

ENERGY Conservation

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Can I contribute?

Why should I contribute?

How can I contribute?

Each one of us

can

Contribute!

Switching ON gadgets if & Only if Required

- Lights & fans
- Computers
- Air Conditioning system
- Pumps , Elevators & other Auxiliaries

Being observant about

- Consumption during non-working periods
- Changes in the consumption / usage patterns
- Part load operation
- Losses & unaccounted consumption

Consumption during non-working periods

- Office Premises – Power
- Factory – Pump
- Lighting - Single Switch
- Lighting - Street / Parking Area

Changes in consumption / usage patterns

- Overall Consumption
- Air Compressors
- Water Pumps
- Air Conditioning System

Part Load Operation

- Centralized Air Conditioning System
- Air Compressors

Losses & Unaccounted Consumption

- Cable Losses
- Power Theft
- Faulty Meters
- Unmonitored consumption

Why
must
I
Contribute?

It Cost Money!

Tube Light	Rs 800/- to Rs 1,200/- per year
Fan	Rs 1,200/- to Rs 1,600/- per year
Computer	Rs 1,000/- to Rs 4,000/- per year
Air Conditioner (1 TR)	Rs 20,000/- to 40,000/- per year
Water Heater (1 kW)	Rs 20,000/- per year
Power Cost of Rs 8.0 per unit	Operation of 2,500 hours a year

It depletes Natural Resources

Tube Light	100 to 250 kg of coal per year
Fans	120 to 160 kg of coal per year
Computers	150 to 600 kg of coal per year
Air Conditioner (1 TR)	3,000 to 6,000 kg of coal per year
Water Heater (1 kW)	3,000 kg of coal per year
Generation & Distribution Efficiency of 18%	Operation of 2,500 hours a year

