

Better M&E at our home



Contact Mr Ruwan Nagahawatta for Any Clarifications
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Home M&E Services

- Electrical System
- Water System
- Ventilation System
- Telephone System
- Laundry
- Kitchen
- Ironing

Paid Services

- Electricity
- Water
- Telephone



Electrical System

- Lighting System
- Heating – Iron/ Kettle/ Geyser
- Refrigerator
- Air Conditioning



Typical Electrical Equipment and Contribution to Electricity Bill

Equipment	Rating (W)	Daily Usage (h)	Consumption per Month (kWh)	Cost per Month (Rs.)
Kettle	1000	0.17	5	90
Fan	60	5.00	9	162
Bulbs	100	6.00	18	324
Refrigerator	150	12.00	54	972
TV	200	6.00	36	648
Radio	40	1.00	1.2	21.6
Iron	600	0.25	4.5	81
Washing Machine	700	0.50	10.5	189
Blender	200	0.17	1.02	18.36
Pump Motor	740	0.17	3.774	67.93
Hot Water Geezer	1000	0.25	7.5	135
A/C	900	4.00	108	1944
Computer	200	3.00	18	324

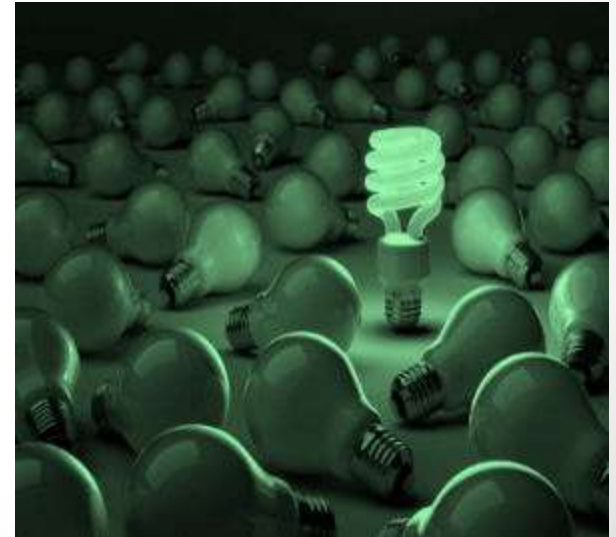
How to reduce the electricity cost

- Identify the key contributors
- Study the equipment characteristics
 - Ex: Fridge
 - Wattage
 - Year of Manufacture
 - Purchased Year
- Study the usage pattern
- What are the key contributions in increase in energy
 - Ex: For Fridge
 - Weather
 - How often you open the door
 - Storage and usage plan for week
- Plan How can I change my electricity usage

How to select efficient lighting system for your home

Types of lights available in the market

- Incandescent
- Fluorescent
- CFL
- LED
- Halogen
- Sodium vapor

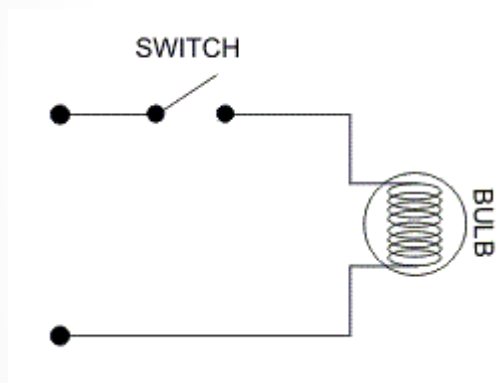


Overview of commonly used lights at our houses

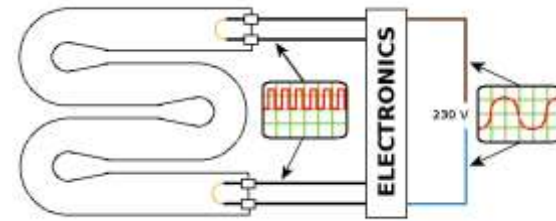
Incandescent/CFLs / LEDs

➤ Circuit Arrangements

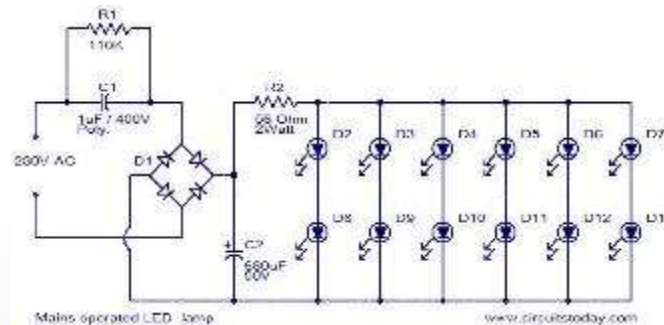
Incandescent Bulb



CFL



LED Bulb



➤ Energy Chart

	incandesc ent bulbs	CFLs	LEDs
			
450 lumens	40 W	10 W	5 W
800 lumens	60 W	13 W	10 W
1100 lumens	75 W	16 W	15 W
1600 lumens	100 W	20 W	19 W

