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Energy Resources - A Comprehensive Study

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Abstract
In this paper we have presented the evolution of energy and how it influenced and impacted the human civilization. Alternative energy was the focus of this study where significant importance was given to renewable energy resources. We have also included, as part of our study, the functionality of most of the processes that extract energy from the energy reservoirs along with many references. A comparison is given between the renewable and non-renewable energy resources and various important factors on a particular power generating unit were critically analyzed. Coal, thermal, uranium as energy resources are discussed and a significant importance was given to the fact that these resources are vanishing on a daily basis. New means of providing energy that are enough to meet the demands of the word are pointed out and sunlight energy, wind energy, geothermal energy and tidal energy are discussed. Comparison is done along with the operating cost, maintenance cost and efficiency of the unit and finally suggestions are given for the use of proper planning and installation of the systems.

Keywords—Coal, Petroleum, Natural Gas, Uranium, Biomass, Geothermal Energy, and Wind Energy.

I. INTRODUCTION

There is a deep connection between human civilization and use of energy resources. The ability of early humans to utilize the power of fire, water and wind energies results in the progress of present great civilization and advance technology. In early stages, the energy resources were considered enough to be used easily and abundantly almost in every application of life. With the production of heat and light energies, the non-civilized hunter societies become able to shift into agrarian and then finally to an industrial societies. To develop an economy of any country industrialization is very essential. The benefits of industrialization were observed when the first industrialization revolution took place in UK about two centuries back. And this requirement for industries created a need to find fuel as an energy source in order to replace wood. Coal was the first energy resource used that replaced wood and maintained its position as a dominant energy source up to 18th century and then in the 20th century oil secured its position and then the natural gas followed it soon. In early stages, the energy resources were considered enough to be used easily and abundantly almost in every application of life. But soon it was realized that the rapid consumption of some of the resources leads them towards extinction [1]. Hence with the passage of time the energy resources were divided into two major types of energy: renewable energy sources and non-renewable energy sources. The renewable energy sources are those sources of energy which can be regenerated and use again and again after production i.e. solar energy, geo thermal energy, bio mass, wind energy and hydro power. While, the non-renewable energy sources are that they are finite and cannot be easily regenerated so must be used sustainably i.e. Coal, Petroleum, Natural Gas, Propane and Uranium [2].

This study creates awareness about the renewable and non renewable energy sources and helps us in understanding that we should try our best to cut down the maximum use of non renewable energy sources or at least try to adopt the ways to conserve the energy sources. On the other hand, it also helps us in knowing the rewards and drawbacks of using renewable and non renewable energy sources with respect to economy, health and environmental degradation

Naturally, the future depends upon the developments that we cannot predict with exactitude. However, economists found the prediction for better future as the key to success. World is transpiring on the basis of many factors and the factors depending upon Energy. Over the next 30 years, the world's energy future varies region by region, emulating various financial and demographic trends as well as the increase in technology and policies.

II. NON RENEWABLE ENERGY SOURCES

A. Coal

The word coal means mineral of fossilized carbon which is a brownish-black or blackish rock which occurs in the form of layers known as coal beds. Usually coal is classified into four general categories that are anthracite, bituminous, subbituminous and lignite depending upon the

content of carbon in it. Coal is primarily made up of carbon with changeable content of other several elements such as sulphur, oxygen, nitrogen and hydrogen. Coal has always been a very useful resource throughout the history. For the production of electricity, coal is the largest source of energy worldwide. Extraction from the ground is called coal mining if extracted underground and shaft mining, if extracted at ground level extraction is known as open pit mining extraction.

As a solid fuel, the primary usage of coal is power and heat production. Energy information administration states that world's total coal consumption in year 2010 was about 7.25 billion tones which is expected to reach up to 9.05 billion tones by the year 2030 [3]. World coal association states that 40% of world's energy depends on coal. From far up to now the total coal deposits discovered by the current associations are enough for lot of years.

There is a technology known as coal refining technology in which coal is upgraded by removing the moisture and certain pollutants. This treatment to coal is applied before the combustion which changes its characteristics before burial. The main purpose of this technology or strategy is to maximize the efficiency of coal and reduce the harmful emissions when it is subjected to burning.

