ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

An Eco-friendly Energy Resources for Green Energy

Mihirkumar C. Rathod[1], Dhaval S. Naik[2]

Assistant Professor, Dept. of EED, LDRP-ITR Engineering College, Gandhinagar, Gujarat, India[1]

PG Student [EPS], Dept. of EED, LDRP-ITR Engineering College, Gandhinagar, Gujarat, India[2]

ABSTRACT: Electrical energy is provided worldwide by cable or overhead transmission lines. However, power systems are still needed to locations which are isolated or far from electrical energy suppliers. Renewable energy resources in micro-grid power systems are interesting topics of recent research as environmental pollution and scarcity of energy resources come to the fore. Moreover, power systems which have renewable sources of energy are becoming popular need of green energy. A micro-grid electricity power system on a local scale usually using renewable source of energy satisfies both problem of isolation and power quality, benefits not available from conventional utility grid system, but also serves a customer with multiple load locations.In this present situation the development of intelligent system that integrate Eco-friendly energy resources such as wind, photovoltaic system, and fuel cell for green energy and cost effectiveness under different environment condition.

KEYWORDS: fossil, Wind energy, Solar Energy, Fuel cell, Micro grid.

I.INTRODUCTION

To develop an intelligent system that can integrate renewable resources -- wind turbine system, photovoltaic system and fuel cell as a back up system to provide continuous electricity without failure thus improves the system reliability. This kind of system helps in meeting the energy requirement without any consequences of depleting the fossil fuels, or facing the potential hazards of Nuclear Setups and also reducing harmful emissions compared to conventional back up sources. Also calculate the overall costing of the project with payback period and emission details to check commercial viability of the system. Energy is the backbone of technology and economic development. Throughout history, the expansion of human population has been supported by a steady growth in generation and our use of high-quality exosomatic energy. If the availability of this energy were to decline significantly it could have serious repercussions for civilization and the human population it supports. However this energy generation should not be harmful for the environment and yet be sufficient to meet all our needs. Hence a system that provides energy through renewable resources helps in generating the green energy continuously with negligible operating & maintenance cost stands as welcome idea to meet this energy requirement. The sun is the ultimate source of most other sources of energy. The heat of the sun can be trapped by using solar panels to heat water or converted to electricity by means of photovoltaic cells. Solar is an emerging technology for clean energy but alone it can notcope up with current demand of world energy but can be integrated with some other energy is the ideal effort to meet the requirement. The use of a commercial web cam as the sensor element does not present most of these disadvantages like high sensitivity of the discrete elements such as photodiodes or phototransistor to weather conditions, particularly to temperature and humidity. Another important aspect to consider is the rapid deterioration that may occur in discrete elements under extreme weather conditions and the cost of the constant maintenance that this implies. The electronics needed to activate the motors are simple and the system can be applied to any electromechanical configuration. With minor adjustments it can be used with various types of collectors including flat-plate, compound parabolic, evacuated tube, parabolic trough, Fresnel lens, parabolic dish and heliostat field collectors.

Extracting the detail from the source wind energy is free, no pollution, easy construction and efficient conversion of wind into electricity but it is not enough to come up the continuous energy demand and same cannot be used as a stand alone energy source due to its dependence on weather condition. Fuel cell technology contains a varietyof approaches toward remaking conventional batteries into biology-based batteries. The variety of applications in which these power cells could possibly work also suggests that fuel cell technology has a bright future. Clean energy technology includes an outstanding variety of ideas for no fossil fuel, nonpolluting power supplies. These technologies currently have an

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

encouraging amount of support from government agencies, leaders, and universities. Not every technology will prove to be realistic due to high costs or difficult technical challenges, but certainly a number of new clean energy technologies are possible and on the horizon. Clean energies have an exciting and promising future in green technology. People outside the environmental sciences can take comfort in the realization that ideas in clean energy have been developing faster than natural resources disappear. Micro-generation units, typically located at users' sites, have emerged as a promising option to meet growing customer needs for electric power with an emphasis on reliability and power quality and contribution to different economic, environmental and technical benefits. As one of the end of the microgrid is a renewable energy resources, with the help of them consumer can generate the adequate energy for his use. For this one can uses renewable resources like solar, wind, fuel cell and many more. Of course one can also contribute into the power system when they have some excess energy.