Fossil Fuels

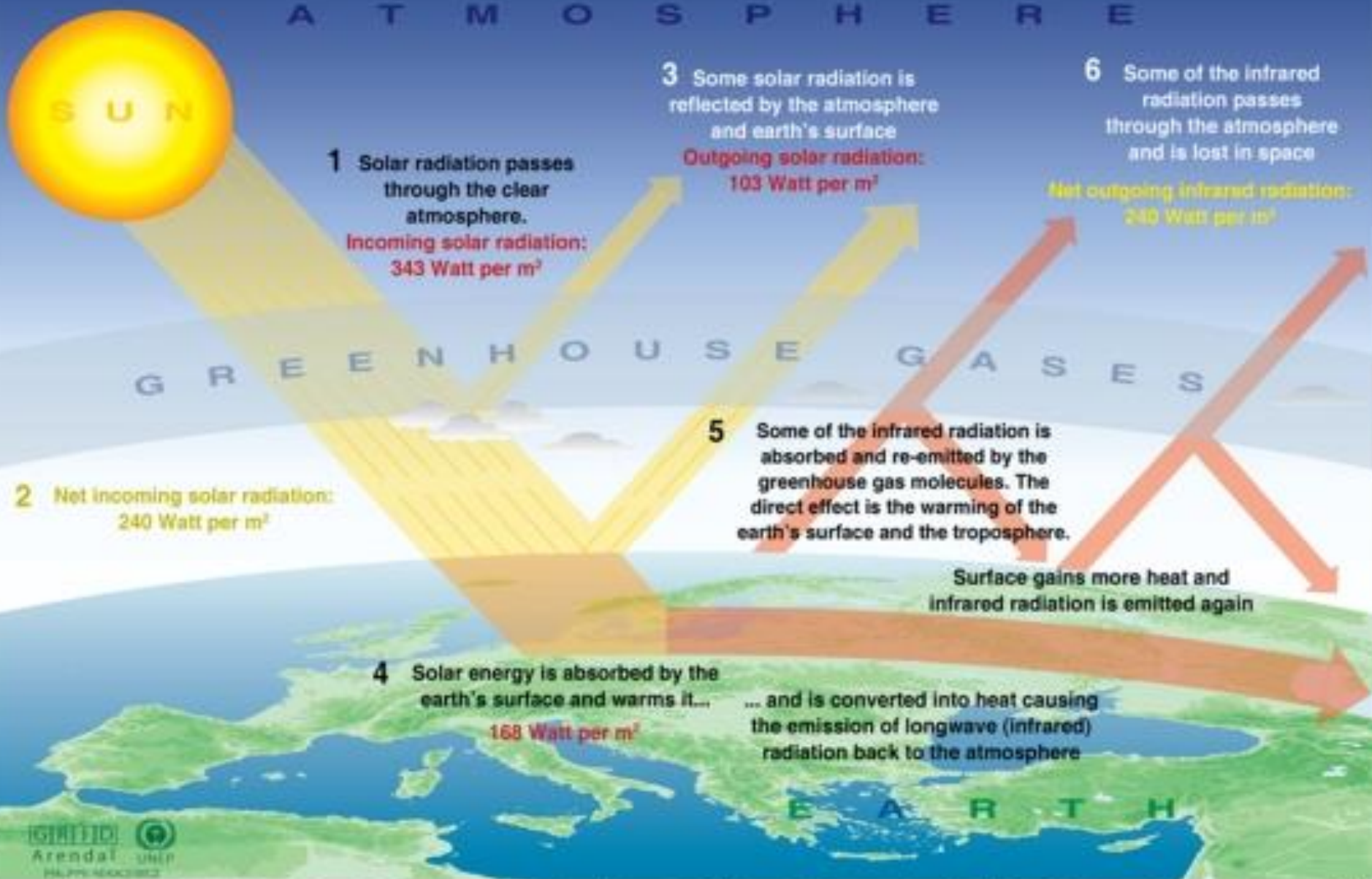
World & India's Reserves

Fossil	World's Reserves	India's Reserves	% of World Reserves	Remarks on Indian Reserves
Coal	984 billion tonnes	84,414 million tonnes	8%	will last for 200 years
Crude Oil	140.4 billion tonnes	658 million tonnes	0.46%	will last for 16 years
Natural Gas	144.8 trillion cubic meter	628 billion cubic meters	0.43%	will last for 23 years

