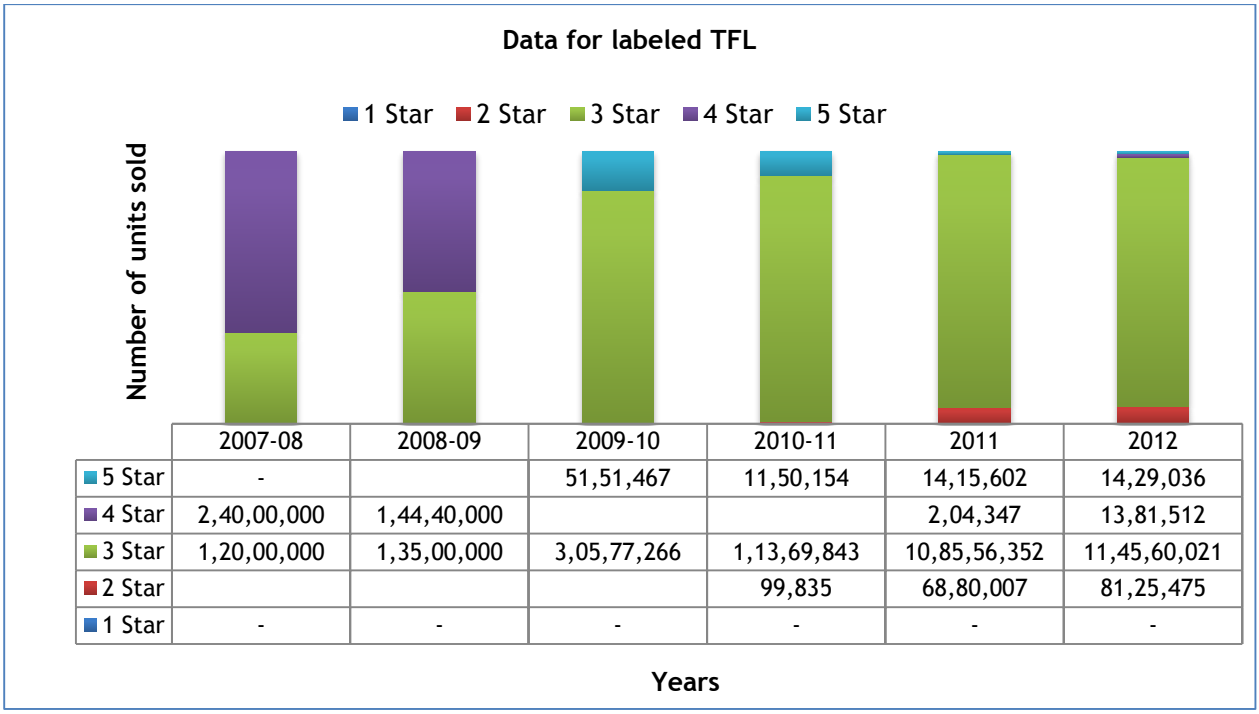


	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star	3,640	5,937	2,36,634	4,86,332	6,32,846	3,73,512
4 Star	11,191	21,823	70,496	1,14,280	75,477	1,80,970
3 Star	10,683	1,62,848	6,92,482	9,93,836	11,77,119	7,90,620
2 Star	2,27,468	3,70,531	8,71,288	12,63,155	10,34,072	11,51,481
1 Star	52,218	94,988	3,61,703	2,65,387	50,636	2,04,807

Graph 72: Data for labeled air conditioners

Air conditioners follow a different trend than other labelled products. Numbers of models of five-star labeled air conditioners registered with BEE are low. Their share is much below the two-star and three-star-labeled products. It is also observed that its share in 2011-12 has remained confined to around the 20-percent mark. However, while in 2009-11 the number of 2 star products realised the highest share in sales of air conditioners, there is a clear shift in 2011, wherein three-star-labeled products have gained the highest share. In 2012 again 2 star categories is found to be dominating the market.

Tubular fluorescent lamps

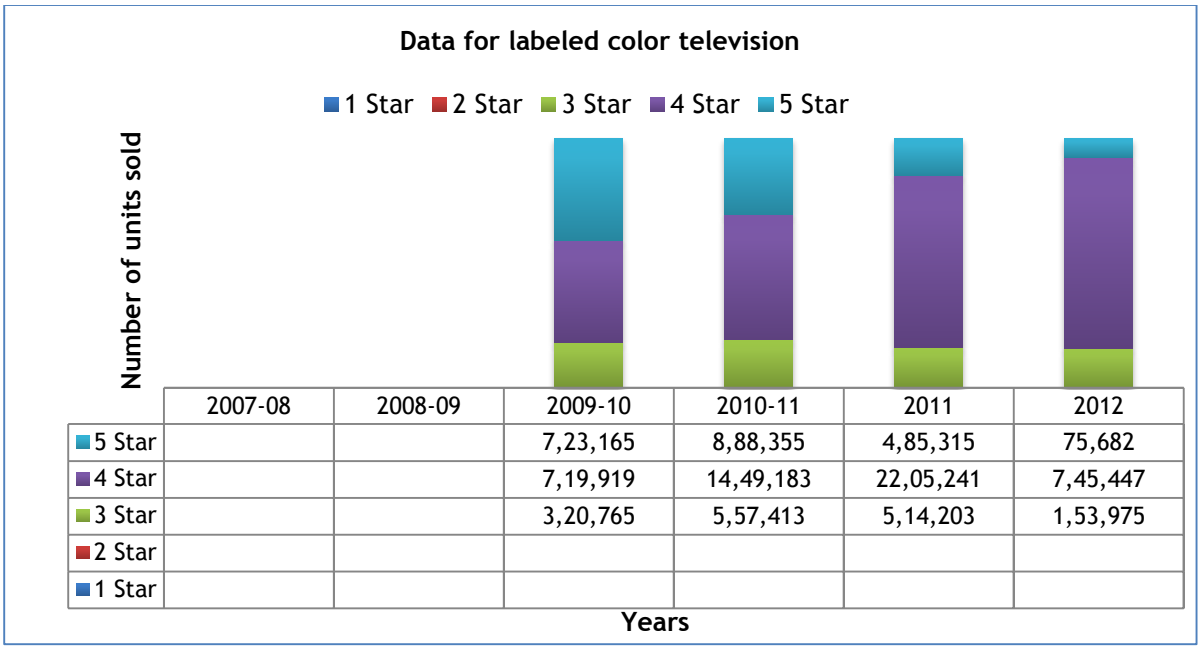


	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star	-		51,51,467	11,50,154	14,15,602	14,29,036
4 Star	2,40,00,000	1,44,40,000			2,04,347	13,81,512
3 Star	1,20,00,000	1,35,00,000	3,05,77,266	1,13,69,843	10,85,56,352	11,45,60,021
2 Star				99,835	68,80,007	81,25,475
1 Star	-	-	-	-	-	-

Graph 73: Data for labeled TFL

From 2007-2009, TFLs were primarily 3 star and 4 star categories. In 2009-2011 the market was dominated by 3 star products.

Color Television

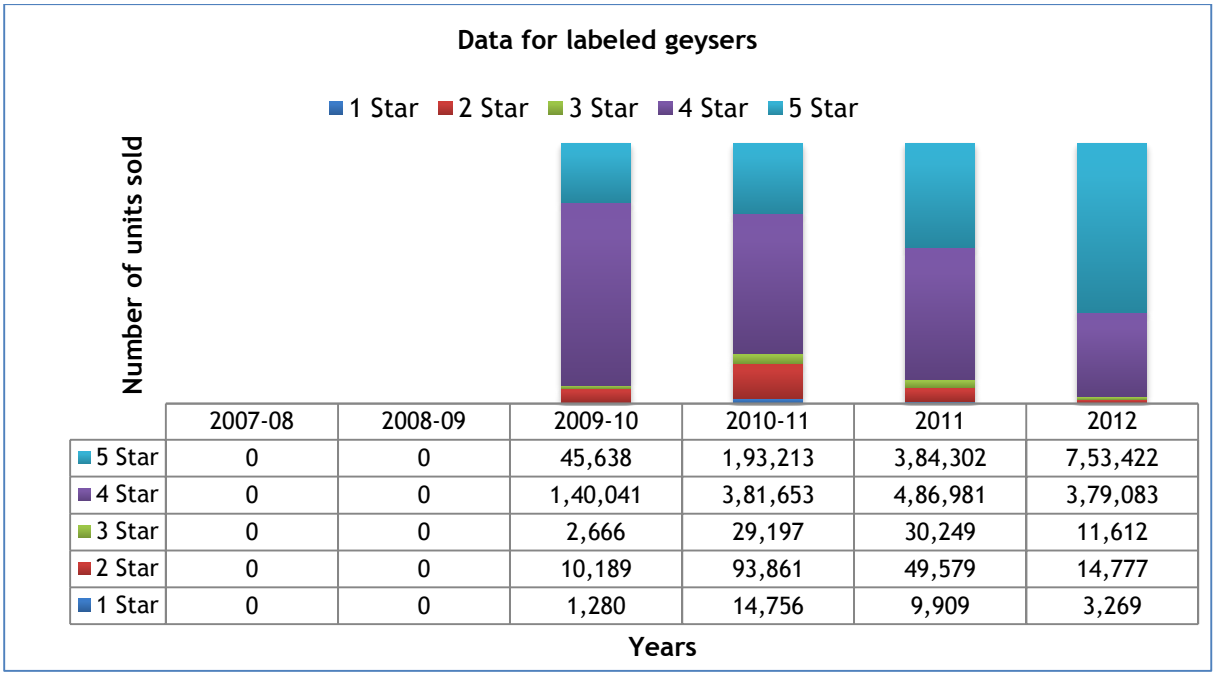


	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star			7,23,165	8,88,355	4,85,315	75,682
4 Star			7,19,919	14,49,183	22,05,241	7,45,447
3 Star			3,20,765	5,57,413	5,14,203	1,53,975
2 Star						
1 Star						

Graph 74: Data for labeled Color Television

The share for 3 star has remained more or less stable whereas the number of models for 4 star category has increased.

Geysers

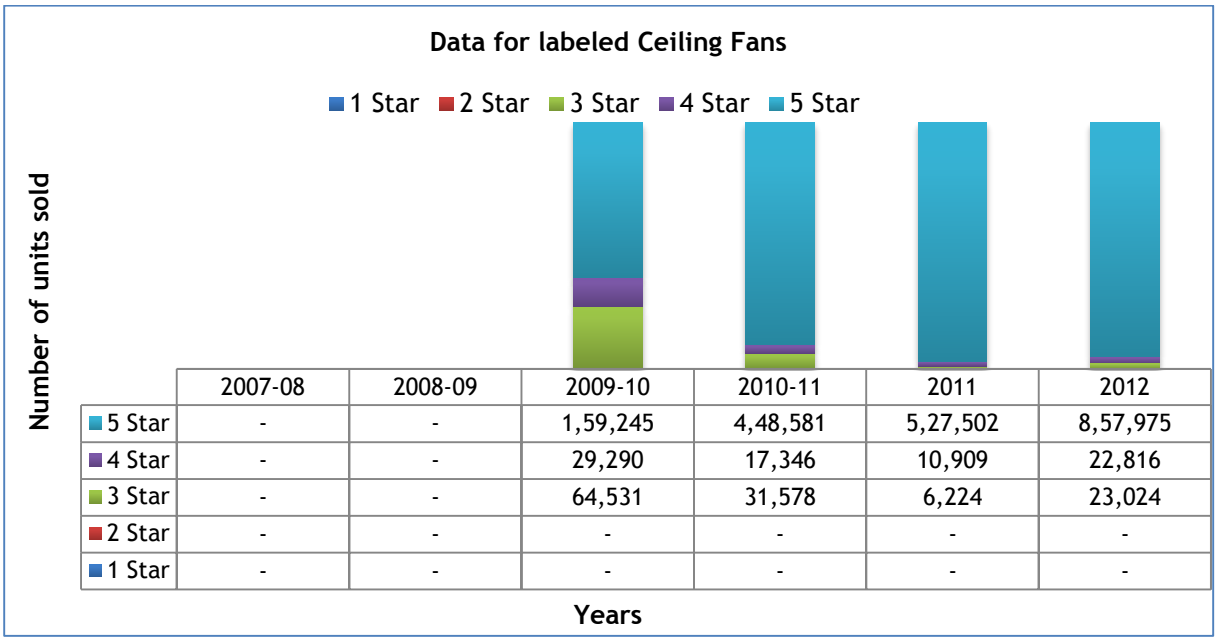


	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star	0	0	45,638	1,93,213	3,84,302	7,53,422
4 Star	0	0	1,40,041	3,81,653	4,86,981	3,79,083
3 Star	0	0	2,666	29,197	30,249	11,612
2 Star	0	0	10,189	93,861	49,579	14,777
1 Star	0	0	1,280	14,756	9,909	3,269

Graph 75: Data for labeled Geysers

The majority of market share is of 4 star geysers. There is almost a 50% increase in the 2011-12 sales of 5 star geysers.