B. Natural Gas

As clear from the name that is the naturally occurring gas. It is basically the mixture of different naturally occurring hydrocarbons composed primarily of methane and other hydrocarbons including carbon dioxide, nitrogen and hydrogen sulphide. Natural gas is one of the non renewable energy sources mainly responsible for heating and electricity. A part from this, other uses of natural gas are in vehicles as fuel and in the manufacturing of plastics and other organic chemicals.

It is established in underground deep rocks or specifically linked with the reserves of coal or petroleum. Natural gas is naturally produced by the two ways which are biogenic and thermo genic. Biogenic gas is made up of methanogenic organisms in shallow sediments, landfills, marshes and bogs. Thermo genic gas is created in high temperature and pressure deeper in the earth from buried organic materials

Before use, natural gas is subjected to processing for cleaning and removing the impurities like water to meet the specific market standards. This process results the formation of some hydrocarbons which includes ethane, butane, hydrogen sulphide, carbon dioxide, helium, nitrogen and many more. Natural gas is dig up at oil fields and natural gas meadow. [4] The largest gas field of the world is Qatar offshore North Field, which is estimated to have 25 trillion cubic meters (9.0×1014cubic feet) of gas and projections conclude that this is enough to last for the next 420 years. The second largest gas field is located in Iranian waters in the Persian Gulf.

One of the important products of natural gas is biogas which came into being by the decomposition of non fossil organic matter. Sources of biogas are mostly swamps, marshes, landfills, manures and sewage sludge. The process black diagram is explained in fig. 1 and show how it works.

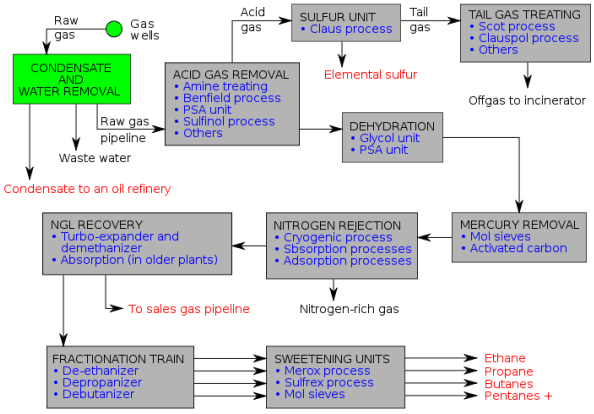

Fig. 1 A Natural gas processing block diagram. [5]

The quantity of natural gas is generally calculated in normal cubic meters or in standard cubic feet. Heat content of one kilogram of gas is about 49 mega joules which are approximately equal to 13.5kWh. However the prices of natural gas are greatly influenced by the dependence upon location and its customers. In United States from the day 2007 to 2008 the values of 1000 cubic feet of gas increased from 7$ to 10$. Gas prices for consumers change greatly across the Europe. In the world, other countries sold natural gas in the retail units of gigajoule and long term distribution contract are being signed in cubic meters.

C. Petroleum

Petroleum is a naturally occurring non-renewable energy resource. It is flammable and volatile liquid that naturally consist of complex mixture of hydrocarbons. There are also many other organic liquid compound that are found beneath the surface of earth mixed in it. In raw form it is also known as crude oil, a hydrocarbon deposit that is created when a great amount of lifeless species are buried under the rocks and undergo extreme heat and pressure (3.8: Broad, 2010) as stated in fig. 2. The National Energy Education Development Organization states in their report it is known as a fossil fuel because of its composition from the leftovers of plants and animals and the extreme amount of energy in it is the energy of those annuals and brutes which actually came from the sun.

Petroleum having excess of energy can be divided into different kinds of fuels such as gasoline, kerosene and heating oil. Most plastics and inks are made up of petroleum too. Individuals are getting energy from oil for a long time ago. They collected leaked oil from the soil into pools and glided on water.