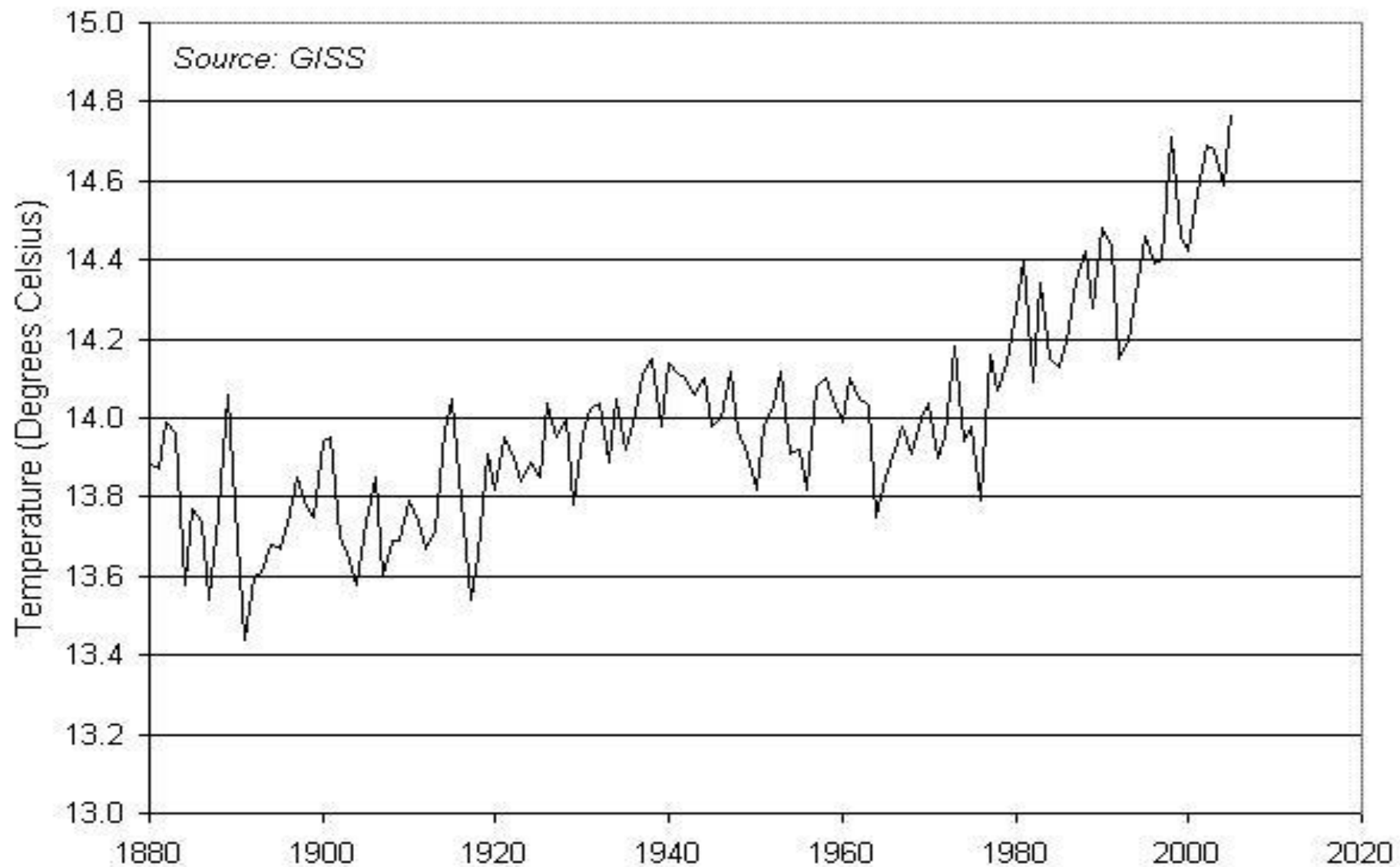
It adds to Global Warming

Tube Light	200 to 500 kg of CO ₂ per year
Fans	240 to 320 kg of CO ₂ per year
Computers	300 to 1,200 kg of CO ₂ per year
Air Conditioner (1 TR)	6,000 to 12,000 kg of CO ₂ per year
Water Heater (1 kW)	6,000 kg of CO ₂ per year
Generation & Distribution Efficiency of 18%	Operation of 2,500 hours a year

The Greenhouse effect



Average Global Temperature, 1880-2005



**How
can
I
Contribute?**

- Take Initiative – Bell the CAT
- Switch ON if & only if REQUIRED
- Be ALERT! Check for Deviations / Changes.
- Set thermostat on the highest comfortable temperature.
- Use daylight, wherever possible

Fundamentals

- Efficient Equipments.
- Minimal Distribution Losses.
- Proficient Operation & Maintenance.
- Effective Utilization.
- Recovery of Waste Energy

Efficient Equipments

Equipment	Normal	Most Efficient
Air Conditioner	1.5 kWh/TR	0.9 kWh/TR
Tube Light	65 Lumen/Watt	110 Lumen/Watt
Ballast for tube light	15 W	3 W with 10% more light
Glass	100% heat gain	10 to 20% heat gain

Minimal Distribution Losses

- Cables / Switchgear of correct Specifications .
(Electricity Boards lose 40 to 50% in Transmission & distribution .)
- Capacitors at key locations.
- Regular cleaning / maintenance of the switch gear.
- Balancing of load.

Proficient Operation & Maintenance

- Regular Cleaning of filters of indoor units.
- Maintaining correct quantity of refrigerant.
- Regular cleaning fins, radiators and fan blades of outdoor units.
- Periodic maintenance of luminaries.

