A CONSOLIDATED REPORT ON SOLAR ENERGY, BIOMASS, BIO-DIESEL, BIO-ETHANOL

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Abstract:- ***To face the energy crisis produced by burning of excessive amount of fossil fuels. The scientists and environmentalists come to realise the importance of renewable sources of energy to eradicate the pollution by developing new technologies and discussing its pros and cons ,in addition to it developing sustainable ways to tackle the problem of global warming and green-house effect.***

Key words: renewable source, global and green-house effect.

1. INTRODUCTION:-

(1) BIOMASS:-

Biomass is the most eminent fuel for producing heat, electricity and light for it's eco-friendly environment fuel , replacing on the grounds of economic entity and nature being renewable. Scientists have discovered it on the economical grounds it to be very beneficial for the energy crisis in future . If the consumption fossil fuels is increased day by day , then one day we will be left with 0% energy fuels ,if we are unable harness bio-fuels for the existence of mankind.

(2) PYROLYSIS:- It is the process of decomposition of biomass into bio-char and biooil, the former can be use Bio-energy is defined as a renewable source of energy which is manufactured from biomass. Organic materials such as trees, plants and waste materials , it is rapid because of rapid growth of fuel prices, fast fossil fuels depletion , environmental degradation by fossil fuels and an alteration of climate change.

Countries like Malaysia and Indonesia are producing world's highest production of palm oil and from this they are producing biodiesel, while in India we have used 5% ethanol in diesel, neem-oil, jatropha, karanja etc,. In china the major source of ethanol production is corn ,it produces around 80%. In brazil, the production of ethanol ,biofuels are from physic nut, sunflower, soybean, castor bean, seasame, canola etc,.d to purify water as a water –filter. Latter can be used as a energy fuel for the replacement of petrol, diesel etc,.

(3) BIO-DIESEL:-

Bio-diesel is an alternative fuel made from biological sources such as vegetable oils both edible and non-edible , animal fats etc,. Bio-diesel is a fuel comprised of mono alkyl esters of long chain fatty acids from vegetable oils or animal fats. With the increasing use of diesel, to more attractive bio-fuel products to increase the production of bio-fuels , there are also some alternatives mainly biogas, producer gas, ethanol, methanol and vegetable oils.

(4) SOLAR ENERGY:- The planet (arrangement of solar panels) which converts solar energy to the light energy from the sun into electrical energy (charge emission) is called a solar power plant process. In solar plant there are many solar panels are connected and in panels there are many cells which make panels. In which special metal is used which is the form of lines and these lines are also connected to very thin lines and all these lines are connected to a metal line frame which is mainly quadrilateral in shape. So there is large area to trap light i.e., now there is a suitable area for light to fall on it electrons start's to emit from thin lines to metal frame and current goes into a diode box which is behind the panel and then into supply wires.

Solar power is an immense source of directly useable energy and ultimately creates resources: biomass, wind, hydro-power and wave energy.

Most of the earth's surface receives sufficient solar energy to permit low-grade heating of water and buildings, although there are large variations with latitude and season. At low latitudes, simple mirrors devices can concentrate solar energy sufficiently for cooking and even for driving steam turbines.

The energy of light shifts electrons in some semiconducting materials. This photovoltaic effect is capable of large-scale electricity generation. However, the present low efficiency of solar PV cells demands very large to supply electricity demands. Direct use of solar energy is the only renewable means capable of ultimately supplanting current global energy supply from non-renewable sources, but at the expense of a land area of at least half a million .

(5) BIO-ETHANOL:- The production of ethanol using diverse conversion technologies and various renewable non-food feedstock marks the beginning of sustainable energy future. Production of ethanol sustainable non-food feedstock in first generation bio-refineries has been recently deployed at commercial scale. Biological conversion processes including hydrolysis-fermentation and syn-gas fermentation have been developed for the production of ethanol . Various process configurations are possible in the hydrolysis-fermentation route. Syn-gas fermentation is an indirect conversion process for production of alcohols and chemicals from CO, CO2 and H2. Advancement in metabolic engineering, strain and process development of syn-gas fermentation resulted in production of new products from syn-gas and enhanced product selectivity, productivity and yields. Further research efforts should be focussed on utilization of different types of non-food feedstock, process integration, metabolic engineering, and discovering new highly productive microorganisms. Ultimately, the reduction in bio-fuels production cost improves their feasibility to become a viable alternative to fossil fuels. Bio-ethanol presents energetic, economic, and environmental challenges, in all the steps of its production (pre- treatment , hydrolysis, fermentation, and distillation) . These challenges include lack of cost -efficient technology ,low yields, costly pre-treatment, cellulose enzymes, and lack of microorganisms capable of fermentation both C5 and C6 sugars. Further research needs to be done in all the stages of the process to increase the efficiency of the production and decrease the costs.