➤ Calculation Example

At the average rate of Rs. 18 per unit,

The cost to operate the 5 nos. of 60W incandescent bulbs for 6 hours a day for 30 days.

$$\text{Electricity Consumption per Month} = \frac{5 \times 60 \text{ W} \times (6 \times 30) \text{ h}}{1000} = 54 \text{ kWh/ Month}$$

$$\begin{aligned} \text{Electricity Cost per Month} &= 54 \text{ kWh/ Month} \times 18 \text{ Rs./ kWh} \\ &= \mathbf{972 \text{ Rs./ Month}} \end{aligned}$$

***With the use of CFLs,
Same light output can be get from 13W CFL,***

$$\text{Electricity Consumption per Month} = \frac{5 \times 13 \text{ W} \times (6 \times 30) \text{ h}}{1000} = 11.7 \text{ kWh/ Month}$$

$$\begin{aligned} \text{Electricity Cost per Month} &= 11.7 \text{ kWh/ Month} \times 18 \text{ Rs./ kWh} \\ &= \mathbf{210.60 \text{ Rs./ Month}} \end{aligned}$$

➤ Calculation Example ctd...

***With the use of LED bulbs,
Same light output can be get from 10W LED,***

$$\text{Electricity Consumption per Month} = \frac{5 \times 10 \text{ W} \times (6 \times 30) \text{ h}}{1000} = 9 \text{ kWh/ Month}$$

$$\begin{aligned} \text{Electricity Cost per Month} &= 9 \text{ kWh/ Month} \times 18 \text{ Rs./ kWh} \\ &= \mathbf{162 \text{ Rs./ Month}} \end{aligned}$$

Bulb	Incandescent	CFL	LED
Electricity Consumption per Month (kWh)	54	11.7	9
Electricity Cost per Month (Rs.)	972	210.60	162
Saving (%)		78.33%	83.33%

➤ Say 'Hi' to LED

Even the initial price is somewhat high you can enjoy more benefits by using LEDs while saving energy and your money.

Why LEDs?

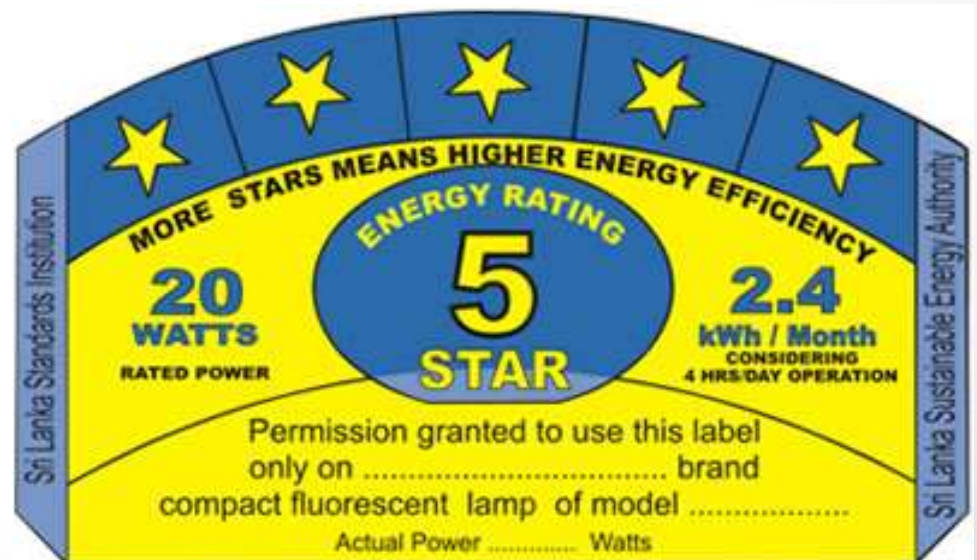
- Longer lifetime
- Eco–friendly, do not contain mercury
- Come in a variety of colors
- Light up immediately, even in cold weather
- Compatible with dimmers and occupancy sensors.



Check for the energy label when purchasing

➤ Available information on the energy label

- Rated power (in W) of the bulb which is given by the manufacturer
- Energy consumption per month based on actual power consumption (Considering 4 hours per day operation.)
- Star ratings which are assigned by evaluating the performance of the bulb.



Better way to select bulb: Shop by “Lumens”

- Have you ever heard about “Lumens” ?

The amount of **energy** required to the bulb is measured by “**Watts**”.

The amount of **light** produced is measured by “**Lumens**”.

