# **Why Conserve Electricity??**

The Indian economy is one of the fastest growing economies in the world and availability of energy is a crucial input for sustaining long term economic growth.India is well endowed with both conventional and non-conventional energy resources but coal has by far been the main source of power generation. Depleting nature of fossil resources has shifted the focus on renewable energy generation. However, addition of generation capacity to meet increasing demand requires enormous capital investment and also takes time. Thus, considering the rising demand, depleting resources and environmental concerns, saving energy has gained national importance. Also, saving a watt is cheaper than generating and supplying a watt. Thus, conserving energy through reduced or more efficient consumption is a cheaper mode of bridging the demand supply which also addresses the environmental concerns.

Energy conservation refers to efforts made to reduce overall energy consumption by reducing the need for heating, lighting and cooling etc. and also through increased efficient energy use by reducing wasteful consumption.Whether you take simple steps like employing efficient devices or make larger investments to make your home/business unit more efficient, you'll see lower energy bills and consequently significant cost savings.

Considering that domestic consumption is largely contributed by electricity fans, lights and refrigerators, replacing these with efficient star labeled devices can reap significant cost savings by reduced energy bills.

***Efficient Lighting-****LEDs can significantly reduce energy consumption, as they consume almost 70% less energy as compared to conventional lights. Replacing a conventional 60 Watt ICL(Incandescent Lamp) with efficientLED can reduce monthly energy consumption by more 10 units[[1]](#footnote-2). Also, LEDs have longer life and provide greater light intensity for lower wattage as compare to conventional ICLs.*

***Efficient Fans-****Start labeled efficient fans are more efficient as compared to regular old fans, having a saving potential of around 30%. Replacing an old inefficient fan with star labeled efficient fan can help save almost 8 units[[2]](#footnote-3) on a monthly basis.*

***Efficient Refrigerator-****Employing efficient refrigerators can provide around 25% savings in energy requirement which may lead to monthly consumption reduction of around 30 units[[3]](#footnote-4)*

***Efficient AC-*** *Air conditioners are high consumption load and replacing inefficient ACs with Five star rated efficient ACs can accrue potential savings of around 30%. An efficient AC can reduce monthly energy requirement by more than 70 units[[4]](#footnote-5)*

For higher consumption consumers as industrial and commercial establishments, saving potential is even higher. Adopting simple best practices as maintaining insulation systems and employing right sized motors can result in significant energy savings and consequently cost savings for the consumer.

Thus, initiating energy conservation efforts will not only help conserve resources for the nation but also bring financial savings to consumers as well as defer the need of large investments in energy generation.

# **How to Conserve? (Energy Conservation Tips)**

# **Agriculture Consumer**

* Replace substandard pump sets by energy efficient pump sets
* Use correct size pump sets and associated accessories
* Substitute rusted G.I suction/delivery pipes by low friction rigid PVC pipes of correct diameter
* Fewer number of bends and fittings in a pipe help save electricity
* Replace substandard foot valve by low friction ISI marked foot valve
* Larger valve helps to save electricity / diesel because less fuel and power is needed to draw water from the well
* Employ and maintain capacitors in good condition to improve power factor and voltage use
* Avoid operation under low voltage conditions
* Install, repair pumpset motors and wiring by competent electrical personnel
* Ensure adequate water availability when pumpsets are operated
* To ensure a high level of operational efficiency of diesel powered engine, ensure that engine should not emit too much smoke.
* Use the correct grade of lubricant recommended by the manufacturer.

# **Domestic Consumer**

**Lighting**

* Turn off the lights when not in use
* Take advantage of daylight by using light-colored, loose-weave curtains on your windows to allow daylight to penetrate the room. Also, decorate with lighter colors that reflect daylight
* Clean bulbs and tube lights periodically to avoid reduction in illumination
* Use task lighting; instead of brightly lighting an entire room, focus the light where you need it
* Use LED lights whichare more energy efficient than incandescent bulbs
* Use electronic chokes in place of conventional copper chokes

**Fans**

* Use light weight / energy efficient fans
* Use electronic regulators for fans for they consume less power and provides fine control
* Avoid rewinding of motors
* Clean fan blades periodically
* Lubricate motor bearing periodically

**Refrigerators**

* Use energy efficient star labeled refrigerators
* Make sure that refrigerator is kept away from all sources of heat, including direct sunlight, radiators and appliances such as the oven, and cooking range
* Keep refrigerator away from wall to allow air to circulate around the refrigerator.
* Clean refrigerator's condenser coilsto make sure that air can circulate freely
* Avoid frequent closing and opening of refrigerator door
* Allow heated food stuff to cool down to normal temperature before refrigerating
* Make sure foods are covered before they are kept in the refrigerator
* Defrost regularly to keep freezers working their best
* Thermostat control in refrigerators should be adjusted to optimum level depending upon climatic condition