Ceiling fans

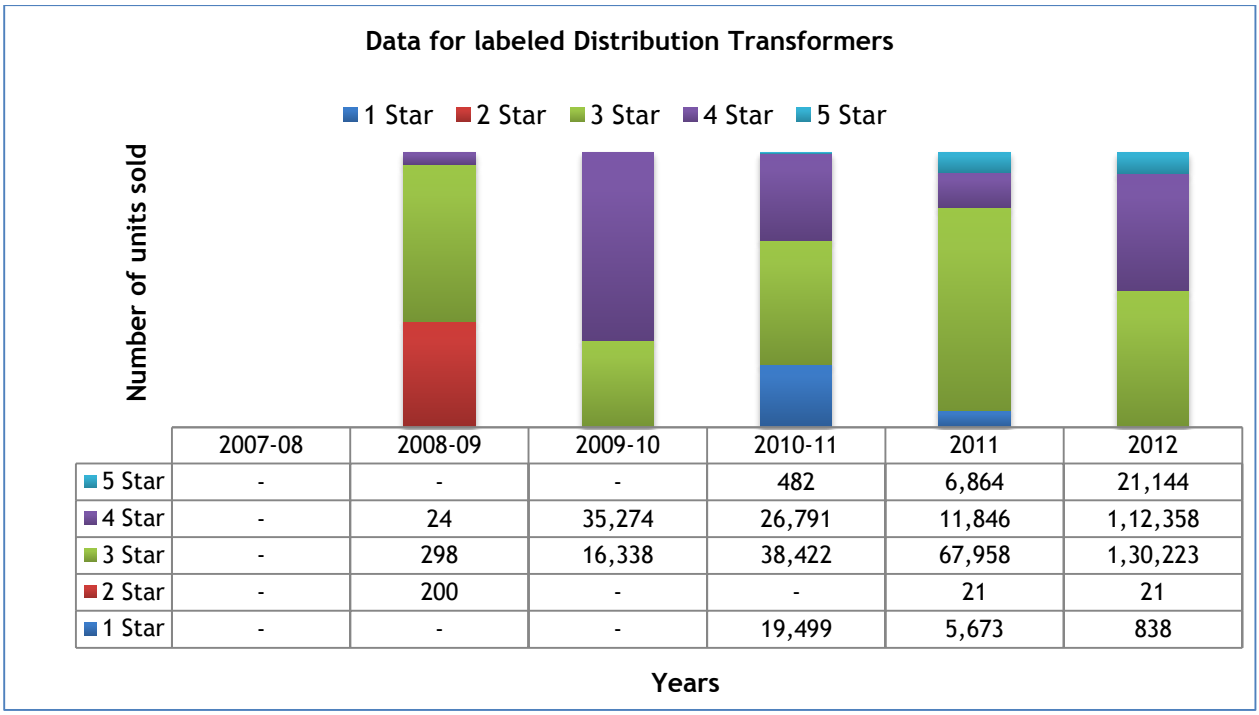


	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star	-	-	1,59,245	4,48,581	5,27,502	8,57,975
4 Star	-	-	29,290	17,346	10,909	22,816
3 Star	-	-	64,531	31,578	6,224	23,024
2 Star	-	-	-	-	-	-
1 Star	-	-	-	-	-	-

Graph 76: Data for labeled Ceiling Fans

Category 5 ceiling fans have a significant majority in all the years analysed.

Distribution Transformers

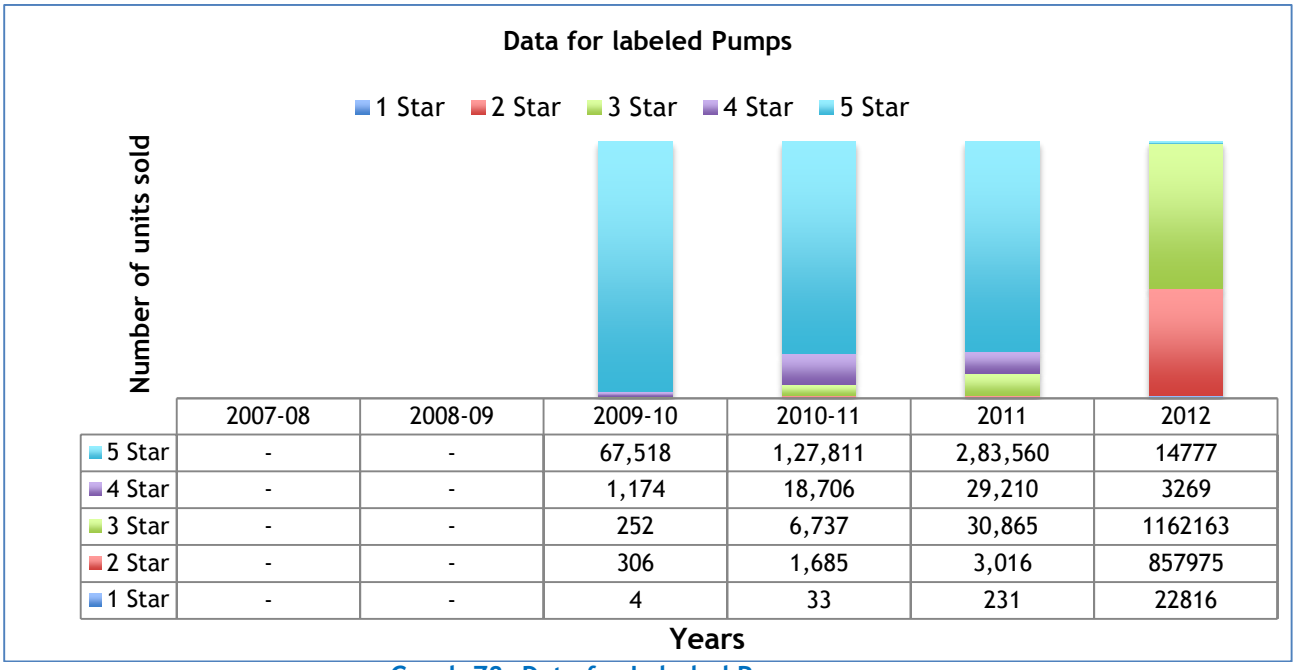


	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star	-	-	-	482	6,864	21,144
4 Star	-	24	35,274	26,791	11,846	1,12,358
3 Star	-	298	16,338	38,422	67,958	1,30,223
2 Star	-	200	-	-	21	21
1 Star	-	-	-	19,499	5,673	838

Graph 77: Data for labeled Distribution Transformers

There is no consistent growth of any particular star rated DT. However in 2011 and 2012, 3 star category DTs dominate the market.

Pumps



	2007-08	2008-09	2009-10	2010-11	2011	2012
5 Star	-	-	67,518	1,27,811	2,83,560	14777
4 Star	-	-	1,174	18,706	29,210	3269
3 Star	-	-	252	6,737	30,865	1162163
2 Star	-	-	306	1,685	3,016	857975
1 Star	-	-	4	33	231	22816

Graph 78: Data for Labeled Pumps

According to the information shared by BEE regarding production of star labeled appliances, the market is gradually moving towards efficient products establishing the market transformation. Market evaluation reveals a clear and strong evolution toward higher efficiency products since the label was introduced. Thus average energy efficiency is estimated to have improved.

S&L program has generated interest among manufacturers resulting in production of efficient products and their registration under the different star label categories.

11 Estimates of energy saving, avoided capacity and GHG reduction

11.1 Basis for Energy Saving Calculation

The energy saving has been calculated based on the operating hours and number of days of operation in a year for different products as given in table.

Table 47: Basis for Calculating Energy Saving

S. No.	Name of the Product	Annual no. of days of operation	Annual Operating Hours	Baseline	Remarks
1	Direct Cool Refrigerators	365	8760	1 star	As per S&L
2	Frost Free Refrigerators	365	8760	1 star	As per S&L
3	Room Air Conditioners	150	1200	0 star	As per S&L
4	Color Television sets	365	6570	3 star	Calculations on daily usage pattern of 6 hours in On Mode and 12 hours in Standby Mode.
5	Ceiling Fans	300	3600	1 star	As per BEE previous reports
6	Geysers	-	250	1 star	-
7	Tubular Fluorescent Lamps	300	1200	40 watt TFL	As per BEE previous reports
8	Distribution Transformers	365	8760	1 star	As per BEE previous reports
9	Pumps	250	2000	1 star	As per BEE previous reports
10	Plant Load Factor	75 %			As per BEE previous reports
11	T&D Losses	23.97%			As per CEA 2013 data

11.2 Rationale for choosing below mentioned capacity/specifications

Table 48: Rationale for choosing below mentioned capacity

Product category	Capacity Chosen	Rationale for choosing mentioned capacity
Air conditioners	1.5 tonnes	60% of market share is of 1.5 tonnes AC
Direct cool refrigerators	190 litres	185-225 litres refrigerators and 165-184 litres refrigerators constitutes 90% of market share[6]
Frost Free Refrigerators	270 litres	226-270 litres refrigerators comprises 61% of the market share[7]
TFL	36 W	Verified Saving Report BEE 2010-11
Color television	21 inches screen size	66% of market share is of 21 inches screen CTVs[8] (For CRT)
Ceiling fans	Sweep=1200,Minimum air delivery=210	Verified Saving Report BEE 2010-11
Geysers	Rated capacity = 25	The most sold geysers have storage capacity of 25 litres[9]

11.3 The avoided generation capacity for star labeled products is calculated based on the following:

$$\text{Avoided capacity at Generation end, MW} = \frac{\text{Total annual savings in MWh}}{\text{Annual usage hours X PLF x (1 – T\&D)}}$$

PLF = Plant Load Factor = 75%
T & D = Transmission & Distribution Loss = 23.97%

Basis of avoided capacity for all the products & schemes =Total annual savings in MWh/Annual usage hours*PLF*(1-T&D)

Where PLF is 0.75 and T&D loss factor considered is 0.24.

[6] TV Veopar Journal,2011
[7] TV Veopar Journal,2011
[8] TV Veopar Journal,2012
[9] http://consumeraffairs.nic.in/consumer/writereaddata/Geysers_13.pdf

11.4 Basis for calculation of GHG Reduction (tCO2)

Emission factors:[10] Weighted average emission factor describes the average CO_2 emitted per unit of electricity generated in the grid. It is calculated by dividing the absolute CO_2 emissions of all power stations in the region by the region's total net generation.

Table 49: Weighted Average emission factor (Source: CEA)

Grid region	2007-08	2008-09	2009-10	2010-11	2011-12
NEWNE grid	0.8	0.84	0.9	0.91	0.94
Southern grid	0.85	0.9	0.85	0.84	0.91
Whole India	0.81	0.85	0.88	0.9	0.93
Note: All the values are in tCO2/MWh					

From the above table, it can be observed that the GHG emission factor trend for all of India has increased at the CAGR of ~3% every year. This indicates the increasing energy mix from fossil fuel based thermal power plants.

For calculation of GHG emissions from grid electricity consumption, following formula is used;

GHG emission in tCO2 = Electricity consumption (MWh) X GHG emission factor (tCO2/MWh)

GHG emission in million tCO2 = GHG emission in tCO2/10^6.

1 Air Conditioners

Air conditioners are rated in terms of EER (energy efficiency ratio). EER is the ratio of the cooling capacity and power consumption. The baseline energy consumption for air conditioners is determined on the basis of EER.