- 1 Foot Candles = 1 Lumens per square foot

➤ Standard Foot Candles for Typical House



➤ Calculation Example

Consider the typical living room with 200 sqft.

Standard foot candles is 20 lumens/ sqft.

Total lumens required for the area = 20 x 200 Lumens
= **4000 lumens**

**To achieve above lighting
requirement,**

Either

4 x 16W CFLs

or

3 x 20W CFLs

can be used.

	incandesc ent bulbs	CFLs	LEDs
450 lumens	40 W	10 W	5 W
800 lumens	60 W	13 W	10 W
1100 lumens	75 W	16 W	15 W
1600 lumens	100 W	20 W	19 W

➤ Standard Lumens for Typical House

	Foot Candles	Area in sqft	Lumens
Living Room	10 – 20	200	4,000
Dining Room	30 – 40	150	6,000
Kitchen	30 – 50	150	7,500
Study Room	35 - 75	100	7,500
Bed Room	10 – 20	100	2,000
Bath Room	20 – 50	50	2,500
Hallways	5 - 10	20	200

~~*“Do not check the bulb by “Watts”*~~

“Calculate your own lumens requirement and then convert”

Electrical Fans

➤ Main Types & Energy Consumption

	Low Speed	High Speed
Ceiling Fan	15 – 21 W	48 – 59 W
Pedestal Fan	40 – 50 W	52 – 64 W
Table Fan	38 – 47 W	50 – 61 W

➤ Calculation Example

At the average rate of Rs. 18 per unit,

The cost to operate the ceiling fan for 6 hours a day for 30 days.

$$\text{Electricity Consumption per Month} = \frac{40 \text{ W} \times (6 \times 30) \text{ h}}{1000} = 7.2 \text{ kWh/ Month}$$

$$\begin{aligned} \text{Electricity Cost per Month} &= 7.2 \text{ kWh/ Month} \times 18 \text{ Rs./ kWh} \\ &= \mathbf{129.60 \text{ Rs./ Month}} \end{aligned}$$

With the use of Pedestal Fan,

$$\text{Electricity Consumption per Month} = \frac{57 \text{ W} \times (6 \times 30) \text{ h}}{1000} = 10.26 \text{ kWh/ Month}$$

$$\begin{aligned} \text{Electricity Cost per Month} &= 10.26 \text{ kWh/ Month} \times 18 \text{ Rs./ kWh} \\ &= \mathbf{184.68 \text{ Rs./ Month}} \end{aligned}$$

Fan is the cheapest way to cool yourself

- Advantages

 - Affordable

 - Low operational cost

 - Low maintenance cost

- Disadvantages

 - Not the best method to get your **Thermal comfort**

Air Conditioning

What is Thermal Comfort ?

- Humans can feel **thermal un comfort** due to following two main elements
 - Temperature - Hot sunny day
 - Humidity – We feel thermal un comfort before rain

Thermal comfort is achieved through control of temperature and humidity

- Air conditioner gives true thermal comfort by controlling both temperature and Humidity

Best human comfort achieve at,

Temperature : 20 - 25 °C

Relative humidity : 30 - 60%

Merits & Demerits of using A/C

Merits

- Give best thermal comfort
- Less noisy – compared to fan
- Support good rest/sleep

Demerits

- Expensive- high capital cost
- High operational cost
- No fresh air circulation
- Get addicted
- Maximum life time- 8 years



Typical Power Consumption

9,000 BTU

- Rated power – 0.9 kW
- Daily operational hours – 6 hr.
- Duty Cycle – 0.5
- Daily power consumption – 5.4 kWh
- Monthly power consumption – 162 kWh
- Monthly expenditure – Rs . 1,782.00

12,000 BTU

- Rated power – 1.1 kW
- Daily operational hours – 6 hr.
- Duty Cycle – 0.5
- Daily power consumption – 6.6 kWh
- Monthly power consumption – 198 kWh
- Monthly expenditure – Rs. 2.178 .00

Inverter vs. Non inverter A/C

Inverter A/C

- Variable Speed
- Energy Efficient
- Quiet Sound
- High Initial Cost

Non Inverter A/C

- Fixed Speed
- High Energy Consumption
- Noise
- Less Initial Cost

How to Calculate the Capacity of AC

- Size of the room – Determine the amount of air in the room to be cooled
- Number of people in the room – Each person emits heat and this heat emission to be consider while deciding the AC capacity.
- Amount of stuff kept in the room – AC unit need to cool each of these items
- Number of electrical appliances in the room – Electrical equipment like lights emit heat
- Windows in the room – More windows, more heat coming from out side
- Wall facing the sun – It increase the room temperature

Calculating Required AC Load

- Measure the length of the room - 10 ft
- Measure the width of the room - 20 ft
- Calculate the area of the room - $10 \times 20 = 200$ sqft
- According to normal condition it will required 60 BTU/hr to cool 1sqft of area
- Required AC capacity - 200×60 BTU/hr
 $= 12,000$ BTU

