

# Efficiency of Lighting and Appliances

## Residential

### Level 1

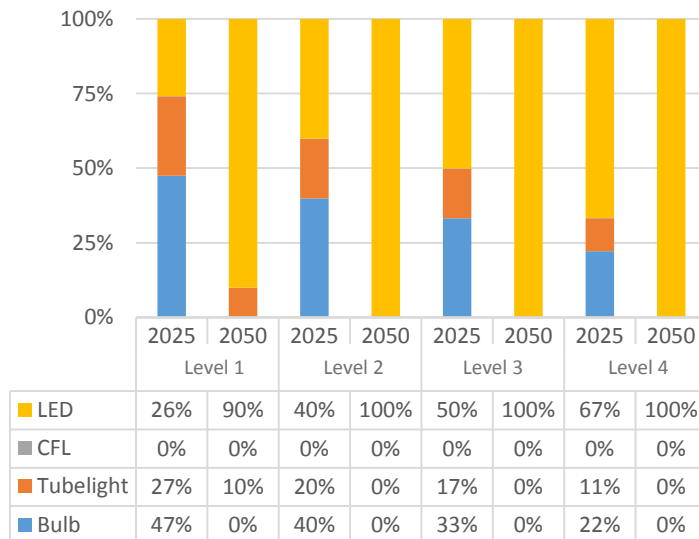
Level 1 assumes that although incandescent lamps will be phased out by 2050, CFLs will continue to be used. Penetration of LED will increase to 26% by 2025 and thereafter increases gradually to reach 90% level in 2050. Remaining 10% will energy efficient tube lights. In 2050, 78% of appliances are assumed to be of low efficiency, 15% are of medium efficiency, and 1% are of high efficiency.

### Level 2

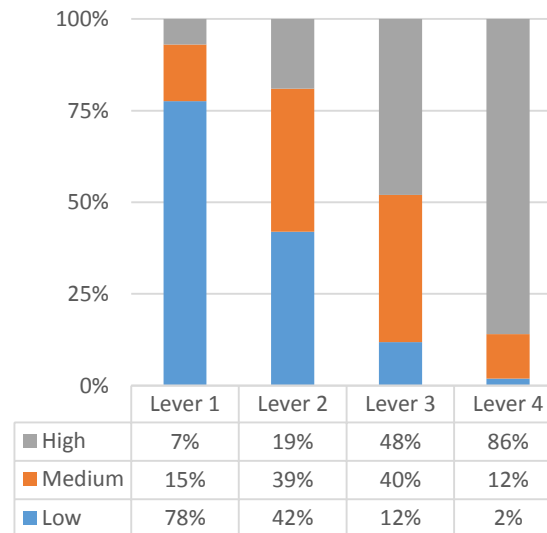
Level 2 assumes that penetration of bulbs will reduce to 40% by 2025. By 2040, all incandescent bulbs and CFLs will be replaced by LEDs. In case of other appliances, 42% have low efficiency while 39% have medium efficiency in 2050.

As per tariff order of Karnataka, residential sector contributes to 23% of the electricity consumption in the state in FY16. Major end use component includes residential lighting, fans, refrigerators, air conditioners and other appliances like washing machine, geysers, computers, televisions. The state government has implemented Domestic Efficient Lighting Programme (DELP) for increasing penetration of LED based among residential and commercial consumers. In addition to this, state is also implementing energy efficient fan program (PAVAN) and Energy Efficient LED Tube light program (EETP). The World Bank report, 'India's State Level Energy Efficiency Implementation Readiness', Karnataka has been ranked number three in terms of the state most prepared for implementation of energy efficiency programmed and schemes. This lever captures the impact of increasing penetration of energy efficient appliances in total electricity demand of residential sector.

Penetration of efficient lighting



Penetration of efficient appliances in 2050



### Level 3

Level 3 assumes that there can be increase in awareness among consumers about benefits of energy efficient appliances, which will result in increasing penetration of high efficiency appliances to 48% in 2050, while 40% would be medium efficiency and remaining 12% would be of low efficient appliances. The lighting demand decreases substantially due to 100% penetration of LED by 2035.

### Level 4

Level 4 is the optimistic scenario which assumes that energy efficiency ratio of air conditioners improves, which can be due to usage of variable speed compressors, advanced technology like BLDC which will improve energy efficiency of fans. Penetration of these high efficient appliances also increase to 86% by 2050. Further, in case of lighting 100% penetration of LED would be achieved by 2030.

# Efficiency of Lighting and Appliances Commercial

## Level 1

Level 1 assumes that there is no significant improvement in efficiency. This could be because of increasing life cycle cost, lack of required policy and decrease in prices of electricity which remains a major obstacle to penetration of best available technologies.

## Level 2

Level 2 assumes considerable improvement in penetration of efficient appliances. By 2050, 30% of demand is met by the best available technologies, remaining 50% and 20% of demand is met by medium efficiency and low efficiency appliances, respectively. The penetration of high efficiency appliances is limited, which could be due to high capital cost and low awareness, especially in rural areas.

As per tariff order of Karnataka, commercial sector in the state accounted for nearly 13% of the total electricity consumption. Energy consumption in commercial buildings depends on a combination of type of appliances used and building envelope. This lever presents change in energy consumption of commercial buildings under scenarios of penetration of energy efficient appliances. Change in energy requirement due to building envelop optimization has been dealt separately.

## Level 3

Level 3 assumes that penetration of high efficient appliances improves significantly. This could be due to policy measures like mandatory use of best available technology in new buildings, tax rebates, etc. In 2050, 50% of energy demand is met through high efficiency appliances, and balance 40% and 10% is met through medium efficiency and low efficiency appliances, respectively.

## Level 4

Level 4 is the optimistic scenario which assumes that low efficiency appliances will completely be eliminated by 2050. This may be supported by government initiatives like tax rebates, mandatory use of high efficiency technology, and decrease in prices of best available technology. In 2050, 80% of energy demand will be by high efficient appliances and remaining 20% by medium efficiency appliances.