Baseline Energy Consumption: Product with same cooling capacity and an EER (Energy Efficiency Ratio) = 2.2 for Baseline (while for a 1 Star AC, EER = 2.3)

Power savings = $\{\text{Cooling Capacity (W)}/\text{EER}_{\text{Baseline}} - \text{Cooling Capacity (W)}/\text{EER}_{\text{Labelled}}\} *$ Number of units registered with BEE*Annual usage hours

In order to estimate the savings of electricity from star labeled Air-conditioners, following methodology has been used:

[10] Source: Central Electricity Authority (CEA)
http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Methodology:

- Production data (labeled and registered with BEE) are taken from BEE for various star category for the year 2007 to 2012.
- The Energy Efficiency Ratio (EER) has been considered individually for all the products.
- The non star (EER – 2.2) has been used as baseline for the calculation of energy savings.
- Annual energy savings is the product of savings by single product in each star category and the total number of products labeled
- Total Power Savings is calculated by subtracting Star wise Annual energy consumption from Baseline Annual energy consumption.
- An average of 150 working days in a year and 8 hours in a day was considered.
- 1.5 tonnage of ACs are considered while calculating savings

Calculation of energy savings

- Assumption: Number of hours of usage per annum: $\mathbf{h = d \times h_{per\ day}}$
  - d is assumed number of days per year = 150
  - $h_{per\ day}$ is assumed number of hours of usage per day = 8
- Baseline power consumption in W : $\mathbf{P_B = CC_R / EER_B}$; where
  - Where P_B is baseline power consumption for a single unit sold
  - CC_R is the representative sample cooling capacity (taken **3.514** for air conditioner)
  - EER_B is the baseline EER (taken 2.2)
- Power consumption of representative sample in W**:** $\mathbf{P_R = CC_R / EER_R}$; where
  - Where P_R is power consumption of representative sample for a single unit sold
- Annual energy saving for a single unit of the representative sample in kWh :

  $\mathbf{E_i = [h \times (P_B - P_R)]}$, For 1.5 tonnes AC, $\mathbf{E_i = [h \times (P_B - P_R)] \times 1.5}$

As the market share of 1.5 tonnes AC is highest, we are taking 1.5 tonnes AC instead of 1 tonne.

- Annual energy saving for room air conditioners in MWh, $\mathbf{E_{,i,total} = n \times E_i / 1000}$; where
  - n is the total number of air conditioners labeled and registered with BEE

Calculation of Avoided Capacity

- Avoided Capacity in MW = **Annual Energy Consumption/ (Annual usage hours=1200)*(1-T&D =0.8)*(PLF=0.75)**

Calculation of GHG savings

- GHG Saving (in tonnes of CO_2e)= (E_{saving} / 1000) X e
  - Where (E_{saving} / 1000) is energy saving in MWh
  - e is the emission factor[11]

Sample Calculation (Year 2012)

For 4 star -

[11] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Annual energy savings (MWh) = (((3.514/2.2)-(3.514/2.9))*1.5*150*8*180970)/10^3 = 1,25,591

Avoided Capacity = 1,25,591/1200*0.7603*0.75 = 184

GHG = 125591*0.93 = 116800

Table 50: Energy Efficiency Ratio for star labeled Air Conditioners

Star category	EER
(Baseline)	2.2
1 star	2.3
2 star	2.5
3 star	2.7
4 star	2.9
5 star	3.1

Product	Nominal Cooling Capacity (kW[12])
Room Air Conditioner	CC_R = 3.514

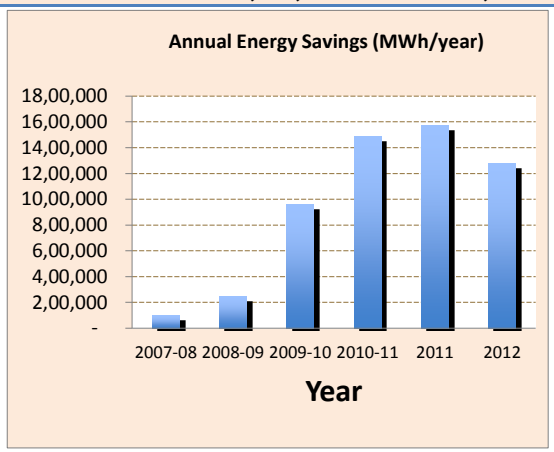
Table 51: Energy Savings by Star Labeled Air Conditioners

Category	Total Products Registered & Labeled with BEE (2012)	Annual Energy Saving (MWh)	Avoided Capacity (MW)	GHG reduction (tCO2)
1 Star	2,04,807	25,602	37	**23,810**
2 Star	11,51,481	3,97,274	581	**3,69,464**
3 Star	7,90,620	4,20,945	615	**3,91,479**
4 Star	1,80,970	1,25,591	184	**1,16,800**
5 Star	3,73,512	3,11,772	456	**2,89,948**
Total	**27,01,390**	**12,81,183**	**1,872**	**11,91,500**

[12] Nominal cooling capacity is defined in KW,(A unit of cooling capacity of an air conditioner)

Table 52: Overall Energy Savings by Star Labeled Air Conditioners

Year	Energy Savings (MWh/ Year)	Avoided Capacity(MW)	GHG Reduction (milion tCO2)
2007-08	1,01,499	148	**0.08**
2008-09	2,46,516	360	**0.21**
2009-10	9,60,955	1,404	**0.85**
2010-11	14,83,371	2,168	**1.34**
2011	15,70,442	2,295	**1.46**
2012	12,81,183	1,872	**1.19**
Total	**56,43,966**	**8,248**	**5**



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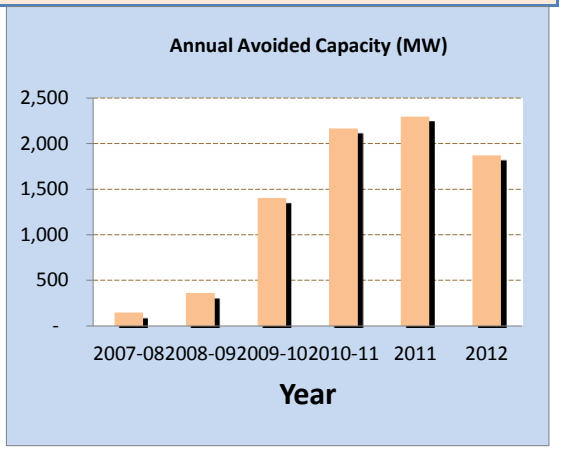

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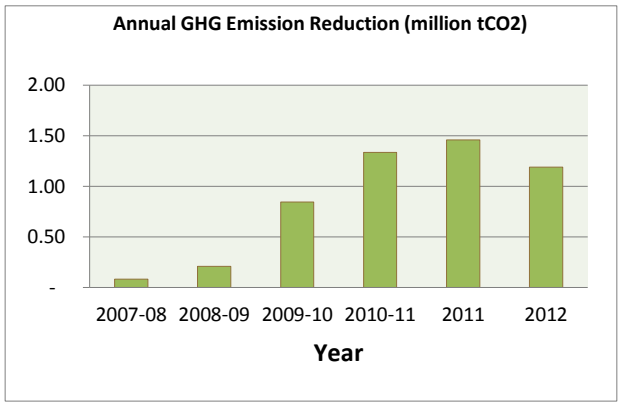

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Results for impact of Air conditioners Labeling Program: The overall energy saving for 2012 due to labeling of air conditioners is calculated to be 1281 GWh. The labeling program has resulted into the avoided capacity of 1872 MW and the GHG abatement of 1.19 Million tonnes of CO_2e

Table 53: Energy Savings, power Avoided Capacity and GHG abatement due to labeling of Air Conditioners

	Year 2012
Energy Saving (in GWh)	1281
Avoided Capacity (MW)	1872
GHG abatement (in Million tonnes of CO2e)	1.19

2 Refrigerators

In order to estimate the savings of electricity due to star labelled refrigerators, following methodology has been used:

Methodology:

- Production data (labelled and registered with BEE) are taken from BEE for various star category for the year 2007 to 2012
- The energy consumption in Star 1 has been used as baseline for the calculation for energy savings by other star rated refrigerators[13].

Calculations on energy savings, Avoided Capacity and GHG abatement

Direct cool refrigerators

Calculation of energy savings

- Baseline annual energy consumption in kWh : $E_{B,i} = V_{adj\_tot\_dc,i} \times K_{dc,b} + C_{dc,b}$; where
  - Where $E_{B,i}$ is baseline energy consumption for a single unit sold in i^{th} star band
  - $K_{dc,b}$ and $C_{dc,b}$ are the baseline multiplier and allowance values (from below mentioned table)
  - $V_{adj\_tot\_dc,i}$ is the representative adjusted storage volume (taken 190 litres)
- Representative sample annual energy consumption in kWh: $E_{R,i} = V_{adj\_tot\_dc,i} \times K_{dc,i} + C_{dc,I}$; where
  - Where $E_{R,i}$ is energy consumption for a single unit sold in i^{th} star band
  - $K_{dc,i}$ and $C_{dc,i}$ are the star band multiplier and allowance values for the representative sample (from table above)
  - $V_{adj\_tot\_dc,i}$ is the representative adjusted storage volume(taken 190 litres)
- Annual energy saving for a single unit of the representative sample in kWh : $E_i = E_{B,i} - E_{R,i}$
- Annual energy saving for the star band in kWh, $E_{,i,total} = n_i \times E_i$; where
  - n_i is the total number of models registered with BEE in the i^{th} star band
- Annual energy saving for the direct cool refrigerators in MWh: $E_{saving} = E_{,i,total} / 1000$

Calculation of Avoided Capacity

- Avoided Capacity in MW = **Annual Energy Consumption/ (Annual usage hours=8760)*(1-T&D =0.8)*(PLF=0.75)**

[13] (According to BEE schedule)

Calculation of GHG savings

- GHG saving (in tonnes of CO_2e)= (E_{saving} / 1000) X e
  - Where (E_{saving}/ 1000) is energy saving in MWh and e is the emission factor[14]

Table 54: Constant Multiplier and Fixed Allowance Values and Corresponding Star Rating Band for Direct Cool Refrigerators taken for calculations[15]

Star Rating Band	K_{dc} (Constant multiplier)	C_{dc} (Constant fixed allowance)
Baseline - 1 Star	$K_{dc,b}$ = 0.645	$C_{dc,b}$ =541.00
1 Star	Not applicable[16]	Not applicable
2 Star	$K_{dc,2}$ = 0.516	$C_{dc,2}$ = 432.00
3 Star	$K_{dc,3}$ = 0.413	$C_{dc,3}$ = 346.00
4 Star	$K_{dc,4}$ = 0.330	$C_{dc,4}$ =277.00
5 Star	$K_{dc,5}$ = 0.264	$C_{dc,5}$ =221.00

Sample Calculation (Year 2012)

For 4 star -

Energy consumption by star rating band= {(190litresX0.33) + 277}
Energy consumption by baseline = {(190litresX0.645) + 541}

Annual energy savings (MWh) = (Energy consumption by baseline - Energy consumption by star rating band)* 30,55,281 = 9,89,453

Avoided Capacity = 9,89,453/8760*0.7603*0.75 = 198

GHG = 9,89,453*0.93 = 9,20,191

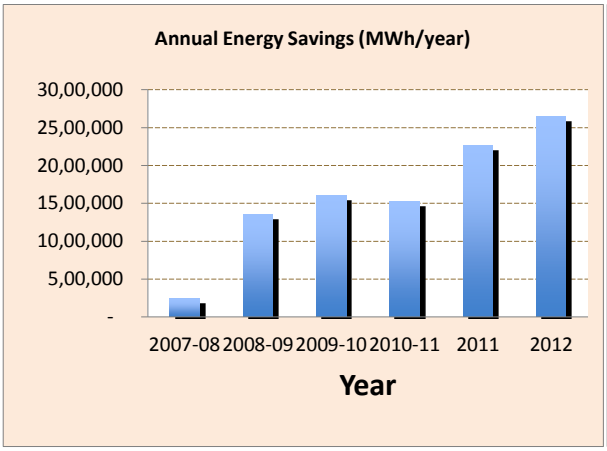
Table 55: Energy Savings by Star Labeled Direct Cool Refrigerators