2. PROCESS DESCRIPTION:-

(1) BIOMASS:- Agricultural industry residues and wastes constitute a significant proportion of worldwide agricultural productivity. Although the quantity of wastes produced by agricultural sector is significantly low compared to wastes generated by other industries, the pollution potential of agricultural wastes is high on a long-term basis. Agricultural waste is unwanted or unusable materials produced wholly from agricultural operations directly related to the growing of crops or raising of animals for the primary purpose of making a profit or for a livelihood.

Some examples of examples of biomass include:-

- Grape vines
- Fruit bearing trees
- Vegetables
- Date palm frounds
- Tallow
- Starchy crops
- Algal crops
- Ligno-cellulosic crops

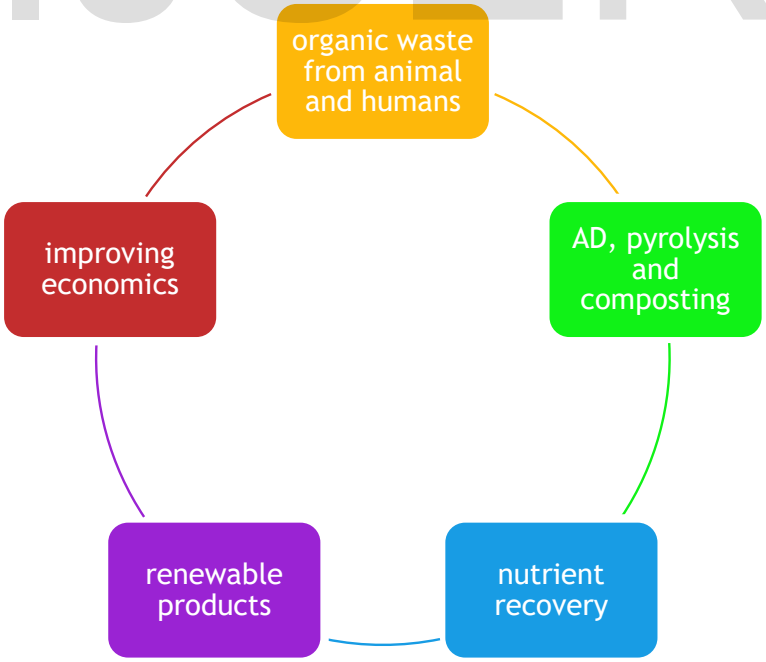

Figure 1- Recycling of biomass production and application.

Biomass gasification can be combined with SOFCs has promise for electricity and heat generation , as well as environmental and socio-economic benefits. Drivers for adopting this technology, particularly in remote rural areas, are both environmental and financial, since connection to the grid can be expensive in such areas and biogas can be produced on site with no significant extra costs.

(2) BIOMASS PYROLYSIS:- (PYROLYSIS PRINCIPLES)

The process of pyrolysis of organic matter is very complex and consists of both simultaneous and successive reactions when organic material is heated in a non-reactive atmosphere. In this process, thermal decomposition of organic components in biomass starts at 350- 550℃ and goes up to 700-800℃ in absence of nitrogen. The long chains of carbon, hydrogen and oxygen compounds in biomass break down into smaller molecules in the form of gases, condensable vapours(tars and oils) and solid charcoal under pyrolysis conditions.

PYROLYSIS CLASSIFICATION:-

There are two types of pyrolysis process:- (1) fast pyrolysis (2) slow pyrolysis

In slow pyrolysis , the vapour residence time is too high and the temperature range is too low, whereas in fast pyrolysis , the vapour residence time is small and the temperature range is high enough.

COMPONENTS OF BIOMASS:-

The components of biomass are cellulose, hemicelluloses and the lignin. The feedstock of biomass contains wood, willow, straw, sweet grass, reed canary grass etc,.

PYROLYSIS REACTORS:-

- Fixed bed reactor
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- Vortex reactor
- Rotating disc reactor
- Vacuum pyrolysis reactor
- Rotating cone reactor
- Pyros reactor
- Auger reactor
- Plasma reactor
- Microwave reactor
- Solar reactor

