



Applications of Renewable Energy in Medical And Dental

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ABSTRACT

Green energy refers to renewable energy sources that are environmentally friendly and have a minimal impact on the planet. What is important is that we must change the life of humans being, due to the concept of the medical and dental, including three dimensions are ecology, economy, and social awareness. This paper gives the analysis of using the renewable energy, through the development of the health system, medicinal facility, and other factors. Through research, attention was paid to analyzing the growth in the share of renewable energy in electricity production, as well as incentives to use renewable energy sources, around people who live without electricity.

Example: - Include solar power, geothermal energy, wind energy and hydroelectric power.

Keywords: - Renewable energy, medical and solar energy

1. Introduction

In present lifestyle means much more energy, with the goal to achieve higher effectiveness and comfort. Now a days, most energy needs are settled using extremely harmful fossil fuels, which, in the future, should be replaced with cleaner energy resources, like renewables or nuclear energy.

Renewable resources of MEDICAL AND DENTAL is philosophy which must be respected by every human in a global world, if he/she wants to settle now a days needs without compromising the ability of future generations to meet theirs [1].

Also, Renewable resources of MEDICAL AND DENTAL, means maintaining a balance between use, saving, and restoring all resources, and understanding that the generations who are coming will largely depend on our present actions [2].

The paper's topic is very current because the development of renewable energy sources is a major challenge for the future of the whole world.

2. Renewable Energy Sources

Renewable sources of energy are on the Earth, which are available in unlimited quantities. Although, the process of changeover and modification is permanently spending their quantities. They can be stored always, these stored is known as alternative energy sources [3]. Renewable energy sources can be divided into several groups, based on similarities, which illustrates figure 1 [3].

- Solar energy,
- wind energy,
- hydropower,
- earth energy,
- energy from biomass and
- other renewable energy.

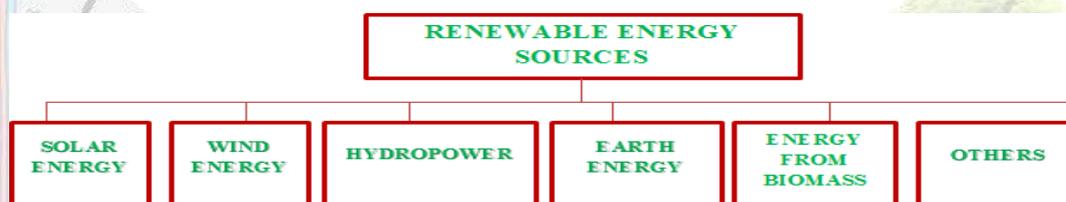


Fig. 1: Renewable energy sources



SOLAR ENERGY can be used actively and passively. The use of solar energy is converted into heat or electricity through solar radiation. Passive use of energy refers to energy in the use of solar energy for heating homes and other buildings [3].

There is most renewable energy like: -

WIND ENERGY is also found from the solar radiation. It takes place like a atmosphere and it atmospheric pressures. It also occur like a complex process of weather, soil heating and evaporation of weather [3].

HYDROPOWER PLANTS are plants in which the potential energy of water is converted into kinetic energy of its flow, then into mechanical energy of the rotation of the turbine shaft and finally into electrical energy, in the generator [4].

GEOTHERMAL ENERGY, is the heat that comes from the Earth core. It includes only that parts of the energy from the ground in the form of heat. Geothermal media (water or steam) which passes from the surface of the earth. This all process generated the electricity in the form of heat in thermal [5].

BIOMASS is defined as the organic material such as plants and wood, that can be used as a source of energy. It is burned they produced heat or convert into biofuels [6]. It is biodegradable part of product, waste product from flora and fauna [7]. There are many energy which are used as renewable resources. These are mainly refers to the energy of seas and oceans [8].

3. Hospitals and Clinics Use Renewable Energies

The studies have shown the consumption of hospitals in energy for the building sector is ~ 6% [9]. The facilities provided by the hospitals and clinics require energy for heating, cooling, and hot water [10,11]. There are various solutions to regular maintenance of filters utilized in heating, ventilation, and air conditioning (HVAC) systems. Isolating materials are used, aquifer systems applying and improved in air conditioning (AC) systems are represented to reduced energy consumption in hospitals [9,12,13]. Renewable energy sources are used in energy supply systems of health care centers.

FIGURE: -2 It shows the energy balance in hospitals.

