Energy

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New build		

Use of BEE Labeled Appliances in all New Buildings

1. Replace existing equipment by BEE labeled appliances/ equipment and use BEE labeled appliances/equipment in all new buildings
2. All the new buildings have to be equipped with the appliances labeled by Bureau of Energy Efficiency (BEE). BEE has labeled refrigerators, tube lights, distribution transformer, air-conditioners and induction motors.
3. Retrofit and replacement in existing premises shall be made only by BEE labeled appliances .

Why is this required?

Today the market is full of variety of equipment. For various equipment and appliances of common use, there is wide variation in energy consumption of products made by different manufacturers. Further, information on a product's energy consumption is often not easily available or easy to understand. This may lead to excessive use of energy. In this case it becomes difficult for customer to select the appliance. In such case selecting the labeled appliance is an easier way.

An appliance is rated based on its performance and energy consumption. Purchasing a labeled appliance not only provides better performance, but also has reduced consumption as compared to the conventional equipments.

How is it beneficial?

The Energy Rating label enables consumers to compare the energy efficiency of domestic appliances on a fair and equitable basis. It also provides incentive for manufacturers to improve the energy performance of appliances. The appliance is rated according to their performance. Rating schemes allow comparing the environmental performance of similar products. This allows more informed choices for consumers and a means to measure progress in reducing our environmental impacts. The present rating, applicable in India is given by BEE; one can identify the labeled appliance by symbol shown in figure. The labeled appliances carry symbol of stars. More number of stars shows more efficiency of the product.

Advantages of using labeled appliances are

- Increased efficiency of appliances
- Better performance
- Cleaner technologies, less wastes are released

Checklist

1. BEE labeled refrigerators ☐
2. BEE labeled air conditioners ☐
3. BEE labeled tube lights ☐
4. BEE labeled induction motors ☐
5. BEE labeled transformers ☐

- Reduced energy consumption
- Protection of environment

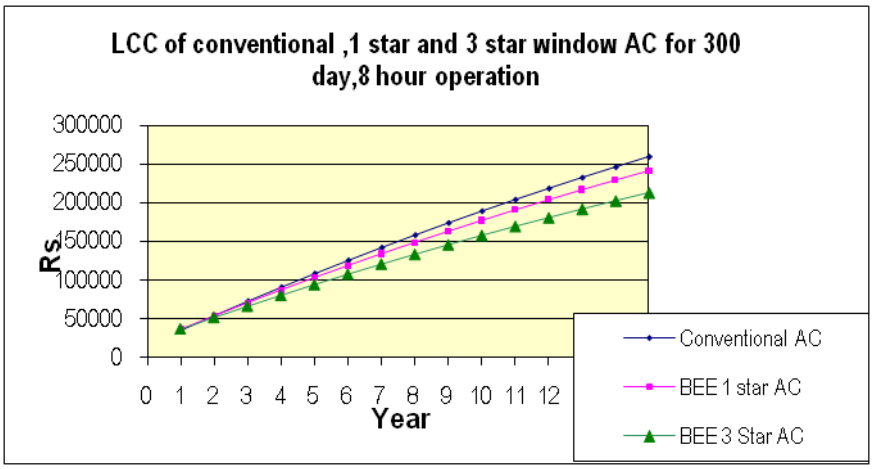

Fig 1 LCC of conventional ,1 star and 3 star window AC for 300 day,8 hour operation

The efficiency of an AC is determined by its energy efficiency ratio or EER (ratio of coiling output to total electric energy input) The number of stars on the BEE (Bureau of Energy Efficiency) label indicates the efficiency of an AC; the higher the number of stars the more efficient the appliance. For instance, a BEE 3-star (EER of 2.84) rated 1.5-tonne window AC would consume 2800 units of electricity in a year (300 days @ 8 hours/day operation per year) compared to an inefficient unrated AC (EER of 2.2) of the same size that would consume 3625 units during the same period. An efficient 3 star 1.5-tonne AC would cost about Rs21000 , whereas an unrated AC would cost about Rs 15 000. The additional Rs 6000 invested on the efficient AC will be recovered in a little over one year due to savings in the electricity bill.