Year 2012				
Category	**Total Products Registered & Labelled with BEE (2011-12)**	**Annual Energy Saving (MWh)**	**Avoided Capacity (MW)**	**GHG reduction (tCO2)**
1 Star	-	-	-	-
2 Star	2,784	372	0	346
3 Star	8,17,322	1,95,405	39	1,81,727
4 Star	30,55,281	9,89,453	198	9,20,191
5 Star	37,11,548	14,56,374	292	13,54,428
Total	**75,86,935**	**26,41,604**	**529**	**24,56,692**

Table 56: Overall Energy Savings by Star Labelled Direct Cool Refrigerators

[14] The value of e has been calculated in the table titled 'Emission factor (e) including T&D losses in India (in tonnes of CO_2e per MWh)'
[15] http://220.156.189.29/Content/Files/Schedule5-DCRefrigerator.pdf
[16] Not applicable for saving calculations as no models are being offered in the 1 star rating bands

Year	Energy Savings (MWh/ Year)	Avoided Capacity(MW)	GHG Reduction (million tCO2)
2007-08	2,39,080	45	**0.19**
2008-09	13,49,006	257	**1.15**
2009-10	16,04,227	305	**1.41**
2010-11	15,21,571	289	**1.37**
2011	22,71,309	432	**2.11**
2012	2,641,604	529	2.46
Total	9,626,796	1,927	9



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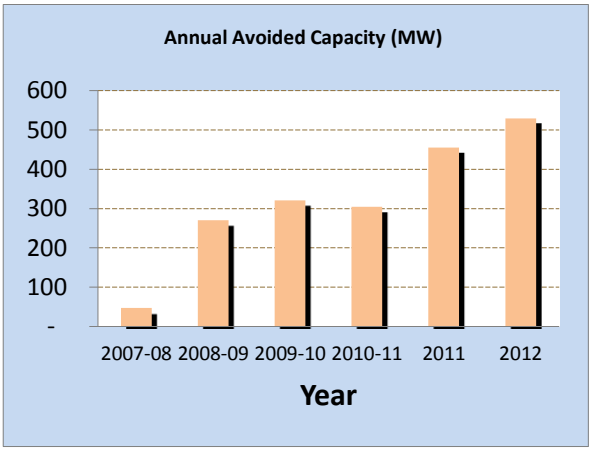

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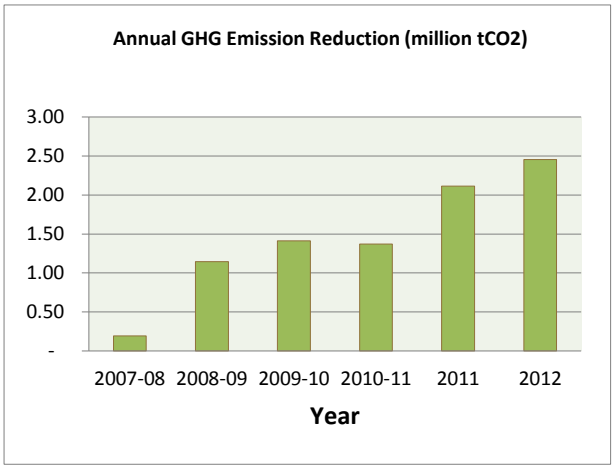

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Impact of direct cool refrigerator labeling program:

The overall energy saving for 2012 due to labeling of DC refrigerators is calculated to be 2641 GWh. The labeling program has resulted into Avoided Capacity of 529 MW and the GHG abatement of 2.4 million tonnes of CO_2e

Table 57: Energy Savings, Power Avoided Capacity and GHG abatement due to Labeling of DC Star Labeled Refrigerator

	Year 2012
Energy Saving (in GWh)	2641
Avoided Capacity (MW)	529
GHG abatement (in Million tonnes of CO2e)	2.4

Frost Free Refrigerators:

The Labeling Program for frost free refrigerators is discussed as below:

- Total Adjusted Volume for Frost Free refrigerator is found as -
  - Adjusted Volume for Frost Free refrigerator (Vadj_tot_dc) = Fresh Food Storage Volume + 1.62 X Freezer Storage Volume (Taken **270 litres** for frost free refrigerators)
- Star Rating Band **(SRB)dc = Kdc X Vadj_tot_dc + Cdc** ; where
  - Kdc is Constant Multiplier (kWh/Liter/Year)
  - Vadj_tot_dc is total adjusted storage volume for Frost free refrigerators (liters)
  - Cdc is Constant Fixed Allowance (kWh/Year)

For example –for 2 Star rating band, Annual energy consumption = {(270 litresX0.6973) + 607} x Production data

Table 58: Constant multiplier and Fixed Allowance Values and Corresponding Star Rating Band for Frost Free Refrigerators[17]

Star Rating Band	Minimum CEC	Maximum CEC
1 Star	≥ 0.8716* Vadj_tot_nf +759	0.6973 * Vadj_tot_nf + 607
2 Star	≥ 0.6973 * Vadj_tot_nf + 607	0.5578 * Vadj_tot_nf + 486
3 Star	≥ 0.5578 * Vadj_tot_nf + 486	0.4463 * Vadj_tot_nf + 389
4 Star	≥0.4463 * Vadj_tot_nf + 389	0.3570 * Vadj_tot_nf + 311
5 Star	≥ 0.3570 * Vadj_tot_nf + 311	

Calculation of multiplier values for the representative sample

The averaged value of constant multiplier and fixed allowance values for a particular star band have been calculated by averaging the K_{dc} and C_{dc} values for the star band. The calculated multiplier and allowance values are as below

Calculation of energy savings

[17] http://220.156.189.29/Content/Files/Schedule1_FFR.pdf

- Baseline annual energy consumption in kWh : $E_{B,i} = V_{adj\_tot\_nf,i} \times K_{nf,b} + C_{nf,b}$; where
  - Where $E_{B,i}$ is baseline energy consumption for a single unit sold in i^{th} star band
  - $K_{nf,b}$ and $C_{nf,b}$ are the baseline multiplier and allowance values (from below mentioned table)
  - $V_{adj\_tot\_nf,i}$ is the representative adjusted storage volume (taken 270 liters)

- Representative sample annual energy consumption in kWh: $E_{R,i} = V_{adj\_tot\_nf,i} \times K_{nf,i} + C_{nf,l}$; where
  - Where $E_{R,i}$ is energy consumption for a single unit sold in i^{th} star band
  - $K_{nf,i}$ and $C_{nf,i}$ are the star band multiplier and allowance values for the representative sample (from table above)
  - $V_{adj\_tot\_nf,i}$ is the representative adjusted storage volume

- Annual energy saving for a single unit of the representative sample in kWh : $E_i = E_{B,i} - E_{R,i}$
- Annual energy saving for the star band in kWh, $E_{,i,total} = n_i \times E_i$; where
  - n_i is the total number of models registered with BEE in the i^{th} star band
- Annual energy saving for the Direct cool refrigerators in MWh: $E_{saving} = \Sigma E_{,i,total} / 1000$

Calculation of Avoided Capacity

Avoided Capacity in MW = **Annual Energy Consumption/ (Annual usage hours=8760)*(1-T&D =0.8)*(PLF=0.75)**

Calculation of GHG savings

- GHG Saving (in tonnes of CO_2e)= (E_{saving} / 1000) X e
  - Where (E_{saving} / 1000) is energy saving in MWh
  - e is the emission factor[18]

Table 59: Constant Multiplier and Fixed Allowance Values taken and Corresponding Star Rating Band for Frost Free Refrigerators taken for calculation[19]

Star Rating Band	K_{nf} (Constant multiplier)	C_{nf} (Constant fixed allowance)
Baseline - 1 Star	$K_{nf,b}$ = 0.8716	$C_{nf,b}$ = 759
1 Star	Not applicable	Not applicable
2 Star	Not applicable	Not applicable
3 Star	0.5578	486
4 Star	0.4463	389
5 Star	0.3570	311

For 2012 data

Star Rating Band	K_{nf} (Constant multiplier)	C_{nf} (Constant fixed allowance)
Baseline - 1 Star	$K_{nf,b}$ = 0.6973	$C_{nf,b}$ = 607
1 Star	Not applicable	Not applicable

[18] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
[19] http://220.156.189.29/Content/Files/Schedule1_FFR.pdf

2 Star	0.5578	486
3 Star	0.4463	389
4 Star	0.3570	311
5 Star	0.2856	249

Sample Calculation (Year 2012)

For 4 star -

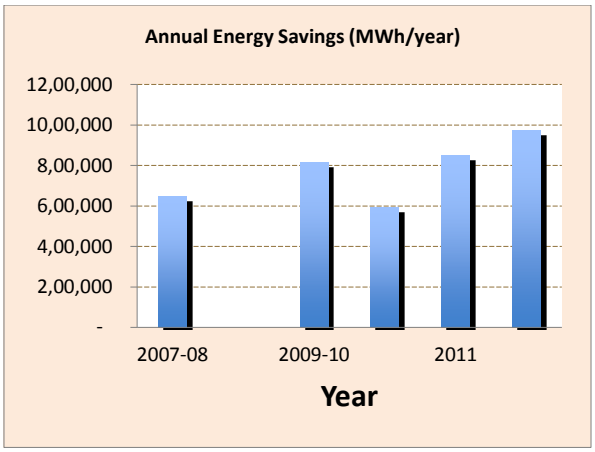
Energy consumption by star rating band= {(270 litresX0.357) + 311}
Energy consumption by baseline = {(270 litresX0.6973) + 607}
Annual energy savings (MWh) = (Energy consumption by baseline - Energy consumption by star rating band)* 1,635,235 = 634,277
Avoided Capacity = 634,277/8760*0.7603*0.75 = 127
GHG = 634,277*0.93 = 589,877

Table 60: Energy savings by Star Labeled Frost Free Refrigerators

Year 2012				
Category	**Total Products Registered & Labelled with BEE (2011-12)**	**Annual Energy Saving (MWh)**	**Avoided Capacity (MW)**	**GHG reduction (tCO2)**
1 Star	95,406	-	-	-
2 Star	155,894	24,735	5	23,003
3 Star	300,144	85,772	17	79,768
4 Star	1,635,235	634,277	127	589,877
5 Star	487,107	228,531	46	212,533
Total	**2,673,786**	**973,314**	**195**	**905,182**

Table 61: Overall Energy Savings by Star Labelled Frost Free Refrigerators

Summary			
Year	**Energy Savings (MWh/ Year)**	**Avoided Capacity(MW)**	**GHG Reduction (milion tCO2)**
2007-08	6,47,484	123	**0.52**
2008-09	-	-	**-**
2009-10	8,16,000	155	**0.72**
2010-11	5,92,599	113	**0.53**
2011	5,42,748	103	**0.50**
2012	973,314	195	0.91
Total	3,876,827	776	3



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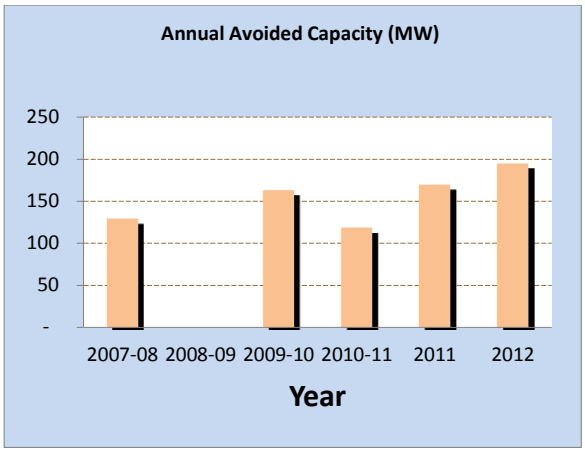

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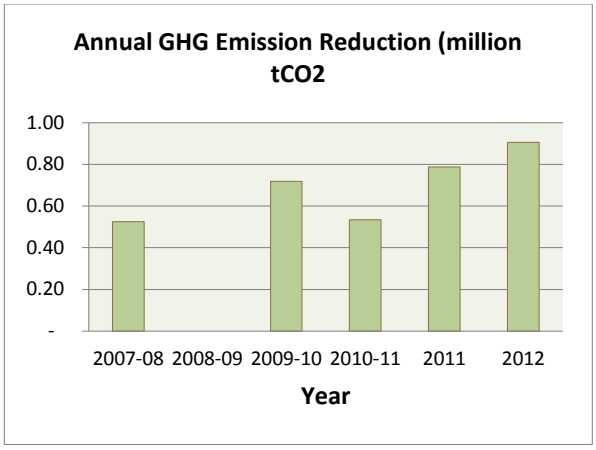