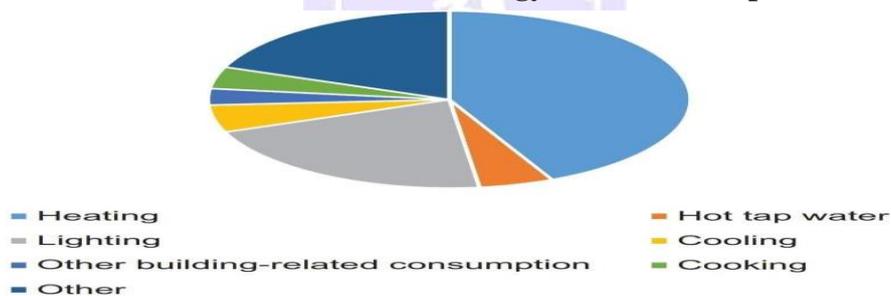


Fig: - 2 [14].

4. Medical Instrument in Renewable Energies

There are various medical instruments are known which require electrical or thermal energy [14]. Autoclave is one of the best equipment for the process of sterilization. It works on the principle of steam under pressure. It operates on high temperature and pressure to kill microorganisms and spores [15]. Medical autoclaves are used to sterilize surgical equipment, laboratory instruments and dental treatment. Thermal energy is used to create high pressure and temperature inside the Autoclave. Solar energy is the best source of energy to produce thermal energy. Solar-powered medical autoclaves are best for sterilization of medical and dental instruments [16].

A 40-L autoclave which has same working principle as pressure cooker was placed in the middle of metal ring and the heat is given by solar concentrator. One advantage of using solar energy is that it produces 313.50 GBP annual saving than using



any other LNG or electricity [17]. Therefore, using solar energy for autoclave is considered because it is more cost effective and has lower greenhouse emissions. The steam which is produced enters the sterilization unit and returns to the solar collector after condensation. Nanofluid is used in this equipment which rapidly increases the temperature of water and steam [19-21]. Using this method, one can keep the temperature and pressure in the ranges of 115–140°C and 12–14 psig, respectively. These are the optimum values for this system to operate functionally [23]. Thermal energy is provided by using solar irradiation and absorbing it by collectors for drying process. The main benefits of using this dryer are to produce lower greenhouse emissions. Electricity generation by solar cells which are subdermal can be used for bioelectronics mediums[25].

A new type of toothbrush has been introduced which contains titanium oxide (TiO₂) N-type semiconductor. The basic principle working of these toothbrushes is decreasing H⁺ ions from the organic acids in plaque which results in its decomposition [26]. The benefits of using this type of toothbrush can have shown the therapeutic response on the prevention of dental caries.



Fig: - 3

FIGURE: - 3 Photograph and schematic of a solar autoclave (I) unit of steam generator, (II) the connection section and (III) the utilized unit for sterilization. The parts of the autoclave are (a) sterilization vessel, (b) sensor of pressure, (c) temperature sensors, (d) relief valve, (e and f) control valves, (g) solar collector which has nanofluid heater solution, (h) check valve and (i) solar concentrator (a plastic Fresnel lens with 0.67-m² area of the surface) [18].

5. The Green Energy for Future

The role of energy is to encourage the growth and the economic development of the health sciences. The energies will develop in the sectors of the domestic companies, increasing investment and competitive of the economy of the health sciences sector by the technological develop. The producers of the electricity from the renewable energy sources are entitled to incentives. The instigation of electricity, it produced from renewable energy. Based on the agreement of the electricity will purchase for production for the electricity. The companies will purchase them and take electricity easily. There are 52 companies achieves the electricity [27].

There are some figures: - FIGURE: - 4 Shows the percentage of different energy plants [28].