How to save electricity with the use of A/C

- Select correct AC-
 - Inverter or non inverter
 - Day use or Night use
- Select correct capacity
- Use correct temperature
- Regular cleaning and maintenance
- Fix air openings to prevent air supply from out side

Refrigerator

Inverter vs. Non inverter Refrigerator

Inverter Refrigerator

- Variable Speed
- Energy Efficient
- Quiet Sound
- High Initial Cost

Conventional Refrigerator

- Fixed Speed
- High Energy Consumption
- Noise
- Less Initial Cost

➤ Calculation Example

At the average rate of Rs. 18 per unit,

The cost to operate the traditional refrigerator for 12 hours a day for 30 days.

$$\text{Electricity Consumption per Month} = \frac{150 \text{ W} \times (12 \times 30) \text{ h}}{1000} = 54 \text{ kWh/ Month}$$

$$\begin{aligned} \text{Electricity Cost per Month} &= 54 \text{ kWh/ Month} \times 18 \text{ Rs./ kWh} \\ &= \mathbf{972 \text{ Rs./ Month}} \end{aligned}$$

With the use of inverter refrigerator,

$$\text{Electricity Consumption per Month} = \frac{72 \text{ W} \times (6 \times 30) \text{ h}}{1000} = 25.92 \text{ kWh/ Month}$$

$$\begin{aligned} \text{Electricity Cost per Month} &= 25.92 \text{ kWh/ Month} \times 18 \text{ Rs./ kWh} \\ &= \mathbf{466.56 \text{ Rs./ Month}} \end{aligned}$$

How to save electricity with the use of Refrigerator

- Select correct refrigerator -
Inverter or Conventional
- Reduce the frequency of door opening
- Place vegetables with the covering bag
- Do not place foods with high temperature
- Set the temperature as per the weather condition and food inside the fridge
- Keep storage based on weekly consumption
- Plan your shopping and don't fill your fridge with unnecessary stuff

Plumbing & Water System

Water Saving

Water consuming devices at our homes

- Water closets
- Taps
- Showers
- Washing machine

Water Closets - WC

- Person use toilet averagely 6 times per day.
- In each time standard water closet consume 6 L of water for flushing.

How to Reduce Water Consumption Per Flushing

- Use dual-flush toilet where you have separate liquid flush and solid flush system.
 - Conventional toilets can use 6 to 7 Liters of water per flush, but low-flow toilet models use as little as 3 to 4 Liters of water per flushing.



Small flush – For liquid waste , 2 to 3 liters
Large Flush – For solid waste , 4 to 5 liters

	Conventional Flush Toilet	Dual Flush Toilet
No of Persons in family	6	6
No of flushing per person per day	6	6
Volume of water consumed in per flushing	6 L	4 L
Volume of water consumed for flushing in one day	216 L	144 L
Total volume of water consumed for flushing in one month	6,480 L	4,320 L
Number of water units for flushing	6	4
Water Bill Per month	Rs 120.00	Rs. 80.00

Shower

- Conventional shower heads comes with 15 to 20 lpm flow rate.
- Normal person spend 4 to 5 minutes under shower.

How to Reduce Water Consumption During shower

- Spend less time in the shower
- Turn off the water during sopping
- Install a low-flow showerhead with a flow rate of less than 10 lpm
 - Aerating showerhead - Mixed air with water, forming a misty spray
 - laminar-flow showerhead - Form individual streams of water



	Conventional Shower head	Low – Flow Shower Head
No of liters per minutes	15 L	10 L
Average time under shower	5 min	5 min
Volume of water consumed During Shower per day	75 L	50 L
Total volume of water consumed for flushing in one month	2,250 L	1,500 L
Number of water units for Shower	3	2
Water Bill Per month	Rs 60.00	Rs. 40.00

Bath & Taps

- Bath tubs consume more water than shower – Stick to shower and use bath tub occasionally.
- Shift to low flow faucet aerator from conventional water tap which reduce water consumption by 50%.