PYROLYSIS PROCESS DESCRIPTION:-

• Feed preparation

• Biomass heating

• Char separation

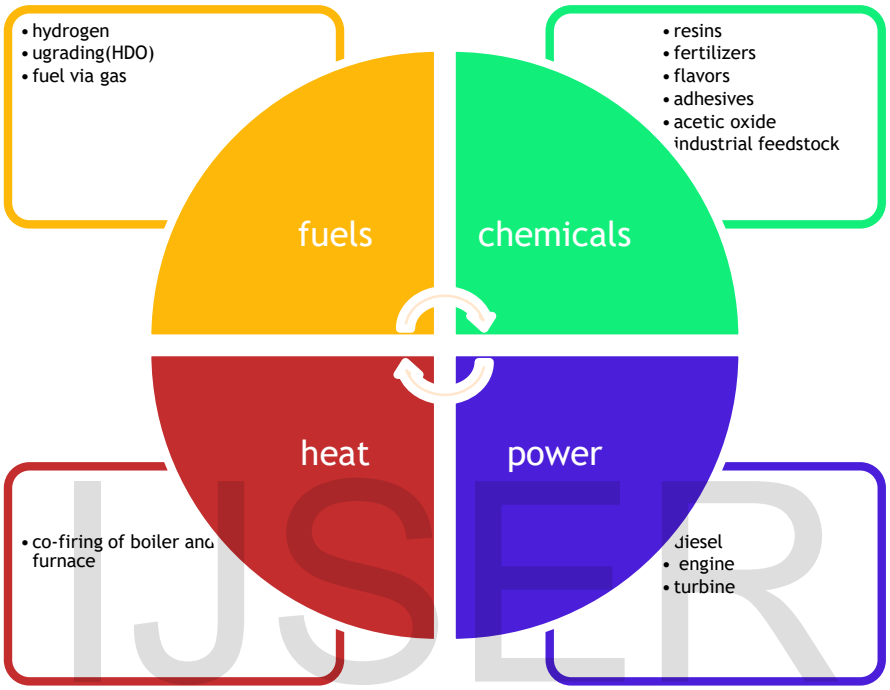

Figure 2- pyrolysis products manufacturing and applications.

The quality of bio-oil depends on the raw material and technology used for pyrolysis . The chemical composition of bio-oil, cellulose, hemicelluloses, and lignin are the sources of chemical l and physiochemical characteristics of bio-oil. During the pyrolysis the cellulose degrades to form levoglucan, oligosaccharides and other glucose compounds . Hemicellulose forms acetic acid, glycoaldehyde, furfural and anhydroxylopyranose. And lignin is converted into aromatic compounds including phenolics and hydrocarbon. From studies we get that the cellulose and hemicelluloses creates maximum yield of biooil, lignin leads to bio-char formation.

The raw material for the production of bio-oil is black spruce hails from Quebec, Canada is taken here.

Here we have used some reactors like:- auger reactors, bubbling, circulating and spouted reactors , latter 3 reactors comes under the list of fluidized bed rectors, the advantage of using fluidized bed reactor is that it provides conduction heat, convection, and radiation, above all it also facilitates the working under high temperatures requiring less residence time. In case of auger reactions, it works on less temperatures and preheat-treatment steps applied to biomass , but we prefer fluidized bed reactor because it works on fast pyrolysis at high temperatures. The operational technique we use is fractional condensation , in this we condense the volatile vapors of bio-oil through the dew point

differences of condensable components. We obtain a fraction of bio-oil with lower water content and higher quantity of organic compounds can be recovered between 70-120℃ . The remaining fractions obtained by using low temperature – controlled condensers, contains high water content and high-oxygenated compounds.

(3) BIO-DIESEL:-

Methods to produce to bio-diesel:-

- Production of bio-diesel by transesterification
- Production of bio-diesel from edible oil
- Production of bio-diesel from non-edible oil
- Production of bio-diesel from waste cooking oil

The conclusion of literature review:-

- Bio-diesel is an important alternative transportation fuel and it posses properties like renewability ,bio-degrability, non-toxicity and environmental friendly benefits
- Bio-diesel can be produced from different feedstock containing fatty acids such as animal fats, edible oils, non-edible oils, and waste cooking oils and by products of the refining vegetables oils
- Trans-esterification is a commonly employed method for its production. The purpose of this method is to reduce the viscosity of oil or fat using acid or base to catalyst in the presence of methanol or ethanol
- Trans-esterification with alkali catalyst (KOH and NAOH) is more economical than acid catalyst and enzyme catalyst The bio-diesel production is strongly affected by parameters such as molar ratio of alcohol, reaction temperature, reaction time and catalyst concentration.

This is the vegetable oil that has had a glycerol removed, a process that involves adding methanol and lye. This makes the mixture less viscous and gives it additional energy density. This makes the fuel easier to use in vehicles year-round , even in winter. Straight vegetable oil (SVO) also is a drop-in fuel, but cold weather can cause the fuel to gel. It’s important to note that bio-diesel replaces diesel fuel, not gasoline. Most diesel-fueled vehicles in the U.S are heavy-duty and commercial trucks.

