International Journal For Technological Research In Engineering (IJTRE)
Volume 2, Issue 7, March-2015
ISSN: 2347-4718

RENEWABLE ENERGY SOURCES SCENARIO AND SOLAR STATUS- A REPORT

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Abstract - **India is the country in which 28% conventional energy like such as Coal, Petroleum, Nuclear energy, etc. is used and rest 72% energy is made up by non conventional energy sources such as wood, Biomass etc. are used. From the present energy scenario of the world we can expect that we will have to find newer way of energy exploration since coal and oil has got limited reserves and they are being used at a very fast rate therefore it can be guessed that after a limited time these energy sources will exhaust and we will left with no other alternative except to use energy which are in present norms called non conventional energy sources. From data it is obvious that indigenous oil production is only 30% of total domestic oil consumption. Coal reserves are 80 billion tones and majority concentrated in the state of Jharkhand and West Bengal. One thing is to be noted that the pollution generated by these conventional fuel is dangerous not for only human beings also for nature. India government has decided to restrict them and more attention towards the maximum utilization on renewable energy resources which reduces the environmental pollution. The purpose of this paper as evident from the title is to frame the renewable energy sources and solar energy present status in India. This paper highlights on solar energy as an exhaustive literature survey.**

Keyword -Renewable Energy, Pollution free, Solar Status, Green House Effect

1. INTRODUCTION

The energy sources available Fig.3 to Fig.15 can be divided into three parts i.e. primary energy sources, secondary energy sources and supplementary sources. Primary sources can be coal, oil, nuclear energy etc. Secondary sources are like solar energy, wind energy, water energy etc. of being used, supplementary as energy in the form of biogas, bio-fuel etc.[1]

We all are acquainted with the term "Green House Effect [3] '' shown in Fig.1 & Fig.2 which is nothing but a manifestation of emission gases generated by the conventional fuel consumption. Developed countries such as U.S.A. U.K., France, and Japan have already stated the retrenchment of these fuels. Some one month ago U.S.A. has declared the diesel as a toxic fuel. Author's aim to discuss the different aspects of conventional and non conventional fuels.

Fig.1 Green House Effect

Fig.2 Green House Effect

1.1 SHARE OF RECENT RENEWABLE IN GLOBAL ENERGY

A recent report from the International Energy Agency (IEA) reveals that the contribution of renewable like wind, solar and wave, energy to the global energy supply is " still very marginal " a mere 0.1% of the worlds total primary energy supply (TPES) or 0.5 percent of the global renewable information 2003, solid biomass is for the largest renewable energy sources at 10.4% of the world TPES or 77 percent of all renewables, followed by hydrogen power at 2.2 percent of world TPES or 3.2 percent of renewables. Renewables provide 13.5 percent of world TPES, with oil holding a 35 percent share.

The respective shares for coal, natural gas and nuclear power are 23%, 21%, and 7%. Since 1990, renewable have grown at an average annual rate of 1.7 percent, slightly higher than the yearly growth rate of world TPES of 1.4 percent. At an annual growth rate of 19% , the new renewable have expended rapidly. Nonetheless, their very low base implies that production still remains small. OECD nation account for almost of the production and expansion of new renewable.

While solid biomass experiences the slowest progress (1.5%) the second highest rate of growth was registered by non – solid biomass combustibles – such as municipal solid waste, biogas and liquid. Biomass, which grew each year by an average of 7.6%. Hydrogrew at 1.7% with growth in non OECD regions at 2.9% and 0.9% in OECD nations.