- The aerator screwed on tip of the faucet will control the water flow

Standard Taps

- 3 Liters per minutes
- Water flow comes without mix with air
- Less initial cost
- Warranty for 1 years



Low flow faucet aerator

- 1.9 Liters per minutes
- Flow comes as mixture of air and water
- High initial cost
- 10 to 15 Years of warranty



Washing Machines

Top Load Washing Machine



- Consume 100 to 120 liters of water per load
- Moderate energy consumption – Rated Power 0.9 kW

Front Load Washing Machine



- Consume 60 to 75 liters of water per load
- Low energy consumption – Rated Power 0.7 kW

Available Options in Washing Machine

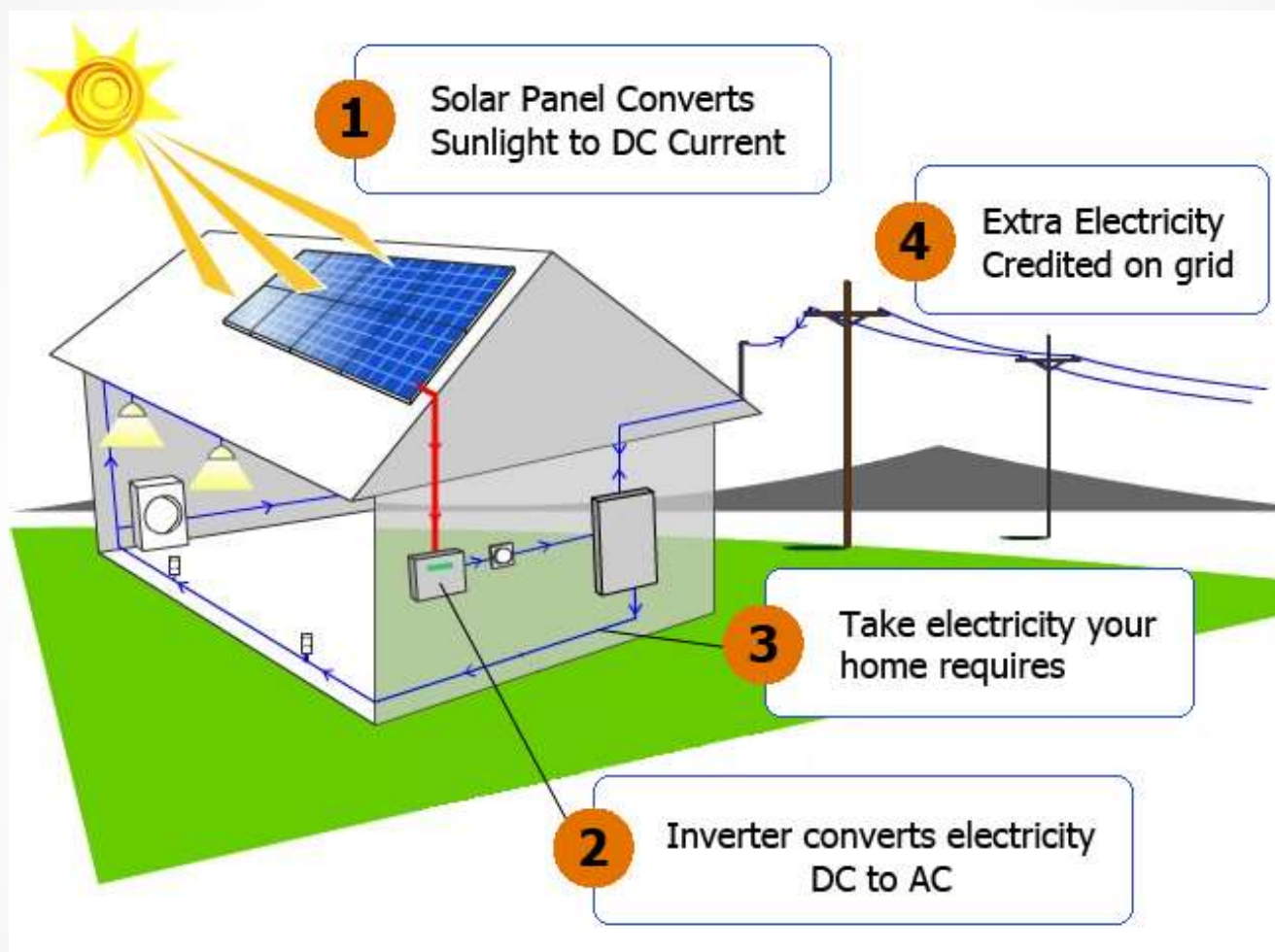


Solar Panels for Own Power Generation

- Available system
 - Net metering
 - Net accounting



How net metering works



- Produced energy is used for house consumption only.