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Impact of Frost Free refrigerator labeling program:

The overall energy saving for 2012 due to labeling of frost free refrigerators is calculated to be 973 GWh. The labeling program resulted in Avoided Capacity of 195 MW and the GHG abatement of 0.91 Million tonnes of CO_2e

Table 62: Energy Savings, power Avoided Capacity and GHG Abatement due to Labeling of FF Refrigerator

	Year 2012
Energy Saving (in GWh)	973
Avoided Capacity (MW)	195
GHG abatement (in Million tonnes of CO2e)	0.91

Cumulative Impact of Refrigerators (Direct Cool Refrigerator and Frost Free Refrigerators)

Results for cumulative impact of refrigerator labeling program:

The overall energy saving for 2011-12 due to labeling of frost free refrigerators is calculated to be 3614 GWh. The labeling program has resulted into Avoided Capacity of 724 MW and the GHG abatement of 3.31 Million tonnes of CO_2e

Table 63: Energy Savings, power Avoided Capacity and GHG Abatement due to Labeling of Direct Cool and Frost-Free Refrigerators

	Year 2011-12
Energy Saving (in GWh)	3614
Avoided Capacity (MW)	724
GHG abatement (in Million tonnes of CO_2)	3.31

3 Tubular Fluorescent Lights (TFLs)

Calculations on Energy Savings, Avoided Capacity and GHG Abatement

Methodology

- In order to estimate the savings of electricity from TFLs, the penetration of star labeled 40W and 36W Tubular Fluorescent Lights were considered.
- Data from the labeled and registered products with BEE were collected for 40W and 36 W TFL.
- The considered number of hours of operation per TFL is 1200 Hrs / year. The energy saved is calculated by the penetration of 36 watt star rated TFL, which is assumed to replace a 40 watt TFL. The energy saved is 4 watts. The energy saving calculated is as follows:

Labeling scheme

The labeling program is based on lumens depreciation after defined hours of usage and is not directly or indirectly related to energy consumption[20].

The labeled TFLs are available in two categories of 36 W and 40 W. Since the lumen based performance varies widely across power consumptions, it is assumed that the 40 W is the baseline case and 36 W is the improvement due to labeling.

Calculation of energy savings

- Assumption: Number of hours of usage per annum: **h = 1200**
- Baseline annual energy consumption in kWh : $\mathbf{E_B = 40\ X\ h/1000}$; where
  - E_B is baseline energy consumption for a single unit sold in i^{th} star band
- Representative sample annual energy consumption in kWh: $\mathbf{E_R = 36\ X\ h/1000}$; where
  - E_R is energy consumption for a single unit sold in i^{th} star band
- Annual energy saving for a single unit of the representative sample in kWh : $\mathbf{E_i = E_B - E_R}$
- Annual energy saving for the star band in kWh, $\mathbf{E_{,saving} = n_i\ X\ E_i}$; where
  - n_i is the total number of 36 W units registered with BEE

Annual energy saving for star band in MWh = (No of 36 W units registered with BEE X 1200 x 4)/10^6

[20] **Star rating plan:**

Star rating	1 star	2 star	3 star	4 star	5 star
Lumens per Watt at 0100 hrs of use	<61	>=61 & <67	>=67 & <86	>=86 & <92	>=92
Lumens per Watt at 2000 hrs of use	<52	>=52 & <57	>=57 & <77	>=77 & <83	>=83
Lumens per Watt at 3500 hrs of use	<49	>=49 & <54	>=54 & <73	>=73 & <78	>=78

The measured values will be converted to star ratings for each point i.e. at 100 hours, 2000 hours, 3500 Hours and the average of the 3 ratings will be taken. This will be rounded of (<0.5 to lower level and =>0.5 to higher level) to the nearest integer which will be the star rating for the product.

Calculation of Avoided Capacity

Avoided Capacity in MW = **Annual Energy Consumption/ (Annual usage hours=1200)*(1-T&D =0.8)*(PLF=0.75)**

Calculation of GHG savings

- GHG Saving (in tonnes of CO_2e)= **(E_{saving} / 1000) X e**
  - Where (E_{saving} / 1000) is energy saving in MWh
  - e is the emission factor[21]

Sample Calculation (Year 2012)

For 4 star -

Annual energy savings (MWh) = 4*1200*13,81,512/1000 =6631

Avoided Capacity = 6631/1200*0.7603*0.75 = 10

GHG = 6631*0.93 = 6167

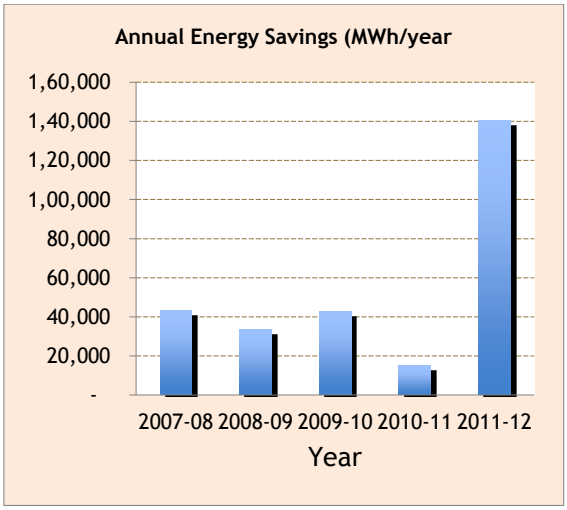
Table 64: Energy savings by Star Labeled TFLs - 36 Watts

Category	Production Data (Labelled and registered with BEE) 2011-12	Annual Energy Savings at 4W each (MWh/year)	Avoided Capacity (MW)	GHG Reduction (tCO2)
1 Star	-	-	0	-
2 Star	81,25,475	39,002	57	36,272
3 Star	11,45,60,021	5,49,888	804	5,11,396
4 Star	13,81,512	6,631	10	6,167
5 Star	14,29,036	6,859	10	6,379
Total	12,54,96,044	6,02,381	880	5,60,214

[21] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Table 65: Overall Energy Savings by Star Labeled TFLs – 36 Watts

Year	Energy Savings (MWh/ Year)	Avoided Capacity(MW)	GHG Reduction (milion tCO2)
2007-08	1,72,800	253	**0.14**
2008-09	1,34,112	196	**0.11**
2009-10	1,71,498	251	**0.15**
2010-11	60,575	89	**0.05**
2011	5,61,870	821	**0.52**
2012	6,02,381	880	**0.56**
Total	**17,03,236**	**2,489**	**1.54**



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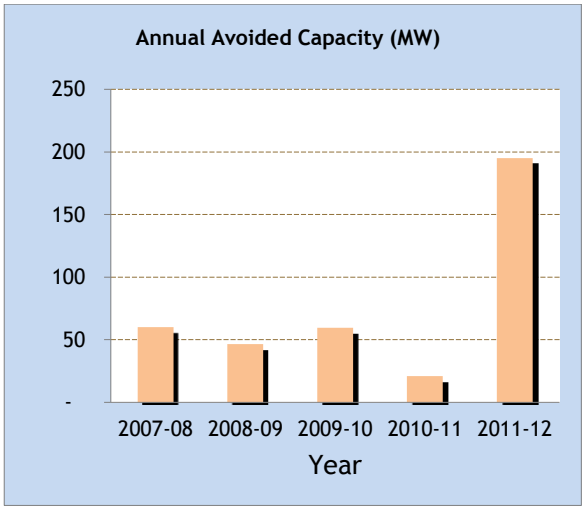

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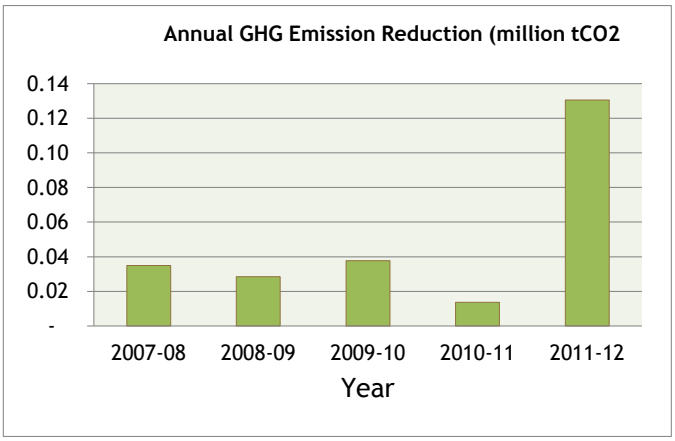

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Results for impact of TFL labeling program:

The overall energy saving for 2012 due to labeling of TFL is calculated to be 602 GWh. The labeling program has resulted into Avoided Capacity of 880 MW and the GHG abatement of 0.56 Million tonnes of CO_2e

Table 66: Energy Savings, Power Avoided Capacity and GHG Abatement due to Labeling of TFL'S

	Year 2011-12
Energy Saving (in GWh)	602
Avoided Capacity (MW)	880
GHG abatement (in Million tonnes of CO2e)	0.56

4 Color Televisions:

Calculations on energy savings, Avoided Capacity and GHG abatement

Labeling Program

The labeling program in India compares the energy consumption of different models on the basis of their screen area. The labeling program is as below:

Star Rating	Maximum Annual Power Consumption
1 - Star (Max Annual Power Consumption in kWh/Year)	P = (0.964 x A) + 4.38
2 - Star (Max Annual Power Consumption in kWh/Year)	P = (0.876 x A) + 4.38
3 - Star (Max Annual Power Consumption in kWh/Year)	P = (0.788 x A) + 4.38
4 - Star (Max Annual Power Consumption in kWh/Year)	P = (0.701 x A) + 4.38
5 - Star (Max Annual Power Consumption in kWh/Year)	P = (0.613 x A) + 4.38
Where A = Screen area in square inches; This annual power consumption estimate will be on the basis of daily usage pattern of 6 hours in on mode and 12 hours in standby mode.	

Star Rating Equations for Televisions (from January 01, 201 to March 31, 2014)[22]

The maximum annual power consumption for each star band can be represented as P = K X A + C where K and C can be tabulated as below:

[22] http://220.156.189.29/Content/Files/Schedule-11=CTV.pdf

Table 67: Redefined Constant Values[23]

Star Level	Redefined constant values	
	K	C
1 Star	0.964	4.38
2 Star	0.876	4.38
3 Star	0.788	4.38
4 Star	0.701	4.38
5 Star	0.613	4.38

Representative sample specification for each star band

Table 68: Representative Sample Screen Area for TV[24]

Specification	1 Star	2 Star	3 Star	4 Star	5 Star
Screen Area in square inches	No model available	No model available	A_3 = 212	A_4 = 212	A_5 = 212

The Star Rating Equations are derived by the following equation:

$$E = (X \times A) + Y$$

Where:

- E (in kWh/year) = annual energy consumption
- A (in square inches) = the effective/viewable screen area calculated by multiplying the display/screen width by the display/screen height
- X (in kWh/year) = On mode power consumption in (W/sq.inch) x hours of operation in 'On Mode' x 365/1000
- Y (in kWh/year) = Standby mode power consumption in W x hours of operation in 'standby mode' x 365/1000

Calculation of energy savings

- Baseline annual energy consumption in kWh : $E_{B,i} = K_B \times A_i + C_B$; where
  - Where $E_{B,i}$ is baseline energy consumption for a single unit sold in i^{th} star band
  - K_B and C_B are the constants' values (from table above)
  - A_i is the representative model screen area
- Representative sample annual energy consumption in kWh: $E_{R,i} = K_i \times A_i + C_i$; where
  - Where $E_{R,i}$ is energy consumption for a single unit sold in i^{th} star band
  - K_i and C_i are the star band constants' values for the representative sample (from table above)
  - A_i is the representative model screen area
- Annual energy saving for a single unit of the representative sample in kWh : $E_i = E_{B,i} - E_{R,i}$
- Annual energy saving for the star band in kWh, $E_{,i,total} = n_i \times E_i$; where
  - n_i is the total number of models sold in the i^{th} star band
- Total annual energy saving for the CTVs in kWh: $E_{saving} = \Sigma E_{,i,total}$;where
  - i has been summed from 3 to 5

