Renewable Energy Saves the World

Saurabh Pandey[1], Shubham Pandey[2]
[1]Department of Electrical and Electronics Engineering, Bhilai Institute of Technology Raipur,
[2]Department of Mechanical Engineering, R. I. T. Raipur

***Abstract* - Is it true that renewable energy saves the world? Most maniacal and punctilious scientists explained through their work papers that renewable energy is a backup for the world when non-renewable energy sources are getting razed. Those backup used are like there are so much appliances having high wattage which consumes our electricity at high cost. Taking care of our household energy can lower our annual power costs without making our home less comfortable, but making it more valuable. The purpose of this paper is to show how to turn an ordinary home to a more energy-efficient one with less wattage consumptions. Also, there has been a trend of increasing price of petrol and diesel that left the public in a dilemma of going for a two-wheeler or not. So for this problem, this paper gives a theory how to use the electric motorcycles in a better way so that it fights with the problems of global warming, fuel consumption and pollutions.**

***Index Terms* – Electricity saving, Petrol Cost, LEDs, Electricity Bike, Renewable Energy**

I. INTRODUCTION

India is a country with more than 1.2 billion people accounting for more than 17% of world's population. It is the 7th largest country in the world.As mentioned in the survey that 72% of the total electricity generated through thermal process having a use of coal which is a non-renewable energy resources and it also described that because of large use of coal, the quality and quantity of coal are getting less. Due to this one time came when non-renewable resources (Coal, Lignite, Petroleum and Natural Gas) are razed and we came to Candle age. This is not only for coal, apart from this Petroleum, which we use for riding our bikes and cars on road are getting less. So, for the saving of valuable non-renewable resources, some ways generate that can save and would use as a backup with the help of some renewable resources like Wind, Small Hydro, Solar, Biomass, Cogeneration Bagasse, Dynamic process etc. As seen in last 5 years that the environmental and electrical problems in India are growing rapidly. Electricity is a form of energy, is a basic part of nature and is one of our most widely used forms of energy.We get electricity, which is a secondary energy source, from the conversion of other sources of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources. Many cities and towns were built alongside waterfalls that turned water wheels to perform work. Before electricity generation began slightly over 100 years ago, we use kerosene lamps, and rooms were warmed by wood-burning or coal- burning stoves. Direct current (DC) electricity had been used in arc lights for outdoor lighting. The modern age has, therefore, been truly called the "age of electricity."So today our whole life style is dependent on electricity with the increasing population the use of electric power is also increasing.

But we know that the resources to generate electricity are limited, and this has lead to the energy crisis. Also, two wheeler Industries in India are flourishing a fast rate. But Indian motorbike is second largest in the world. Major two wheeler giants have entered into market in 2009.Motorcycles are one of the most affordable forms of motorized transport in many parts of the world and, for most of the world's population; they are also the most common type of motor vehicle. In today's world of crisis; economy, financial, job, and fuel to name a few, getting a motorcycle that is fuel efficient has taken a higher priority than what it would have been a few years ago. Many people nowadays don't buy a motorcycle not because of the engine size, speed, looks, price and brand name but because of the higher fuel rate. Fuel consumption is something that you pay attention to, especially with record high oil barrel prices from last year still fresh in your mind.

II. PROBLEM OVERVIEW

Electricity and Innovation in India are the big problem which is faced by a person who resides in the country? The problems regarding electricity and petrol are rising day by day. The entire appliance that used to make a home efficient is just work because of electricity. And this gives very big problems.The equipment's that we are used frequently in day to day life without thinking about the consumption of electricity and its future harmness. From a survey, it seems that in so many homes some equipment's like Lighting, TV, etc. Are left start after work without switching off. This consumes lots of electricity. Actually the main problem in today scenario is that no one wants to know about the watt and the ratings of the appliances used in their homes. No one have enough time to check about their specifications that are mentioned in that appliance or even not want to know this things before earning the appliance. They just go to shop, see the appliance that it works properly or not and firstly see the cost of that appliance at the time of earning. If there is too high having less watt then the person not interested to buy but if the appliance having more watt and its cost is less compared to that one having less watt, the person take heavy watt appliance and use and after one month when the electricity bill comes then due to heavy watt consumption, the electricity bill comes so high which the person think that there is a mistake of either electricity generating company or the meter has a defected one which read such a large reading but it is wrong. This is our own mistakes. There is an another problem that many people not even know all the appliances and equipment's like we know CFL bulbs but we not know LED tube lights which is more efficient and energy conserved material. A 4 watt LED bulbs is equal to a 13 watt CFL bulbs in all type of configurations. Also some peoples think

that a zero watt bulb actually consumes zero watts. But this is totally wrong. A zero watt bulb is actually a 15 watt bulb and due to this, all persons can leave that bulb in ON position and due to this lots of electricity could be consumed.

This problem is not related to electricity only. It continues with the highly consuming petrol too.For this vehicle play a very big role in entire country not only in India, but also in whole world. Vehicle emissions are responsible for 70% of the country's air pollution. The major problem with government efforts to safeguard the environment has been enforcement at the local level, not with a lack of laws. Air pollution from vehicle exhaust and industry is a worsening problem for India. Exhaust from vehicles has increased eight-fold over levels of twenty years ago. There are the major pollutants from motor vehicles are particulate matters, Hydrocarbons, Nitrogen oxides, Carbon monoxides and dioxides, sulphur dioxides, greenhouse gases and most hazardous air pollutants that are toxic and really harmful for health. As seen from survey, 1,510 x 10^6 tons CO_2 are emitted every year in India. Due to these gases so many disease are spreading over the world like Asthma, Lung cancer, Emphysema, Heart disease, chronic obstructive pulmonary disease etc. This type of gases is released by bikes, cars, buses, trucks, etc. Following graph represents cars and motorcycles population in overall world.

