Conventional and Nonconventional Energy Sources: Review

S.V. Agnihotri[1], T. R. Tatte[2], P.V. Tumram[3]
[1,3]*Department of Physics, Amolakchand Mahavidyalaya Yavatmal.445001, Maharashtra state, India*
[2]*Department of Physics, Shri. Dr. R. G. Rathod Arts and Science College, Murtizapur- 444107, Maharashtra State, India*

***Abstract*—This paper reviews the conventional and nonconventional sources of energy. Sun is the main source of energy on earth. We get abundant energy from the sun. Renewable energy source is the best option for electricity. Due to environmental pollution, traditional thermal energy such as coal, oil power stations are planned to be reduced. In India sun rays is available for longer hours per day and in it have great strength. In future Solar energy, has great potential for future energy source. Solar energy is main alternative when it compared to renewable energy. This paper reports conventional and nonconventional energy sources, uses and application of solar energy.**

***Index Terms*—Conventional, Nonconventional source, renewable energy, solar energy, electricity.**

I. INTRODUCTION

In current situation, development of new technology, population growth, demand of energy and rate of consumption of electricity is highly increase [1,2]. In 1839 Edmond Becquerel known the "father of solar energy" at only 19 years old, who discovered the photovoltaic (PV). When material is expose to sunlight, an electric current is produced, this effect is the photovoltaic effect. For human daily needs, conventional energy generation resources are normally based on fossil fuel. The use of conventional energy resources damages the environment and it is mainly responsible for the climate change and global warming. Total dependency on conventional energy resources to supply the energy demand is very dangerous for human society. So, renewable energy resources such as solar, wind, tidal, biomass, hydro, geothermal, etc., are considered as a sustainable substitute to fulfil the high energy demand [3]. This paper reports the types of fossil fuel, renewable and non-renewable energy resources.

II. LITERATURE SURVEY

A. Conventional sources of energy:

Energy is required for all activities. Energy can be generated from fuel minerals like coal, petroleum, natural gas, uranium and from electricity. Energy resources can be classified as conventional and nonconventional sources. Conventional sources include firewood, cattle dung cake, coal, petroleum, natural gas and electricity like hydel and thermal. Nonconventional sources include solar, wind, tidal, geothermal, biogas, and atomic energy. Firewood and cattle dung cake are most common in rural India. According survey more than 70 percent energy requirement in rural households is met by these two; continuation of these is increasingly becoming difficult due to decreasing forest area.

Coal: In India coal is the most abundantly available fossil fuel. It provides a substantial part of the nation's energy needs. It is used for power generation, to supply energy to industry as well as for domestic needs. India is highly dependent on coal for meeting its commercial energy requirements. In India coal occurs in rock series of two main geological ages, namely Gondwana, a little over 200 million years in age and in tertiary deposits which are only about 55 million years old. The major resources of Gondwana coal, which are metallurgical coal, are located in Damodar valley (west Bengal). Peat, Lignite and Sub-Bituminous Coal, Steam coal anthracite, Graphite are the types of coal.

Petroleum: After coal petroleum is the major energy source in India. It provides fuel for heat and lighting, lubricants for machinery and raw materials for a number of manufacturing industries. Petroleum refineries act as a nodal industry for synthetic textile, fertilizer and numerous chemical industries. Petroleum

is found in fault traps between porous and nonporous rocks. Gas being lighter usually occurs above the oil. Rajasthan, Gujarat and Assam are the main states in India which are contributing 23.295 of crude oil.

Natural gas: Natural gas found with petroleum deposits and is released when crude oil is brought to the surface. It can be used as a domestic and industrial fuel. It is used as fuel in power sector to generate electricity, for heating purpose in industries as raw material in chemical, petrochemical fertilizer industries, as transport fuel and as cooking fuel. High and allied fields along the west coast which are supplemented by finds in the Cambay basin. Along the East Coast, new reserves of natural gas have been discovered in the Krishna- Godavari basin.

Electricity: Electricity has such a wide range of application in today's world that, it's per capital consumption is considered as index of development. Electricity is generated mainly in two ways, by running water which drives hydro turbines to generate hydroelectricity and by burning other fuels such as coal, petroleum and natural gas to drive turbines to produce thermal power once generated the electricity is exactly the same. Hydroelectricity is generated by fast flowing water, which is a renewable resource. India has a number of multipurpose projects like the Bhakra Nagal, Damodar Valley corporation, the Kopili Hydel Project etc. producing hydroelectric power. Thermal electricity is generated by using coal, petroleum and natural gas. The thermal power stations used nonrenewable fossil fuels for generating electricity.