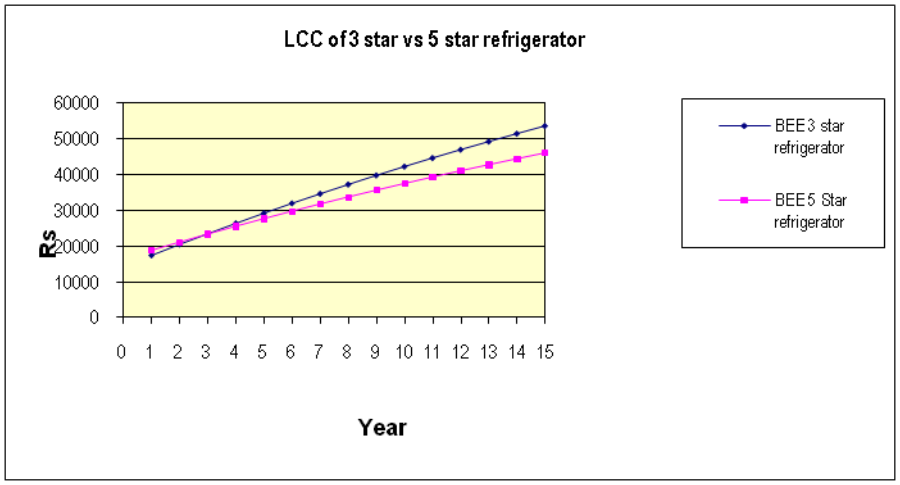

Fig 2: LCC of 3 star vs 5 star AC

Refrigerators are one of the highest consumers of electricity in houses. However, they have become significantly efficient in the past few years, and are still improving. A typical refrigerator has a lifespan of 15–20 years. The cost of running it over that time period is several times the initial purchase price. Comparison between a specific make of 5 star vis-a-vis 3 star refrigerator showed that the initial incremental investment pays back in the 3rd year of operation itself.

Submittals

The following submittals are required for compliance:

Name of the equipment (refrigerator/Air condition-erTL etc)	Serial no.	Numbers	Star rating	Date of purchase

Guidance Notes

BEE Labeled Appliances

Efficient air conditioners

ACs (air conditioners) is used to cool or heat a room and usually consume the highest energy among all home appliances. Window ACs and split ACs are most commonly used. These are available in different sizes– 0.75 tonne, 1tonne, 1.5 tonne, and 2 tonne. Insulation of the walls, roof, and efficient windows in the room would allow one to pick an AC with lesser tonnage.

The energy consumption of an AC depends on its size. A 1-tonne AC is appropriate for a 150 sq ft room, while a 2-tonne AC is sufficient for a room, which is 300 sq ft in area. Use of BEE labeled air conditioners help save energy and must be used.

- **Installing an AC**

  While installing an AC, ensure that the exterior (or back) of the AC is not exposed to direct sunlight and is away from heat sources such as chimneys. Efficient airflow across the exterior would ensure efficient operation of the AC. Make sure that air does not escape through doors and windows by sealing them properly. This would help in reducing energy consumption. To optimize the efficiency of the AC ensure that equipments such as televisions, computers or lamps are placed away from it.

- **Operating an AC**

  The energy consumed by an AC is also affected by its operation. Set the temperature higher to reduce energy consumption. It is ° estimated that a temperature setting of 23 C consumes 10% more ° energy than a temperature setting of 26 C. A few ACs equipped with the 'sleep' mode enable savings during operation.

- **Maintaining an AC**

  Regular maintenance of ACs helps in improving their efficiency. Clean the filters of the AC at least once in 15 days to ensure efficient airflow and cooling. Also, to enable the AC to operate efficiently, the exterior part (or back) of the AC should be free from dust, preventing blockage.

Refrigerators

Refrigerators are one of the highest consumers of electricity in houses. However, they have become significantly efficient in the past few years, and are still improving. A typical refrigerator has a lifespan of 15–20 years. The cost of running it over that time period is several times the initial purchase price. So buy the most efficient model available; investing a little more in a refrigerator with higher efficiency offers solid payback. When you buy a new refrigerator, buy the most efficient model available. A listing of energy efficient appliances can be found at the Bureau of Energy Efficiency's website - www.bee-nic.in & www.energymanagertraining.com

Smaller models will obviously use less energy than larger models. Generally, the larger the refrigerator, greater is the energy consumption. Don't buy a refrigerator that's larger than you need. But one large refrigerator will use less energy than two smaller ones with the same total volume.