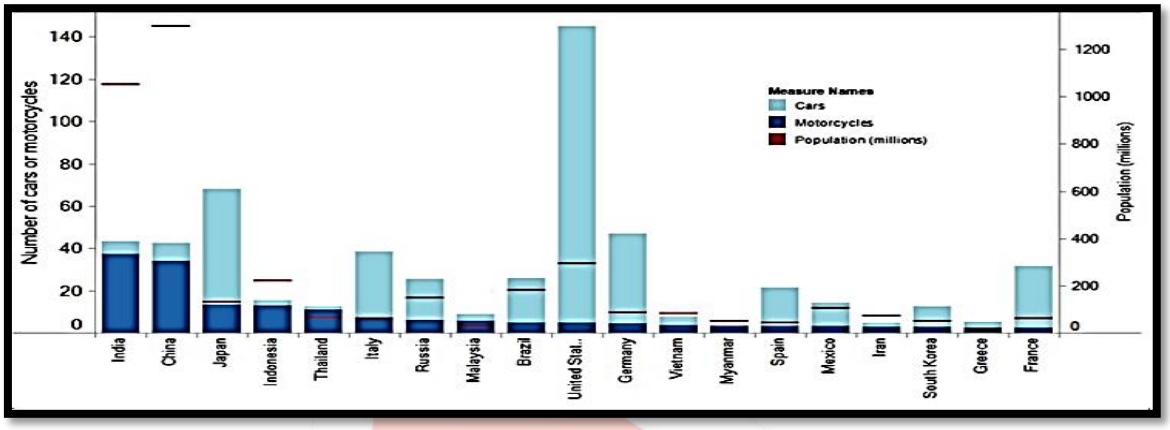

Figure1.Cars and motorcycles populations in different countries

So such technologies generate which can gave speed but is eco-friendly also so that disease and pollution caused by emission of gases from vehicles can be prevented.

III. ENERGY SCENARIO

Energy is one of the most important building blocks in human development, and, as such, acts as a key factor in determining the economic development of all countries. It is the prime mover of economic growth and is vital to the sustenance of a modern economy. Future economic growth crucially depends on the long term availability of energy from sources that are affordable, accessible and environmentally friendly.India ranks fifth in the world in total energy consumption and needs to accelerate the development of the sector to meet its growth aspirations. The country, through rich in coal and abundantly endowed with renewable energy in the form of solar, wind, hydro, and bio-energy has very small hydrocarbon reserves (0.4% of the world's reserve). Due to less production of electricity and very large consumption of electricity, we have to conserve electricity. The generation of electricity in India has been increased rapidly in the past decade, and is higher than the rest of other countries.

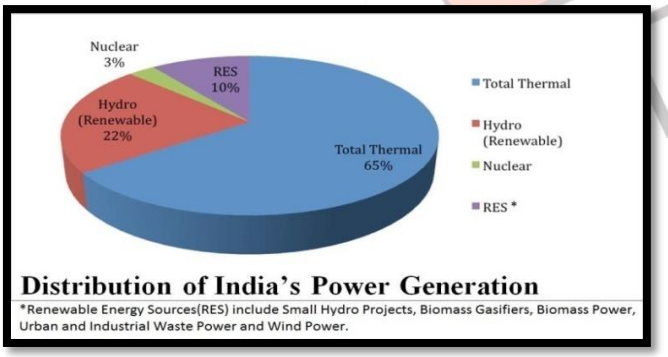

Figure2. Distribution of India Power Generation

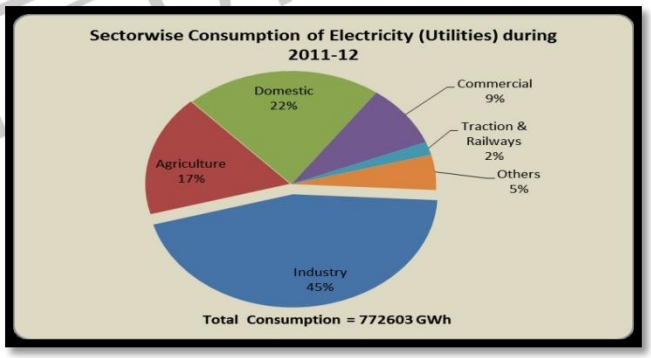

Figure3. Sector wise Consumption of Electricity.

Total Electricity Generation in the country, from Utilities and Non-Utilities taken together, during 2011-12 was ***1,051,375 GWh***. Out of this ***759,407 GWh*** was generated from Thermal, and ***130,510 GWh*** was from Hydro and ***33,286 GWh*** was generated from Nuclear Sources. Total output from non-utilities was ***128,172 GWh***. The estimate electricity consumption increased from ***43,724 GWh*** during 1970-71 to ***7,72,603 GWh*** during 2011-12. The increase in electricity consumption is 11.26% from 2010-11 ***(6,94,392 GWh)*** to 2011-12 ***(7,72,603 GWh)***. Of the total electricity sales in 2011-12, Industry sector accounted for the largest share (44.84%), followed by ***Domestic (22.01%), Agriculture (17.30%)*** and ***Commercial sector (8.97%)***.According to the survey chart, the production of electricity in year 2012 is **835.3 billion KWh** and the consumption of electricity in year 2012 is **600.6 billion KWh**. It means that the saving of electricity in year 2012 is only **234.7 billion KWh** which is very serious matter. And is seen that mostly electricity is consumed in Industry and Domestic sectors and these two sectors are consumed lots of electricity.

- Total appliances – 47,782 watt consumed per day
- Total appliances – 53 items (all included)

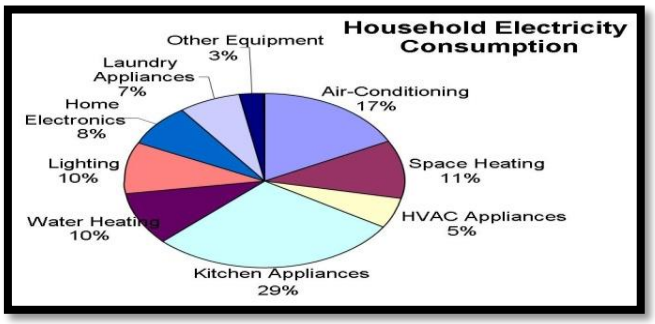

Figure4.Household Electricity Consumption

IV. RESEARCH

4.1. INCANDESCENT BULBS

Figure5. Different shapes of Incandescent bulbs.

These types of bulbs called Incandescent bulbs are available in various variants: 40W, 60W, and 100W which are most inefficient in terms of energy consumption. 90% of the energy they consume is lost as heat and only 10% is converted into useful light. Due to cheap cost (PRs. 10/-), a lot of household still use. Most common wattages of incandescent bulbs that are available in Indian market are from 15 to 100 (although some high wattage bulbs of 200, 300 and 500) are also available. These bulbs come in 3 different types of shapes: round, tapered and flat top are as shown.