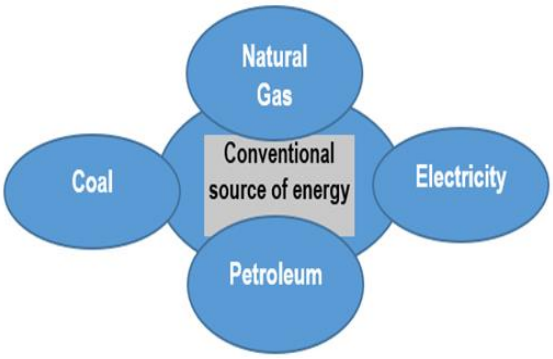

Fig.1 Conventional source of energy

B. Non-Conventional Source of Energy:

The growing consumption of energy has resulted in the country becoming increasingly dependent on fossil fuels such as coal, oil and gas. Rising prices of oil and gas and their potential shortages have raised uncertainties about the security of energy supply in future, which is in turn has serious environmental problems. From last few years, greenhouse gas emission into the atmosphere from power generation is the major issue which damage the ozone layer [4]. Therefore, renewable energy sources such as solar, wind, hydro, biomass, geothermal and hydrogen energies have been introduced to produce electricity to overcome current environmental problems [5–7]. Eco-friendly features and capacity to produce power with zero or almost nil emission of air pollutants, renewable energy getting more and more attention, due to the increasing awareness of clean environment which is beneficial for the society [8,9].

C. Nuclear or Atomic Energy:

Nuclear energy harnessed around the world today to produce electricity is through nuclear fission. This source of energy can be produced in two ways fission; when the two nuclei of atoms split into several parts or fusion: when nuclei fuse together. It is obtained by altering the structure of atoms. When such an alteration is made, a big energy is released in the form of heat and this is used to generate electric power. In nuclear power plant, this heat is used to boil water to produce steam that can be drive large turbines. The turbines drive generators to produce electrical power. In India, Uranium and Thorium which are available in Jharkhand and the Aravalli ranges of Rajasthan Mahadek basin, Cuddapah basin in Andhra Pradesh and Telangana are used for generating atomic or nuclear Power. The Monazite sands of Kerala is also rich in Thorium. India's uranium deposits are mainly low grade and India's proven resources are 3% of the worlds.

D. Solar Energy:

India is a tropical country. It has enormous possibilities of tapping solar energy. The sun converts five million tons of matter into energy every second. Solar energy reaches the Earth's surface as ultraviolet (UV) light, visible light, and infrared light. It is estimated that solar energy equivalent to over 15,000 times the world's annual commercial energy consumption reaches the earth every year. India receives solar energy in the region of 5 to 7 kWh/m2 for 300 to 330 days in a year. This energy is sufficient to set up 20 MW solar power plant per square kilometre land area. Many other electromagnetic waves are stopped in the upper parts of the

atmosphere. Photovoltaic technology converts sunlight directly into electricity. Solar energy is fast becoming popular in rural and remote areas. Some big solar power plants are being established in different parts of India which will minimize the dependence of rural households on firewood and dung cakes, which in turn will contribute to environmental conservation and adequate supply of manure in agriculture. The radiation reaching the earth surface is able to provide light and heat, generate electricity, cause chemical reactions etc. Almost 99.9% energy flowing on the earth surfaces is due to solar radiation. Recent advancement in technology, solar energy systems are effortlessly obtainable for industrial and domestic usage with the extra advantage with minimum maintenance. As compare to other season, the summer season, plays a major role to produce a large number of efficient energies [10-13]. Solar energy is free from the corbondioxide. Solar water heating, solar cooking and photovoltaic cells are the main application of solar energy. Scientists expect that the sun will continue to provide light and heat energy for the next five billion years. India's first solar panel was developed in northern Gujarat, in December 29th 2010.

Wind Energy: Wind is produced due to irregular heating of earth's surface by Sun. Speed and direction of wind are the vital factors that decided the magnitude of wind energy. Oil. The speed of wind increases with height from the surface and hence mechanical devices like windmills and turbines are always situated at high altitude that converts wind energy into electrical energy**.** Electricity generation, water pumping and irrigation are the main application of wind energy**.** Wind energy produce no waste and greenhouse effect**.** In India largest wind form cluster is located in Tamil Nadu from Nagarcoil to Madurai. Apart from these, Andhra Pradesh, Kerala, Maharashtra and Karnataka, Gujarat, Lakshadweep have important wind farms. Nagarcoil and Jaislmer are well known for effective use or wind energy in the country.