Effective Utilization

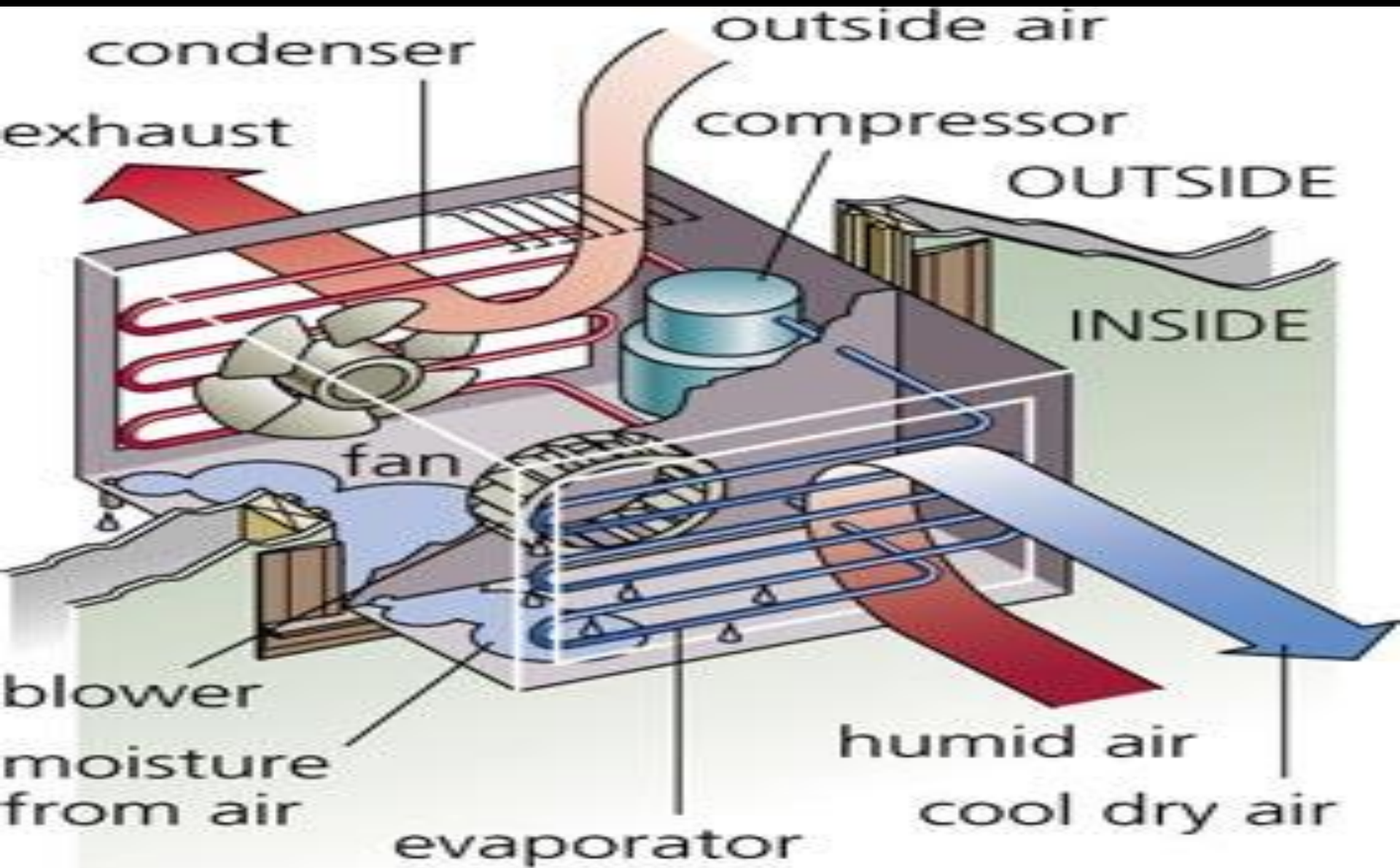
- Setting thermostat at the maximum comfortable temperature.
- Maintaining correct illumination level.
- Switching off equipments in un-occupied areas.