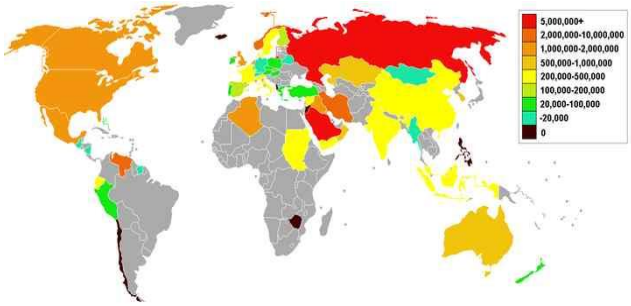

Fig. 2 Word Petroleum Map. [6]

Manufacturing industry of petroleum is busy in the global process of refining, exploring, extracting and transporting of petroleum. It is an unprocessed material for many goods together with pharmaceuticals, fertilizers, insect killers and many more. Petroleum itself is important to many factories and is of significance enough to maintain the civilization's industry, so as the decisive worry to many states. A huge amount of world's energy percentage consumption is reserved by petroleum. International energy annual report by Energy Information Administration states that oil consumption starts ranging from 32% for Asia and Europe and approaching to height of 53% for Middle East. Former areas including America and Africa consume approximately 42% of their energy from oil. Crude oil year book declared that the top oil consumers mainly consist of developed nations and the world at large consumes around 30 billion barrels of oil per year.

The mainly ordinary distilled parts of petroleum are a fuel which comprises of liquefied petroleum gas, butane, petrol, diesel, jet fuel, kerosene and many more which being commonly as energy sources and minor in manufacturing and productions. Now, by the year 2011 it is estimated that world's oil consumption has increased from 30 to 87.42 barrels per day.

Consumption is the last couple of centuries have been abundantly increased by the automobile growth. The organization of petroleum exporting countries believes that oil producing countries will have to implement low consumption policies in future. [7] There is a projection that the production of petroleum will touch its height and then decline at the same rate as it increased before the peak. The acme of oil detection was in 1965 and every year the creation has exceeded the past discoveries since 1980.

D. URANIUM

Uranium is a chemical element having metallic properties placed in the actinide chain of periodic table with atomic number 92. It contains 92 protons as well as electrons. Its isotopes are unstable which makes uranium a radioactive element. Uranium-238 and uranium-235 are included among the most common isotopes of uranium. Uranium has a very slow decay rate. It decays by emitting alpha particles. The uranium-238 half life is around 4.47 billion years.

Among several isotopes of uranium, the uranium-235 (U-235) is important because it can effortlessly smash and produce a massive amount of energy under certain conditions. This is the reason of uranium being used in nuclear fission. The nucleus of U-235 contains 143 neutron and 92 protons. If enough of these neutrons are thrown to break the other isotopes, a fission chain reaction can be achieved. When this process occurs again and again over a million of times, a large amount of heat energy can be produced with a tiny amount of uranium. This process is known as burning of uranium and it happens in nuclear reactors.

In order to achieve energy from the fission; nuclear reactor having uranium fuel is assembled in such a way that a controlled chain fission reaction should take place. In these reactors the energy from fission is controlled to heat the water into steam. The chain reaction takes place in the nucleus of a nuclear reactor and is controlled by using control rods. These rods basically absorb neutrons and can be withdrawn or inserted to maintain the desired power level. Raising and lowering the rods control the rate of nuclear reaction. The uranium fuel present, acts as an extremely massive source of heat which turns the water into steam used to spin generators for power production. A normal 1000 megawatt nuclear reactor can provide enough power up to one million people.

To avoid the direct contact or radioactive water or steam, the steam from the reactor goes into an intermediate heat exchange process in which another loop of water is converted into steam to drive turbines.

Uranium is found in rocks even it is also found in sea water. Uranium ore is economically recoverable within the earth's crust. The challenge is to find the areas where the concentration is enough to make a valuable deposit economically. [8] Globally the largest deposits of uranium ore are found in Canada, Australia and Kazakhstan. Average concentration of uranium on earth is 2 to 4 a part per million. It is found in thousands of minerals, significantly in phosphate, lignite and monazite deposits.