2. RENEWABLE ENERGY SOURCES AND ITS ASPECTS IN INDIA.

Solar energy keeps the temperature of earth above that in colder space, cause current in atmosphere and ocean. The solar power where the sun kits the surface is 10^{17} watts. whereas the solar power on earth's surface is 10^{16} watts. The basic research in solar energy is being carried out in universities and educational and research institutions, public sector institutions. Bharat Heavy Electricals Ltd. and Central are carrying out a coordinated programme of research in solar energy. Projects are heating and cooling of residential building, solar water heating, solar drying agricultural and animal products, solar distillation in a small community scale. Fossil fuels are sometimes purchased based on quantity and unit costs that are not representative. of their energy value.[3]

The total coal reserves of the world in approximately 1/60 billion tons of which anthracite and bituminous is approx. 600 billion tons and rest is of sub-bituminous and lignite type. Briefing of renewable energy sources in needed first. Initially, considering solar energy which can be a major source of power. Its potential in 178 MW which is about 20,000 times the worlds demand. Sun's energy can be utilised as thermal and photovoltaic. Wind energy potential in India is nearly 20,000 to 25000 MW. Geothermal energy in India is unexploitable source.

Energy from the sea waves and tides are having the sea waves and tides are having the potential of generating 40,000 MW and 80000MW respectively. Biomass is another renewable source of energy which has got the vast potential. Other fossil fuels such as liquified natural gas. It is stored and transported at - 260°F (- 162°C). Its density varies with the amount of ethane and heavier components that are part of the liquid. Indonesia is the largest LNG production currently.

Worldwide Energy Consumption 2012
Oil -37%, Coal -25%, Gas -23% i.e. 85% Fossil fuels dominate energy sources – oil, coal, gas
Nuclear-6%, Biomass-4%, Hydro 3% i.e. 13%,
Solar heat-0.5%, Wind-0.3%, Geothermal-0.2%, Biofuel-0.2% & Solar Photovoltaic- 0.04% i.e. 1.24%

- Renewable and alternative energies. Fig.3
- Using natural resources to create electricity.
- Most are cleaner and safer than fossil fuels.
  - Solar
  - Wind
  - Geothermal
  - Hydroelectric
  - Nuclear
  - Biomass

Fig.3

Renewable vs. Alternative

Renewable – Never run out	Alternative – efficient but can run out

Solar Power: Solar Energy [6],[7],[8] see Fig.4

- Capturing the sun's energy to fuel a power plant to create electricity
- Turning the sun's energy directly into electric energy using solar cells.

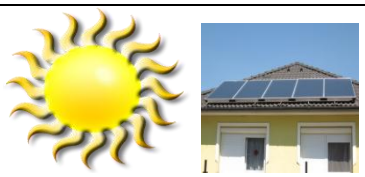


Fig.4

Wind Energy Fig.5

- Using wind turbines to harness the wind's energy.
- The wind turbines turn a generator which creates electricity.

Fig.5

Hydroelectric Energy Fig.6

- Using the energy of moving water to turn turbines and create electricity.

Fig.6

Tidal Energy Fig.7, Fig.8

Tidal energy is globally harnessed from facilities in Russia to France, with 400 kW to 240 MW capacity.

The US is a late-comer to the field.

Britain's Severn Estuary (26 ft) and Canada's Bay of Fundy (32 ft) have potential of 8,000 and 30,000 MW.

A tidal range of 21 feet is needed to power the turbines. There are few such places in the world. Fig.9

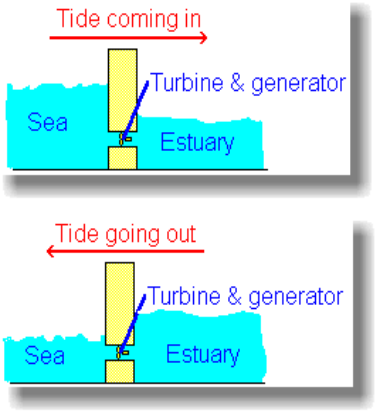
It has been estimated that worldwide, approximately 60 GW can potentially be recovered for electricity generation.

Advantages:

- Once built, tidal power is free.
- produces no greenhouse gases or other waste.
- needs no fuel.
- produces electricity reliably.
- Inexpensive to maintain.
- Tides are predictable.
- No pollution
- Renewable resource
- More efficient than wind because of the density of water
- Predictable source of energy vs. wind and solar
- Second generation has very few disadvantages
- Does not affect wildlife
- Does not affect silt deposits
- Less costly – both in building and maintenance

Disadvantages:

- A barrage across an estuary is very expensive to build
- The environment is changed for many miles upstream and downstream.
- There are few suitable sites for tidal barrages.
- Only provides power for around 10 hours each day, when the tide is moving in or out.