Recovery of Waste Energy

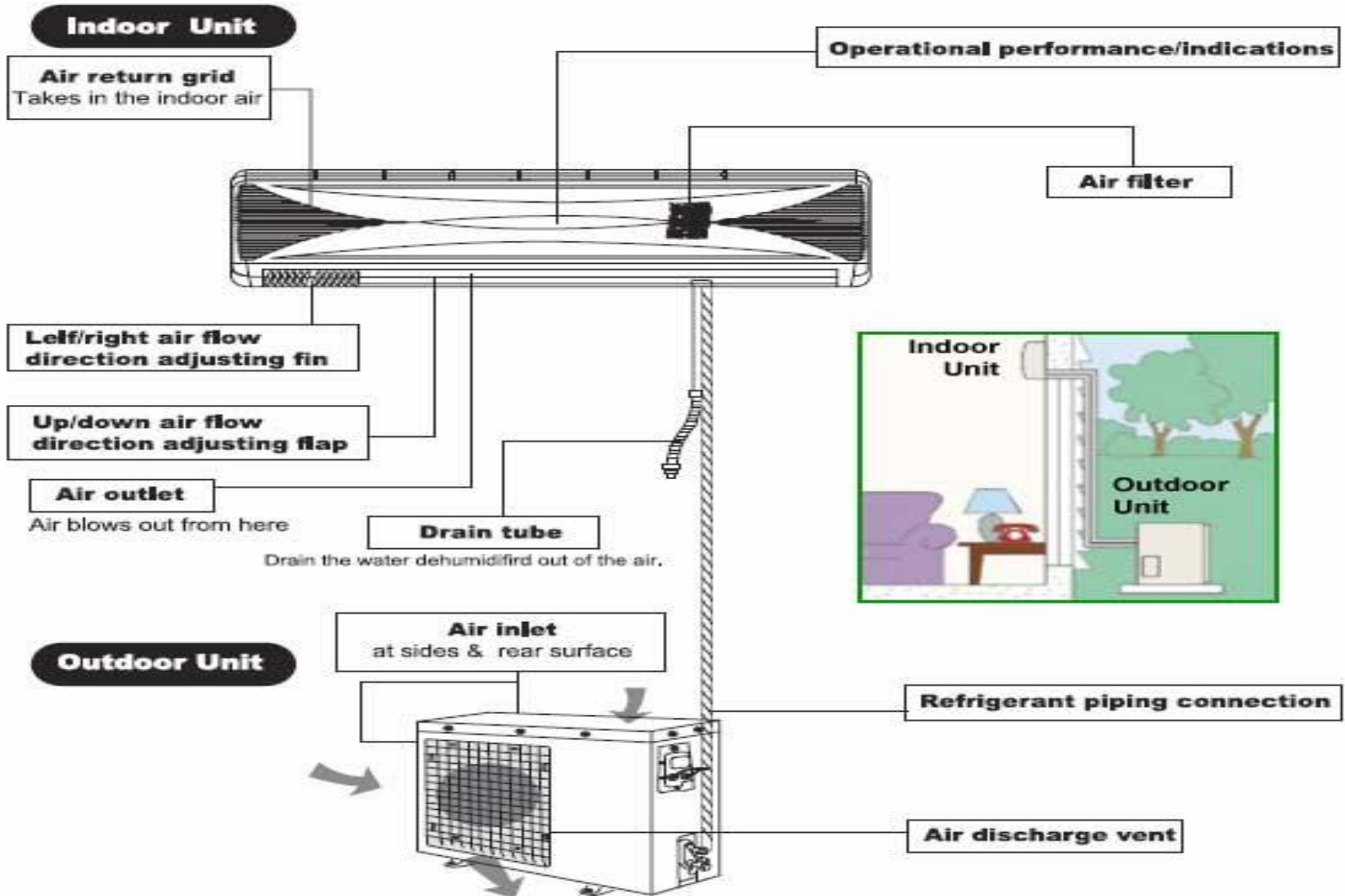
- Heat pump for simultaneous generation of hot & cold water.
- Biogas from canteen waste.