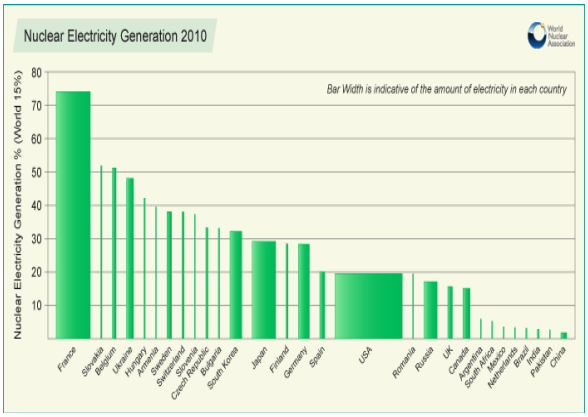

Fig. 3 World's Nuclear Energy Generators [9]

More than 14 % per cent of the world's energy is produced from uranium reactors. There are 440 nuclear reactors operating across 30 countries having total output capacity of 377000 megawatts). Among these countries France is top producer of nuclear power production as shown by the statistics on year 2010 in figure 3. According to the world nuclear association, more than 150 nuclear power plants are planned which shows the transition of the world towards this cheap and economical mode of power production.

III. RENEWABLE ENERGY SOURCES

A. BIO MASS

Biomass is the crude biological material obtained from plants and animals which are living or recently lived. It contains the energy stored from sun which is absorbed by the plants through photosynthesis. This chemical energy from the plants gets transferred to annuals and people who eat them. Biomass is the ever existing energy source because trees and crops can always be grown and their waste will always exist here. Biomass can be used indirectly or directly by converting it into another form of energy product like bio fuel. Three processes are adopted to convert biomass into energy:

1. Chemical conversion
2. Biochemical conversion
3. Thermal conversion

Biomass energy has been harnessed by the humans from the time of burning wood to make fire. Today wood is the largest biomass energy source. In plants biomass is used to produce power with the help of steam turbines or to produce heat by direct combustion. Biomass from plants refers to forest remains such as dead trees, branches, wood chips, yard clippings and other solid waste. Biomass indirect usage includes its conversion into fibres and other industrial chemicals. Industrial biomass can be produced from plants like bamboo, corn, willow and variety of other trees. Biomass power station works similarly like a fossil fuel power station.

Biomass is biologically produced matter based in oxygen, hydrogen and carbon. The world's estimated biomass production is 146 billion tons per year which mostly consist of wild growing plants. Biomass energy can be derived from six different distinct energy sources such as wood, garbage, waste, plants, alcohol, and landfill gases. Amount of power generated by biomass varies in the world. Biomass is converted directly or indirectly from one form to another form into energy by using different technologies. Conversion process use heat as the commanding mechanism for the conversion of biomass into chemical form. Chemical conversion involves a series of chemical process can be used to convert biomass. The first step is the gasification which involves a great risk and is the most expensive. Gasification cause incomplete combustion which helps to produce combustible gas known as producer gas which provides fuel to various vital processes. Biochemical conversion makes the microorganisms to break down biomass. Other way is to break down carbohydrates and sugars to produce alcohol.

The use of biomass is environmental friendly as plants store carbon dioxide which is released at the burning time. This carbon dioxide can be used by the planted crops, so this carbon dioxide cycle can be closed by replanting crops and using biomass. If the crops are not planted, it can contribute towards global warming. Biomass is cheap and less demanding than fossil fuels as represented in fig. 4.

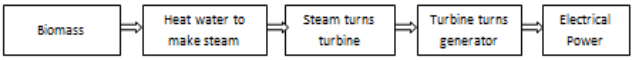

Fig. 4: Bio Mass Power Generation Block Diagram [10]

B. GEOTHERMAL ENERGY

Geothermal energy is the energy that is produced and stored in the earth. This heat is clean and permanent. The resource of geothermal energy series from deep ground to hot water, hot rocks which are found some miles down the surface of earth and even deeper to the extreme high temperatures of magma (molten rocks.) 20% geothermal energy of the earth crust actually originates from the creation of this planet and remain 80% from the radioactive decay of the minerals. The difference between the core and surface of the planet gives a constant conduction of heat from core to the surface.

As mentioned, thermal energy is created by the radioactive decay of minerals. The temperature sometimes reaches up to 5000^0 C. Heat from the core conducts to the surrounding rocks which cause them to melt and create magma. This heat moves upwards and increases the temperature of rocks and water sometimes up to 370^0 C. Geothermal power is

considered as renewable as the heat extracted or used is much low as compared to the world geothermal energy content. Internal heat content is 1031 joules. It is also considered sustainable because of its power to maintain the earth's difficult ecosystem.