II. DISCUSSIONS ABOUT FOSSIL

These energy sources are finite, exhaustible and cannot be replaced quickly. Coal, petroleum and natural gas are the fossil fuels. About 360 billion years ago, these resources took 40 billion years to form, but they are being rapidly exhausted within a few hundred years. That is why they are called non-renewable energy sources. On combustion fossil fuels give out a large quantity of heat, which can be used to generate electricity. Fossil fuel electricity generation provides about 63 % of the world's electricity. Coal has been used as a source of heat energy since about 1000 BC. It was not until the industrial revolution, from 1800 onwards, that coal became a major source of energy. Energy from coal is the cheapest and provides a large amount of energy per unit weight. Coal, oil, natural gas, etc, are the commonly used fossil fuels and provide most of our energy needs. Figure 2.1 shows the Fossil fuel contribution to global energy demand.

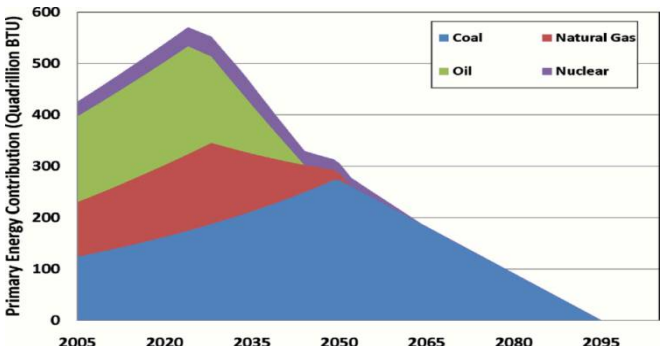

Fig.1: Nonrenewable contribution to global energy demand

Source / Technology	Potential Availability	Potential exploited
Biogas Plants	12 Million	2 Million
Biomass-based power	17.000 MW	Marginal
Efficient Woodstoves	120 Million	18.5 Million
Solar Energy	5 x 10^15 Whr / Year	-
Small Hydro	10,000 MW	250 MW
Wind Energy	20,000 MW	250 MW
Ocean Thermal	50,000 MW	-
Sea Wave Power	20,000 MW	-
Tidal Power	9,000 MW	-

Fig.2 Renewable Energy Potential in India

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

III. WIND ENERGY

The global demand for energy far surpasses its supply. The reserves of petroleum, coal and natural gas, which are the conventional sources of energy, are being eroded rapidly. Hence there is a constant search for alternate sources of energy that are renewable or will not get exhausted and will at the same time be non-polluting. There is great potential to harness the movement of water and wind. Though the initial investments for installing these renewable energy equipments are high, in the longer run, they shall prove to be an asset for life.

