

Paper

by Hamza

Submission date: 10-Jun-2020 09:20PM (UTC+0500)

Submission ID: 10640182012

File name: Hamza_Researc_paper.docx (161.68K)

Word count: 2268

Character count: 11778

Abstract

The use of renewable resources is the only way to tackle the current energy crises of Pakistan and the only way to maintain and advance a maintainable economy. Lack of energy not only affects the state economy but also in other areas such as education and health. Pakistan's deficiency has profound impact on the education sector as well as lab, classrooms students not only felt disturbance, but also their valuable time are gone because of the disruption of electrical power. this research paper here present a innovative idea of "Green environmental trade center" renewable energy based trade center a test case of shopping mall "Peshawar deans trade center" is take to convert all the load of the center completely on photovoltaic (solar) energy and biogas and more to minimize the loss which occurs in conversion so all AC loads are electrify from AC sources, and all DC loads are electrify from DC sources, mathematical modeling and cost study is also done with payback time.

Introduction

For the development of any country energy is basic element but electrical energy is top to all other form of energy. The rapid increase in population of world put force on government energies departments to meet the usage of energy because energy is a basic element of the every country development. Population's of Pakistan is approximately 181 million. 63% of peoples are living in rural area and 37% are lives in urban areas. The growth rate of population is 2.04%.Geographically Pakistan lies on the equator surface between longitude 60.0E and 76.0E and latitude 23.0N and 27.0N [1].the 46% of Pakistani peoples are dose not access to electricity [14].the supply is approximately 12760MW while demand is 18880MW during July 2011 to march 2012[15].so the supply and demand difference is very high. Demand and lake of supply is shown in table-1[2][18].

(Table-1) ² condition of Electricity in Pakistan.

S.No	Year's	Demand (MW)	Supply (MW)	Difference(MW)
1	2004 to 2005	14642.00	15082.00	-440.00
2	2005 to 2006	15483.00	15072.00	-411.00
3	2006 to 2007	16542.00	15091.00	-1457.00
4	2007 to 2008	17689.00	15055.00	-2634.00
5	2008 to 2009	19080.00	15055.00	-4025.00
6	2009 to 2010	20584.00	15055.00	-5529.00
7	2010 to 2011	20684.00	15055.00	-5629.00
8	2011 to 2012	20884.00	15055.00	-5829.00
9	2012 to 2013	22080.00	16111.00	-5969.00
10	2013 to 2014	22289.00	16050.00	-6239.00
11	2014 to 2015	22270.00	16050.00	-6220.00

Electricity generates through generator by hydro or any other sources are costly. There is also losses will occur in transmission and distribution point. Renewable or non-conventional energy is one that is reversible on the human time scale e.g. sunlight, biogas and wind etc. Solar energy can play an important role in transforming it into a green economy [1]. It is also considered one of the most important technologies for sustainable development [2].from biomass energy (renewable) throughout the world the is approximately 16.00% with 10.00% of this energy is uses for the heating purposes [5].the biggest energy source in the world is solar from solar energy we get heat and light. In solar energy technology we have active and passive solar. Active solar technology is used as a solar thermal collector and also as a photovoltaic panel for tackle of energy. Passive solar technology used to dispersing property, orientating a building to the sun.

Biomass energy produces from dead organisms and from living organisms' wastes. Bio gas are produces from biomass under a specific condition 'anaerobic' (in the absence of air).and also produces heat from biomass either directly (by combusting) or indirectly (converting to biofuels) [16].due to the lack of power supply and demand different techniques are uses to maintain currently situation by shed off power from generation center, so due to the load shedding many sectors are suffers like research laboratories, education sector, health sectors, industries sectors.

The purpose of this research paper to give reliable and cost efficient power supply to 'deans trade center Peshawar' from wastes of human and hotels kitchens which convert this waste to biomass and then biogas and energy from sun through solar panels, and as well compare the cost charges benefit from this nonconventional resources after interconnection with the main supply.