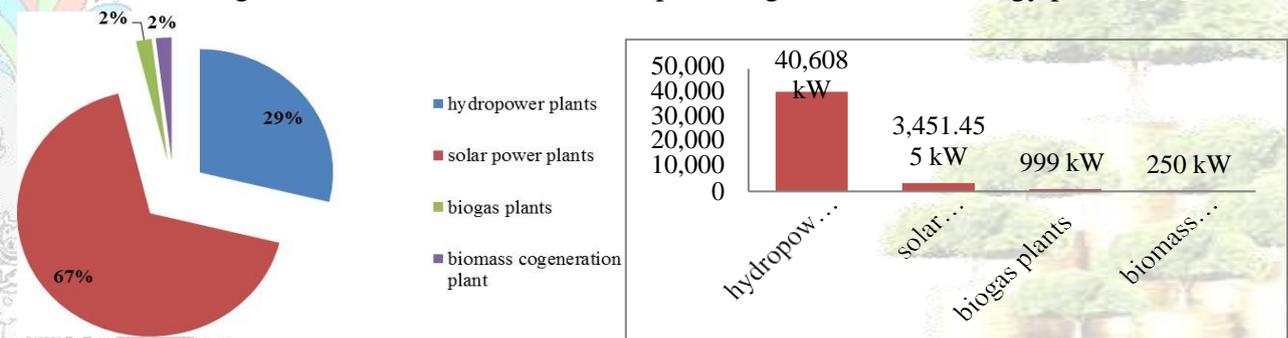


FIGURE: - 5 It gives the information about the total amount of the above show'splants [29]. Fig: - 4 Fig: - 5



Conclusion

Today's humans face many problems in the energy sector. The energy is increasing day by day, it is growing more and more. It is due to the climate change day by day. An environmentally friendly solution, there are renewable energy sources. New technologies at the stage of development. Also utilizing renewable energy system, air conditioner (AC) technologies with higher efficiency and lower carbon dioxide (CO₂) is achieved for medical facilities in hospitals and health care centers.

In other, there are several medical mediums that can be used as renewable energies. The solar powered toothbrush and the solar power autoclave are the most useable instruments. For future studies focused on the other application of renewable energy system in medical and dental for use as a turbine. The use of novel solar concentration provides the required thermal energy of solar autoclave, solar toothbrush.

As a result, many countries are with the various measures of incentives, that affect the development and use of the renewable energy source, including the medicines and dentals. It results in more well founded and well organized.

References

- [1]. NIKOLIĆ Z., PUCAR M., DAKIĆ P. (2006) Renewable energy on Mount Athos, Proceedings of the conference Alternative Energy and the future of their application, Podgorica, CANU, vol. 77, Department of Natural Sciences vol 10, pp 109-116.
- [2]. VUČIĆEVIĆ, B. S. (2014) Analysis and assessment of sustainable development of energy systems in the building (thesis), University of Niš, Faculty of Mechanical Engineering, Niš.
- [3]. NIKOLIĆ Z., PUCAR M., DAKIĆ P. (2006) Renewable energy on Mount Athos, Proceedings of the conference Alternative Energy and the future of their application, Podgorica, CANU, vol. 77, Department of Natural Sciences vol 10, pp 109-116.
- [4]. VUČIĆEVIĆ, B. S. (2014) Analysis and assessment of sustainable development of energy systems in the building (thesis), University of Niš, Faculty of Mechanical Engineering, Niš.
- [5]. NIKOLIĆ, Z., KRAGIĆ R., PETROVIĆ S., ŠAMŠALOVIĆ S. (2010) Renewable energy sources, Union of Mechanical and Electrical Engineers and Technicians of Serbia, Belgrade.
- [6]. NIKOLIĆ, Z., KRAGIĆ R., PETROVIĆ S., ŠAMŠALOVIĆ S. (2010) Renewable energy sources, Union of Mechanical and Electrical Engineers and Technicians of Serbia, Belgrade.
- [7]. LABUDOVIĆ, B. (2002) Renewable energy sources, Eenergy marketing, Zagreb.
- [8]. POČUČA N. (2015), The environmental effects of the biomass application, AGM books, Belgrade - Zemun.
- [9]. Teke A, Timur O. Assessing the energy efficiency improvement potentials of HVAC systems considering economic and environmental aspects at the hospitals. *Renew Sustain Energy Rev* 2014; 33:224–35. Doi: 10.1016/J.RSER. 2014.02.002.
- [10]. Renedo CJ, Ortiz A, Manama M, et al. Study of different cogeneration alternatives for a Spanish hospital center. *Energy Build* 2006; 38:484–90. doi:10.1016/J.ENBUILD.2005.08.011.
- [11]. Kodachrome J, Nasrollahi N. Thermal comfort in hospitals—a literature review. *Renew Sustain Energy Rev* 2012; 16:4071–7. Doi: 10.1016/J.RSER. 2012.03.054.
- [12]. Sayegh AAM, World Renewable Energy Network. Mediterranean green buildings & renewable energy: selected papers from the World Renewable Energy Network's Med Green Forum. n.d.
- [13]. Chen Y. Study on energy-saving design and operation of hospital purification air