(4)SOLAR ENERGY:-

The solar energy is produced by the sunlight is an non-vanishing renewable source which is free from eco-friendly. Even hour enough sunlight energy reaches the earth to meet the world’s energy demand for a whole year. In today’s generation we needed electricity every hour. This solar energy is generated by as per applications like industrial, commercial, and residential. In this article, we have reviewed about the solar energy from sunlight and discussed about their future trends and aspects. The article also tries to discuss working, solar panel types: emphasize the various applications and methods to promote the benefits of solar energy.

Most of the people are aware about non-renewable energy resources. Solar energy has become increase more popular due to their economic benefits. By on battery backup, solar energy can even provide electricity 24by7, even on cloudy days and at night. This is also used with intergrid system with continuously power supply. It has more benefits compared to other forms of energy like fossil fuels and petroleum deposits. It is an alternative which is promise and consistent to meet the high energy demand. Research on solar cell and solar energy is promise has a future worldwide.

The sun is the major source of inexhaustible for planet earth, to generate electricity, purify water ponds,etc,. Approximately around 4 million joules of energy is required to harvest and some contributions are made by countries like California, India, etc,. Are giving their full effort to replace the fossil fuel crisis in transportation sector

Policies , investments, and supports (including funding) from various governmental and nongovernmental organizations for solar technologies have helped build up a solid foundation for the exploitation of this renewable sources of system. In addition to, greater subsidiaries should be provide d for residential generators over utility-scale generators. In this article, we will discuss about the perspectives of solar energy, related to their potential ,present capacity, limitations and policies.

POTENTIAL OF SOALR ENERGY TECHNOLOGIES AND COMPARISONS:-

Solar energy exhibits the highest global potential since geothermal has a few locations to be planted .some sunniest countries like Africa, western china, California ,Australia are labelled very good for solar energy implantation as they have favourable weather conditions like high altitudes, low fugitive dust, high transparency, and low humidity. On global front we observe that, the earth reflects 30% of solar radiation and only 70% is captured and harvested. Recently Morocco, is going to launch one of the largest solar energy project of 200MW.

Now there are two types solar technologies:- Passive solar technologies

Active solar technologies

TECHNICAL RE VIEW:-

First generation PV panels are made from silicon wafers at relatively high cost. They represent the industry standard, delivering efficiencies between 12-20% and are particularly durable.

Second generation PV devices are made by depositing thin film of semiconductor directly onto glass, metal foil or plastic , reducing the cost of materials but resulting in a loss in efficiency (usually to 10% less) when manufactured over large areas. All plastic, flexible solar cells have the possibility of very low manufacturing cost, but the efficiency (4%) and lifetime (typically one year of operation) need to be improved.

Third generation, PV devices, currently under development, aim to improve the efficiency of solar conversion towards the thermodynamic efficiency limit of 86.8%. Currently , the highest efficiencies achieved are around 40% , with very high costs. Nevertheless, these technologies are used in terrestrial concentrator solar power plants and used to power modern communication satellites.

On the domestic scale, the quantity of electricity that PV panels can provide depends upon their efficiency , size and local level of solar illumination. PV panels suitable for use of roofs are now

manufactured in sufficient quantity that the electricity generation is favourable in almost reaches grid parity.

Figure 3- Passive solar technologies.

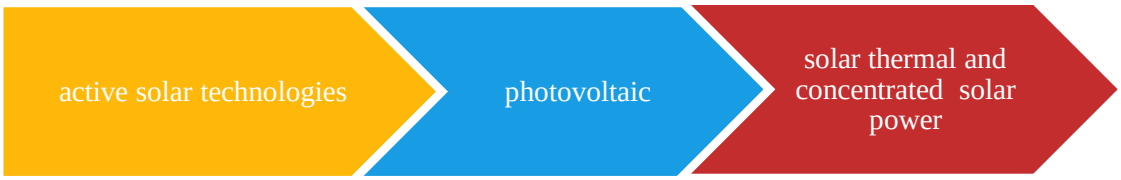

Figure 4- Active solar technologies.