2. 4

Biogas is a type of biofuel which produces naturally by the decomposition of organic wastes (e.g. food wastes animals, humans wastes, garbage's) all of these wastes are break down in the absences of air (anaerobic environment) produces a mixture of gases but mostly produces carbon dioxide CO₂ and methane CH₄[4]. Some terminologies are uses in this kind of energy.

2.1 Total solid

Total solid defines the amount of total solid material which can not contain any part of liquid called total solid which is denoted by Ts [6]. For fermentation the considerable value of Ts is approximately is 8% for the solid materials.

2.2 Fresh Discharge

A discharged wastes which comes directly from human and as well animals' wastes [6].

2.3 Hydraulic Retention time (HRT)

HRT defines a timing of the solid waste or liquid waste materials are placed in to digester is known as HRT [6].

¹
HRT= Volume of digester /volume of slurry per day

It's represents in days.

2.4 Solid Retention Time (SRT)

¹
SRT= mass of the volatile solids/mass per unit time of volatile solid discharging system.

2.5 Liquid Part

Liquid part of the system defines water added to the fresh discharge for making TS value to 8%.

²
The given biogas plant is shown in fig-1.

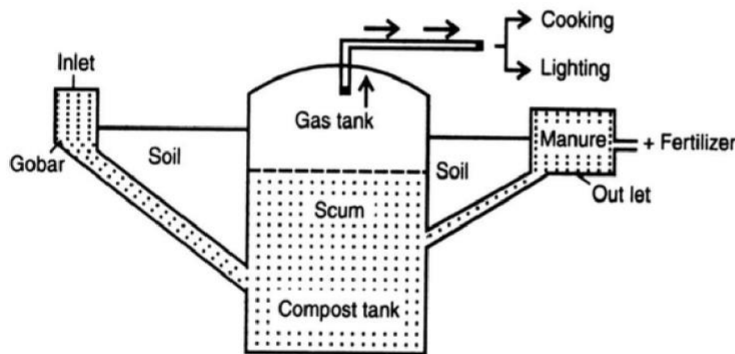


Fig.1 biogas plant

3 Solar photovoltaic system

The biggest energy source in the world is solar. Which give heat energy and light energy sun is bigger from our plant (Earth) approximately 109.0 times [7].Distance from the earth to sun is approximately 149.630×10^6 Km and light touches the earth surface in 8 mints and 31 sec. with a speed of 186282.00 miles per sec. [8][9].So from solar power plants we get electricity from the light of the sun and heat.

Many components are uses in solar power plants are given below in fig.2

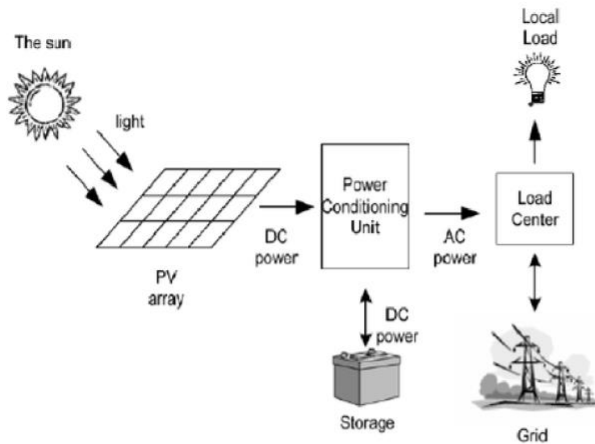


Fig 2. Components of PV system.

3.1 Solar Cell

It consist of semiconductor pentavalent material silicon wafers/pane are also known as photovoltaic cell. When the sun radiations are strike to the photovoltaic cell the electrons are energized and starts motion which causes produces electricity directly [10].

3.2 Inverter

5 Direct current (Dc) is converted to Alternating current (Ac) which produces from solar panels is known as inverter [11].

3.3 Electrical storage

During the cloudy weather or during the night hours there is no sun light, no electricity generation at PV so at that time we don't have electricity so we use some storage devices to store electricity for later use.