- **Note -The bulb available in market named "zero watts" bulb is actually 15 watts bulb**.

Wattage	Lumens (brightness)			MRP
	Round	Tapered	Flat	
15 W	110			12.00 PRs.
25 W	230	210		15.00 PRs.
40 W	415	400		15.00 PRs.
60 W	710	660	760	15.00 PRs.
75 W	935		1000	
100 W	1450			18.00 PRs.
200 W	3040			25.00 PRs.
300 W	4530			62.00 PRs.
500 W	8150			87.00 PRs.

Table1. Incandescent bulbs wattage and MRP rates.

4.2. FLUORESCENT TUBE LIGHTS

The fluorescent lamps are better than Incandescent bulbs (50 – 70% better in providing same amount of light) and they have been there in the market since quite some time. It started coming in the form of tube lights and later graduated to come in form of CFLs. A typical Fluorescent lamp has a ballast to stabilize the current through that lamp and a tube. In past tube lights used coming with electromagnetic ballast which caused the lights to flicker on start. But now a day we get electronic ballast which prevents the fluorescent lamp to flicker. Electromagnetic ballast consumes more electricity than electronic ballast. Tube lights are also available in various variants: T12, T8 and T5. These numbers represent the thickness of the tube light. The number is smaller, the efficiency is higher. **T5 tube lights with electronic ballast are the best available fluorescent tube lights options in the market.** A T12 tube light with electromagnetic ballast typically consumes 55W of electricity but a T5 with electronic ballast will consume only 28W of electricity. Thus a T5 provides about 50% electricity saving over a regular T12 tube light. Although T5s are little expensive, the payback is within a year. Also their life is quite good and they last for 3-4 years at least.

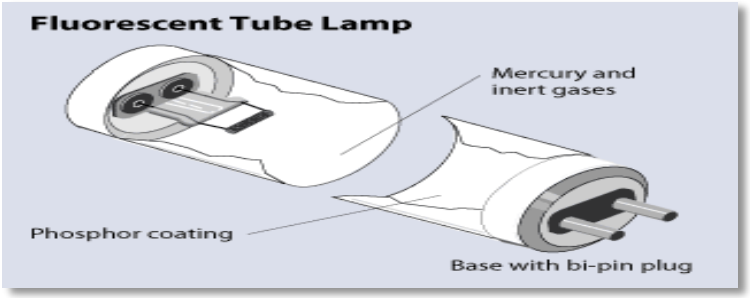

Figure6. Fluorescent Tube Light Lamps.

Variant	Power Rating	Ballast Type available	Power Rating with Ballast (Power consumption)
T – 12	40 Watts	Electromagnetic (15 Watts) Electronic (3 Watts)	55 W (electromagnetic) 43 W (electronic)
T – 8	36 Watts	Electromagnetic (15 Watts) Electronic (3 Watts)	51 W (electromagnetic) 39 W (electronic)
T – 5	25 Watts (for 4 ft. long tube) 13 Watts (for 2 ft. long tube)	Electronic (3 Watts and 1 Watt for 4 ft. and 2 ft. tubes respectively)	28 W (for 4 ft. long tube) 14 W (for 2 ft. long tube)

Table2. Fluorescent tube light with ballast type and power rating.

Type	Wattage	Lumens		MRP
		Cool Daylight	Warm Daylight	
T – 5	13	1150	1250	130.00 PRs.
T – 5	25	2500	2700	140.00 PRs.
T – 8	36	2425		45.00 PRs.
T – 8	36	3250		125.00 PRs.
T – 12	40	2450		45.00 PRs.

Table3. Wattage and MRP of Fluorescent Tube lights.

The prices above are just for tubes and not for the tube light fittings and ballasts. They come for extra cost. Also their wattage is only for tubes only. Their ballast occur an additional wattage.

4.3. COMPACT FLUORESCENT LAMPS (CFLs)

Wattage	Lumens		MRP	
	Linear	Spiral	Linear	Spiral
5	210 - 220	210 - 285	PRs 145.00	PRs 160.00
10	580		PRs 160.00	
15	788	875	PRs 175.00	PRs 195.00
20	1120	1185	PRs 195.00	PRs 235.00
25		1500		PRs 275.00
30	1800		PRs 325.00	
35		2350		PRs 490.00
45		2900		PRs 625.00
65		3975		PRs 750.00

85		5250		PRs 850.00

Figure7. Different shapes of CFLs.

Table4. Wattage, Lumen, and MRP of CFLs.

CFLs have been regarded as the best energy saving option in our country since quite some time. CFL is a variant of fluorescent lamps but has a different application.CFLs act as a point source of light (light originating from one point) whereas tube lights are line source (tube lights have bigger lengths) and thus the area covered by tube lights is lot more than that of CFLs. That's why people feel that CFLs produce lesser lights than tube lights. Even with equal wattage (2x14W CFLs) the amount of light is felt lesser than a T5 tube light (of 28W).CFLs provide up to 70% energy savings over a typical incandescent bulb. A compact fluorescent light bulb (CFL) is fluorescent lighting designed to be used in a standard (incandescent) light bulb socket. Fluorescent lighting works by passing a current through a gas-filled tube. Incandescent light works by heating up a metal filament until it is white-hot. They are available in 2 shapes: linear and spiral as shown in figure.

4.4. LIGHT EMITTING DIODES (LEDs)

Figure8. Different types of Light Emitting Diode Bulbs.

LEDs are the latest and most efficient lighting option which is available in the market. Their electricity consumption is 50% less than that of CFLs and fluorescent lamps for the same amount of light. LEDs also are long lasting with a life of about 10-25 years and their performance remains the same throughout their lifetime (Tube lights and CFLs get dim with time). Although a little expensive (with a payback of about 2 years), the benefit with LEDs is that it is maintenance free. Once installed, it will not need any repair of change for at least 10 years. A lot of companies manufacturing LED options give replacement warranty for up to 10 years which makes the option even more attractive.

Wattage	Initial Flux	Life expectancy
1 W	80 lm	> 35000 Hours
2 W	180 lm	> 35000 Hours
3 W	202 lm	> 35000 Hours
5 W	316 lm	> 35000 Hours
6 W	445 lm	> 35000 Hours
8 W	750 lm	> 35000 Hours

Table5. Wattage, Lumen, and MRP of CFLs.