The most common technique to capture the geothermal energy from sources is to tap into the hydrothermal convictions where cooler water seeps down to the earth's crust where it gets heat up and forced to rise to the surface in to form of steam. This steam is extracted and is used to run the electric generators. Geothermal power plants bore their own holes into the rocks where the survey has shown more geothermal energy.

Minor temperature geothermal resources are also being used in direct applications such as green houses, district heating, fisheries, mineral recovery and industrial process heating. Using binary cycle, power can also be generated by low temperature thermal resources. Geothermal heating application use mesh of hot water pipes to heat buildings across the whole communities. More than 72 countries are having instant usage of geothermal energy among them Iceland is the leader. It has the biggest heating system on the globe. Once Iceland was known as the most infected country and now it is the cleanest due to the geothermal energy. 93% of its homes are heated with geothermal energy which helps in saving more than 100 million dollars annually to the International Geothermal Association (IGA). In 2005 24 countries around the globe were producing 10,715 megawatts of power using geothermal energy as showed in fig 5. [9] However there is only an increase of 20% in the online ability since 2005. IGA projects this growth to increase up to 18,500 megawatts in 2015.

TABLE I
GEOTHERMAL INSTALLED CAPACITY [11]

Country	Geothermal Electric Capacity		
	Capacity	Capacity	% Production
United States	2687	3086	0.30%
Philippines	1969.7	1904	27%
Indonesia	992	1197	3.70%
Mexico	953	958	3%
Italy	810.5	843	1.50%
New Zealand	471.6	628	10%
Iceland	421.2	575	30%
Japan	535.2	536	0.10%
Iran	250	250	
El Salvador	204.2	204	25%
Kenya	128.8	167	11.20%
Costa Rica	162.5	166	14%
Nicaragua	87.4	88	10%
Russia	79	82	
Turkey	38	82	
Papua-New Guinea	56	56	

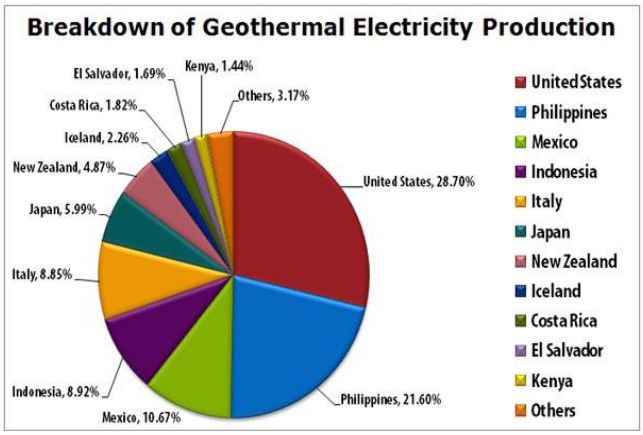

Fig 5 Pie Chart of Countries Producing Geothermal Energy [12]

C. HYDRO ELCTRIC POWER

Hydropower or we can say water power is the power achieved from the energy of falling water on turbines and also this energy may be used for many useful purposes. Hydropower has been used for the function of a range of mechanical devices and irrigation purposes. This falling water may be of rain or melted snow which usually originates in mountains and hills. This water makes rivers or streams that run to the ocean with the energy that can be important. This energy has been cashed for centuries. Farmers have used water wheels to grind the wheat into floor. A water wheel placed in the river was used to run the mills converting kinetic energy into mechanical energy.

At the end of 19th century, hydropower became the source of power production. In 1878 the first hydropower generator was developed that was used to control a single arc lamp. In 1881 the first hydropower station was built at Niagara Falls and began to produce 12.5 kilowatts of power. At the start of 20th century, many small hydroelectric power plants were built by the commercial companies. Hydropower was referred as white coal because of its efficiency and plenty. Hydroelectric power plants become larger throughout the 20th century. In 1936 the world larger hydroelectric power plant was built at Hoover Dam with the initial ability of 1,345 megawatts.