- Fig.7

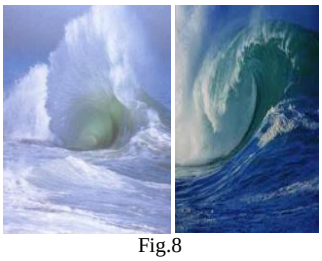


Fig.8

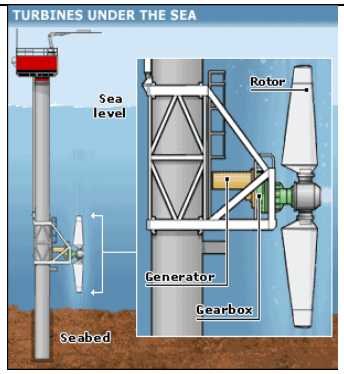


Fig.9

Geothermal Energy Fig.10

- Using the natural heat and steam from inside the earth to spin a turbine to create electricity.

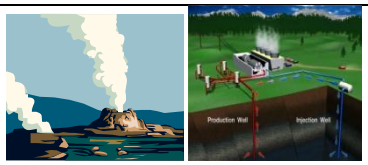


Fig.10

Nuclear EnergyFig.11

- Using the energy from inside of an atom to create heat.
- The heat will make steam to spin a turbine and create electricity.

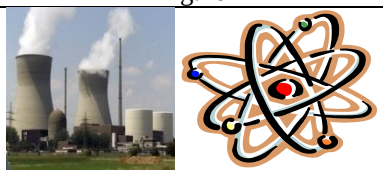


Fig.11

Biomass Energy Fig.12

- Burning of trash, crops or other "living" material.
- The burning will create steam which will turn a turbine to create electricity.

Fig.12

Definition of biomass energy Fig.13

Biomass is a renewable energy resource derived from the carbonaceous waste of various human and natural activities. It is derived from numerous sources, including the by-products from the timber industry, agricultural crops, raw material from the forest, major parts of household waste and wood.Fig.14 & Fig.15

- Biomass energy is the use of living material to create electricity
- Some materials used could be plants, garbage, and animal waste

Advantages

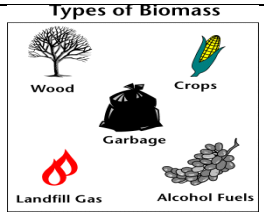
- Biomass energy will never run out
- It does not add to air pollution
- When we grow plants for biomass energy it helps clean the air
- Using garbage for energy will help reduce landfills

Disadvantages

- Collecting enough waste for bio-power could be hard
- Biomass materials burn faster than oil and coal so more would

Fig.13

Fig.14

be needed ➢ The land that is needed for creating biomass crops is being used for food production	 Fig.15

3. PRESENT STATUS OF COAL AND PETROLEUM IN INDIA

Table 1 : Comparison of Coal and Petroleum production.

Category	Coal	Petroleum
Reserve life for mine and well	10-40 years	5-15 years
Production rate	Uniform	Majority of recoverable
Reservoir recovery	50-90%	Reserves produces in first few years
Cost of finding reserves	Low	25 + Cent
Cost of Production	Very high	Very high
Variability of fuel quality	very high	Low
Market transactions	Spot and term	Low
Primary customers	Electric utilities	Spot
All Sectors of the economy		
Concentration/market Influence	Very competitive with A large number of Independent producers	A few large producers e.g. OPEC and large governmental owned companies.

4. OTHER SOURCES

Energy generation and utilisation like generation of steam through solar energy from sea water for nearby industries, solar cookers, solar engines for water pumping, food refrigeration etc. Solar photovoltaic cells, which can be used for conversion of solar energy directly into electricity or for water pumping in rural agricultural purposes. Solar heat is also contained in chemicals celled esthetic or phase, changing salts. India is placed amongst the top five nations in the production of solar power is now offering other nations solar energy solutions for the electrification of remote areas.