Electricity bill with net metering

NET METERING

DEC-2016
 C-41-P-035
 Homagama
 24-29-007.00
 4113167400
WPS 2
WPS 2 DEC-2016
 14.298
 4113167400 **12**
 4113167400

R. T. NAGAHAWATTE
 531/S, BORELLA RD.,
 KOTTAWA
 PANNIPITIYA

1,154.60CR
 1,184.60CR + 30.00
 1,154.60CR

1-28	27-56	57-84	85-112	113-121
28	28	28	28	9
7.85	7.85	10.00	27.75	32.00

0	0.00	30.00	0.00	30.00	0.00	0.00
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1,154.60CR

දින	මීටර් කියවීමේ අගය	මීටර් කියවීමේ අගය
16-11-25	122	2259
16-12-19	65	149

30.00

1124.60

16/12/20

4113167400

Please do not detach

Payment by

12

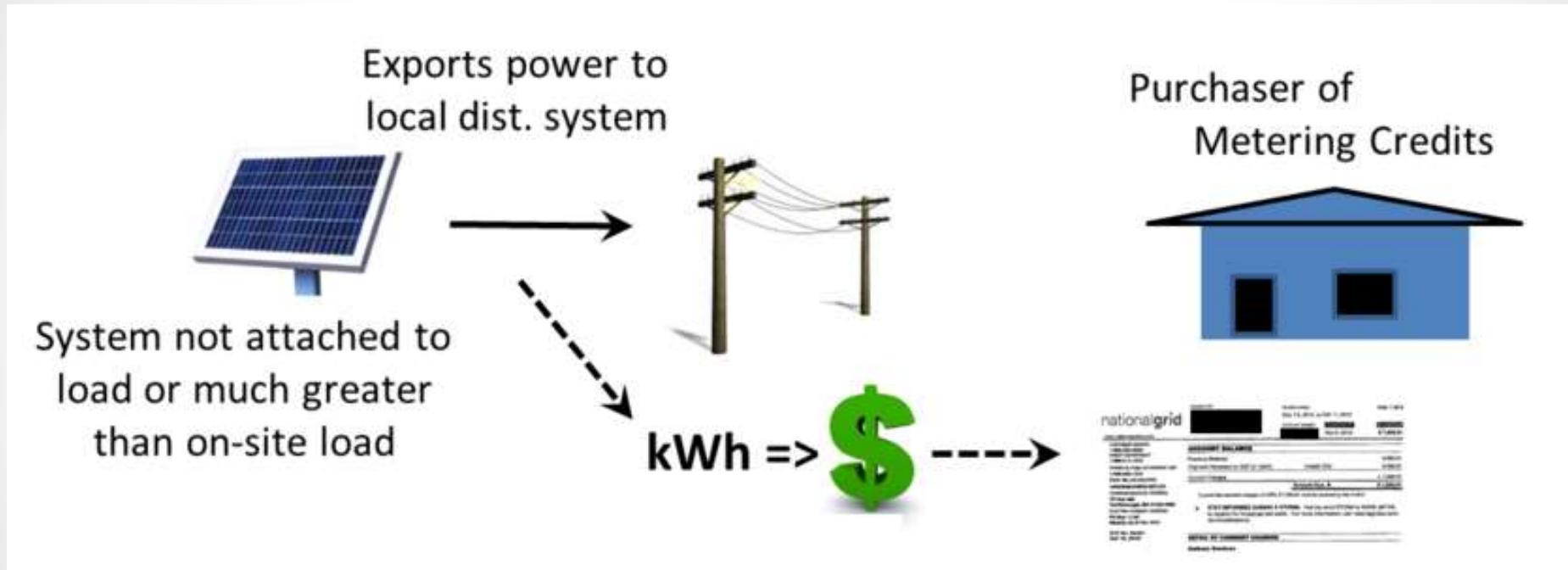
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124.60