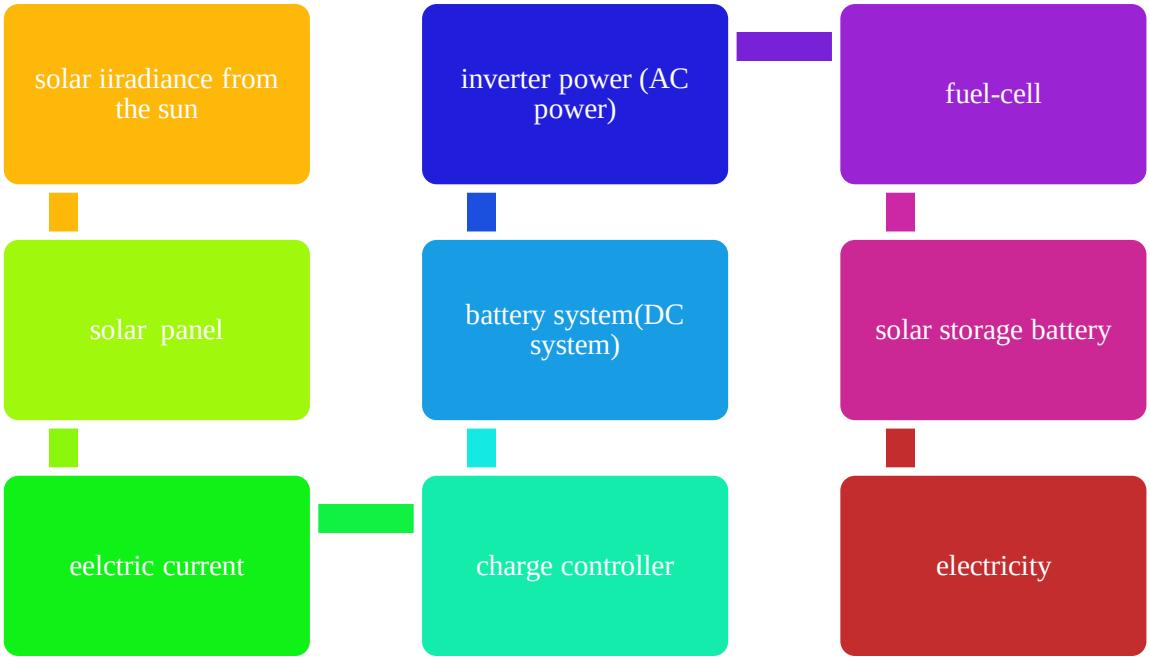

Figure 5- Solar energy production cycle.

(5) BIO-ETHANOL:-

In this paper, we have taken the strain of yeast(K. Marxiamus)separated from bagasse hydrolysates. It has grown under both aerobic and anaerobic conditions at 48 and produced ethanol efficiently by fermentation. It can also utilize the cellobiose, xylose, arabinose, and lactose without them into ethanol by fermentation. At 42 , the strain of above yeast produced ethanol , but at 30 , we used eucalyptus-cedar hydrolysates poorly produced ethanol. On other we have taken another yeast strain called S.cerevisiae produced more yield. of ethanol than the former strain of yeast same conditions.

In this paper we have discussed about producing bio-ethanol from lignocellulosic biomass ,first step is pre-treatment, the process consists of ultra-filtration, nano-filtration, in addition to it enhancing of pre-treatment involving fungi(T.reesi and Basidiomycetes) , Candida , pichai and dekkra from sugarcane molasses, with low pH and high temperature. This process requires genetically modified fermentative and cellulolytic microorganisms under the stress conditions of the ethanol yield and productivity for the production bio-ethanol processes. Simultaneous saccharification and combined fermentation of enzymate hydrolyzate and also CBP is considered appropriate for cost-reducing and effective. Here is genetic engineering is playing a vital role for the production of bio-ethanol and also their recombinations of DNAs play a good role in this process of their fungi.

The cellulosic bio-ethanol production process involves specific processing steps, especially in the pre-treatment and hydrolysis . Fermentation of C5 and C6 sugars needs adapted microorganisms , still to be further investigated.

New combined processes reduce both the number of operation steps and the production of chemical inhibitors. Recent advances in genetically engineered S.cerevisiae and Z.mobilis are promising for higher alcohol tolerance and conversion efficiency. Second generation bio-ethanol could surpass the traditional first generation processes, provided present processing bottlenecks are removed and the best combination of advanced system is used. With the urge of the fossil fuels , on the depletion zone , the demand of petroleum products have been on a low mode because of its drastic depletion . So we have invented , a lignocellulosic biomass which consists of the cellulosic, hemicellulose and lignin are processed along with the distillation, pretreatment, enzymatic hydrolysis, fermentation and dehydration.

Shifting the transport sector from petroleum and gasoline towards more sustainable , renewable and environmentally friendly energy sources such as second generation bio-ethanol is one of the greatest challenges in engineering. The production of lignocellulosic bio-ethanol requires improvements related to the pre-treatment , enzymatic hydrolysis and fermentation stages , in order to increase the cost-effectiveness of ethanol production, and to make the transition from the laboratory to the industrial/commercial scale. One of the most important goals is to increase the efficiency of the fermentation process to the point where all the sugars(pentoses and hexoses) released during the pretreatment and hydrolysis steps are fermented to ethanol. Technical barriers to second generation biofuels production include the variable composition of biomass, generation of inhibitors during presaccharification treatment, end-product inhibition, osmotic , progress is being made and these technical barriers can be expected to be overcome in the near future , optimizing the bio-chemical.

