

Saving Potential from Ceiling Fans in Indian Households

Even though ceiling fans are probably the most common electrical appliance after electric lights in Indian households and offices, they are rarely mentioned in discussions of energy efficiency. This is a serious omission. Fans consume about 20% of the electricity in Indian households. Furthermore, their numbers are growing rapidly. Production of fans in India during 2008-09 was about 40 million units; of which about 29 million were for sale within India. With a growth of 10% per year in sales, we can expect that of the fans in 2020, about 70% will have been added just since 2009. Fans are rarely replaced; therefore, this new stock will have a long life. It is important that this new stock be efficient. In this context, we decided to review the fan industry and market in order to determine the opportunities for improving their energy efficiency.

How to Make Fans More Efficient

Standard fans today use induction motors which can be made more efficient through three actions: (1) increasing the height of the stator and rotor stack (more steel); and (2) by making the wires thicker (more copper), and (3) by using a smaller (lower value) capacitor to reduce the top speed of the fan. However, using these methods, the power consumption of a fan can be brought down to about 45W at full speed, from the present 70-80W. These super-efficient fans are expected to have a manufacturing cost that is about Rs. 50 more than standard fans.

Fan manufacturers are beginning to explore the use of brushless DC (BLDC) motors in ceiling fans. It is expected that with BLDC technology, the power consumption of ceiling fans can be reduced to about 35W at full speed, about half of the power consumption of a standard fan today.

National Program for Fans

Given the energy saving potential of super-efficient fans, it is important to find ways to quickly promote their use. BEE has already established a labeling program for fans and the market is likely to bring about some improvements in energy efficiency on its own. In addition, many utilities and state regulatory commissions have initiated DSM programs, which can target fans in future. However, given consumers' lack of awareness of energy efficiency particularly regarding fans, and the slow progress in DSM in most states, new avenues to bring about a rapid shift to super-efficient fans need to be found quickly. A national program for fans with upstream incentives to manufacturers to make and sell super-efficient fans could provide the required push for rapid shift towards super-efficient fans. An incentive of Rs. 50 per fan paid directly to manufacturers for every super-efficient fan sold, would greatly facilitate the rapid transformation of the market to super-efficient models. Providing benefits upstream would be less expensive because only Rs. 50 per fan needs to be given. In contrast, if consumer rebates had to be given they would probably need to be Rs. 100-150 because of the mark-ups for sales and marketing and taxes and duties.

Table 1-A: Potential Savings from National Fan Program in 2020

Power Savings per Fan (W)	15	W
Usage	1350	hours/yr
Energy Saved per Fan	20.25	kWh/yr
Power purchase cost saved per fan per year	60.75	Rs/yr/fan
Fan additions 2010-2020	537	million
Energy Saved at Bus-Bar in Year 2020	13603	GWh
Fraction of fans on during summer peak hours	50%	
Reduction in Summer Peak Capacity Reqmt in 2020	5930	MW

Table 1-B: Utility Perspective

Incentive Paid to Manufacturers @ Rs.50/fan	2687	crores
Avoided Power Purchase Costs @ Rs. 3/kWh in one year	4080	crores
Avoided Power Purchase Costs @ Rs. 3/kWh over lives of all fans	61200	crores

- In the next 10 years the existing fans will form less than 30% of the total stock. Remaining 70% of the stock would have been added after 2010.
- If all fans sold from now to 2020 were super-efficient models, energy savings in 2020 would be more than 10 TWh. The corresponding generating capacity avoided would be about 5900MW.
- An incentive of Rs. 50 per fan to cover the increased manufacturing cost would have a payback period of less than one year even though the fans will last for 15-20 years.
- A national program with upstream incentives to manufacturers can reduce complexity, transform the market, and realize huge energy savings.