16/12/20

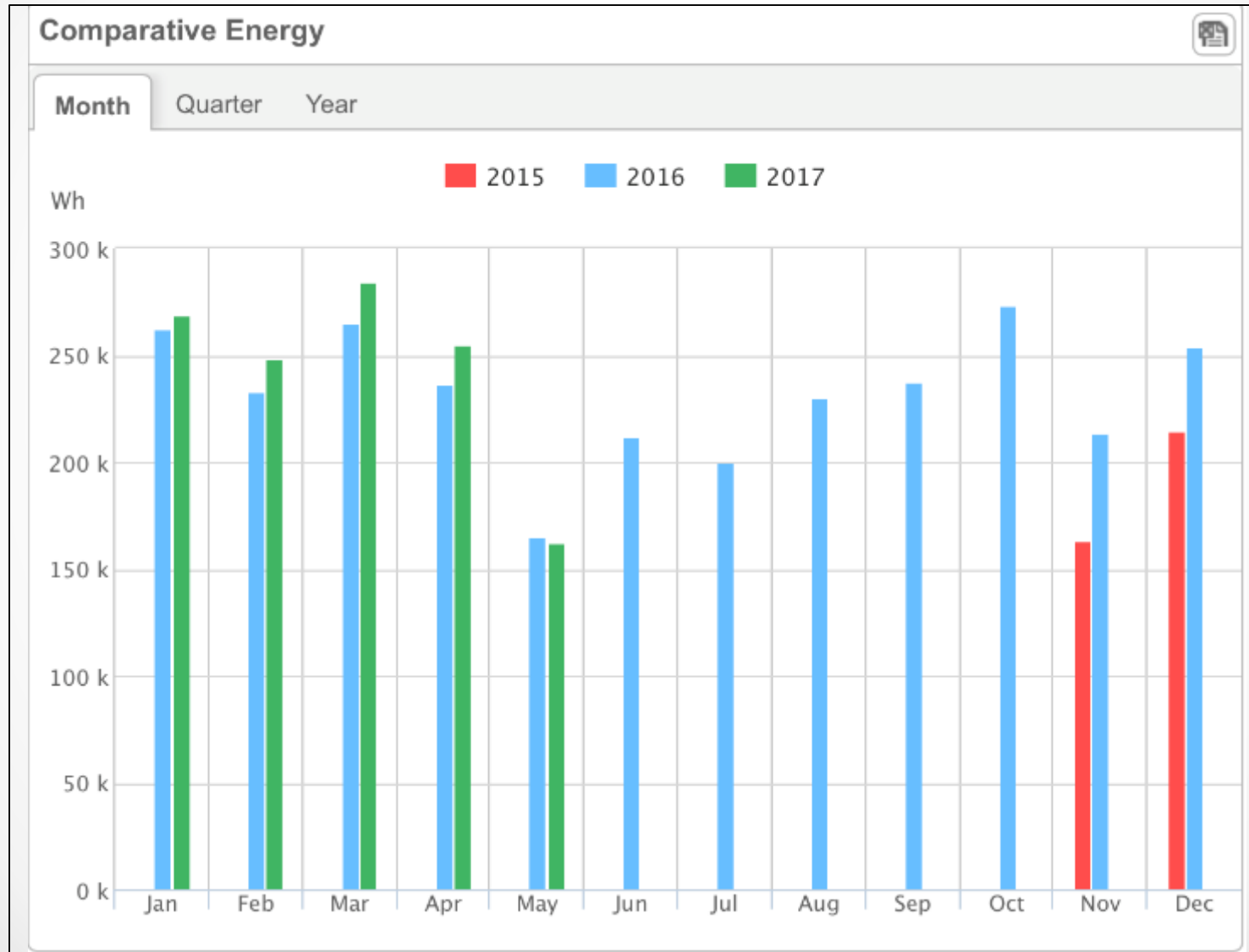
4113167400

How net accounting works



- Produced energy is used as the revenue.