**Room Air Conditioners**

* Use energy efficient star labelled ACs
* Use correct capacity air-conditioner to suit the requirement.
* Avoid frequent opening and closing of air-conditioned room.
* Clean the AC filters periodically
* Set the thermostat of room air conditioner at 25°C (77°F) to get cooling at the least cost
* Use timer and leave the unit off for some time

**Water Heaters**

* Insulate hot water pipes, especially where they run through unheated area to reduce heat loss
* Reducing the temperature setting of water heater at useable temperatures
* Employ solar heaters
* Use star labeled geysers

**Computers**

* Turn off your equipment when not in use
* Battery chargers, such as those for laptops, cell phones and digital cameras, draw power whenever they are plugged in and are very inefficient
* Screen savers save computer screens, not energy. Start-ups and shutdowns do not use any extra energy, nor are they hard on your computer components. In fact, shutting computers down when you are finished using them actually reduces system wear - and saves energy
* Setting computers, monitors, and copiers to use sleep-mode when not in use
* If your computer must be left on, turn off the monitor;

**Washing Machine**

* Run washing machine only with full load.
* Use the shortest cycle time.
* Always wash only with full loads.
* Use optimal quantity of water.
* Use timer facility to save energy.
* Use the correct amount of detergent.
* Use hot water only for very dirty clothes.
* Always use cold water in the rinse cycle.
* Prefer natural drying over electric dryers

# **Industrial Consumer**

**Boilers**

* Preheat combustion air with waste heat
* Use variable speed drives on large boiler combustion air fans with variable flows
* Insulate exposed heated oil tanks
* Clean burners, nozzles, strainers, etc.
* Inspect oil heaters for proper oil temperature
* Close burner air and/or stack dampers when the burner is off to minimize heat loss up the stack
* Use boiler blowdownto help warm the back-up boiler
* Optimize deaerator venting
* Inspect for scale and sediment on the water side
* Add an economizer to preheat boiler feed water using exhaust heat
* Recycle steam condensate
* Study part-load characteristics and cycling costs to determine the most-efficient mode for operating multiple boilers
* Establish a boiler efficiency-maintenance program. Start with an energy audit and follow-up, then make a boiler efficiency-maintenance program a part of your continuous energy management program

**Steam System**

* Fix steam leaks and condensate leaks
* Accumulate work orders for repair of steam leaks that can't be fixed during the heating season due to system shutdown requirements. Tag each such leak with a durable tag with a good description
* Use back pressure steam turbines to produce lower steam pressures
* Use more-efficient steam desuper heating methods
* Ensure process temperatures are correctly controlled
* Maintain lowest acceptable process steam pressures
* Reduce hot water wastage to drain
* Use waste heat for water heating
* Consider recovery of vent steam

**Furnaces**

* Check against infiltration of air: Use doors or air curtains.
* Monitor O2 /CO2/CO and control excess air to the optimum level.
* Match the load to the furnace capacity.
* Improve burner design, combustion control and instrumentation.
* Provide temperature controllers.

**Insulation**

* Repair damaged insulation
* Insulate any hot or cold metal or insulation
* Use an infrared gun to check for cold wall areas during cold weather or hot wall areas during hot weather.
* Replace wet insulation
* Insulate all flanges, valves and couplings
* Insulate open tanks

**Waste Heat Recovery**

* Recover heat from flue gas, engine cooling water, engine exhaust, low pressure waste steam, drying oven exhaust, boiler blowdown, etc.
* Recover heat from incinerator off-gas.
* Use waste heat for fuel oil heating, boiler feed-water heating, outside air heating, etc.
* Use chiller waste heat to preheat hot water.
* Use heat pumps.
* Use absorption refrigeration.
* Use thermal wheels, run-around systems, heat pipe systems, and air-to-air exchangers

**Motors**

* Properly size to the load for optimum efficiency
* Use energy-efficient motors where economical.
* Use synchronous motors to improve power factor.
* Check alignment.
* Provide proper ventilation
* Check for under-voltage and over-voltage conditions.
* Balance the three-phase power supply.
* Demand efficiency restoration after motor rewinding.

**Drives**

* Use variable-speed drives for large variable loads.
* Use high-efficiency gear sets.
* Use precision alignment.
* Check belt tension regularly.
* Eliminate variable-pitch pulleys.
* Use flat belts as alternatives to v-belts.
* Use synthetic lubricants for large gearboxes.
* Eliminate eddy current couplings.
* Shut them off when not needed.

**Compressors**

* Consider variable speed drive for variable load on positive displacement compressors.
* Use a synthetic lubricant if the compressor manufacturer permits it.
* Be sure lubricating oil temperature is not too high (oil degradation and lowered viscosity) and not too low (condensation contamination).
* Change the oil filter regularly.
* Periodically inspect compressor intercoolers for proper functioning.
* Use waste heat from a very large compressor to power an absorption chiller or preheat process or utility feeds.
* Establish a compressor efficiency-maintenance program. Start with an energy audit and follow-up, then make a compressor efficiency-maintenance program a part of your continuous energy management program.