According to the director of photovoltaic Divisions under the Ministry of Non – Conventional Energy Sources (MNES) out of 121MW of solar production capacity , nearly 55MW of modules have so far been exported to the United states, Europe, Australia, Nepal, Bangladesh and Sri Lanka.

A major benefit of PV modules, being produced largely by Public Sector companies such as Bharat Neavy Electricals Limited and Central Electronics Limited, is that donot have to be connected to the power grid. At present eight Indian companies hold international certification for their products. Indias largest solar power success has been the electrification of villages in the sundenwans the world's largest mangrove forest.

The Ministry of Non-Conventional Energy Sources (MNES) is targeting cellular project (operators) to solar technology. MNES is reaching out to mobile service providers to promote the use of photovoltaic technology by utilizing PV to supply energy at their sites responsible for transmitting signals. MNES expects that the use of PV would prove to be a more effective power source than generator powered energy.

As per the statement of adviser Dr. E.V.R. Sastri a few mobile operators in Delhi and Rajasthan have experimented with solar energy and are satisfied with the results. MNES in planning to organize programmes to congregate vendors and mobile operators on a common platform. It is also scouting other evanesces where the technology can be marketed, e.g. railways and defense establishments. Dr. Sastry says that the railways is already

imploring PV technology to power railway signals in several divisions.[4] Development has been nominated as the nodal energy to execute the above said project. Solar and biomass are the two large renewable sources that fulfil the needs of electrification, but are not likely to be grid connected. Other alternatives to ensure power supply in rural areas would be to set up small generating units based on a variety of local fuels and localized distribution by bringing NGOs together. The MNES initiative complements the National objective of " Power for all " by 2012[5]. India – based Ankur Scientific Energy Technologies Pvt. Ltd. will supply its biomass gasifier model WBG 200 to the Energy and Environment Research Centre (EERC) at the University of North Rakota the United States.

Power generation in India has grown in size to around 1 lakh MW, which is distributed through a vast network of transmission, sub-transmission and distribution lines that reach all villages even in remote areas. The demand for power is growing rapidly. The problem will be compounded due to fast depletion of fossil fuel deposits, quality of fuels, heavy price to be paid for basic materials plus their transportation cost and above all the environmental degradation caused by the use of conventional energy sources. Under such conditions, environment-friendly and pollution-free, non-conventional and renewable energy sources known as 'clean and green energy' have emerged as important alternatives to conventional energy sources. The renewable energy sources are clean and inexhaustible as they rely on sun, wind, biomass, etc., as primary sources of energy. Renewable energy sources, or RES, are those energy sources, which are not destroyed when their energy is harnessed. Renewable energy sources are distinct from fossil fuels, which must be consumed to release energy. Human use of renewable energy requires technologies that harness natural phenomena, such as sunlight, wind, waves, water flow, biological processes such as anaerobic digestion, biological hydrogen production and geothermal heat.

Traditional uses of wind, water, and solar power are already widespread; but the mass production of electricity using renewable energy sources has become popular only recently, reflecting the major threats of climate change, concerns about the exhaustion of fossil fuels and the environmental, social and political risks of extensive use of fossil fuels and nuclear power. Many countries and other organizations (transnational organizations, municipalities, and societies) promote renewable energies by specific development policies. Several statutory definitions of the term renewable energy have been adopted to define eligibility.

Renewable energy resources may be harnessed directly, such as in solar ovens, geothermal heating, watermills, and windmills. They may require energy harvesting through appropriate technologies such as: electricity generation through wind turbines or photo electrochemical cells (PEC)s, or photovoltaic cells, production of biofuels such as biogas from anaerobic digestion, or ethanol from biomass.

Now we will discuss about the use of wind energy and its exploitation at different places in India. In India, the government intends to raise its power generation capacity by 450MW by renewable energy of the current renewable energy generation capacity of 4GW 1870 GW is produced by harnessing the wind energy. India targets on additional generation capacity of 100GW by 2012 , renewable resources like wind, solar biomass, industrial/ municipal wastes and small hydro-projects are expected to contribute 10GW.