This all works on 90 ~ 145 V AC input voltage having a beam angle of 270° and all this have E 27 base so as to fit in the normal bulb socket.

Also the electricity comes in now road travelling section too. Here, petrol is coming at a high cost. Recently it is PRs 75.84 which is very high for a normal middle class person and non-affordable for villagers. So for this problem, many solutions arise but the one who got high performance id Electric bike named YO-Bike. This two wheeler scooter was launched by company named ELECTROTHERM (India) Ltd under the brand name YO-bike in India on a national in an organized manner. YO-bikes are battery-operated, economical, and Zero Tail Pipe Emission two wheelers. YO-bikes are based on electrical technology where the rechargeable battery replaces the conventional engine. YO-bikes can be charged as easily as a mobile phone wherever electric power connection is available. Once fully charged YO-bikes can travel up to 75kms* in one charge depending on the load, speed &road condition. What's more, for a fractional cost of just PRs 50 YO-bikes can runs for 500kms*. **This means forever freedom from the expensive petrol.**

Figure9.YO – Bike

Table6.Technical specifications of a YO-bike.

Technical Specification of YO-Bike	
Vehicle Specification	
Length x Width x Height	1785mm x 650mm x 1060mm
Vehicle Weight	109 Kgs
Battery	
Type	VRLA Deep Discharge
Capacity	33 Ah
Electricity Consumption	1.6 units
Charging time	6 to 8 hours
Motor	
Type	BLDC (Hub motor)
Output power (watt)	750 Watt
Operational Specifications	
Max. Speed	45 Km/hr.
Max. Range	70 – 75 Km
Pay Load capacity	130

But as seen that the speed of this scooter is very low that is 30 - 45km/hrs. And this YO-bike is not used for all time means that it can be charging for maximum of4 to 8 hrs. Per day and it can give only an output of 70 to 75 km* at one full charging. That is not sufficient in today's time. It means that this YO-bike has a disadvantage of longer "fill up" or recharge time and lower maximum speed at similar price points.

V. METHADOLOGY

5.1. Electricity Consumption through Lighting

As we not realise it, but electricity consumption be one of the most environmentally destructive activities that we involved in. Every time when flick on a light switch or notch up the AC or cooler to cool down our home, we pollute our environment and contributing in global warming. How can this be? Electricity is mostly generated by burning fossil fuels (coal, oil and gas) and these results in air pollution and the release of vast quantities of greenhouse gasses. These greenhouse gasses lead to global warming, which will change the face of the Earth as we know it. But what can we do about it? It seems that use only that amount of electricity that we need saves our electricity for future. Slashing our electricity use saves us money on our monthly bills as well as doing the environment a favour - two very good reasons to make that extra bit of effort .And the electricity that an appliance consumes most is lights. We just flick on the light switch and then we forget the switch at on position. This consumes lots of electricity. In Lightning, as we clear from above that CFLs (Compact Fluorescent Bulbs) and LEDs (Light Emitting Diodes) are much helpful than all other bulbs and tube lights moreover LEDs bulbs and Tube lights are much better then CFLs Bulbs in Saving Electricity. Let us take some facts so as to see that which one is more suitable for lightning.

5.1.1. How much Lightning is good lightning for a room?

In past if we see we had always compared brightness of a light by comparing wattage of the bulbs. But after CFLs we realized that same amount of light we achieved even in lesser wattage also. So next question arise is "Is watt a good representation of Brightness"? The sensible answer is NO. The actual technical term for brightness is Lumens. More the Lumens, Brighter the Light is.

Incandescent Watts	CFL Watts	LED Watts	Lumens (Brightness)
40	8 – 12	4 – 5	450

60	13 – 18	6 – 8	890
75 – 100	18 – 22	9 – 13	1210
100	23 – 30	16 – 20	1750
150	30 – 55	25 – 28	2780

Table7. Lumen (Brightness) of all 3 types of Bulbs with Watts.

Type	Lumens (Brightness)
T12 40W 4ft	2800
T8 36W 4ft	2700
T5 28W 4ft	2750
T5 14W 2ft	1275

Table8. Lumen (Brightness) of all types of Tube lights with Watts.

Through this we explain the lumen (brightness of different kinds of bulbs and tube lights.

5.1.2. Is it better to use multiple CFLs instead of a tube light?

Yes, but it depends. If we use all the CFLs at same time then the total wattage may be more than the wattage of a tube light. But if we use only one CFL at a time, then the total wattage will be much less than a tube light. Also its make clear that to get brightness equivalent to a tube light, maximum 3 or more CFLs will be required in a room, which will make the wattage requirement more than a tube light

5.1.3. What is LED and how it differs from other types of lights?

LEDs are a member of type of lighting most commonly referred as solid-state lighting. This type of lights illuminate when current passes through a semiconductor material. They produce more "lights" and comparing very less "heat". In comparison an incandescent bulb lights up when filament in it heats up. Thus it releases 90% of its electricity as heat. CFLs or tube lights light up when electricity current is passed through tube containing gases. CFLs also release heat but less compared to incandescent but very much more than LEDs. The other difference is that LEDs are unidirectional (or emits light in a specific direction but incandescent and CFLs emit light in all directions.

Figure10.Different types of Bulbs with Heat and Light description.

5.1.4. What are the different parts of LED bulb?

Typical LED bulbs contain one or multiple LED chips mounted on a circuit board that is programmed to control the LED lighting. The whole thing is mounted on a heat sink to manage the heat generated from LED.

5.1.5. What are LED beam angles and how to use them?

As we said, LEDs are unidirectional or emit light in a specific direction, it is important to figure out the right spread of a LED light in degrees before using it. This spread is mentioned on LEDs as beam angle. Typical beam angles that are available in the market are 15, 30, 45, 60 and 100 (with some very few with 120 and 180 as well). Beam angles less than 30 are excellent for spotlights. Their output (brightness) or lumens per watt is highest available in the market. Most of them have wattage of less than 5 and are of great use in Shops (where focused lighting is needed on products), Workshops where a specific work is to be done or at homes where specific area has to be focused with decorative lighting. One or more such lights can be used near walls as spotlights. A 30-45 degree beam angle is good if the ceiling is high (more than 10-11 ft.). If the ceiling is less than that, then it is better to use 60-100 degree beam angle. Housing societies can benefit by using LED street lights.