Typical Power Generation of 2kW Unit



Your Contribution to the Environment

Environmental Benefits



CO2 Emission Saved
1,720.75 kg



Equivalent Trees Planted
5.75



Light Bulbs Powered
13,302.02 For a day

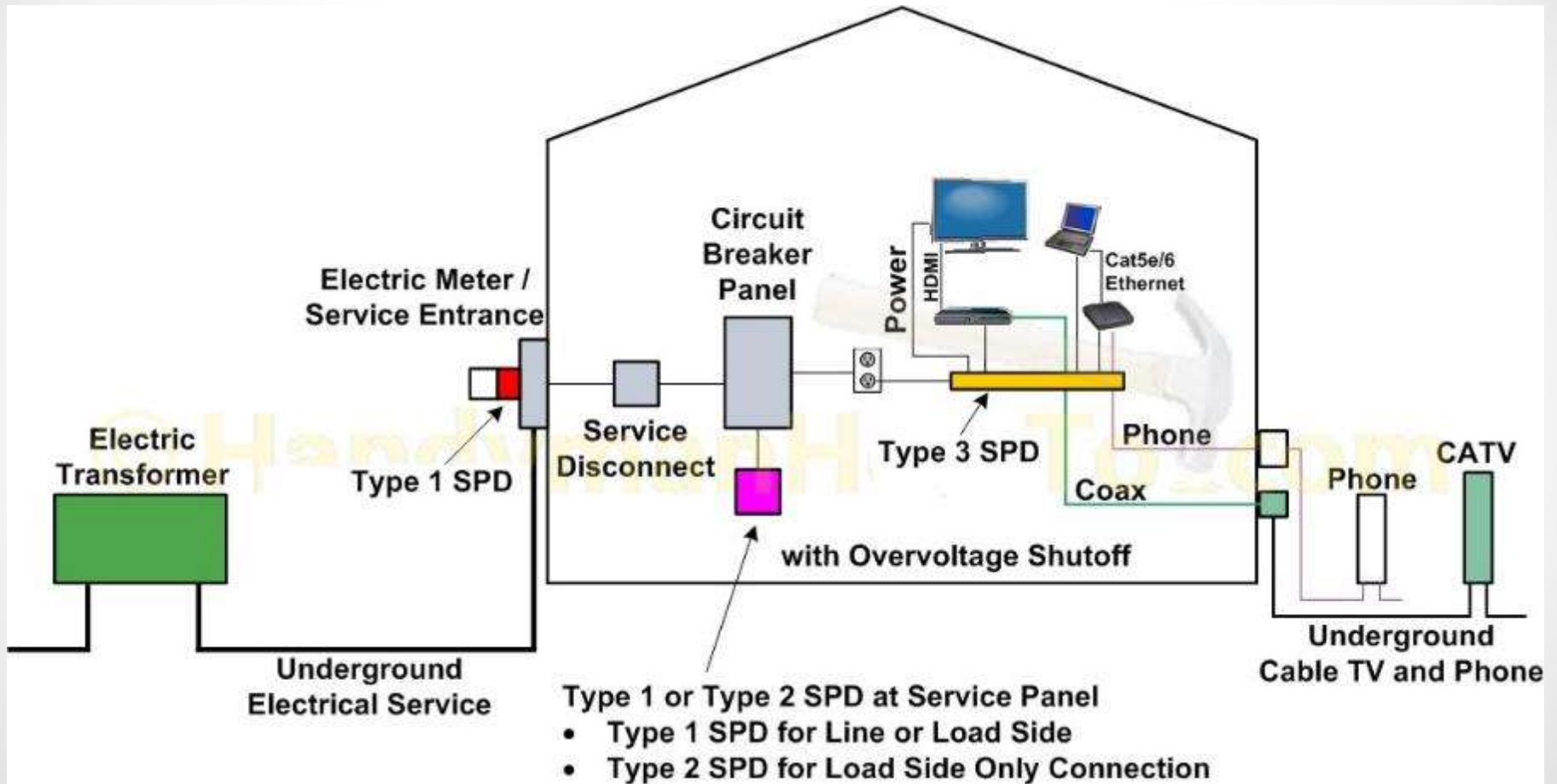
Electrical Safety

Electrical Safety at Home

- Protection from Lightning
- Check for the functioning of RCCB
- General practicing



➤ Use of individual SPDs for sensitive items



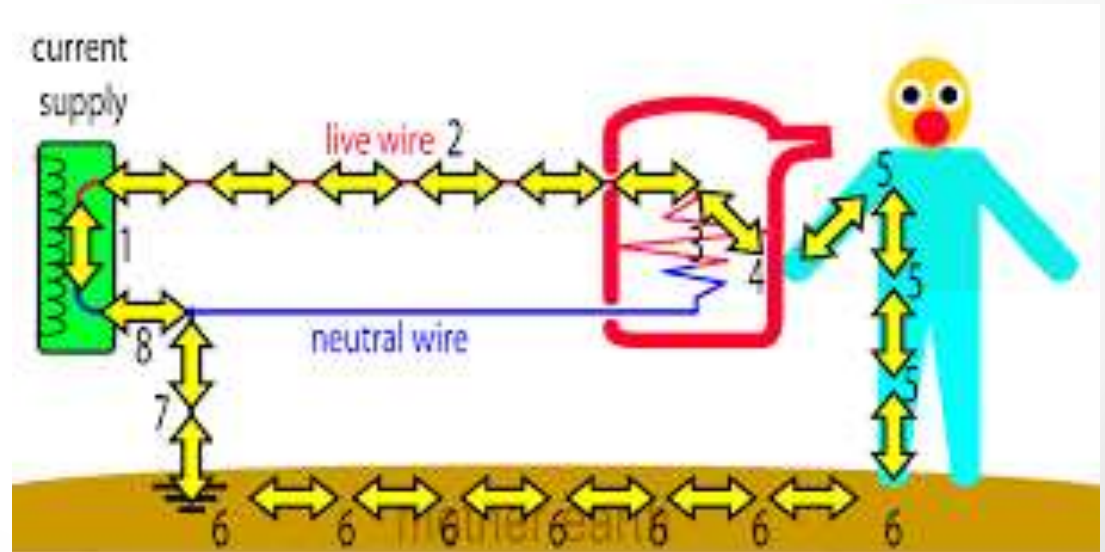
2. Checking for the functioning of RCCB

➤ Electrical Shock

- Creates the current that passing through the human body

➤ Severity of the shock depends on

- Amount of current
- Length of the time



➤ RCCB is protect human from electrical shock by tripping off the device

➤ Check for the functioning



1. Push the test button marked "T".



2. Circuit breaker switch will trip

3. General Practicing

- Check electric cords often for damage.
- Do not overload electric outlets with too many items plugged in at once.
- Water and electricity do not mix.
- Never stick any hairclips, tools or anything except electric plugs into electric outlets.
- Unplug any appliance that emits sparks or that does not work properly.
- Always unplug an appliance before cleaning or repairing it.
- Remember that a turned-off appliance is still connected to electricity until it is unplugged.
- Limit use of extension cords. Make sure the cord is the appropriate size for use.

Thank You