- conditioning system. *Int J Low-Carbon Technol* 2018; 13:184–90. doi:10.1093/jilt/cty013.
- [14]. Congradac V, Prebiračević B, Jorgovanović N, et al. Assessing the energy consumption for heating and cooling in hospitals. *Energy Build* 2012;48: 146–54. Doi: 10.1016/J.ENBUILD.2012.01.022.
- [15]. Whiffen TR, Riffat SB. A review of PCM technology for thermal energy storage in the built environment: Part II. *Int J Low-Carbon Technol* 2013;8: 159–64. doi:10.1093/ijlct/cts026. tuttinauer.com n.d.
- [17]. Kaseman T, Boubou J, Schuler DA. Validation of the efficacy of a solar thermal powered autoclave system for off-grid medical instrument wet sterilization. *Am J Trop Med Hyg* 2012; 87:602–7. doi:10.4269/ajtmh.2012.12- 0061.
- [18]. Dravid MN, Chandak A, Phule SU, et al. The use of solar energy for powering a portable autoclave. *J Hosp Infect* 2012; 80:345–7. doi:10.1016/J.JHIN.2012.01.006.
- [19]. Neumann O, Feronti C, Neumann AD, et al. Compact solar autoclave based on steam generation using broadband light-harvesting nanoparticles. *Proc Natl Acad Sci* 2013; 110:11677–81. doi:10.1073/pnas.1310131110.
- [20]. [Ahmadi MH, Ahmadi MA, Nazari MA, et al. A proposed model to predict thermal conductivity ratio of Al₂O₃/EG nanofluid by applying least squares support vector machine (LSSVM) and genetic algorithm as a connectionist approach. *J Therm Anal Calorim* 2018:1–11. doi:10.1007/s10973- 018-7035-z.
- [21]. Ahmadi MH, Nazari MA, Ghasempour R, et al. Thermal conductivity ratio prediction of Al₂O₃/water nanofluid by applying connectionist methods. *Colloids Surfaces a Physicochemist Eng Asp* 2018. Doi: 10.1016/j.colsurfa. 2018.01.030.
- [22]. Ahmadi MH, Mirlohi A, Nazari MA, et al. A review of thermal conductivity of various nanofluids. *J Mol Liq* 2018. Doi: 10.1016/j.molliq.2018.05.124.
- [24]. Panwar NL, Kaushik SC, Kothari S. Thermal modeling, and experimental validation of solar tunnel dryer: a clean energy option for drying surgical cotton. *Int J Low-Carbon Technol* 2013;11: ctt053. doi:10.1093/ijlct/ctt053.
- [25]. Al-oqla FM, Omar AA, Fares O. Evaluating sustainable energy harvesting systems for human implantable sensors. *Int J Electron* 2018; 105:504–17. doi:10.1080/00207217.2017.1378377.
- [26]. Song K, Han JH, Yang HC, Nam K Il, Lee J. Generation of electrical power under human skin by subdermal solar cell arrays for implantable bioelectronics devices. *Biosensor Bio electron* 2017; 92:364–71. Doi: 10.1016/J.BIOS. 2016.10.095.
- [27]. Hoover JN, Singer DL, Pahwa P, et al. Clinical evaluation of a light energy conversion toothbrush. *J Clin Periodontal* 1992; 19:434–6. doi:10.1111/j.1600-051X.1992.tb00674. x.
- [28]. Rahman KA, Nishimura M, Matsumura S, et al. Inhibition of the adhesive ability of *Streptococcus mutans* on hydroxyapatite pellet using a toothbrush equipped with TiO₂ semiconductor and solar panel. *Pediatr Dent J* 2010; 20:16–21. doi:10.11411/pdj.20.16
- [29]. ANTIĆ D., KRSTIĆ I., ĐORĐEVIĆ A. (2013) Indicators of the energy performance of the technological systems, *Safety Engineering*, Vol 3, pp 151-160.
- [30]. POWER UTILITY OF THE REPUBLIC OF SRPSKA (2017) Report of the achievement of stimulating of the electricity production from renewable energy sources and efficient cogeneration in the Republic of Srpska for December 2016 and for the period January - December 2016.