5.1.6. LEDs Tube lights

T8s LED fluorescent light is the next generation solution to replace conventional fluorescent lights. They give high efficiency, more reliability compared to the previous generation. They are using very well in homes, office, museums, galleries, shop windows, hotels, restaurants, meeting rooms and as well as in industrial sector, just like conventional fluorescent lights. With completely patented thermal control technology, LED tube light substantially achieves good thermal property and plays more stable performance and of course last up to 50,000 hours compared to 5,000 hours from fluorescent light. It adopts high efficiency surface mounted LED that use surface mount technology which makes them produce equivalent or better light intensity by consuming only 13 watts compared to 40 watt fluorescent light which is basically 77 watt consumption due to Ballast. LED Tube Lights can directly drop into existing T8 Fixture/sockets, no need Ballast and Starter. Different types of LED tube lights are as follows:-

Figure11.Energy Saver LED Tube Lights.

Dimension	LED Quality	Lumen	Watt	Volt
600 mm	174	696lm	8 W	220V AC
800 mm	210	750lm	10 W	220V AC
1200 mm	285	1104lm	15 W	220V AC
1200 mm	342	1381lm	16 W	220V AC
1200 mm		2020lm	18 W	220V AC

Table9. Types of LED tube lights with wattage, Lumen, Quality and colour.

5.1.7. Comparing LED Tube light with Fluorescent light

a. The Greener Option

LED is the greenest option available in all forms of lighting. And that is because it does not contain any mercury, which is harmful for environment unlike the fluorescent bulbs and lights and the second is that it lasts much longer (about 10-20 years) and thus their disposal is less of a concern. Fluorescent lights on the other hand contain mercury that is harmful for environment and their disposal is a concern. And this is a problem with both CFLs and fluorescent tube lights.

b. Life of Lights

As with all light bulbs, the life of the luminaries will depend on the quality. All lights emit heat and the better the heat sink, the better the life.

Type	Life
Incandescent Bulb	750-1000 hours
CFL	6000-10000 hours
Tube-lights	7000-24000 hours
LEDs	25000-50000 hours

Table10. Life of all the respective Bulbs

c. Costs of different Bulbs

It's commonly known that LED luminaries are expensive. They cost at least 3-4 times more than T5 fluorescent lights.

Types	Costs	Payback	Life	Efficiency
T – 8 LED Tube lights	PRs. 1600 – 2000	3 – 4 years	10 – 15 years	About 110-120 lumens per watt
T – 5 Fluorescent Tube lights	PRs. 500	6 months to 1 Year	3 to 4 years	110 lumen per watt
Regular Fluorescent T – 8 Tube lights	PRs. 100		3 to 4 years	60 – 80 lumen per watt (lower for one with electromagnetic ballast)

Table11. Comparison between Fluorescent tubes and LED tubes in terms of Cost, Life and Efficiency.

	LED Fluorescent Light	Traditional Fluorescent Light
Wattage	15 W	40 W
Life Span	50,000 Hours, 10 times longer	8000 Hours
Ballast	No Needed	Needed
Brightness Device	No Needed	Needed
Power Consumption	14.0 W (saves 80 – 85 %)	77 W (due to Ballast)
Electric Wire	Free from contamination due to high power factor, reduce to have work loss	Ordinary electric flow due to low ballast power

Table12. Comparison between LED Fluorescent Lamps and Traditional Fluorescent Lamps.

d. Installation Instruction

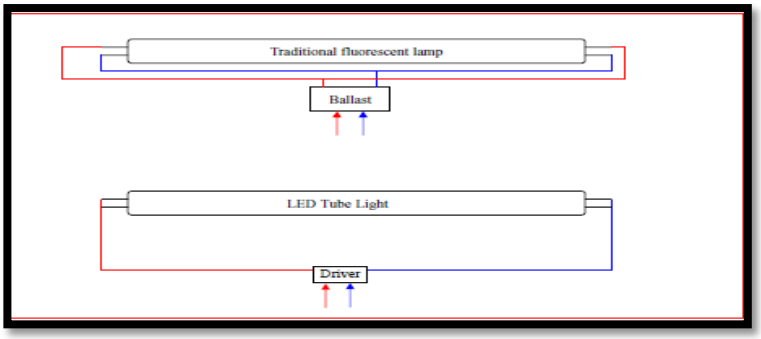

Figure12.Installation of both Traditional Fluorescent and LED tube Lights.

Through LEDs we are capable to save electricity because maximum number of electricity would be consumed by lighting and this type of innovation gives help a lot.

5.2. Solution Against High Cost of Petrol

When we see electricity consumption we also see about the petrol consumption. Because of large usage of petrol, the cost is so much high that a normal middle class person can't afford that cost. As we already known about electricity scooter. But that scooter named YO- bike not having so much speed and also not having a proper distance. And also due to charging problem this scooter can't be so much success. So for getting distance and proper output, we take practical's on the same scooter by changing some parts and we got a real positive result. After changing parts on that scooter we see that in place of 70 to 75 km*, the bike can run 700 to 750 km* without charging. We cannot use any type of outlet source for charging. This can be done by making such dynamic system so that it can charge by himself when the scooter goes on running.

The technical report of that electro-bike starts from the main part of that bike which is the motor. We generally use high speed high efficiency DC Induction motor having a diameter of 19 cm dia. / 9.5 cm radius. It has at most a speed of 180 rpm. Also this motor has 1 horse power motor. In place of 4 slots, we made and use 16 slots inside the motor because as slots increases, the speed of motor decreases theoretically. This we done without change the space distance. The motor is the heart of that electro-bike. In those slots, we make windings of 32 SWG winding of a thick copper wire which has a consumption of 32V, 20 watt. The turns in each coil is 4500 which means if there is 16 slots there could be 16 coils and each coil contains 4500 turns. Here in this, 1 set of coils is made of 4 poles and there are total 4 set of coils present. In this 2 set of coils are connected in series and the other two set of coils are connected in parallel.