D. SOLAR ENERGY

Converting sunlight into power is called Solar Power/Solar. It can be done either directly using photovoltaic (PV), or indirectly using concentrated solar power (CSP) and the rate of the production is explained in fig. 6. In concentrated solar power systems lenses or mirrors and tracking systems are used to focus a large area of sunlight into a small beam. Photovoltaic cells then convert beam

of sun light into electric current using the photoelectric effect.

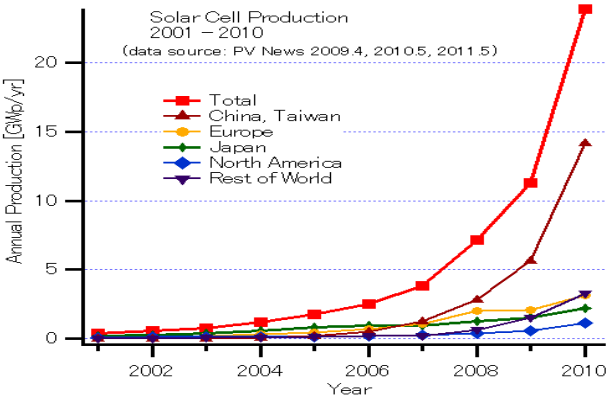

Fig 6 Annual Solar Energy Production Rates [13]

Concentrating Solar Power (CSP) systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. The most developed are the parabolic trough. A parabolic trough consists of a linear parabolic reflector that directs intense light to a receiver positioned along the focal line. The receiver is a tube positioned above the middle of the parabolic mirror and is filled with a working fluid. The reflector follows the Sun during the daylight hours by tracking along an axis. Parabolic trough system provides the best use factor of any solar technology. The parabolic concentrating dish combines Stirling solar dish with a Stirling engine which drives an electric generator. The advantages of photovoltaic cells over Stirling solar are longer lifetime and higher efficiency of converting sunlight into electricity. Parabolic dish systems give the maximum efficiency among CSP technologies. Solar power tower use a range of tracking reflectors to focus light on a central receiver mounted at tower top. Power towers allow maximum efficiency and better energy storage ability among CSP technologies and are more cost effective.

In photovoltaic power systems, Solar cells generate direct current (DC) power which fluctuates with the concentration of sunlight. For convenient use this requires conversion to alternating current (AC), by the use of inverters. Series of solar cells are connected inside modules. Modules are then wired together to form arrays, and then connected to an inverter, which produces power at the required voltage, and for AC, the required frequency/phase 14 MW photovoltaic power plants.

E. WIND ENERGY

Winds are originated by the sun warming atmosphere irregularly and the abnormalities of the earth's surface. The energy in the wind is known as wind energy and the power attained from the conversion of wind energy into useful form by wind turbines to generate electrical power or wind refines for mechanical power is known as wind power. Big wind farms include many individual turbines associated to the electric power broadcast networks. Offshore wind farms harness more powerful winds and can produce power more efficiently.

In order for a wind turbine to work effectively, usually wind speed should be made 12 to 14 miles per hour. The wind must be at this speed to be quick enough turbines to generate electricity. Turbines are usually producing about 50 to 300 kilowatts of power each. You can light a 100-watt lamp that menthol ten with 1,000 watts. Thus, wind turbine of 300 kW (300,000 watts) can be activated 3,000 lights bulbs that use 100 watts.

Table 2: Top 10 countries producing wind power [14]

Country	**Capacity**	**% Word**
United States	2687	3086
Philippines	1969.7	1904
Indonesia	992	1197
Mexico	953	958
Italy	810.5	843
New Zealand	471.6	628
Iceland	421.2	575
Japan	535.2	536
Iran	250	250
El Salvador	204.2	204
Kenya	128.8	167
Costa Rica	162.5	166
Nicaragua	87.4	88
Russia	79	82
Turkey	38	82
Papua-New Guinea	56	56

As an alternative to fossil fuels, wind power widely distributed, renewable, plentiful, producing no greenhouse emissions and require a small land. Any effects on the environment are less difficult than other forms of power generated a quarter of its power from wind. Worldwide wind energy production is increasing at the rate of 25 % per year. And the wind power production capacity in 2011 is shown in the table 2.