[23] http://220.156.189.29/Content/Files/Schedule-11=CTV.pdf
[24] Aspect ratio taken from BEE schedule

Sample Calculation (Year 2012)

For 4 star -

Baseline = 0.788*212 + 4.38 =171, where 212 is screen area

4 star rating = 0.701*212 + 4.38 = 153

Annual energy savings (MWh) = (171-153)* 7,45,447/1000 =13728

Avoided Capacity = 13728/6570*0.7603*0.75 = 4

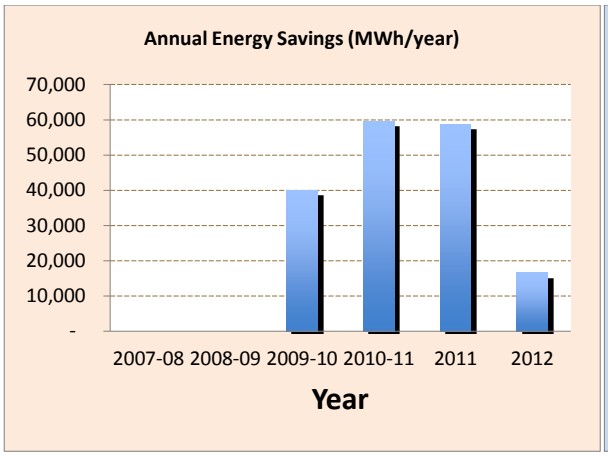
GHG = 13728*0.93 = 12767

Table: 69: Energy Savings by Star Labeled Color Television

Year 2012				
Category	Production Data (Labeled and registered with BEE) 2011-12	Annual Energy Savings (MWh/year)	Avoided Capacity (MW)	GHG reduction (tCO2)
1 Star	-	-	-	-
2 Star	-	-	-	-
3 Star	1,53,975	-	-	-
4 Star	7,45,447	13,728	4	12,767
5 Star	75,682	2,804	1	2,607
Total	**9,75,104**	**16,532**	**4**	**15,375**

Table 70: Overall Energy Savings by Star Labeled Color Television

Summary			
Year	Energy Savings (MWh/ Year)	Avoided Capacity(MW)	GHG Reduction million (tCO2)
2007-08	-	-	
2008-09	-	-	-
2009-10	40,047	10	0.04
2010-11	59,597	15	0.05
2011-12	58,590	15	0.05
2012-13	16,532	4	0.02
Total	174,766	47	0.16



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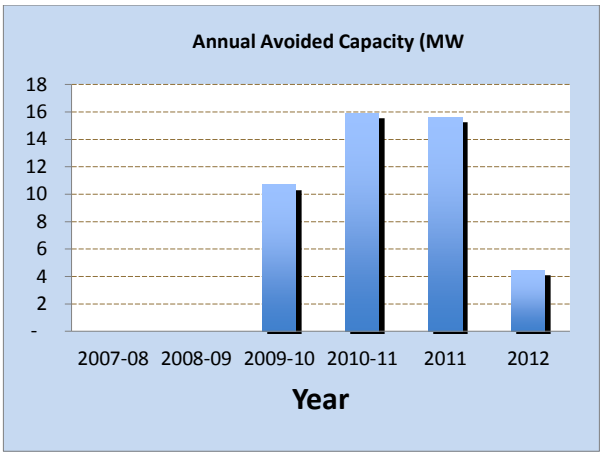

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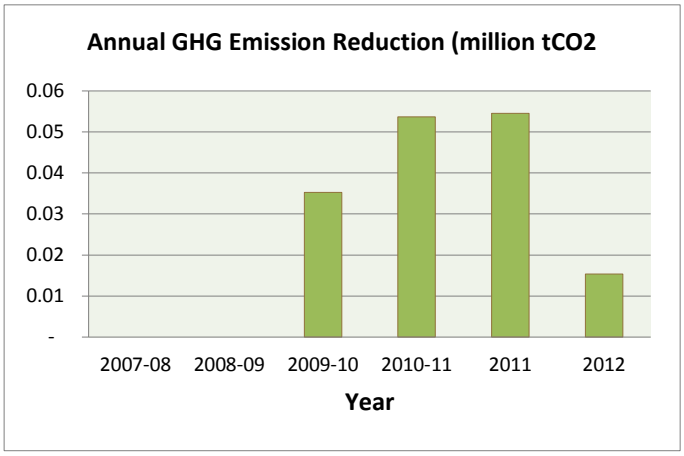


Graph: 92

Results for impact of Color Television labeling program:

The overall energy saving for 2012 due to labeling of color television is calculated to be 16 GWh. The labeling program has resulted into Avoided Capacity of 4 MW and the GHG abatement of 0.02 million tonnes of CO_2e

Table 71: Energy Savings, Power Avoided Capacity and GHG Abatement due to Labeling of Color Television

	Year 2012
Energy Saving (in GWh)	16
Avoided Capacity (MW)	4
GHG abatement (in Million tonnes of CO2e)	0.02

5 Geysers

Calculations on Energy Savings, Avoided Capacity and GHG abatement

Labeling scheme

The Labeling Program rates the Geysers on the basis of standing heat loss for standard storage volumes and is detailed as below:

Table 72: Star Level Variations Based on Standing Losses for Storage Water Heaters[25]

Rated Capacity (Liters)	1 Star	2 Star	3 Star	4 Star	5 Star
	Standing Losses (kwh/24 hour/45 deg C)				
6	≤ 0.792 & >0.634	≤ 0.634 & >0.554	≤ 0.554 & >0.475	≤ 0.475& >0.396	≤ 0.396
10	≤ 0.990&>0.792	≤ 0.792&>0.693	≤ 0.693&>0.594	≤ 0.594&>0.495	≤ 0.495
15	≤ 1.138&>0.910	≤ 0.910&>0.797	≤ 0.797&>0.683	≤ 0.683&>0.569	≤ 0.569
25	≤ 1.386&>1.109	≤ 1.109&>0.970	≤ 0.970&>0.832	≤ 0.832&>0.693	≤ 0.693
35	≤ 1.584&>1.267	≤ 1.267&>1.109	≤ 1.109&>0.950	≤ 0.950&>0.792	≤ 0.792
50	≤ 1.832&>1.466	≤ 1.466&>1.282	≤ 1.282&>1.099	≤ 1.099&>0.916	≤ 0.916
70	≤ 2.079&>1.663	≤ 1.663&>1.455	≤ 1.455&>1.247	≤ 1.247&>1.040	≤ 1.040
100	≤ 2.376&>1.901	≤ 1.901&>1.663	≤ 1.663&>1.426	≤ 1.426&>1.188	≤ 1.188
140	≤ 2.673&>2.138	≤ 2.138&>1.871	≤ 1.871&>1.604	≤ 1.604&>1.337	≤ 1.337
200	≤ 2.970&>2.376	≤ 2.376&>2.079	≤ 2.079&>1.782	≤ 1.782&>1.485	≤ 1.485

Representative sample specifications for each star band

Since the star ratings are done for the standard storage volumes, the representative specification for each star band is the rated storage capacity

Table 73: Representative Sample Rated Storage Capacity for Geysers

Specification	1 Star	2 Star	3 Star	4 Star	5 Star
Rated storage capacity (L)	25.00	25.00	25.00	25.00	25.00

Calculation of energy savings

The program rates products on the basis of measured standing heat losses. Each of the categories identifies rated storage volumes. The baseline standing loss is assumed to be the maximum loss allowed for 1 star rating. The representative model standing loss for 25 rated capacity is taken from BEE schedule (above Table 68). The maximum standing loss for each category has been taken. The results are tabulated as below:

Table 74: Baseline and Representative sample standing heat loss (kWh/24 hour/45 deg C)

Star Rating Band	Baseline standing heat loss	Representative model heat loss
1 Star	$E_{B,1}$ = 1.386	$E_{R,1}$ = 1.386
2 Star	$E_{B,2}$ = 1.386	$E_{R,2}$ = 0.109
3 Star	$E_{B,3}$ = 1.386	$E_{R,3}$ = 0.970
4 Star	$E_{B,3}$ = 1.386	$E_{R,4}$ = 0.832
5 Star	$E_{B,3}$ = 1.386	$E_{R,5}$ = 0.693

[25] http://220.156.189.29/Content/Files/Schedule_10.pdf

Assumption on usage: Number of hours of usage per annum (h): **250**

- Annual energy saving for a single unit of the representative sample in kWh:

  $E_i = (E_{B,i} - E_{R,i}) \times 250$; where

  - $E_{B,i}$ is baseline energy loss for a single unit sold in i^{th} star band when operational for 24 hours, from the table above
  - $E_{R,i}$ is energy loss for a single unit sold in i^{th} star band when operational for 24 hours, from the table above
  - It is assumed that the reduced energy loss will fully contribute to savings in electric energy
- Annual energy saving for the star band in kWh, $E_{,i,total} = n_i \times E_i$; where
  - n_i is the total number of models sold in the i^{th} star band
- Total annual energy saving for the Geysers in kWh: $E_{saving} = \Sigma E_{,i,total}$;where
  - i has been summed from 1 to 5

Sample Calculation (Year 2012)

For 4 star -

Annual energy savings (MWh) = (1.386-0.832)*250*379,083 = 52,503

Avoided Capacity = 52503/250*0.7603*0.75 = 368 MW

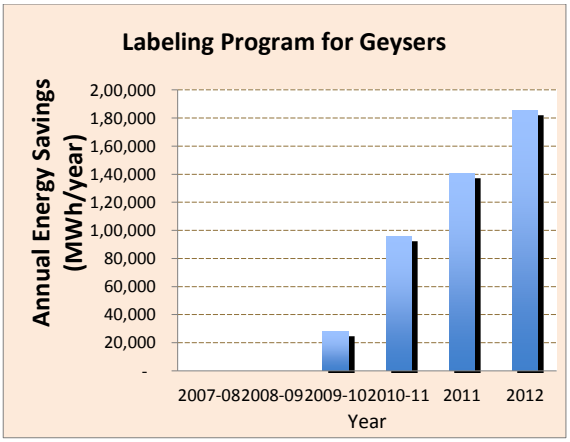
GHG = 52503*0.93 = 48,828 (tCO2)

Table 75: Energy Savings by Geysers

Year 2012				
Category	Total Products Registered & Labelled with BEE (2011-12)	Annual Energy Saving (MWh)	Avoided Capacity (MW)	GHG reduction (tCO2)
1 Star	3,269	-	-	-
2 Star	14,777	1,023	7	952
3 Star	11,612	1,208	8	1,123
4 Star	379,083	52,503	368	48,828
5 Star	753,422	1,30,530	916	1,21,393
Total	**1,162,163**	**1,85,264**	**1,300**	**1,72,296**

Table 76: Overall Energy Savings by Geysers

Summary			
Year	Energy Savings (MWh/ Year)	Avoided Capacity(MW)	GHG Reduction (milion tCO2)
2007-08	-	-	
2008-09	-	-	-
2009-10	1,13,141	198	0.10
2010-11	3,83,478	673	0.35
2011	5,62,426	986	0.52
2012	7,41,057	1,300	0.69
Total	**18,00,102**	**3,157**	**1.66**



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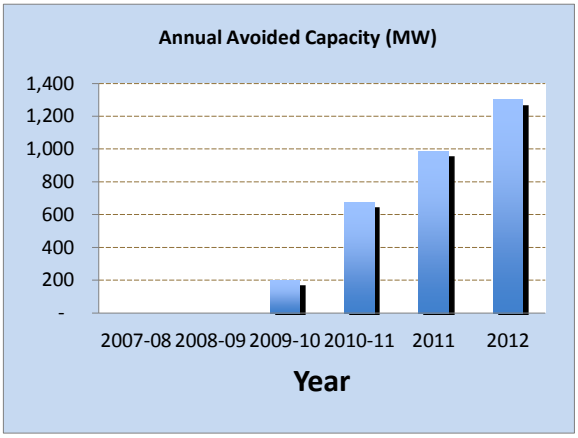

