EFFICIENCY OF RESIDENTIAL LIGHTING AND APPLIANCES

The residential sector contributed to 25% of the total electricity consumption in India in 2011. Lighting and major appliances like ceiling fans, televisions, refrigerators and air-conditioners account for about 80% of residential consumption. The rest comes from smaller and lesser-used appliances like washing machine, geyser, computers etc. Appliance ownership is significantly increasing both in rural and urban households due to a rise in income levels. This analysis captures the penetration of higher efficiency appliances in the residential sector, which when accounted with other factors, will determine the total demand for electricity in this sector. The star rating programme of the Bureau of Energy Efficiency is expected to have a major role in this sector.

The consumption of kerosene for lighting by households with no appliance ownership decreases from 2013 million litres (145 million litres in urban and 1868 million litres in rural areas) to 161 million litres (79 million litres in urban and 82 million litres in rural areas) in 2047.

Level A

Level A assumes only slight improvement in efficiency over 2007 levels. In 2047, 98% of appliances are assumed to be of low efficiency, 1% is of medium efficiency, and 1% is of high efficiency. Incandescent bulbs still form the major source of lighting although there is a substantial mix of compact fluorescent lamps (CFL) and thin tube-lights. Low efficiency motors are used in ceiling fans, refrigerators and air-conditioners. A number of televisions still use the cathode ray tube (CRT) technology. The usage hours of appliances are also high.

The total domestic electricity consumption by appliances is expected to be about 2200 TWh in 2047 at this efficiency level.

Level B

Level B assumes that in 2047, 45% of the appliances are low efficiency, 38% are medium efficiency and 17% are high efficiency appliances. Use of incandescent bulbs is reduced while that of CFL and thin tube-lights is increased along with a small share of light emitting diode (LED) lights. As a result the electricity consumption decreases by about 20% as compared to level A.

Level C

Level C assumes a 50% share of high efficiency appliances with a small share (11%) of low efficiency and the balance being medium efficient in 2047. The lighting demand is halved due to increased penetration of LED bulbs and tube-lights. TVs use advanced LED backlit LCD technology to decrease the consumption. The efficiency of other appliances like washing machines, geysers etc. also improve. Public awareness on conservation leads to decrease in usage. The total residential consumption decreases by about 35% as compared to level A.

Level D

Level D assumes a complete market transformation to high efficiency appliances. Incandescent bulbs are eliminated and 90% of the lights are LED tube-lights and bulbs. Ceiling fans use advanced technology like brushless DC motors. All the refrigerators use high efficiency compressors and better insulations. ACs have variable speed compressors resulting in high energy efficiency ratios. There is high public awareness on conservation, resulting in 90% of appliances being high efficiency, 9% being medium efficiency and 1% being low efficiency. The electricity consumption in this scenario is 50% lesser than that compared to Level A.
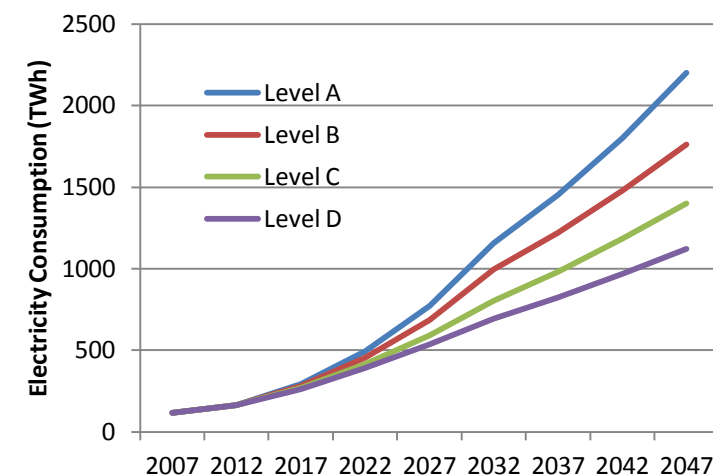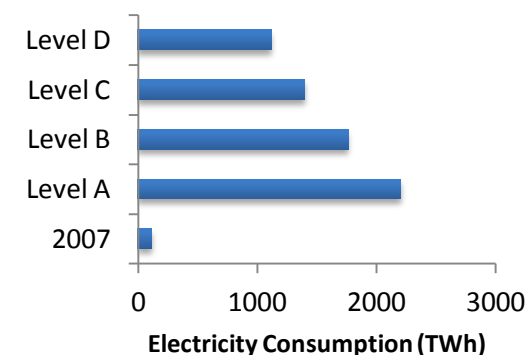

Figure 1: Electricity consumption for 4 scenarios

Electricity consumption in 2047 in 4 scenarios compared to 2007