F. BATTERY STORAGE

A storage battery, rechargeable battery, or accumulator is a type of electrical battery. It is a type of energy accumulator and is made up of one or more electrochemical cells. Its electrochemical reactions are electrically reversible because of this, it is also known as secondary cell. Rechargeable batteries are in many different shapes and sizes, ranging from the size of the button cell to megawatt systems connected

to stabilize the power distribution network. Countless combinations of chemicals used as: lead acid, nickel cadmium (NiCad), nickel metal hydride (NiMH), lithium ion (Li-ion) and lithium-ion polymer.

In grid energy applications, rechargeable batteries are used for alignment. A lot of batteries are connected in parallel to make battery banks as showed in fig. 7. They store electric energy to be used during peak demand hours when the production is not enough to meet the requirement, levelling energy comes from the large banks of storage batteries. Charging the batteries during periods of low demand and return energy to the grid while the high electrical demand balancing helps reduce the need for expensive peaking power plants and helps bring back the cost of generators over more hours of work.

Fig 7 Storage Bank [15]

IV. DISCUSSIONS

Before putting effort into cumulating the use of energy, we should consider two things. Can the resource turned into useful form of energy by any practical way? Sometimes is more fuel is burnt for harvesting the energy that is being burnt? What if it took more energy to make solar panels than we could get from the solar panels once they were working? Then solar energy would not be worth pursuing until better solar panels were developed. What happens when energy is produced from resources? What happens by using that resource? A lot of health problems may be caused by mining or environmental damage may be produced. A large amount of pollution may be produced by using the resource. Fuel may also not be the greatest way for an energy resource in this case. However that fuel may be much more efficient in generating energy. These all issues must be kept in account while planning the energy production and selecting energy source type to provide self-sustainability, reliability and efficient energy production.

More than 200 years yet increasing portion of our energy has come from non-renewable resources such as lubricant and firewood. While mandate for energy is rising and these assets are running out. Fossil fuels are non-renewable because they are going to run out one day. Burning those produces greenhouse smokes and depends on them for energy production is unsustainable. Hence the need of hour is to find more recycle able and maintainable ways of generating energy. Sources that quickly replenish themselves and can be used again and again and are self-sustainable are called renewable resources as explained in fig. 8. We can easily find out the most efficient and sustainable energy source by working on the availability, pros and cons of different energy sources as some are mentioned in the following figure

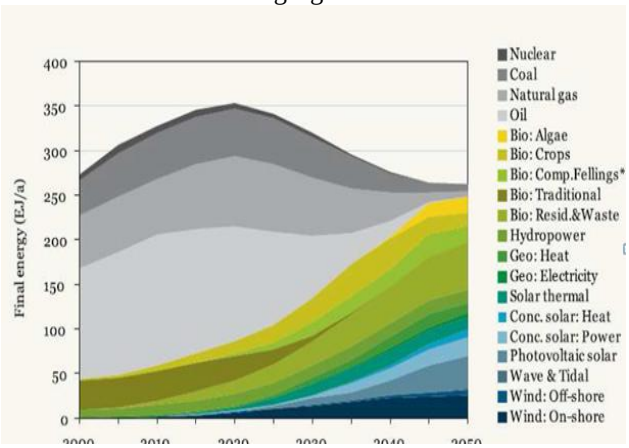

Fig 8 World's Energy Comprrison [16]

V. CONCLUSION

Natural gas, uranium, coal and oil are the most familiar fuels in the world today. They are known to be non-renewable, due to their extensive use and lack of ability of mankind to merge similar fuels rapidly. Except uranium, all are called fossil fuels because of their origin in rotting plant and brute remains. Natural gas, nuclear energy, oil and coal altogether are responsible for approximately 87 per cent of the world's energy supply.

Natural gas and oil industry still remains a most important contributor to the economy of state. Its future is likely to be categorized by more costly production methods, both on a ground level and offshore, the rising importance of eccentric ways of fetching oil and gas resources, better conservation technology, more introducing volumes and prices and political policies planned to increase maintenance. Crude oil, which is refined to manufacture gasoline and diesel fuel, remains the prominent source of moving fuel. Natural gas, meanwhile, accounts for about half of all power production in the world. Liquefied petroleum gases are now being used as motor fuel, for cooking and heating purposes. Coal is the biggest source of power production in world, and is the nation's primary source of electricity. Demand for coal is rising across the world and some governments are allowing for restrictions on greenhouse gas emissions. Such factors could impact the development of new coal plants, at least until technology to capture carbon emissions becomes cost effective.

