Household appliances and lighting: the huge opportunity to improve energy efficiency

Emissions today	Energy use today	Energy use in 2050	
		With growing demand for household appliances and lighting	*+ With energy efficiency improvements*
Appliances: 4.1 $GtCO_2$ Lighting: 0.7 $GtCO_2$ *13% of global emissions in total*	Appliances: 6,000 TWh Lighting: 1,800 TWh *Of which electricity ~100%*	↑↑ Appliances: ~11,000 TWh ↑↑ Lighting: ~3,500 TWh	↔ Appliances: ~6,500 TWh ↓ Lighting: ~1,500 TWh *But relies on strong policy action*

The huge opportunity to improve the efficiency of lighting and appliances:

- Without any action to improve energy efficiency, electricity demand for lighting and household appliances (e.g., fridge freezers, washing machines, TVs) could double, from ~7,800 TWh today, to almost 14,500 TWh.[1] This comes as more households can afford appliances and use them more often and for longer.
- However, there is a huge opportunity to almost half this electricity demand by improving the energy efficiency of new household appliances and light bulbs through minimum energy performance standards. While already in place in many countries, these need to be much more ambitious
    - Household appliances: if governments across the world set and enforce higher minimum efficiency standards that new appliances on the market must meet, this could offset more than 70% of the increase in electricity demand for appliances.
    - Lighting: if all buildings used LED light bulbs, rather than incandescent lighting, the huge increase in demand for lighting could be entirely offset, with annual electricity needs lower than they are today, at 1,600 TWh in 2050. LED light bulbs are over 80% more efficient than incandescent lighting, they run for 30–50 times longer and have significantly lower lifetime costs. In most countries today, they are also as cheap to purchase. Minimum energy performance standards can drive this change.
- Improving the efficiency of appliances and lighting in hot countries has wider benefits, as appliances produce heat, which in turn drives greater electricity in AC systems.

Priority policy actions to tip the dial:

1. Implement minimum energy performance standards for lighting and a wide variety of appliances, increasing their stringency over time.
2. Government bulk procurement of LED lighting and small appliances to help lower consumer prices. These policies have proven to be hugely successful at growing the market for LEDs in India 130-fold in just five years.[2]
3. Continue to drive further improvements in efficiency with targeted R&D support (e.g., financial incentives, prizes), focussing for example on developing smart appliances which work effectively within smart building systems to provide demand-side flexibility.
4. Use financial incentives to encourage households to replace older, less efficient appliances. These should be targeted at large, energy-consuming white goods such as fridges and freezers. This must be accompanied by investment in recycling and reuse facilities, with retailers obliged to offer trade-in schemes.

1 IEA (2023), *World Energy Outlook 2023.*
2 Carbon Brief (2020), *Guest post: How energy-efficient LED bulbs lit up India in just five years.*