Renewable energy figures high in the country's power – for – all plans with 18,000 remote villages which cannot be connected economically to the grid, expected to get their own power system.[5] In India, the Ministry of non-conventional Energy Sources (MNES) has estimated the nations gross wind power potential that can be tapped at present is about 13,000 MW. A total Wind power capacity of 1870 MW has been installed to date, representing 14.4 percent of the exploitable potential. Also MNES has been implementing a " Nation Programme " for Energy Recovery from Urban and industrial wastes since June 1995. This programme offers financial and fiscal incentives for setting up waste – to – energy projects, including garbage produced in cities. The energy recovery potential from urban wastes has been estimated to be around 2700 MW. Twenty one projects with a total capacity of 25.75 NW have so far been set up, while 11 projects with a total capacity of 25.75MW are in the process of being installed. [3]

The union Ministry of Textiles has declared interest rate subsidy for select textile units setting up captive wind energy based power plants. Units fulfilling specific norms would be eligible for an interest rate subsidy of 5 percent on investment made to set up wind power plants.[9]

India may surpass its target for boosting wind energy over the next four years as a result of is developed and improved grid lines. India has set a target of installing 1500 MW of wind power for 2002 – 2007 period. Around 700MW would be set up in the first two years, which leaves 800MW for the next three years. Mr. Ajit Gupta from the Ministry of Non – Conventional Energy Sources reports that the latter figure would probably be higher at about 1200-1500MW. Seeing the enhanced grid connections. With the World's fifth largest wind power market, India's installed wind capacity of 200MW is projected to reach 2300MW by March 2004. [4]

Now we focus on the biomass energy which has got the vast potential of utilisation as a useful energy. In India more than 300 villages in the Southern part of Karnataka will be supplied with power tapped from renewable sources. The Ministry of Non – Conventional Energy Sources (MNES) has Identified about 18000 villages in the country for

electrification through 10,000MW of power generated from renewable sources. Broadly situated in the north interior part of Karnataka the villages are geared to top mostly Solar and biomass energy for power generation. The Karnataka renewable Energy.

The gasifier system is to be coupled with three 300KWe micro turbines produced by Flex – Energy for field demonstration. EERC plans to install the gasifer and turbines on a flat bed trailer. The Flex units are modified captaincy turbines that can accept low-Btu, low pressure gas. This project is supported by the California Energy Commission and NREL. The Ankur biomass gasifer system incorporates several proprietary and patented features, including a unique reduction bed control system as well as filter media and filtering system which yield ultra-clean gas. Thereby overcoming a major rural faced by other biomass gasifier system of equipment.[6]

Another type of renewable energy source is wave and tidal energy source is wave and tidal energy. In India wind speeds generally obtainable are in the lower ranges. Attempts are therefore, on the development of low cost, low speed mills for irrigation of small and marginal forms for providing drinking water in rural areas.

The developments are being mainly concentrated on water pumping mills suitable for operation in a wind speed range of 8 to 36 KM per hour. In India high wind speeds are obtainable in coastal areas of somewhere , western Rajasthan and some parts of Central India. Many projects on the wind mill systems for water pumping and or production of small amount of electrical power have been taken up by the various organisation in our country.

Following are some of the developments :

a) CAZRI wind mill at Jodhpur (Rajsthan).
b) WP – 2 water pumping wind mill by NAL Bangalore.
c) MP-1 sail wind mill at NAL Bangalore.
d) Wind mills at Central Salt and Marine Chemicals Research, Institute Bhavnagar (Gujarat).
e) 12PV 500 wind mill at NAL Bangalore.
f) Madurai wind mill at Madurai (Tamil Nadu).
g) Tayebji wind mill at Tilonia near Ajmer (Rajasthan)
h) Sholapur wind mill at sholapur (MS)

India has a potential of 20000MW of wind power and ONES is trying to use it up to the optimum.[1] Another important renewable energy source is use of fuel cells. It may be defined as an electro – chemical device for the continuous conversion of the portion of the free energy change in a chemical reaction to the electrical energy. It is distinguished from a battery in that it operates with continuous conversion of the portion of the fuel and the oxidant at active electrode area and does not require revering.