Nuclear power –expensive but efficient:

From uranium we get nuclear fuel which is proven efficient source of power production capacity. As nuclear power energy production is very much expensive and it is not utilized by many countries so its contribution is minor in world's total power production. The increasing cost of other fuel sources, along with revised federal regulation intended to promote the production of nuclear power plants, signify that nuclear production capacity across the globe is likely to grow.

Alternative energy sources:

There are many alternative energy sources that have more than ability to replace currently prominent fossil fuels if they are given sufficient money for their other development. The main benefit of different energy sources is that they are economically suitable energy sources that unlike fossil fuels they do not release large quantities of CO2 and different injurious greenhouse gases into the environment, which causing global warming and weather change. This is really the benefit that should indicate fast development of different energy technologies because otherwise world will lose the fight against climate changing. Government has become conscious of the fact, and world looks ready to introduce new laws that should decrease current production levels. To get success in this world we will need to stop depending upon fossil fuels to fulfil its energy demand, and we will have to concentrate on different energy sources, especially renewable energy sources, and make them more efficient.

Hydropower–the most efficient energy source:

Hydroelectric power, as compared to other energy sources, is a demonstrated technology that assures competence rates up to 90%, much better than anything wind plant and solar power can offer. It is recommended by many people and organisations as a solution to our energy demands that can be implemented right away. We can build river, barrages, and dams and establish hydroelectric turbines that convert wave energy into power along our requirements. It seems like a perfect solution but, as with all forms of power.

Hydropower uses the energy of running water without decreasing the quantity. Hydroelectric power plants with storage reservoirs sometimes offer unrivalled elasticity as they can immediately respond to increase and decrease in the demand for electricity. The elasticity and storage capacity of hydroelectric power plants make them more reasonable and proficient in supporting the use of irregular sources of renewable energy. River water is a domestic source so hydropower it is not subject to market price fluctuations providing the highest cost benefit ratio, efficiency and flexibility. The ability of hydroelectric systems to attain its position from zero to maximum production in a fast and predictable way makes them extraordinarily apposite for addressing changes in the utilization and giving additional services to the power system, so it achieves the balance between the supply and demand of electricity. Hydroelectric life cycle generates very small amount of greenhouse gases as compared to plants operated by gas, coal or oil. It helps to slowdown global warming. With a standard lifetime of 70 to 100 years, hydroelectric production is basically lasting investments that can promote economies and can be easily updated to assimilate more advanced technologies and have very low working and maintenance costs. Operating costs of hydroelectric power plants are very low as they are totally automated and demand very little human resource. Hydroelectric plants can easily control the energy production in low and peak times by the controlled water flow through dam gates as compared to the nuclear or fossil fuel fired plants which are very difficult to stop on daily basis during less power demands hours. Hydroelectric power plants can constructed in different sizes depending upon the river or stream used to activate them, its sufficient to control a single home, factory, small town, or large city.

Recycling resources:

All types of metal wastes, glass and paper and plastic can be recycled and used again. Scarp collected from various points is recycled and can be used again to make paper, plastic containers and metal articles. Hence, recycling helps to conserve fuels. Recycling of paper helps to conserve forests.

Repair and use:

Try your best to repair and reuse the appliance that stops working. This will discourage the new production and waste production ratio.

Energy Taxes:

Design such a program that aim to charge high taxes on high energy consumers. A proper baseline shall be designed and any usage above this line will be charged according to its high consumption limit. This baseline protects the poor householders while charging a tax to only high energy consumers.

Why should we conserve energy?

Energy conservation is needed immediately in order to protect and save our environment from the drastic changes and also to save the depletion of natural resources for our future production. The present energy depletion rate is going to damage this world in many different ways. In other words, the conservation program helps us to save our environment. By using less energy, we can reduce the negative impacts. The increase in the cost of this energy helps us in realizing the fact that how much

these energy resources are useful and how we can do our bests to avoid wasting it.

Start conserving energy is not a big deal at all. We can start this from our homes, than spread this at a wider scale at our society level, then moving towards city to district level and then finally at country level.

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