**HVAC**

* Tune up the HVAC control system
* Consider installing a building automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
* Balance the system to minimize flows and reduce blower/fan/pump power requirements.
* Eliminate or reduce reheat whenever possible.
* Use appropriate HVAC thermostat setback.
* Use morning pre-cooling in summer and pre-heating in winter (i.e. -- before electrical peak hours).
* Use building thermal lag to minimize HVAC equipment operating time.
* In winter during unoccupied periods, allow temperatures to fall as low as possible without freezing water lines or damaging stored materials.
* In summer during unoccupied periods, allow temperatures to rise as high as possible without damaging stored materials.
* Improve control and utilization of outside air.
* Use air-to-air heat exchangers to reduce energy requirements for heating and cooling of outside air.
* Reduce HVAC system operating hours (e.g. -- night, weekend).
* Optimize ventilation.
* Ventilate only when necessary. To allow some areas to be shut down when unoccupied, install dedicated HVAC systems on continuous loads (e.g. -- computer rooms).
* Provide dedicated outside air supply to kitchens, cleaning rooms, combustion equipment, etc. to avoid excessive exhausting of conditioned air.
* Use evaporative cooling in dry climates.
* Reduce humidification or dehumidification during unoccupied periods.
* Use atomization rather than steam for humidification where possible.
* Clean HVAC unit coils periodically and comb mashed fins.
* Upgrade filter banks to reduce pressure drop and thus lower fan power requirements.
* Check HVAC filters on a schedule (at least monthly) and clean/change if appropriate.
* Check pneumatic controls air compressors for proper operation, cycling, and maintenance.
* Isolate air conditioned loading dock areas and cool storage areas using high-speed doors or clear PVC strip curtains.
* Install ceiling fans to minimize thermal stratification in high-bay areas.
* Relocate air diffusers to optimum heights in areas with high ceilings.
* Consider reducing ceiling heights.
* Eliminate obstructions in front of radiators, baseboard heaters, etc.
* Check reflectors on infrared heaters for cleanliness and proper beam direction.
* Use professionally-designed industrial ventilation hoods for dust and vapor control.
* Use local infrared heat for personnel rather than heating the entire area.
* Use spot cooling and heating (e.g. -- use ceiling fans for personnel rather than cooling the entire area).
* Purchase only high-efficiency models for HVAC window units.
* Put HVAC window units on timer control.
* Don't oversize cooling units. (Oversized units will "short cycle" which results in poor humidity control.)
* Install multi-fueling capability and run with the cheapest fuel available at the time.
* Consider dedicated make-up air for exhaust hoods. (Why exhaust the air conditioning or heat if you don't need to?)
* Minimize HVAC fan speeds.
* Consider desiccant drying of outside air to reduce cooling requirements in humid climates.
* Consider ground source heat pumps
* Seal leaky HVAC ductwork.
* Seal all leaks around coils.
* Repair loose or damaged flexible connections (including those under air handling units).
* Eliminate simultaneous heating and cooling during seasonal transition periods.
* Zone HVAC air and water systems to minimize energy use.
* Inspect, clean, lubricate, and adjust damper blades and linkages
* Establish an HVAC efficiency-maintenance program. Start with an energy audit and follow-up, then make an HVAC efficiency-maintenance program a part of your continuous energy management program

**Refrigeration**

* Use water-cooled condensers rather than air-cooled condensers.
* Challenge the need for refrigeration, particularly for old batch processes.
* Avoid oversizing -- match the connected load.
* Consider gas-powered refrigeration equipment to minimize electrical demand charges.
* Use "free cooling" to allow chiller shutdown in cold weather.
* Use refrigerated water loads in series if possible.
* Convert firewater or other tanks to thermal storage.
* Don't assume that the old way is still the best -- particularly for energy-intensive low temperature systems.
* Correct inappropriate brine or glycol concentration that adversely affects heat transfer and/or pumping energy. If it sweats, insulate it, but if it is corroding, replace it first.
* Make adjustments to minimize hot gas bypass operation.
* Inspect moisture/liquid indicators.
* Consider change of refrigerant type if it will improve efficiency.
* Check for correct refrigerant charge level.
* Inspect the purge for air and water leaks.
* Establish a refrigeration efficiency-maintenance program. Start with an energy audit and follow-up, then make a refrigeration efficiency-maintenance program a part of your continuous energy management program

**Electric Utilities**

* Optimize the tariff structure with utility supplier
* Schedule your operations to maintain a high load factor
* Minimize maximum demand by tripping loads through a demand controller
* Use standby electric generation equipment for on-peak high load periods
* Relocate transformers close to main loads.
* Set transformer taps to optimum settings.
* Disconnect primary power to transformers that do not serve any active loads.