Next we are coming to dynamos. The dynamos are the one which convert mechanical to electrical energy. Here also this principle applies. As already it described that this bike doesn't have a charging process from outer source. This could be done because of those dynamos only. This is because we say that this bike works on simple dynamic process. In this, we fix two dynamos (one at the front wheel and other on the body) so as to generate a maximum voltage of 12 V and charge 2 set of batteries. That dynamo which we fix on the wheel is getting from a normal scooter engine. That dynamo is connected through engine to charge battery of the scooter. And the other dynamo that we connect in the body for cutting air and generate electricity is a 3 wheeler dynamo which we got from a tempo car. This dynamo cut the air and the plates inside it rotates and due to this it convert mechanical energy to electrical energy. Now this electrical energy goes to the battery for charging purpose. The batteries that we use are normal ups 12 Volt - 7 Ampere Battery means they are generally Lead Acid Batteries. In that bike we use 2 sets of batteries. In each set of batteries, there are 5 batteries which mean there is a combination of 10 batteries. We use batteries so as to run a dc motor. The dynamo generate electricity when the bike run and the mechanical energy converts to electrical energy and then this electrical energy store in batteries and through this batteries the motor run and due to this the total electric bike run on road. It means as high as the bike run, as high as it got distance. Because in this the distance depends on the battery and the battery depend on the dynamo. In this there is a controller system we set or we say an alternator system set up is settled in between both set of batteries. So that if one set of batteries are having low charge by some per cent set in that controller then automatically motor shifted to other set and run by another set of batteries and the first set of batteries is automatically goes to get charge by dynamos fitted in that bike.

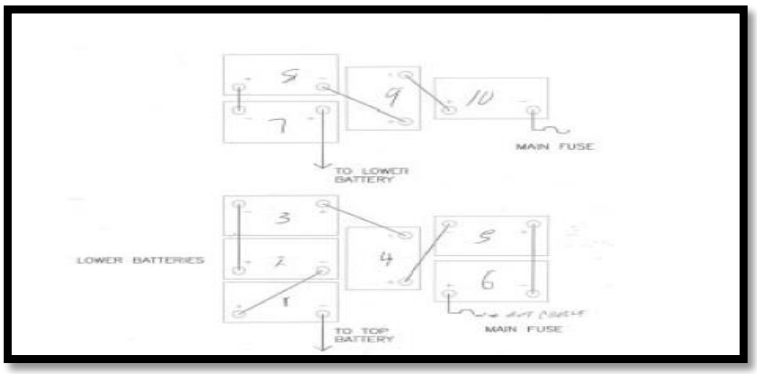

Figure13. Battery wiring, top and bottom level

The controller by far is one of the most important components of every electric vehicle (EV). The technology and advancements in electronics today make the controller a simpler solution for the EV enthusiasts. Past EV pioneers could only dream of the great advancements of today. Future advancements in technology will yield greater efficiency, more control features,

and reductions in size and weight. The controller choice is an important decision and needs to be thought out. Just like the process of selecting your electric motor or other components, this need to weigh all your options. The choice of controller is narrower and depends on your motor selection, but nonetheless, it is very crucial. The motor, batteries, pack voltage, and available current play a very important role in controller choice. All these factors must be balanced properly to achieve significant performance and efficiency whether your vehicle is an all-out tire-burning quarter-mile machine or an energy sipper with efficiency and excellent range. In this we generally use a contactor. The main contactor is basically a big relay. This is a single-pole normally open contactor. What this means is the contactor must be energized by the 12-V circuit to activate and complete the main circuit. This kind of contactor is rated anywhere from 100–300 A. For safety, every EV should have a main circuit breaker or a quick disconnect to separate the batteries from the rest of the system. In essence, we want to be able to disconnect the main battery pack in an emergency. On some vehicles, a sign or plate is mounted near the main disconnect to alert any emergency personnel in an extreme situation. There are also so many accessories that we connect so as to make this bike a perfect one.

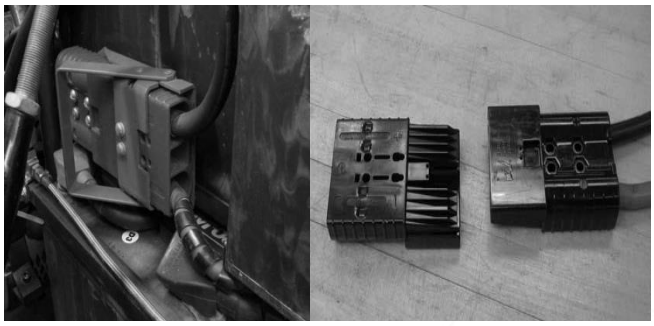

Figure14. Quick disconnects circuit breaker.

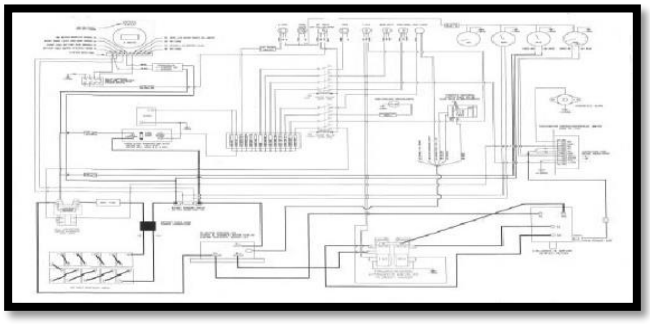

Figure15. 120 V batteries with motor wiring scheme

In this key switch, potentiometer, Ammeter, Voltmeter and other instrumentations, Safety interlock, safety fuse and other accessories are connected so as to make it a perfect bike. Apart from this, there is an external charging facility present in this bike so that on emergency we charge the batteries and then ride. But it is very rare case.

VI. CALCULATION

6.1. *Unit Power Consumption Comparison Chart between LED tube light and Normal Fluorescent tube light*

HI IMPACT LEDs Tube light (T8) Model 15 Watts	**Normal Fluorescent Tube lights (T8) Model 77 Watts**
For example ...	
If 1000 Tube lights are consuming.....	
LED Tube light Ampere:- 0.06	Normal Fluorescent Tube lights Amp:- 0.35
15 Watt x 1000 = 15,000 Watts	77 Watt x 1000 = 77,000 Watts
Per hour consumption of energy = 15 KW	Per hour consumption of energy = 77 KW
15 KW x 24 hour = 360 KWh = 360 units	77 KW x 24 hour = 1,848 KWh = 1,848 unit
360 unit x unit cost PRs. 2.10 = PRs. 756	1,848 unit x unit cost PRs. 2.10 = PRs. 3,880.8
PRs. 756 x 30 days = PRs. 22,680	PRs. 3,880.8 x 30 days = PRs. 1,16,424
PRs. 22,680 x 12 months = PRs. 2,72,160	PRs. 1,16,424 x 12 months = PRs. 13,97,088
Maintenance Cost – no required for 10 years	Maintenance Cost - PRs. 45,000 per year
LED tube light Life – 50,000 to 80,000 Hours.	Fluorescent tube lights life – 6000 Hours

Table13. Unit Power Consumption Comparison Chart.