Bio-ethanol presents energetic, economic, and environmental challenges, in all the steps of its production (pre-treatment , hydrolysis, fermentation, and distillation) . These challenges include lack of cost-efficient technology ,low yields, costly pre-treatments, cellulose enzymes, and lack of microorganisms capable of fermentation both C5 and C6 sugars. Further research needs to be done in all the stages of the process to increase the efficiency of the production and decrease the costs.

In the distillation process, the biggest challenge refers to the large fraction of biomass waste that is produced and left unused at the end of process. The best solution for utilisation of these waste-products is still under investigation.

Utilisation of waste-products through further AD has been as a possible path to reduce costs of bio-ethanol production by adding economic value to the production chain, increasing the efficiency of the process, and as an environmental solution to a large quantity of process residue with high BOD that is generated during bio-ethanol production.

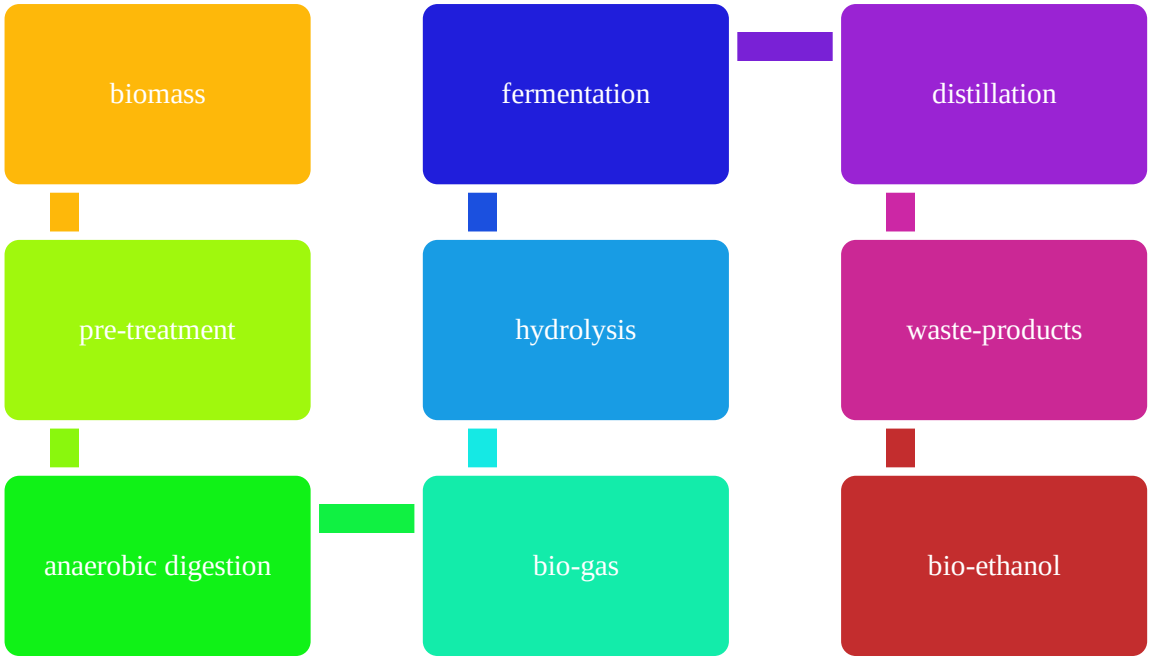

Figure 6- Bio-ethanol production cycle.