The national chemical laboratory at Pune, India has developed a 5KW fuel cell to replace noisy and polluting diesel generators used for back up power at homes and offices. According to Mr. Paul Ratnaswamy of NCL, the fuel cell power pack is the outcome of a US $ 1.25 million national programme launched by the council of scientific and industrial Research.

Other partners in this endevaour include the South Indian Petrochemical Co. BHEL and Kirloskar Engineering Co.[5] By the above given facts and the knowledge extracted about various renewable energy sources and its present harnessing status and application in India we can say that we have in sum and short overviewed the topic thoroughly through literature survey based on the journals related to renewable energy sources.

5. SOLAR POWER

Indian government plans to set up 10000 new solar shops around the country by March 2016. This goal is part of the Nations 12th five year plan, which also forces an additional 200MW of PV production. According to Mr. E.V.R. Sastry Solar energy adviser at the Ministry of Non – Conventional Energy Sources (MNES), 90 percent of the shops will be set up by private entrepreneur and NGOS. Each establishment can avail of a one time grant equal to about 20-23 percent of the cost of starting the business. While MNES plans to sanction 500 shops the rest would be set up directly by the government.[5]

More than 340 MW integrated solar combined cycle power project scheduled for implementation in Rajsthan.[6]

Solar power as a direct energy source Fig.16 has not been captured by mechanical systems until recent human history, but was captured as an energy source through architecture in certain societies for many centuries. Not until the twentieth century was direct solar input extensively explored via more carefully planned architecture (passive solar) or via heat capture in mechanical systems (active solar) or electrical conversion (photovoltaic). Increasingly today the sun is harnessed for heat and electricity.

Solar Power was once considered, like nuclear power, 'too cheap to meter' but this proved illusory because of the high cost of photovoltaic cells and due to limited demand Experts however believe that with mass production and improvement in technology, the unit price would drop and this would make it attractive for the consumers in relation to thermal or hydel power. The Solar Photo Voltaic (SPV) technology which enables the direct conversion of sun light into electricity can be used to run pumps, lights, refrigerators, TV sets, etc., and it has several distinct advantages, since it does not have moving parts, produces no noise or pollution, requires very little maintenance and can be installed anywhere. These advantages make them an ideal power source for use especially in remote and isolated areas, which are not served by conventional electricity making use of ample sunshine available in India, for nearly 300 days in a year.

A Solar Thermal Device Fig.16 & Fig.17on the other hand captures and transfers the heat energy available in solar radiation. The energy generated can be used for thermal applications in different temperature ranges. The heat can be used directly or further converted into mechanical or electrical energy. Solar power is the technology of obtaining usable energy from the light of the Sun. Solar energy has been used in many traditional technologies for centuries and has come into widespread use where other power supplies are absent, such as in remote locations and in space.

Solar energy is currently used in a number of applications:

- Heating (hot water, building heat, cooking)
- Electricity generation (photovoltaic, heat engines)
- Desalination of seawater.

Its application is spreading as the environmental costs and limited supply of other power sources such as fossil fuels are realized.