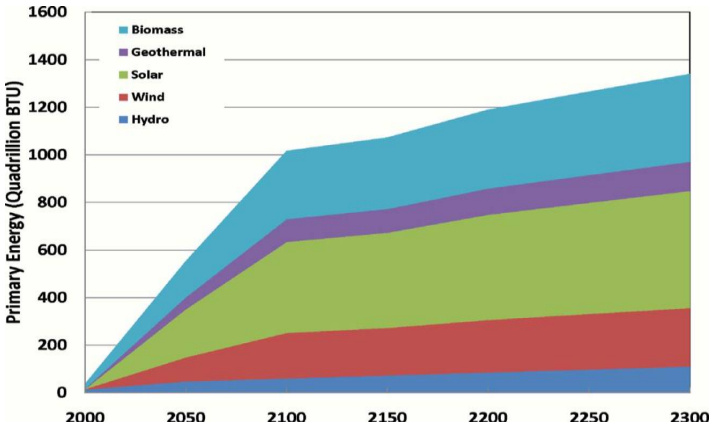

Fig.3 Renewable contribution to global energy portfolio

IV. SOLAR ENERGY

The sun is the ultimate source of most other sources of energy. The heat of the sun can be trapped by using solar panels to heat water or converted to electricity by means of photovoltaic cells. India receives about 6000 billion MW of solar energy per year. If only one percent of this energy could be tapped at even 10 percent efficiency, it would be about 30 to 35 times India's present electricity generation (Gusain, 1990). For domestic purposes, investing in solar water heaters, solar panels for generating electricity, solar lamps, and the likes can go a long way in conserving our finite natural resources.Conversion of solar energy to electrical energy depends on a device called the photovoltaic cell, also called a solar cell. Photovoltaic cells work by capturing the energy in the Sun's radiation, called photons; the photons then dislodge electrons from a material inside the cell and the flow of electrons produce an electric current. Semiconductor materials such as silicon act as the best substance for this conversion of photon energy to Electric current. Photons in sunlight hit the solar panel and are absorbed by semiconducting materials, such as silicon. Electrons (negatively charged) are knocked loose from their atoms, allowing them to flow through the material to produce electricity. Due to the special composition of solar cells, the electrons are only allowed to move in a single direction.

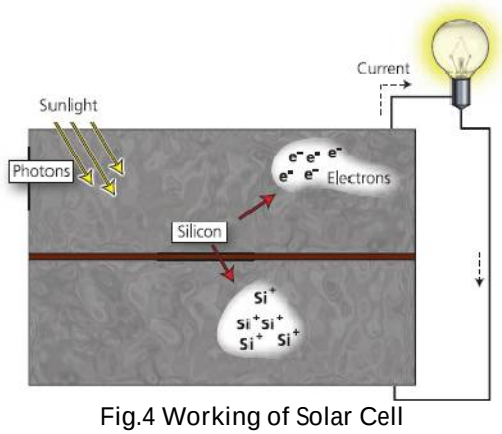

Fig.4 Working of Solar Cell

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

V. FUEL CELL

A fuel cell is a device that generates electricity by a chemical reaction. Every fuel cell has two electrodes, one positive and one negative, called, respectively, the anode and cathode. The reactions that produce electricity take place at the electrodes.

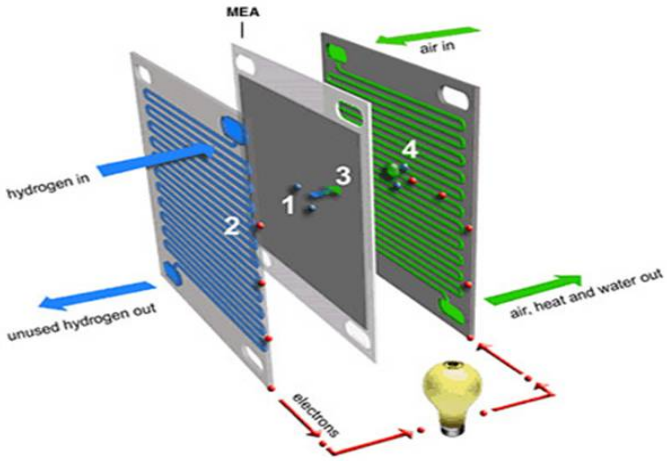

Fig.5 Fuel Cell

Every fuel cell also has an electrolyte, which carries electrically charged particles from one electrode to the other, and a catalyst, which speeds the reactions at the electrodes. Hydrogen is the basic fuel, but fuel cells also require oxygen. One great appeal of fuel cells is that they generate electricity with very little pollution—much of the hydrogen and oxygen used in generating electricity ultimately combine to form a harmless byproduct, namely water. One detail of terminology: a single fuel cell generates a tiny amount of direct current (DC) electricity. In practice, many fuel cells are usually assembled into a stack.