Outcome from above comparison for 1000 Tube Lights:-

- ***Daily saving – PRs. 3,124.8***
- ***Monthly saving – PRs. 93,744***
- ***Yearly saving – PRs. 11, 24,928***

6.2. *Electro-bike calculations*

Technical specifications of Experimental Bike

a.	Motor Type	-	High efficiency Induction Motor
b.	Motor diameter	-	19 cm dia. / 9.5 cm radius
c.	Motor Power	-	20 watt
d.	Number of Slots	-	16 slot (without changing the space distance)
e.	Winding in slots	-	32 SWGA
f.	Coil Type	-	thick copper wire
g.	Coil Consumption	-	32V, 20 watt
h.	Turns in 1 coils	-	4500 turns
i.	Total Windings	-	4500 turns x 16 coils
j.	Number of poles	-	4 Poles

k.	Distance	-	700 to 750 Kms*
l.	Speed	-	45 to 50 km/hrs.
m.	Dynamo	-	32V tempo car (3 wheeler) dynamo
n.	Batteries charging by Dynamo	-	4 hrs. (approx. 75%)
o.	Battery type	-	Normal UPS battery
p.	Battery Capacity	-	12 V – 7 A
q.	Sets of Battery	-	2 sets (1 set = 6 batteries)
r.	Total Batteries	-	12 Batteries
s.	Torque Capacity	-	same

Other applications:-

- 1 set of coils is made up of 4 poles.
- Total 4 sets of coils present – 1) 2 sets of coils are connected in parallel
  2) 2 set of coils are connected in series
- 2 sets of batteries are fixed. In each set, 6 batteries of 12V – 7A are connected in series.
- Alternator system set up is settled in between both sets of batteries. So that if one set of batteries are having low charge then automatically motor runs by another set of batteries and the first set of batteries is automatically charging by a dynamo.

Let,

Output power of motor, P = 10,000 watt

And **Synchronous speed of motor, N = 11,000 rpm**

$$P = 2 * \pi * N * T / 60$$

$$\text{Or, } 10{,}000 = \frac{2 * 3.16 * 11{,}000 * T}{60}$$

$$\text{Or, } T = \frac{10{,}000 * 60}{2 * 3.14 * 11{,}000}$$

Or, **T (torque) = 8.68 Nm**

This is a torque produced by the motor.

But in this experiment, **we can reduce torque from 8.68 Nm to 8.50 Nm.**

Now,

We know that Motor takes Input in the form of Voltage and Current. So, for the input of the Motor,

Let,

I (current) = 30 Amp

ή (motor efficiency) = 70 % or 70 / 100

Cos ϕ = 0.95

So, from formula,

P = √3 * ή * V * I * cos ϕ

Or, 10,000 = √3 * 0.70 * V * 30 * 0.95

$$\text{Or, } V = \frac{10{,}000}{\sqrt{3} * 0.70 * 30 * 0.95}$$

Or, **V (in) = 290 V**

This is the motor input voltage which is further depends upon the impedance of the motor.

Some designs of bike are as follows,

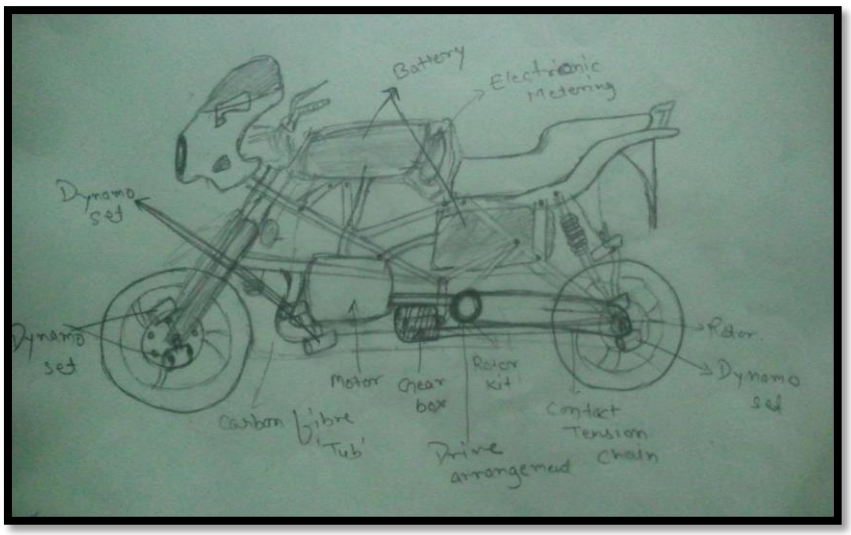

Figure16. Arrangements in an Electromech-1 bike

Figure17. Arrangements and practical work in an Electromech-1 bike

I. RESULT AND DISCUSSIONS

So, from the above we came to a result that in terms of lighting we will save much amount of electricity through LEDs rather than we use all other electric light appliance like Incandescent bulb, CFL and all. LEDs have only one time investment and then we are free from extra electricity bills that we paid monthly which are useless. As LEDs use then electricity bills also save and then that money we use for future purpose. Not only our future, but we make our coming generations future.