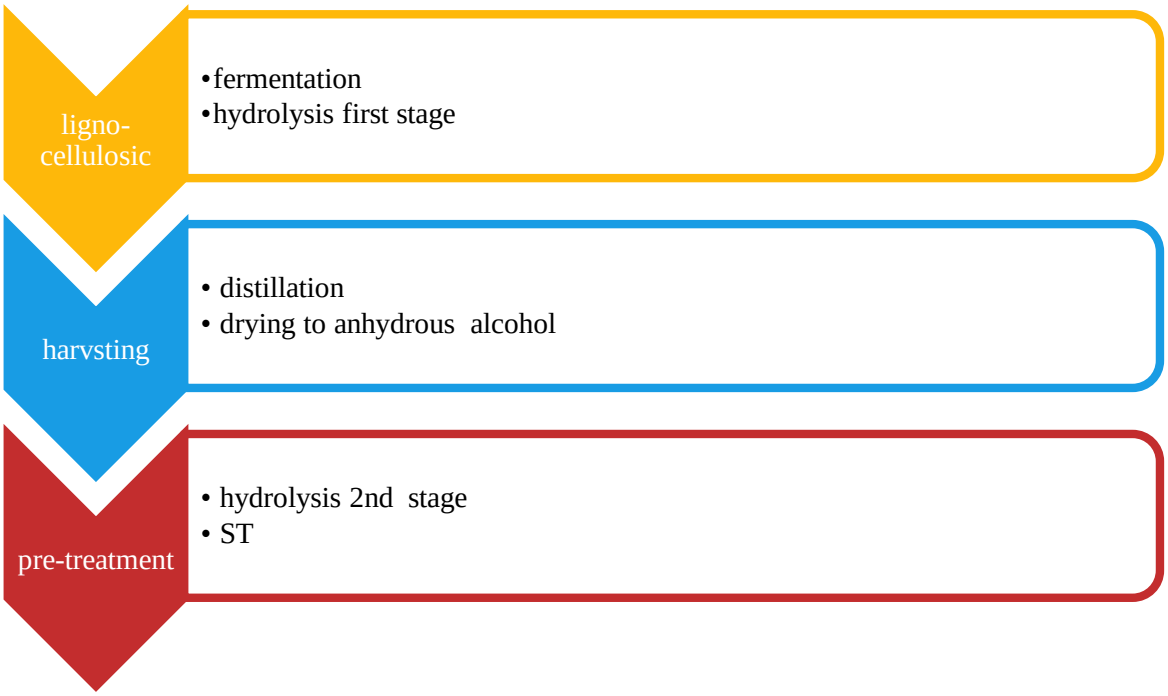

Figure 7- Production of bio-ethanol from lingo-cellulosic plants.

3. MERITS AND DEMERITS:-

(1) BIOMASS:-

MERITS-

- It is widely available as a renewable source of energy
- It is carbon neutral
- It is less expensive than fossil fuels
- It adds revenue in landfills

DEMERITS-

- Agricultural wastes will not be available if the basic crop is no longer grown
- Additional work is needed in areas such as harvesting methods
- Land use for energy crops maybe in demand for other purposes, such as farming, conservation, housing, resort or agricultural wastes
- Some biomass conversion projects are from animal wastes and are relatively small and there fore limited

(2) BIOMASS PYROLYSIS:-

MERITS-

- It is a simple, inexpensive technology for processing a wide variety of feedstocks
- It reduces wastes going to landfill and greenhouse gas emissions
- It reduces the risk of water pollution

DEMERITS-

- The product stream is more complex than for many of the alternative treatments
- The product gases cannot be vented directly in the cabin without further treatment because of the high CO concentrations

(3) BIO-DIESEL:-

MERITS-

- It is produced from renewable resources
- It can be used in existing diesel engines
- Less greenhouse gas emissions
- Grown, produced and distributed locally

 Cleaner bio-fuel refineries

 Bio-degradable and non-toxic

DEMERITS-

 Variation in quality of bio-diesel

 Not suitable for use in low temperatures

 Food shortage

 Increased due to fertilizers

 Clogging in engines

 Regional suitability

 Water shortage

(4) SOLAR ENERGY:-

MERITS-

 It is eco-friendly and renewable source product Reduces electricity bills

 Diverse applications

 Low maintenance costs

 Rise in technology development

 Reducing the global warming effect by generating electricity through solar energy

 Good ratio of power efficiencies ratio than coal , petroleum products etc,.

 A team of MIT(USA) have developed a new solar cell using two different layers of sunlight absorbing material to harvest a broader range of suns' energy ,using a heat-resistant device to generate electricity by using a green polymer obtained from bio-waste was applied to the dye-sensitized solar cells.

DEMERITS-

 High initial costs

 Lengthy payback period and small revenue

 Performance limitations of other battery components like (batteries. Inverters) need a side improvement

 Factors associated loss of skilled workers, demands for installation, maintainenance etc,. Need to be supervised

 The plausibility of cracks within PV module, water intrusion, exposure to dust, and algal growth can greatly lower the performance of the system.

(5) BIO-ETHANOL:-

MERITS-

- It is a renewable source of energy
- It is cheaper than petrol
- It burns more cleanly in air than petroleum , producing less carbon(soot) and carbon monoxide

DEMERITS:-

- It may undergo oxidation reaction to form acetic acid, which corrodes engine parts
- It has lower heat of combustion
- Various environmental problems may arise out of disposal of fermentated liquors
- Environment
- Costs
- Energy
- Waste-products

On going concerns about climate change have made renewable sources of energy an important component of the world energy consumption . Renewable sources technology can reduce carbon dioxide emissions by replacing fossil fuels in the power generation and transportation sector. Due to negative and irreversible externalities in conventional energy production, it is necessary to develop and promote renewable energy technologies. Power generation using renewable energy sources should be increased to decrease the unit cost of energy and to make them compatible with a competitive alternative to the conventional energy sources. Two main solutions may be implemented to reduce CO2 emissions and to overcome the problem of climate change : replacing fossil fuels with renewable energy sources as much as possible and enhancing energy efficiency regardless of type. In this literature review, we have considered hydro, wind, solar and geothermal sources. Renewable energy production and supply is continuously increasing on global level.