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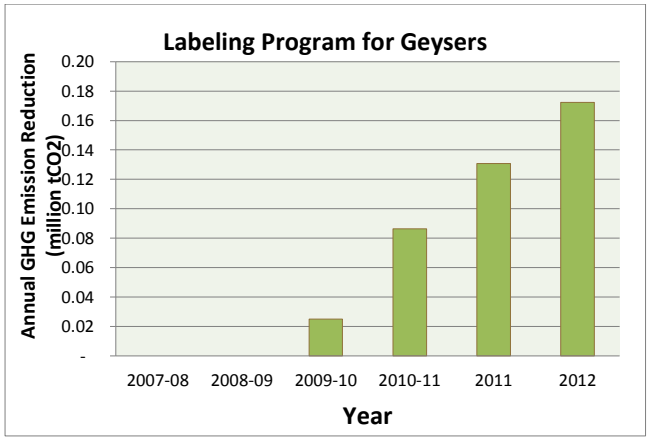

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Table77: Energy Savings, Power Avoided Capacity and GHG Abatement due to Labeling of Geysers

	2012
Energy Saving (in GWh)	1800.0
Avoided Capacity (MW)	1300
GHG abatement (in Million tonnes of CO2e)	1.66

6 Ceiling Fans

Calculations on energy savings, Avoided Capacity and GHG abatement

Labeling scheme

The labeling program rates the ceiling fans on the basis of 'service value[26]' and is detailed as below

Table 78: Star Rating Index Calculation for Ceiling Fans[27]

Star Rating	Service Value for Ceiling Fans
1 Star	3.2 to < 3.4
2 Star	3.4 to < 3.6
3 Star	3.6 to < 3.8
4 Star	3.8 to < 4.0
5 Star	4.0 and above

Table 79: Star Rating Index Calculation for Ceiling Fans[28]

Specification	1 Star	2 Star	3 Star	4 Star	5 Star
Air delivery rate (Cubic meter per minute at maximum speed)	No model available	No model available	ADR_3 = 210	ADR_4 = 210	ADR_5 = 210

Service values for representative sample in each star band

The service values for different star rating categories taken for calculation are as follows:

Table 80: Representative Sample Service Values

Star Rating	Service Value for Ceiling Fans
1 Star	3.2
2 Star	3.4

[26] **It is the ratio of air delivered by fan in cubic mtrs per minute and electrical power input in watts, when fan is operated at rated voltage**. Service factor & air delivery are as listed for 1200mm sweep operating at rated voltage and rated frequency at full speed.
[27] http://220.156.189.29/Content/Files/Schedule8-CF.pdf
[28] All ceiling fans covered under this standard shall comply with minimum Air Delivery of 210 cu m/min, Source: BEE schedule

3 Star	3.6
4 Star	3.8
5 Star	4.0

Calculation of energy savings

- Assumption on usage: Number of hours of usage per annum: $\mathbf{h = d \times h_{per\ day}}$
  - d is assumed number of days per year = 300
  - $h_{per\ day}$ is assumed number of hours of usage per day = 12

- Baseline annual energy consumption in kWh : $\mathbf{E_{B,i} = (h \times P_{B,i})/1000}$; where
  - $E_{B,i}$ is baseline energy consumption for a single unit sold in i^{th} star band
  - $P_{B,i}$ is baseline power consumption obtained by using the definition of service value; $P_{B,i}$ in W = (ADR_i / S_B) i.e. Air delivery/service value

For example - Baseline Power consumption (for all-star band) = 210/3.2

- Representative sample annual energy consumption in kWh: $\mathbf{E_{R,i} = (h \times P_{R,i})/1000}$; where
  - $E_{R,i}$ is energy consumption for a single unit sold in i^{th} star band
  - $P_{B,i}$ is baseline power consumption obtained by using the definition of service value; $P_{B,i}$ in W = (ADR_i / S_i)

For example – Star wise power consumption (for 3-star band) = 210/3.6

Star wise power consumption (for 4-star band) = 210/3.8

Star wise power consumption (for 5-star band) = 210/4

- Annual energy saving for a single unit of the representative sample in kWh: $\mathbf{E_i = E_{B,i} - E_{R,i}}$

- Annual energy saving for the star band in kWh, $\mathbf{E_{,i,total} = n_i \times E_i}$; where
  - n_i is the total number of models registered with BEE in the i^{th} star band

- Total annual energy saving for the Ceiling Fans in kWh: $\mathbf{E_{saving} = \Sigma\ E_{,i,total}}$; where
  - i has been summed from 3 to 5

Sample Calculation (Year 2012)

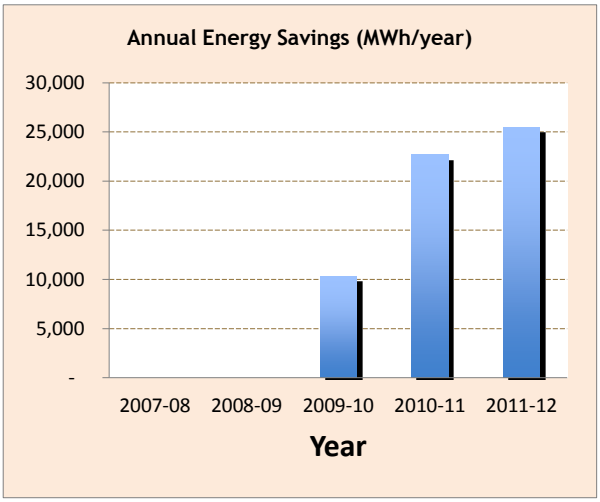
For 4 star -
Annual energy savings (MWh) = (66-55)*3600* 22816= 851
Avoided Capacity = 851/3600*0.7603*0.75 = 0.135
GHG = 851*0.93 = 792

Table 81: Energy savings by Ceiling Fans

Year 2012				
Category	Total Products Registered & Labelled with BEE (2011-12)	Annual Energy Saving (MWh)	Avoided Capacity (MW)	GHG reduction (tCO2)
1 Star	-	-	-	-
2 Star	-	-	-	-
3 Star	23,024	604	0	562
4 Star	22,816	851	0	792
5 Star	8,57,975	40,539	20	37,702
Total	**9,03,815**	41,995	20	39,055

Table 82: Overall energy savings by Ceiling Fans

Summary			
Year	Energy Savings (MWh/ Year)	Avoided Capacity(MW)	GHG Reduction (million tCO2)
2007-08	-	-	-
2008-09	-	-	-
2009-10	10,311	5	0.01
2010-11	22,671	11	0.02
2011	25,495	12	0.02
2012	41,995	20	0.04
Total	**1,00,472**	**49**	**0.09**



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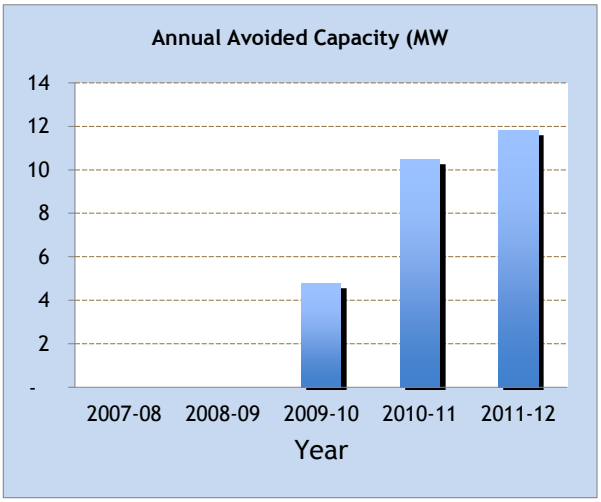

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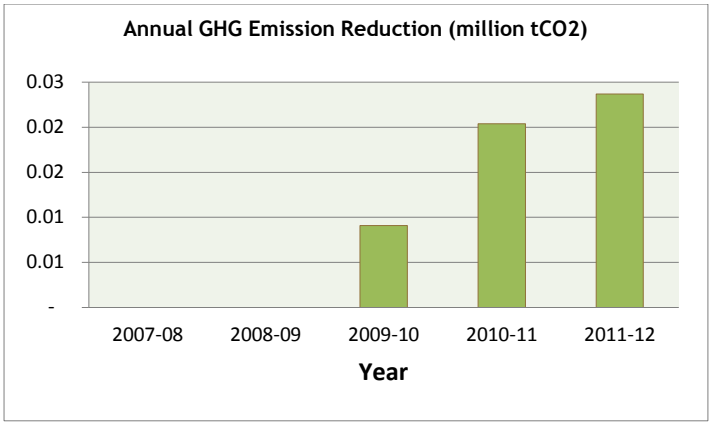

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Table 83: Energy Savings, Power Avoided Capacity and GHG Abatement due to Labeling of Ceiling Fans

	2012
Energy Saving (in GWh)	42
Avoided Capacity (MW)	20
GHG abatement (in Million tonnes of CO2e)	0.04

7 Distribution Transformers

Labeling scheme

According to BEE schedule

- For Distribution Transformers maximum losses at 50% (watts) are as table given below –

Table 84: Star Rating Index Calculation for Distribution Transformers[29]

Star Rating	Star wise-Max Losses at 50% (Watts)
1 Star (Baseline)	290
2 Star	235
3 Star	210
4 Star	190
5 Star	175

Calculation of energy savings

- Assumption on usage: number of hours of usage per annum: $h = d \times h_{per\ day}$

[29] BEE - Schedule 4

- d is assumed number of days per year = 360
- $h_{per\ day}$ is assumed number of hours of usage per day = 24

- Baseline annual energy consumption in kWh : $E_{B,i} = (h \times P_{B,i})/1000$; where
  - $E_{B,i}$ is baseline energy consumption for a single unit sold in i^{th} star band
  - $P_{B,i}$ is baseline power consumption obtained by using the Star rating Index table given above;

    $P_{B,i}$ in W = 290

- Representative sample annual energy consumption in kWh: $E_{R,i} = (h \times P_{R,i})/1000$; where
  - $E_{R,i}$ is energy consumption for a single unit sold in i^{th} star band

Sample Calculation (Year 2012)

For 4 star -

Annual energy savings (MWh) = (290-190)*8760* 112358=98426

Avoided Capacity = 98426/8760*0.75 = 14.98

GHG = 14.98*0.93 = 91536

Table 85: Energy savings by Distribution Transformers

Year 2012				
Category	Total Products Registered & Labelled with BEE (2011-12)	Annual Energy Saving (MWh)	Avoided Capacity (MW)	GHG reduction (tCO2)
1 Star	838	-	-	-
2 Star	21	10	0.00	9
3 Star	1,30,223	91,260	13.89	84,872
4 Star	1,12,358	98,426	14.98	91,536
5 Star	21,144	21,300	3.24	19,809
Total	2,64,584	2,10,996	32	1,96,227

Table 86: Overall Energy savings by Distribution Transformers

Summary			
Year	Energy Savings (MWh/ Year)	Avoided Capacity(MW)	GHG Reduction (million tCO2)
2007-08	-	-	-
2008-09	326	0.065	0.00
2009-10	42,350	8	0.04
2010-11	50,881	10	0.05
2011	64,927	13	0.06
2012	2,10,996	42	0.20
Total	**3,69,480**	**73.65**	**0.35**

Table 87: Energy Savings, Avoided Capacity and GHG Abatement due to Labeling of Distribution Transformers

	2012
Energy Saving (in GWh)	210
Avoided Capacity (MW)	42
GHG abatement (in Million tonnes of CO2e)	0.2

8 Agricultural Pumps

Table 88: Star Rating Index Calculation for Agricultural Pumps

Star Rating	Overall efficiency of the Pump Set
1 Star (Baseline)	>=1.00 & <1.05
2 Star	>=1.05 & <1.10
3 Star	>=1.10 & <1.15
4 Star	>=1.15 & <1.20
5 Star	>=1.20

- Overall Efficiency = H*Q/102*Input to pump , where H is Head & D is Discharge
- Overall efficiency = Efficiency factor/efficiency of pump set for the star rating*(as given in above table)

Ex Energy saving for 3 star = (H*Q/102)* (1/Xi – 1/Xb)*250*8*Production data

- Xi = overall efficiency /1.1
- Xb = Overall efficiency/1

Sample Calculation (Year 2012)

For 4 star -

Annual energy savings (MWh) = (21*6.25))* (1.02*52/1.15 - 1.02*52)*250*8*Production data/1000 =296