Models with top- or bottom-mounted freezers average 12% less energy use than side-by-side designs.

Features like through-the-door ice, chilled water, or automatic ice-makers increase the energy consumption, purchase price and also greatly increase energy use and are far more likely to need service and repair. Avoid these costly, troublesome options.

Be willing to pay a bit more initially for lower operating costs. A five-star refrigerator that costs more initially but costs less per year to operate due to better construction and insulation, will pay for itself in less than four years compared to a two-star refrigerator.

Recycle older or second refrigerators. Don't keep the old, inefficient refrigerator running in the occasional refreshments. It could cost you significantly more per year in electricity.

Star Rating Available for Different Appliances

Table 1 Linear fluorescent tube lights

Star Rating	*	**	***	****	*****
Lumens per Watt at 0100 hrs of use	<61	>=61 & <67	>=67 & <86	>=86 & <92	>=92
Lumens per Watt at 0100 hrs of use	<52	>=52 & <57	>=57 & <77	>=77 & <83	>=83
Lumens per Watt at 0100 hrs of use	<49	>=49 & <54	>=54 & <73	>=73 & <78	>=78

Transformer losses: The total losses at 50% and 100% loading shall not exceed the values given below.

Table 2 Transformer Losses

Rating	1 star		2 star		3 star		4 star		5 star	
KVA	Max losses at 50% (Watts)	Max Losses at 100% (Watts)	Max losses at 50% (Watts)	Max Losses at 100% (Watts)	Max losses at 50% (Watts)	Max Losses at 100% (Watts)	Max losses at 50% (Watts)	Max Losses at 100% (Watts)	Max losses at 50% (Watts)	Max Losses at 100% (Watts)
16	200	555	165	520	150	480	135	440	120	400
25	290	785	235	740	210	695	190	635	175	595
63	490	1415	430	1335	380	1250	340	1140	300	1050
100	700	2020	610	1910	520	1800	475	1650	435	1500
160	1000	2800	880	2550	770	2200	670	1950	570	1700
200	1130	3300	1010	3000	890	2700	780	2300	670	2100

Refrigerators

The following equation shall be used to determine the Star Rating Bands for a particular model in a refrigerator (Direct Cool Refrigerators)

Star Rating Band (SRB)dc = kdc * Vadj_tot_dc + cdc

Where,

kdc = Constant Multiplier (kWh/Litre/year)

Vadj_tot_dc = Total adjusted storage volume for Direct Cool (litre)

cdc = Constant Fixed Allowance (kWh/Year)

Table 3 Star Rating Band valid from 01 January 2009 to 31 December 2011

Star Rating Band	k_{dc} Constant Multiplier	c_{dc} Constant Fixed Allowance
1 Star *	0.413	346
2 Star **	0.330	277
3 Star ***	0.264	221
4 Star ****	0.211	177
5 Star *****	0.169	141

Frost Free refrigerator

The following equation shall be used to determine the Star Rating Bands for a particular model.

Star Rating Band (SRB)nf = knf * Vadj_tot_nf + cnf

Where,

Knf = Constant Multiplier (kWh/Litre/year)

Vadj_tot_nf = Total adjusted storage volume for No Frost (litre)

Cnf = Constant Fixed Allowance (kWh/Year)

Table 4: Star rating for frost free refrigerator

Star Rating Band	K_{nf} Constant Multiplier	C_{nf} Constant Fixed Allowance
1 Star *	0.5578	486
2 Star **	0.4463	89
3 Star ***	0.3570	311
4 Star ****	0.2856	249
5 Star *****	0.2285	199

Air conditioners

STAR RATING - ROOM AIR CONDITIONERS

The star rating parameters **EER** shall be obtained from TABLE 5, depending on the year of manufacturing/import/assembling

Table 5 Star Rating Band valid from 01 January 2010 to 31 December 2011

EER (W/W)		
Star Rating	**Min**	**Max**
1 Star *	2.30	2.49
2 Star **	2.50	2.69
3 Star ***	2.70	2.89
4 Star ****	2.90	3.09
5 Star *****	3.10	

List of BEE labeled appliances are available on the website: www.bee-india.nic.in

References

1. www.bee-india.nic.in