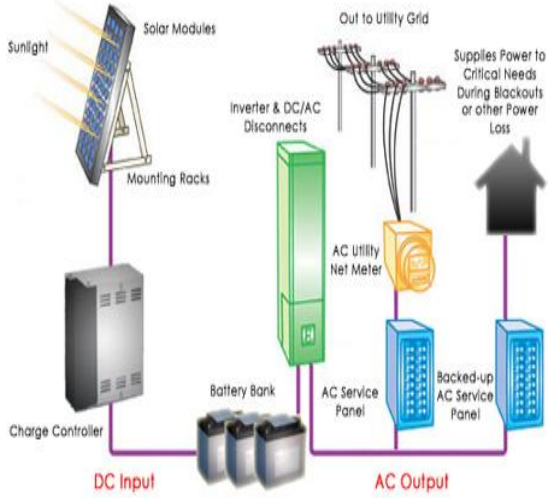


Fig.16: Generation of Solar Power

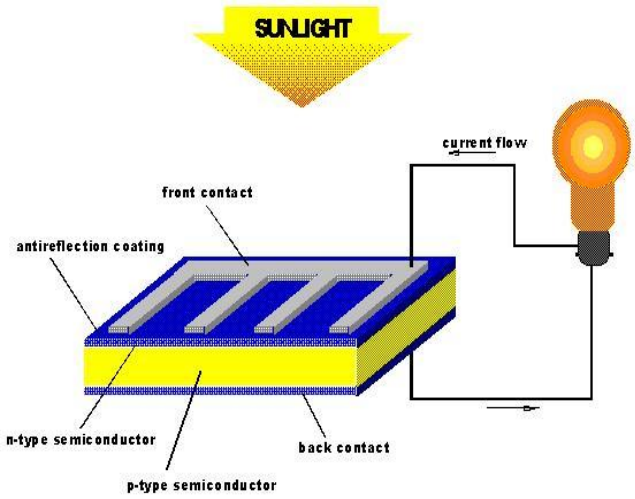


Fig.17: Basic structure of a typical solar cell

Solar radiation reaches the Earth's upper atmosphere at a rate of 1,366 watts per square meter (W/m2). While traveling through the atmosphere, 6% of the incoming solar radiation (insolation) is reflected and 16% is absorbed resulting in a peak irradiance at the equator of 1,020 W/m². Average atmospheric conditions (clouds, dust, and pollution) reduce insolation by 20% through reflection and 16% through absorption. In addition to affecting the quantity of insolation reaching the surface, atmospheric conditions also affect the quality of insolation reaching the surface by diffusing incoming light and altering its spectrum.

Photovoltaic panels currently convert about 15% of incident sunlight into electricity; therefore, a solar panel Fig.17 in the contiguous United States on average delivers 19 to 56 W/m² or 0.45-1.35 kWh/m²/day. The dark disks on the second image on the right are an example of the land areas that, if covered with solar panels, would produce slightly more energy in the form of electricity than the total primary energy supply in 2003. While average insolation and power values offer insight into solar power's potential on a regional scale, locally relevant conditions need to be assessed to determine the solar potential of a specific site.

A recent concern is global dimming, an effect of pollution that is allowing less sunlight to reach the Earth's surface. It is intricately linked with pollution particles and global warming, and it is mostly of concern for issues of global climate change, but is also of concern to proponents of solar power because of the existing and potential

future decreases in available solar energy. The order of magnitude is about 4% less solar energy available at sea level over the timeframe 1961–90, mostly from increased reflection from clouds back into outer space.

After passing through the Earth's atmosphere, most of the sun's energy is in the form of visible and infrared radiations. Plants use solar energy to create chemical energy through photosynthesis. Humans regularly use this energy burning wood or fossil fuels, or when simply eating the plants.

Advantages

- The 122 PW of sunlight reaching the earth's surface is plentiful compared to the 13 TW average power consumed by humans.
- Solar power is pollution free during use. Production end wastes and emissions are manageable using existing pollution controls. End-of-use recycling technologies are under development.
- Facilities can operate with little maintenance or intervention after initial setup.
- Solar electric generation is economically competitive where grid connection or fuel transport is difficult, costly or impossible. Examples include satellites, island communities, remote locations and ocean vessels.
- When grid connected, solar electric generation can displace the highest cost electricity during times of peak demand (in most climatic regions), can reduce grid loading, and can eliminate the need for local battery power for use in times of darkness and high local demand; such application is encouraged by net metering. Time-of-use net metering can be highly favorable to small photovoltaic systems.
- Grid connected solar electricity can be used locally thus minimizing transmission /distribution losses (approx 7.2%).
- Once the initial capital cost of building a solar power plant has been spent, operating costs are low when compared to existing power technologies.

Disadvantages

- Limited power density: Average daily insolation in the contiguous U.S. is 3-7 kWh/m^2 usable by 7-17.7% efficient solar panels.
- Locations at high latitudes or with substantial cloud cover offer reduced potential for solar power use.
- Like electricity from nuclear or fossil fuel plants, it can only realistically be used to power transport vehicles by converting light energy into another form of energy (e.g. battery stored electricity or by electrolysing water to produce hydrogen) suitable for transport.
- Solar cells produce DC which must be converted to AC when used in currently existing distribution grids. This incurs an energy penalty of 4-12%.