Avoided Capacity = 296/250*8*0.763*0.75 = 5

GHG = 5*0.93 = 4.65

Table 89: Star Rating Index Calculation for Agricultural Pumps

Pump Set Rating (Kw)	Overall efficiency (%)	Star Rating
4.5	48	1

13	51.5	1
2.2	39	2
11	53	2
7.5	51.5	2
11	48	3
3.7	41	3
9.3	43	3
7.5	45	3
5.5	42	3
2.2	52	4
2.2	59.7	4
3.7	60	4
5.5	50	4
3	35	4
2.2	56	5
1.5	50.62	5
5.5	62.4	5
3.7	50	5
2.2	52	5

Table 90: Energy savings by Agricultural Pumps

Year 2012										
Sr. no.	Head	Discharge	No. of Stages	Pump Set Rating (kW)	Overall Efficiency (%)	Star Rating	BEE Labelled Production in FY(2011-12)	Saving in (MWh) in FY(2011-12)	Avoided capacity in (MWh) in FY(2011-12)	GHG Reduction (in tonnes CO2) FY 2011-12
1	14	15	2	4.5	48	1	0	0	0	0.00
2	14	15	2	4.5	48	1	2	0	0	0.00
3	90	10	12	13	51.5	1	0	0	0	0.00
4	21	6	1	2.2	39	2	37	12	0	0.20
5	21	6	1	2.2	39	2	3	1	0	0.02
6	56	13.34	8	11	53	2	40	55	1	0.94
7	35	13.34	5	7.5	51.5	2	1	1	0	0.02
8	98	7.6	6	11	48	3	1	3	0	0.05
9	46	3.9	6	3.7	41	3	1	1	0	0.01
10	190	2.2	30	9.3	43	3	1	2	0	0.03
11	90	3.9	12	7.5	45	3	25	38	1	0.65
12	84	3.4	12	5.5	42	3	55	73	1	1.24
13	21	6.25	1	2.2	52	4	400	297	5	5.04
14	13	12	1	2.2	59.7	4	0	0	0	0.00
15	20	11	1	3.7	60	4	0	0	0	0.00
16	29	11.7	1	5.5	50	4	5	10	0	0.17
17	29	11.7	1	5.5	50	4	5	10	0	0.17
18	74	1.5	12	3	35	4	3	3	0	0.05
19	23	5	1	2.2	56	5	10	8	0	0.14
20	23	5	1	2.2	56	5	0	0	0	0.00
21	19	7.5	1	2.2	56	5	4	4	0	0.07
22	14	4	1	1.5	50.62	5	4	2	0	0.03
23	31	14	1	5.5	62.4	5	6	16	0	0.28
24	22	10	1	3.7	50	5	80	138	3	2.34
25	19	9	1	2.2	52	5	100	129	2	2.19
							783	803	15	13.63

Table 91: Energy Savings, Avoided Capacity and GHG Abatement due to Labeling of Agricultural Pumps

	2012
Energy Saving (in GWh)	0.803
Avoided Capacity (MW)	15
GHG abatement (in Million tonnes of CO2e)	0.00

Overall S & L Program

The Standards and Labeling (S&L) Program has resulted in electricity saving of 5,954 GWh, equivalent to avoided capacity generation of 4847 MW and GHG reduction of 5.55 million tonnes CO2 in year 2012. Details are presented in the table below-

Table 92: Cumulative Energy Saving, Avoided Generation Capacity and GHG Reduction

Sr.no.	Name of the Product	Annual Productions/sales (2012)	Savings in MWh (2012)	Avoided Capacity (MW)	GHG Reduction (million tonnes CO2)
1	Direct Cool Refrigerators	**75,86,935**	**26,41,604**	**529**	**2.46**
2	Frost Free Refrigerators	**26,73,786**	**9,73,314**	**195**	**0.91**
3	Room Air Conditioners	**27,01,390**	**12,81,183**	**1,872**	**1.19**
4	Tubular Fluorescent Lamps (36 Watts)	**12,54,96,044**	**6,02,381**	**880**	**0.56**
5	Color Television Sets	**9,75,104**	**16,532**	**4**	**0.02**
6	Ceiling Fans	**9,03,815**	**41,995**	**20**	**0.04**
7	Geysers	**11,62,163**	**185,264**	**1,300**	**0.17**
8	Distribution Transformers	**2,64,584**	**2,10,996**	**32**	**0.20**
9	Pumps (openwell, monoset & Submersible)	**783**	**803**	**15**	**0.00**

10	**Total**	**14,17,64,604**	**59,54,072**	**4,847**	**5.55**

In terms of avoided capacity, air conditioners appear to have a bigger role to play than all the other product segments. This is because of the relatively higher energy-saving capacity of energy-efficient air conditioners.

A sustained S&L Program and the potential to increase the number of products in the S&L list can be expected to make a significant contribution in achieving both energy saving and CO2 reduction.

Producers encouraged by government initiatives and consumers' positive responses are now giving significant weightage to production of energy-efficient products. This is reflected in growing sales and popularization of energy efficient products throughout the world.

12 Key Findings and Recommendations

12.1 Key findings

a) Consumers

Overall, BEE's labeling program has had a huge impact on consumer behavior with respect to usage and purchase of appliances. Consumers save money and understand the importance of saving energy. The figure below indicates the increase in the level of awareness since the last impact assessment study conducted in 2010.

Consumers	2014	2010
Awareness of comparative label on energy conservation	63%	33%

Consumer behavior is impacted by multiple factors, including level of awareness and willingness to pay a premium for EE products. These, in turn, are influenced by income level, consumer's location, rural-urban divide, gender, product's easy availability and accessibility.

A higher income appears to have a higher influence on ownership of high-priced appliances. Ownership declines when income levels decline. However, data also shows that relatively high-priced appliances have started penetrating the lower income group consumers to some extent.

For a large number of consumers, reduction in cost and/or price of EE products can stimuluate increased acceptance of these products.

No major differences are observed with respect to zones; however, labeled appliances have lesser penetration in rural areas. This is due to lower levels of awareness and the inability/unwillingness to spend more money on the same category commodity.

Energy conservation practices are followed for high energy consuming products, as people tend to use them wisely due to the electricity costs associated with them.

For products such as refrigerators, ACs and electric geysers, energy efficiency is one of the top factors of consideration for consumers at the time of purchase.

Consumers also reveal a higher level of knowledge of BEE's labeling program, which shows that they value labeled products.

Table: 93: Meaning of Energy Efficiency labels for the consumer

Consumers	2014	Indicator	2010
Save power	82%		65%
Save energy	67%		61%

More star more power saving	51%		55%
Save money	54%		47%
Good technology	37%		38%
Safe product	32%		30%
Good product	26%		21%
More durability	14%		16%

The above table shows that consumers now have a higher level of awareness and are able to interpret the right meaning of EE labels with greater ease. Power-saver and energy-saver are the key associations with EE labels.

Consumers have difficulty in understanding technical parameters and energy efficiency values on the label. The general perception is that more stars means more energy saving. Consumers are of the opinion that the information on the label should be simple, easy to understand and help in informed decision making.

Television media is the key source of awareness among consumers. However, in the year 2010, television acted as a source of information for 81% consumers which reduced to 76% in the year 2014, reflecting that other means and channels, including social media, have started to gain ground.

Consumers	2014	2010
Source of awareness (Television)	76% 	81%

Barriers in the uptake of labeled products include higher prices, lack of incentives and lack of awareness and an inadequate outreach program.

b) Retailers

Retailers understand the merit of labeled products. Retailers dealing in heavy consumer durables such as ACs and refrigerators, as well as light electronic durable goods show a high level of familiarity and advocacy. 63% feel the labeling program has fueled growth in sales of EE appliances however some bit is attributed to mandatory labeling on certain product categories.

Retailers	2014	2010
Familiarity with BEE star labeling program	96%	97%

Findings from retailer surveys resonate with findings from consumer surveys. Retailers, as well as consumers are of the opinion that for high power consumption products such as ACs and electric geysers, energy efficiency is of high priority. Retailers also emphasize that the price sensitivity of the market and lack of awareness act as barriers for uptake of labeled products.

Power saving, technologically advanced and certified appliances are the key advantages associated with BEE's star labels.

Table: 94

Advantages associated with star labeling program	2014	Indicator	2010
It saves power	88%	↑	83%
It has advanced technology	69%	↑	49%
It is a certified product	71%	↑	43%
Reasonable price	50%	↑	31%
It has good resale value	47%	↑	16%
Good quality brand	56%	↑	21%
Life of product is more than non-star rated product	24%	↑	11%
It is trustworthy/reliable	15%	↑	9%

Retailers feel that EE labels have resulted in increased sales. Though they have limited knowledge, they are keen to know more about it. In 2014, 10% of the retailers attended the training program as compared to 2% in 2010.

Retailers	2014	2010
Training attended for promoting sales of EE products	10% 	2%

c) Manufacturers

Manufacturers across verticals express a high level of awareness. They almost all feel that BEE's S&L program has positively impacted the overall market conditions for EE products.

Demand pull followed by technological advancement are the key motivators for manufacturers to adopt the current BEE S&L program. Manufacturers also feel that the star label clearly differentiates technologically advanced EE products from low quality inefficient products.

There is a general perception among manufacturers that sales for efficient appliances have increased due to the S&L program, which is the biggest motivator for developing efficient products. Consumers' increased awareness in urban areas is causing a shift towards star labeled products.

Manufacturers show great interest in the S&L program; in all communications from their side, almost all major brands have adopted star ratings as a promotion mechanism. Manufacturers believe barriers for EE appliances include low interactions with the key stakeholders and frequent change in thresholds leading to investments in upgrading technology and processes. Other barriers include the labeling fee, price sensitivity of the market and lack of incentives.

12.2 Impact (in terms of Energy savings) of the S&L Program

The Standards and Labeling (S&L) Program has resulted in electricity saving of 6509 GWh, equivalent to avoided capacity generation of 4857 MW and GHG reduction of 6 million tonnes of CO2 in the year 2012.

In terms of avoided capacity, ACs appear to have a bigger role to play than all other product segments. This is because of the relatively higher energy-saving capacity of EE air conditioners.

A sustained S&L program and the potential to increase the number of products in the S&L list can be expected to make a significant contribution in achieving both energy saving and reduction in the emission of greenhouse gases.

12.3 Key Recommendations

Awareness-raising campaigns: The cognitive processes and responses vary, depending on the different preferences of people in different age groups and strata. Hence, different communication channels should be adopted to influence a wider audience. The current spate of communication is said to be sporadic; hence, to obtain sustained results, the communication should be continuous and varied. BEE's communication campaign has done impressively well in creating awareness of EE Labels and the benefits that the S&L program offers (energy saving). Advertisements on television in national languages play a critical role in creating the impact. However, some advertisements were

not persuasive enough to change the behavior patterns, although discontinuation of television advertisements diminished the intensity of the impact.

In order to bridge this gap, the need arises to consistently stimulate the masses not only through TV programs but also through other communication channels. Also, considering the linguistic diversification of our country, it becomes imperative to cater to each regional segment through commercials made in local and regional languages.

The penetration of EE products can be higher when consumers are educated about the star label and are able to relate domestic appliances to energy consumption, lower energy bills and wider issues such as climate change. Awareness-raising campaigns need to be undertaken on a continuous basis. Communication in vernacular languages in order to have a larger impact. Communicate the exact value proposition to the consumer and point out the cost benefit in simple terms

Retailer Training: Consumers are more likely to buy EE appliances, if proper information is provided to them at the point of sale. Retailers and other members of the sales chain are knowledgeable, although, as yet they have not really received any formal training. Structured training programs will help the retailer's sales pitch for energy efficient appliances.

Other key suggestions:

- Rewards incentive on the usage of EE products.
- Simpler saving calculation on the labels so that consumers can understand the same.
- Discount coupons on the purchase of EE appliances which one can use while paying off their electricity bills.
- Utilities can have a point system. On the purchase of an EE labeled product, they can provide some points which the consumers can redeem while paying their electricity bills.
- Consumers belonging to lower income groups need more education and understanding on the importance of labels as had it not been mandatory, some would have opted for products without these labels.
- Revisions in benchmarks and thresholds should be well communicated. Consumers should also be educated about such revisions.
- Development of a mechanism to take the inefficient appliances out of the system.
- Subsidizing four and five star appliances to minimize the cost differential which can result in higher uptake.
- Consumer helpline with contact details where they can reach out with their queries.