Air Conditioners

Window Air Conditioner



Split Air Conditioner



Effect of Temperature

Evaporator Temperature	Condenser Temperature		
		+40 ^o	+50 ^o
+5 ^o C	TR	1.43	1.27
	Power (kW)	1.02	1.17
	kW/TR	0.72	0.93
0 ^o C	TR	1.18	1.04
	Power (kW)	0.968	1.09
	KW/TR	0.82	1.05
-5 ^o C	TR	0.96	0.84
	Power (kW)	0.896	0.994
	KW/TR	0.93	1.19

- Each 1 °C increase in thermostat setting saves 3 to 5% in power. It also drops capacity by 1.5 to 2%.
- Each 1 °C rise in condensing temperature increases power by 5 to 6%. It also reduces capacity by 3 to 4%.
- Solar rays directly falling on the condenser can increase power by 5 to 15%. It shall also reduce capacity by 3 to 10%.

Heat load on Air Conditioners

- Human beings – 20 to 40% of load
- Heat ingress from windows – Up to 0.8 TR/M²/day.
- Heat gain through ceiling – Up to 1.5 TR/M²/day.
- Heat ingress through openings.
- Heat gain through walls, window frames, doors
- Heat load from computers , printers & lighting.

Lighting

Light Sources

Description	Rating W	Efficacy Lumen/W	CRI	Life Hour
Incandescent Bulb	12 to 500	8 to 17	100%	1000
Fluorescent Tube Light	5 to 65	50 to 110	65 to 80%	5000
Compact Fluorescent Lamp	5 to 65	40 to 70	70 to 80%	8000
High Pressure Mercury Vapour	80 to 1000	25 to 50	50%	8000 to 10000
High Pressure Sodium Vapour	70 to 1000	60 to 90	40%	12000
Metal Halide	70 to 250	70 to 80	80%	10000
LED Lamps	0.1 to 100	60 to 140	80 to 100%	50000 to 100000

Illumination Level

General	20 to 50 Lux	Outdoor, stores, Yards
Interior	50 to 200 Lux	Warehouse, Dining Hall, Lobby
Office	150 to 250 Lux	Office work / Reading room
Workshop & Drawing	300 to 500 Lux	Inspection & Drawing
Task	500 & Above	Visually difficult task

Computers

CPU

Description	Tower	Laptop
Maximum	150 W	75 W
Average	120 W	60 W
Idle	80 W	40 W
Stand by / Hibernate	15 W	3 to 5 W
Power Supply	10 W	6 W

Monitor

Parameter	CRT	LCD
Consumption	76 W	25 W
Screen colour	Highly Sensitive.	Insensitive.
Brightness	Moderately sensitive.	Sensitive.
Contrast	Sparingly sensitive.	Insensitive.
Turned off - Power Setting	2W	0 W
Screen Saver Mode consumes similar power.		

Printers & Scanners

Description	Power
Idle	10 W
Scanning	15 W
Printing	35 W

Road Ahead

- Monitoring & Control
- Equipment Maintenance
- Heat ingress
- Hall conditions
- Energy Saving gadgets
- Usage of daylight

Monitoring & Control

- Day to day consumption
- Consumption during non-working period
- Performance of Air Conditioners
- Hall Conditions
- Switching ON if & only If required

Equipment Maintenance

- Filter cleaning
- Refrigerant Quantity
- Radiator cleaning
- Cleaning of luminaries

Heat Ingress

- Films / coating for glass - Reject 75% of solar heat.
- Coating for Ceiling - Reradiate 85% of solar heat.
- Outdoor units in Shade / with Plant cover .
- Plug leakages / gaps to arrest leakages.
- Computers - TFT & Effective Power Management system.

Hall Conditions

- Maintain Highest comfortable Temperature.
- Switch Off, if not occupied.

Energy Saving Gadgets

- Intelligent Energy saver for A Cs – saves 15 to 25% energy.
- Timer based Energy saver for A Cs – saves 10 to 15% energy.
- Capacitors – minimize cable losses.
- Solar Water Heater.

Beyond Office

- Energy Conservation Initiatives
 - Commuting & Travelling
 - Home
 - Housing Society
 - Community
- Benchmarking specific energy consumption

Thank
You!