Water , Energy, Biodiversity (WEB) is a private organization planning to introduce a solar power – driven water purification facility in Maldives. The " Solarflow System " supplied by the Solar Energy System, Australia can produce 500 l/d of potable water. It combines a reverse osmosis unit specifically designed for operation from solar pannels. While WEB plans to launch the purification facility in Maldives with the co-operation of a private company, a pilot project will first be undertaken in association with the planning Ministry prior to embarking on the Venture.[6]

6. FUTURE DEVELOPMENT

In the long-term future space exploration could yield a number of energy sources, though they are unlikely to be relevant in tackling humanity's current difficulties with energy sources.

The nearest-term possibility is solar power satellites, where solar cells are placed on orbiting platforms in 24-hour sunlight; the energy is then beamed to earth as microwaves received by arrays of receiving antennas. A fundamental development in space launch technology (such as a space elevator) and/or massive industrial developments beyond Earth orbit will be required to make such a scheme economically competitive with terrestrial sources.

Fissionable materials could theoretically be obtained from asteroid mining; however, the technical barriers to asteroid mining are probably considerably higher than those of breeder reactors, which remove any practical supply constraints on fission power. Another interesting long-term possibility is the mining of helium-3 from the Moon for use in aneutronic fusion reactors, which have several advantages over the fusion reactor designs currently being

experimented with. Helium-3 is unavailable in quantity on Earth. However, even "conventional"fusion power reactors are decades away from commercialization. Another suggestion is electrodynamic tethers. In the very distant future, a spacefaring humanity has a number of options for very large-scale power generation; as well as fusion and very large-scale solar power (of which the ultimate such is the Dyson sphere) there has been speculation as to how an extremely advanced society might exploit the mass-energy conversion capabilities of black holes (like the accretion disc). Such technologies are obviously far, far, beyond our present capabilities, and are at this stage essentially thought experiments for engineers and science fiction writers.

7. CONCLUSIONS & RECOMMENDATIONS

The basic demand of a human life is a good health and better life uses appliances which facilitates to us a frictionless conditions. So energy is the key tool for these basics. Renewable energy sources helps to give the pollution free energy economically. In near future non conventional energy sources should have more percentage of generation of energy in comparison of conventional sources.

It believes that biomass is a very good source of energy for our future. The only downfall seems to be collecting enough waste for energy production. Authors think the biggest advantages are that it could reduce trash in landfills and that we can grow it here in our country. The biggest benefit would be that we can eliminate garbage and other waste while creating clean energy at the same time. The advantages far outnumber the disadvantages for bio-power

A Solar Thermal Device on the other hand captures and transfers the heat energy available in solar radiation. The energy generated can be used for thermal applications in different temperature ranges. The heat can be used directly or further converted into mechanical or electrical energy. Solar power is the technology of obtaining usable energy from the light of the Sun. Solar energy has been used in many traditional technologies for centuries and has come into widespread use where other power supplies are absent, such as in remote locations and in space.

Author's have discussed different facet of renewable energy sources such as solar energy, wind energy, wave and tidal energy, fuel cells, biomass etc. It is observed that we the people of India with support from government can harness renewable energy sources but it is also clear that still we are far behind the developed nations who are researching ahead with a good pace in the energy exploitation.

Also enough research infrastructure is not provided and it is yet to find some economically viable indigenous technology. The government is concentrated on doing work in this area in specific places of subcontinent. Through literature survey we can say with full authority that Japan, U.S.A., U.K., France, Italy, Sweden, Denmark are developing latest technology to harness this energy. They are moving forward with a long term planning but we still lack the vision and eagerness. Situation will blow out of proportion if we are not alert enough and farsighted to develop indigenous technology or imported technology.

There is ample chances of research in this work, Government, NGOS, Organisation, Scientist, Academician should come closer to take the challenge in a high spirit and uplifted motivation.

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