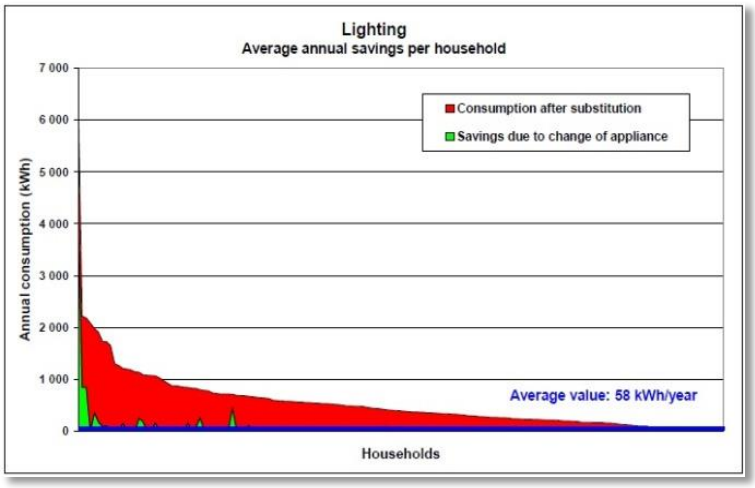

Figure18. Lighting – Average annual savings

Apart from this as see that electric motorcycles are really very much beneficial to all human beings who are really frustrated from the daily rising cost of petrol and diesel. This electric bike gives a beautiful opening of a new world. And moreover in this bike there will be no charging problem; this gives a very large chance to change the future. Also, due to its high speed and longer distance, this bike is suitable for all the younger generations and the older ones. This project gives a very high saving in field of petrol in the upcoming days.

Basis of calculations	**Petrol two wheeler**	**Electricity two wheeler bike**
Fuel	Petrol	Electricity
Fuel unit rates	PRs 75.45/litre	PRs 8 / unit
Mileage (km per unit of fuel)	65 km/litre	Above 700km / dynamic charging
Running Cost (cost for travelling 1 km distance)	PRs 1.16/km	PRs 0.011/km
Average commutation/day	30 km	30 km
Average commutation/year	10800 km	10800 km
Average spending on fuel/year	PRs 13392	PRs 1152

Table14. Comparison between 2 wheeler petrol type and electricity type scooters

VII. CONCLUSION

At last, that question again arises that "Is it true that renewable energy saves the world?" and now from the above whole research we conclude that YES, it saves the world but only when non-renewable energy is present in this world otherwise as I say

that one time came when we see ourselves in candle age where there could be no electricity, no motor vehicles, no house hold appliances etc. Just because we aren't depend totally on renewable resources. Renewable resources are just a backup as like when light is falling down then torch is a backup. But we are not totally depending on torch. We want light to live and to survive. Similarly we want non-renewable energy resources to live and to survive. As Mahatma Gandhi Ji said that "The earth provides enough to satisfy every man's need but not every man's greed". All persons want more and more without thinking that we are the only one who damages our whole world. And because of that lots of disasters came due to atmospheric and environmental changes. So save our world, save our environment, save our resources this had given by earth. Because save earth and save resources will definitely save our world.

VIII. FUTURE EXPECTS

In India, we are getting problems on electricity crisis. But on the other side a report come from China that there electricity crisis stops. How does it happen? According to the report of china, the electricity has been rationed for each sector as permitted. Energy rationing primarily involves measures that are designed to force energy conservation as an alternative to price mechanism in energy market. Because of its economic consequences energy rationing is used often as method of last resort, often at times of emergency such as during an energy crisis. Energy rationing may include penalties such as surcharges and disconnection from electricity supply for those who not reduce their demands voluntarily. Load shedding is a common form of energy rationing used when electricity markets cannot keep up to demand, particularly peak demand. Limited electricity supply from power stations at times of drought or after infrastructure is damaged, can lead authorities to implement rationing. Reducing demand in this way aims to avoid force power outages which are more disruptive than rationing. For example, there is 100 unit fixed for each house whether it is city wise or village wise. After 100 units the light supply would be cut off or take a penalty as cleared on the above paragraph. This is a very wonderful way to save lots of electricity and we also save our environment. Also apart of rationing, we make electric bike in a better way so that one day it can stop petrol crisis completely. As we know and a big scientist said that "The more electricity we produce, the more financial losses we bear". So if we increase the production of electricity we also have to bear financial loss and also destroy our environment which is not safe for our human kind and for our future. So save electricity and be happy.

MAKE ELECTRICITY SAVING A HABIT....!!!

IX. REFERENCES

[1] Lumina Technologies, "Analysis of energy consumption" in a San Francisco Bay Area research office complex, for (confidential) owner, Santa Rosa, Ca. May 17, 1996

[2] "The Twin Pillars of Sustainable Energy: Synergies between Energy Efficiency and Renewable Energy Technology and Policy". Aceee.org. Archived from the original on May 5, 2008. Retrieved 2010-07-08.

[3] Renewable Energy and Efficiency Partnership (August 2004)."Glossary of terms in sustainable energy regulation" (PDF). Retrieved 2008-04-19.

[4] "The Sustainable Energy Community: invest | invest Definition of Sustainable Energy". Invest. Retrieved 2010-07-08.

[5] Jamaica Sustainable Development Network. "Glossary of terms". Archived from the original on 2007-11-30. Retrieved 2008-04-19.

[6] International Energy Agency (2007). Renewable in global energy supply: An IEA facts sheet, OECD, 34 pages.

[7] Jacobson, Mark Z. (2009). "Review of solutions to global warming, air pollution, and energy security". Energy and Environmental Science (Royal Society of Chemistry) 2 (2): 148.Doi: 10.1039/b809990c. Retrieved 2008-12-21.

[8] Ferris, David (3 November 2011). "The Power of the Dammed: How Small Hydro Could Rescue America's Dumb Dams". Retrieved 4 January 2012.

[9] "Trends in consumption and production: household Energy consumption" "Oleg Dzioubinski, Ralph Chipman" April 1999, paper no. 6, ST/ESA/1999

[10] A.-H. Mohsenian-Rad and A. Leon-Garcia. Optimalresidential load control with price prediction inreal-time electricity pricing environments. Smart Grid, IEEE Transactions on, 1(2):120 –133, sept 2010.

[11] C. Wang and M. de Groot. Managing end-user preferences in the smart grid. In Proceedings of the 1st International Conference on Energy-Efficient Computing and Networking, e-Energy.

BIOGRAPHICAL NOTES

SAURABH PANDEY has received **B.E.** in **ELECTRICAL AND ELECTRONICS ENGINEERING** from **BHILAI INSTITUTE OF TECHNOLOGY, RAIPUR (CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY)** in 2014. His research interest includes ENERGY SAVING AND WORK ON SAVING CRISES OF FUEL.

SHUBHAM PANDEY pursuing **B.E.** in **MECHANICAL ENGINEERING** from **RAIPUR INSTITUTE OF TECHNOLOGY, RAIPUR (CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY)**.