VI. MICRO GRID

Microgrids offer the possibility of coordinating the distributed resources in a more or less decentralized way, so that they behave as a single, controlled entity. In this way, distributed resources can provide their full advantages in a consistent way. Microgrids comprise Low Voltage (LV) distribution systems with distributed energy sources, such as micro-turbines, fuel cells, PVs, etc., together with storage devices, i.e. flywheels, energy capacitors and batteries, and controllable loads, that behave as a coordinated entity, thus offering considerable control capabilities over the network operation. These systems are interconnected to the Medium Voltage Distribution network, but they can be also operated isolated from the main grid, in case of faults in the upstream network. Thus, Microgrids can provide network support in times of stress by relieving congestions and aiding restoration after faults. From the customer point of view, Microgrids provide thermal and electricity needs, and in addition enhance reliability, reduce emissions, improve power quality by supporting voltage and reducing voltage dips, and potentially lower costs of energy supply.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

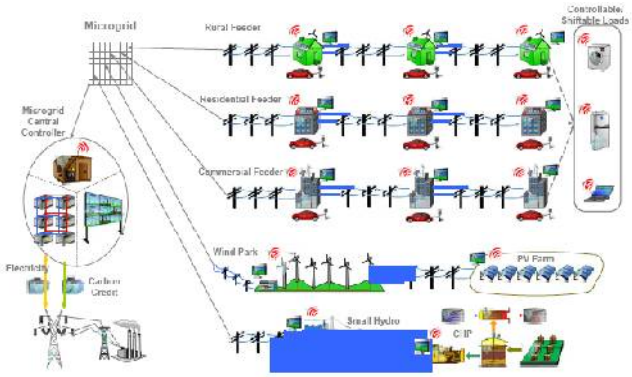

Fig 6. Sample Micro-grid as a LV grid

VII.CONCLUSION

This intelligently integrated system provides continuous electricity without failures and thus improves the reliability. The system has been so designed that the fuel cell operates only when the power of the battery falls below 600 KW (which is minimum 30% of the total battery capacity). This helps to reduce the operating hours of the fuel cell, thus making it cost effective. This also ensures a better performance and longer operational life of the battery. This system seems to be highly Green Energy compliant as both the wind turbine and photovoltaic systems are Clean Energy sources because those systems do not use any fuel source while most of the thermal power generation systems use fuel based on petroleum producing pollution materials. This kind of system helps in meeting the energy requirement without any consequences of depleting the fossil fuels, or facing the potential hazards of Nuclear Setups and also reducing harmful emissions compared to conventional back up sources. Therefore, micro-grid power systems are Environment-Friendly. Fuel cell systems are also clean energy sources because combination between air and hydrogen only produces water which does not produce any pollutant materials.

REFERENCES

[1] Evolution of the Transition to a World Driven by Renewable Energy by Contributed by the Advanced Energy Systems Division of ASME for publication in the journal: Energy Resources Technology (DOI: 10.1115/1.4001574)
[2] World Energy and Population: Trends to 2100, By Paul Chefurka. 20 November, 2009
[3] Insight- Clean Energy in Gujarat. Center for innovation, incubation and entrepreneurship, January 2009
[4] Advanced Architectures and Control Concepts for More Microgrids. Specific Targeted Project Contract No: SES6-019864. Report on the technical, social, economic, and environmental benefits provided by Microgrids on power system operation. December 30th 2009 Final Version. Company: Siemens AG
[5] A. Parera Ruiz, MarcianCirstea, WlodzimierrzKoczara, Remus Teodorescu, "A Novel Integrated Renewable Energy System Modeling Approach, Allowing Fast FPGA Controller Prototyping"
[6] Minor M. Arturo, García P. Alejandro, "High–Precision Solar Tracking System"
[7] S.pay and Y. Baghzouz, "Effictiveness of battery-supercapacitor combination in electric vehicles," IEEE, 2003
[8] Yu Zhang, Zhenhua Jiang, Xunwei Yu, "Control strategies for Battery/Supercapacitor hybrid energy storage systems," IEEE, 2008
[9] T. Senjyu, M. Tokudome, A. Uehara, T. Kaneko, A. Yona, H. Sekine, and C.H. Kim, "A New Control Methodology of Wind Farm using Short-Term Ahead Wind Speed Prediction for Load Frequency Control of Power System," IEEE, 2008
[10] M. Liao, L. Dong, L. Jin, and S. Wang, "Study on rotational speed feedback torque control for wind turbine generator system," ICEET, 2009.
[11] W. Fengxiang, H. Quangming, B. Jianlong, and P. Jian, "Study on control system of low speed PM Generator Direct Driven by Wind Turbine," IEEE, 2005