Biogas: Biogas is clean and efficient fuel**.** Shrubs farms waste, animal and human waste are used to produce biogas for domestic consumption in rural areas. Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene during cake and charcoal. Biomass converted into liquid fuel. Biomass is carbon neutral. Biogas plants are set up at municipal, cooperative and individual levels. The biogas consists of 60% methane with rest mainly carbon-di-oxide. By fermentation process, biomass is converted into ethanol and alcohol. Corn is used for the production of bio fuel. Biogas is a safe fuel for cooking and lighting. The plants using cattle dung are known as Goober gas plants in rural areas. The bio-gas has a particular significance in India because of large cattle population, which is about 250 million. These provides twin benefits to the farmer in the form of energy and improved quality of manure. The reaction takes

$H_2O + CO_2 \xrightarrow{\text{solar energy}} CH_2O + O_2$

Tidal Energy: Ocean energy is refilled by sun and is indirect technique to make use of solar energy. The ocean energy includes both wave energy and tidal energy. Oceanic tides can be used to generate electricity. The interface between wind and topmost layer of ocean water generates wave. Hence the wave energy is resulting from the wind energy. Number of instruments is developed to catch the wave energy which is used to spin the turbines that converts wave energy into electricity. Floodgate dams are built across inlets. During high tide water flows into the inlet and gets trapped when the gate is closed. After the tie falls outside the flood gate, the water retained by the floodgate flows back to the sea via a pipe that carries it through a power generating turbine. In India the gulf of Khambhat, the Gulf of Kachchh in Gujrat on the western coast and Gangetic delta in Sunderban regions of West Bengal provide ideal conditions for utilizing tidal energy. This energy is free and needed no fuel and doesn't produce pollution.

Hydropower: Hydropower is our most mature and largest source of renewable power, producing about 10 percent of the nation's electricity. India rank 5th globally for installed hydroelectric power capacity. There are 197 hydropower plants in India. Existing hydropower capacity is about 77,000 megawatts (MW). Hydropower plants convert the energy in flowing water into electricity. The most common form of hydropower uses a dam on a river to retain a large reservoir of water. Water is released through turbines to generate power. "Run of the river" systems, however, divert water from the river and direct it through a pipeline to a turbine. Hydropower plants produce no air emissions but can affect water quality and wildlife habitats. Therefore, hydropower plants are now being designed and operated to minimize impacts on the river. Some of them are diverting a portion of the flow around their dams to mimic the

natural flow of the river. But while this improves the wildlife's river habitat, it also reduces the power plant's output. In addition, fish ladders and other approaches, such as improved turbines, are being used to assist fish with migration and lower the number of fishes killed.

Geothermal energy: Geo thermal energy refers to the heat and electricity produced by using the heat from the interior of the Earth. Geothermal energy exists because the Earth grows progressively hotter with increasingly depth. Where the geothermal gradient is high, high temperature in such area found at shallow depths. Ground water in such areas absorbs heat form the rock and become hot. It is so that hot water when it rises to the earth's surface, it turns into steam. This steam is used to drive turbines and generate electricity. Dry steam power plant and soil warming, growing of mushroom, animal husbandry are the main application of geothermal energy. It conserves the fossil fuel. There are several hundred hot springs in India, which could be used to generate electricity. This energy generally involves low running costs since it saves 80% on fossil fuels. Two experimental projects have been set up in India to harness geothermal energy. One is located in the Parvati valley near Manikarn in Himachal Pradesh and the other is located in the Puga Valle, Ladakh.

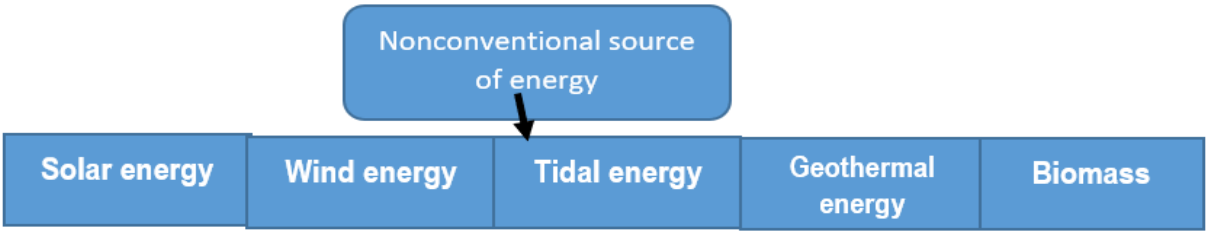

Fig. 2 Nonconventional source of energy

Usage of various energy sources in India:

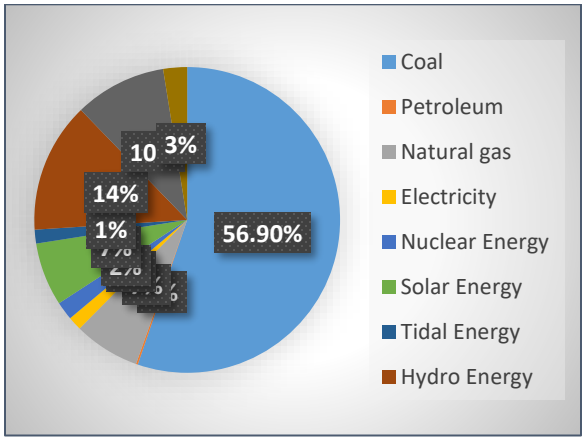

Fig. 3 Chart for energy usage in India.