Here we are discussing about the hydro power is the largest renewable energy source for power generation around the world. Hydro power is attractive due to a combined supply of water for agriculture, household, recreation and industrial use. In addition to it, it can store water and energy that can be used for both base and peak load power generations. Also it has very less cost efficiency. It needs to be implemented in perennial river site location for the project to be implemented.

Now we have also considered about geothermal energy which is originated under the earth's crust in the form of vapour heat or steam generation. It is also cost efficient and beneficial to produce energy efficiency.

Energy is an requirement in our daily lives , we make every possible effort to make our both ends need through energy. Primarily there are two types of sorces of energy:- (1) Nonrenewable source (2) renewable source of energy. The former consists of :- petroleum products, wood, charcoal, other inorganic chemical compounds, plastics , fossil fuels ,etc,. The latter consists of:- solar energy, wind

energy , OTEC, biomass, bio-gas, hydro energy, wave energy etc,. According to the renewable energy production biomass, bio-fuel and biogas energy and wind energy are the most prominent sources of eco-friendly energy production. By further inventions from bio-fuel crops like sugarcane, palm oil , jatropha etc,. Are discovered by environmental scientists to improve the energy efficiency .

The renewable sources of energy involves following factors:-

- Energy security
- Social and economic development
- Energy access
- Climate change mitigation and reduction of environmental and health impacts

Solutions to the Challenges affecting renewable energy sources:-

- All sectors and regions have the potential to contribute by investing in renewable energy technologies and policies to help reduce it
- Reducing the carbon footprint through the changes in our lifestyle and behaviour patterns can contribute a great deal to the mitigation of climate change
- Research into innovation and technologies that can reduce land use and reduce accidents from renewable energy sources and the risk of resource competition ,for example, in bio-energy where food for consumption competing with energy production
- Enhancing international cooperation and support for developing countries towards the expansion vices as away of mitigating climate change and its impact

There are following factors affecting the policies and policy instruements:-

- Technological innovation
- Cost
- Barriers(market failures, lack of information, future limited access to raw materials and economic)
- Growth affecting the renewable sources supplies(sources and technologies) and sustainability

From the findings the following suggestions are made:-

- Formulation of policies and discussions from all sectors towards the improvement of technologies in the renewable sector to sustain them
- Efforts that aim at increasing the share of renewable sources of energy and clean fuel technology into global portfolio will help reduce climate change and its impact
- Increase research in these areas, so that the fear of some renewable posing risks in the future is limited

 Improve education, awareness-raising and human institutional capacity on climate change mitigation, adaption, impact reduction and early warning. Developed countries should incorporate decarbonisation policies and strategies into the industry , energy, agricultural, forest , health , transport, water resource, building and other sectors that have the potential of increasing the greenhouse gas emissions.

4. CONCLUSIONS:-

The objective of the overview of this consolidate report is to give the importance of RET(renewable energy technologies) and RES(renewable energy sustainability) . RES such as solar, wind and biomass are mostly used in the manufacturing of domestic products; namely, windmills to produce electricity, water pumps and heat and power generation, etc,. Among all types of renewable energies, solar energy is available in the majority of the world. This is the reason for solar energy being the most suitable substitute for fossil fuels and most household products leverage solar energy in RET. In order to ensure sustainable development for the future generations, it is indeed important to raise awareness about RES. RE can be utilized in making many products employed in daily use, such as solar cookers, solar cookers and heaters, as well as solar dryers. The application of RES such as solar is worldwide. Biomass assists to absorb dangerous gases such as CO2 and can also be used for electricity and as a fuel. Wind is another useful RES resource that can be used to produce electricity and power generation. Our findings endorse the fact that the success of RE may be gained by providing greater awareness of RES and RET to the public. This can be achieved by introducing educational programs related to RE through domestic and international platforms.

We have to establish these two prominent factors at domestic level and public opinion about the use of RET through the use of well-established keywords. Overall the analysis is a qualitative interpretation of RES and RET practises among the public providing aggregate overview of the research and thus allowing us to systematically identifying future research avenues. We hope this symmetric review can assist both academia and industry to promote renewable energy and encourage the analysis of public opinions that are present in twitter or other social network platforms such as linkedin.