# **Glossary**

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| **Appliance** | A piece of equipment, commonly powered by electricity, used to perform a particular energy-driven function. Examples of common appliances are refrigerators, clothes washers and dishwashers, conventional ranges/ovens and microwave ovens, humidifiers and dehumidifiers, toasters, radios, and televisions. |
| **Ampere** | A unit of measure for an electrical current; the amount of current that flows in a circuit at an electromotive force of one Volt and at a resistance of one Ohm. Abbreviated as amp |
| **Boiler** | A vessel or tank where heat produced from the combustion of fuels such as natural gas, fuel oil, or coal is used to generate hot water or steam for applications ranging from building space heating to electric power production or industrial process heat |
| **Compressor** | A device used to compress air for mechanical or electrical power production, and in air conditioners, heat pumps, and refrigerators to pressurize the refrigerant and enabling it to flow through the system |
| **Connected Load** | The sum of the ratings of the electricity consuming apparatus connected to a generating system |
| **Current** | The movement or flow of electricity.  |
| **Distribution wires** | Power lines that carry electricity through towns and neighborhoods to homes and businesses. Distribution lines can run overhead or underground. |
| **Electrical Energy** | The energy associated with electric charges and their movements. |
| **Electricity** | The flow of electrons. |
| **Energy** | The ability to do work. People get energy from food. Your toaster and your washing machine get their energy from electricity. |
| **Fluorescent bulb** | A light bulb that emits light because the gas inside it glows when it is charged by electricity. |
| **Fossil Fuels** | Fuels (coal, oil, natural gas, etc.) that result from the compression of ancient plant and animal life formed over millions of years.  |
| **Fuel cell** | A technology that produces electricity through a chemical reaction similar to that found in a battery. |
| **Furnace** | A combustion heating appliance in which heat is captured from the burning of a fuel for distribution, comprised mainly of a combustion chamber and heat exchanger |
| **Generator** | A machine that converts mechanical energy into electrical energy. |
| **Generating Capacity** | The amount of electrical power a power plant can produce.  |
| **Geothermal energy** | Energy that is generated by converting hot water or steam from deep beneath the Earth's surface into electricity.  |
| **Grid** | The layout of an electrical distribution system.  |
| **HVAC Load** | Heating Ventilation Air Condition and Cooling load |
| **Incandescent bulb** | A light bulb that emits light due to the glowing of a heated filament inside it.  |
| **Insulation** | is the reduction of heat transfer (the transfer of thermal energy between objects of differing temperature) between objects in thermal contact or in range of radiative influence |
| **Kilowatt–hour** | One kilowatt of electricity produced or used in one hour. |
| **Load** | The power and energy requirements of users on the electric power system in a certain area or the amount of power delivered to a certain point.  |
| **Megawatt** | 1,000,000 watts of power or 1,000 kilowatts. |
| **Motor** | A machine supplied with external energy that is converted into force and/or motion. |
| **Nonrenewable** | Fuels that cannot be easily made or "renewed." We can use up nonrenewable fuels. Oil, natural gas, and coal are nonrenewable fuels.  |
| **Power** | The rate at which energy is transferred. Electrical energy is usually measured in watts. Also used for a measurement of capacity.  |
| **Power plant** | A place where electricity is generated.  |
| **Peak Load Plant** | A plant usually housing old, low-efficiency steam units, gas turbines, diesels, or pumped-storage hydroelectric equipment normally used during the peak-load periods.  |
| **Renewable Energy Sources** | Energy that is collected from resources which are naturally replenished or renewed, such as sunlight, wind, rain, tides, waves, and geothermal heat |
| **Time of Day Tariff** | System under which consumers will have to pay more for power consumption during peak hours and less for consumption during non-peak hours |
| **Transformer** | A device used to increase or decrease electricity's voltage and current.  |
| **Turbine** | A device which blades, which is turned by a force, e.g. that of wind, water, or high pressure steam. The mechanical energy of the spinning turbine is converted into electricity by a generator.  |
| **Utility** | A company or other organization that provides a public service, such as supplying electricity, natural gas, or water.  |
| **Voltage, volts** | A measure of the pressure under which electricity flows. |
| **Wattage, Watts** | The rate of energy transfer equivalent to one ampere under an electrical pressure of one volt. One watt equals 1/746 horsepower, or one joule per second. It is the product of Voltage and Current (amperage |

1. For 8 hours of operation per day in a month [↑](#footnote-ref-2)
2. For 12 hours of operation per day in a month [↑](#footnote-ref-3)
3. For 24 hours of operation per day in a month [↑](#footnote-ref-4)
4. For 4 hours of operation per day in a month [↑](#footnote-ref-5)