III. CONSERVATION OF ENERGY RESOURCES

Energy is a basic requirement for economic development. Every sector of the national economy – agriculture, industry, transport commercial and domestic needs inputs of energy. The economic development plans implemented since independence necessarily required increasingly amounts of energy to remain operational. As a result, consumption of energy in all forms has been steadily rising all over the country. India is presently one of the least energy efficient countries in the world. We have to adopt a cautious approach for the judicious use of our limited energy resources. For example, as concerned citizens we can do our bit by using public transport systems instead of individual vehicles, switching off electricity when hot in used, using power saving devices and using nonconventional sources of energy. After all, "energy saved is energy produced".

IV. CONCLUSION

Almost 99% energy flowing on the earth due to solar radiation. In this paper we discuss conventional and non-conventional source of energy. Many nonrenewable energy sources can cause danger to the environment and human health. So use of renewable energy is beneficial for the environment and society. We reported the various source of energy, which is find in different state of India. Energy future is the nonconventional source. Solar energy is the best option of energy. Solar water heating, solar cooking and photovoltaic cells are the main application of solar

energy. Wind energy is and tidal energy is also the cost-effective source of energy. India's renewable energy capacity up to the 200 GW. By means of this significant progress, India achieving the energy target 500 GW from non -fossil sources by 2030.

REFERENECS

[1] S.R. Madeti, S. Singh, monitoring system for photovoltaic plants: A review, Renew. Sustain. Energy Rev. 67 (2017) 1180–1207.

[2] H. Rezk, I. Tyukhov, M. Al-Dhaifallah, A. Tikhonov, Performance of data acquisition system for monitoring PV system parameters, Measurement 104 (2017) 204–211.

[3] N. Panwar, S. Kaushik, S. Kothari, Role of renewable energy sources in environmental protection: A review, Renew. Sustain. Energy Rev. 15 (3) (2011) 1513–1524.

[4] S. Manish, I.R. Pillai, R. Banerjee, Sustainability analysis of renewables for climate change mitigation, Energy Sustain. Dev. 10 (4) (2006) 25–36.

[5] W.G. Santika, M. Anisuzzaman, P.A. Bahri, G. Shafiullah, G.V. Rupf, T. Urmee, From goals to joules: a quantitative approach of interlinkages between energy and the Sustainable Development Goals, Energy Res. Social Sci. 50 (2019) 201–214.

[6] A. Raheem, S. Samo, A. Memon, S.R. Samo, Y. Taufiq-Yap, M.K. Danquah, R. Harun, Renewable energy deployment to combat energy crisis in Pakistan, Energy Sustain. Soc. 6 (1) (2016) 16.

[7] N. Ahmad Ludin, N.I. Mustafa, M.M. Hanafiah, M.A. Ibrahim, M.A. Mat Teridi, S. Sepeai, A. Zaharim, K. Sopian, Prospects of life assessment of renewable energy from Solar photovoltaic technologies: a review, Renew. Sustain. Energy Rev. 96 (2018) 11–28.

[8] R. Banos, ˜ F. Manzano-Agugliaro, F.G. Montoya, G. Consolacion, ´ A. Alcayde, J. A. Gomez, ´ Optimization methods applied to renewable and sustainable energy: a review, Renew. Sustain. Energy Rev. 15 (4) (2011) 1753–1766.

[9] A. Qazi, F. Hussain, N. Abd Rahim, G. Hardaker, D. Alghazzawi, K. Shaban, K. Haruna, Towards sustainable energy: a systematic review of renewable energy sources technologies, and public opinions, IEEE Access 7 (2019) 63837–63851.

[10] D.V.N. Lakshmi, P. Muthukumar, Apurba Layek, Prakash Kumar Nayak., Drying kinetics and quality analysis of black turmeric (Curcuma caesia) drying in a mixed-mode forced convection solar dryer integrated with thermal energy storage. 10.1016/j.renene.2017.12.053.

[11] A.K. Karthikeyan, S. Murugavelh., 2018, 'Thin-layer drying kinetics and exergy analysis of turmeric (Curcuma longa) in a mixed-mode forced convection solar tunnel dryer'Renewable Energy, Vol. 128, pp. 305- 312.

[12] Jin-Hee Kim, Jun-Tae Kim, Performance Analysis of Roof-Integrated Water-Type PVT Heating System International Journal of Smart Home, Vol. 10, No. 3, (2016), pp.301-314.

[13] Amna A. Alzaabi, Nadine K. Badawiyeh, Hind O. Hantoush, A. K. Hamid, Electrical/thermal performance of hybrid PV/T system in Sharjah, UAE, International Journal of Smart Grid and Clean Energy, (2014),385- 389.