7 3.4 Charge Controller

Charge controller is used to regulate or control the incoming electricity which comes from PV

To batteries, load to battery, and as well protects batteries from over loading and over charging.

1 4 Problem formulation

This research paper is on the uses of renewable energies Resources. So by using biogas and solar energy to decrease the lack of electrical power during the load shedding. For biogas plantation We design a model which generates electricity from humans waste and kitchens

wastes and also determine the top roofs of the trade center to establish solar plant and the cost study either it is costly or not when we connect it to trade center power supply.

4.1 Biogas Power Plant

Average compositions of biogas are listed in below table -2 in percentages. The highest composition in biogas is methane CH₄ gas is approximately 55%-75% [12].

Table 2: Composition of Biogas

Matter	Percentage %
CH ₄ (Methane)	55 % to 75 %
CO ₂ (Carbon dioxide)	25 % to 45 %
N ₂ (Nitrogen)	1 % to 5%
H ₂ (Hydrogen)	0 % to 3 %
O ₂ (Oxygen)	0.1 % to 0.5 %
CO (Carbon monoxide)	0 % to 0.3 %

4.2 Mathematical Calculation for Biogas plant

4.2.1 From restaurants kitchen wastes.

Total numbers of restaurants kitchen is = 20 (2 kitchens in each storey)

1kg waste of kitchens produces 0.3m³ of biogas when digest it.

Average production of gas from kitchen waste is = 160kg/day

160 x 0.3 = 48m³/day.

From each m³(cubic meter) biogas produces and contains 6.00kwh of calorific energy. But during the conversion cycle from gas to electricity we get 2.0kwh of electricity and remaining energy is transformed in to heat energy, which used for many other application/purposes so now the total generation of electricity from kitchen waste is

Kitchen Waste = 48 x 2.0 KWh = 96 KWh

4.2.2 From human wastes

The average of human waste per person in approximately 0.50kg. And the average of peoples comes to trade center in day is round about 5000 and the probability of using the washroom is half of the total incoming peoples in trade center so total waste is produced from this is

2500 x 0.50 = 1250Kg

Value of human's waste (total solid) = 20.00%

And HRT (hydraulic retention time) = 40 day's

² The biogas obtained in normal temperature of 30°C from human waste = 0.365m³/kg TS (approximately) [19]

So total generation of biogas from this strength is = 2500 x 0.50 x 0.20 x 0.365 = 91.250 m³

OR

Total generation of electricity from human waste = 91.250 x 2Kwh = 182.50 KWh

¹ 4.2.3 Total Generation capacity

From kitchen's waste = 96 KWh

From human's waste = 182.50 KWh

Total capacity of biogas energy is = 96 KWh + 182.50 KWh = 278.50 KWh

5 Solar energy system

Solar system is defines the conversion of light energy which consist of photons is directly converted into electricity the effect is known as Photo Voltaic effect [13].

5.1 Required solar panels

Required area for 100 watt solar panel is

⁶ Length is = 3.36 ft, and

Width is = 2.20 ft

So Area is = 7.3920 sq.ft

So the roof space of the trade center is = 30 kanal

As 1 kanal = 5445 sq.ft

Or 30 kanal = 163350 sq.ft

So 7.3920 sq.ft equals to 100 watt

so 1 sq.ft = 100/7.392

1 sq.ft = 13.520 watt

So, 163350 sq.ft = 100 x 163350/7.3920

=2209, 821 watt

=2209.821 Kw

Total power (Approximately) = 2200 Kw

So required solar panels is =22098 piece

And each panel are = 100 watt

6 Total energy generation from solar system and biogas

Total energy generation from biomass (i.e human's and kitchen waste) = 278.50 KWh

Total power produces from solar PV = 2200Kw.

Loads panding

Conclusion

This research describe currently electricity crisis and its way out by using the non conventional sources like solar or biogas etc. electrical power is generating from conventional resources is a expensive choice so we are explore the renewable energies which generates from solar energy and from biomass. Our research shows energy generated from biomass and from solar is very cheaply as compare to the non renewable energies and as well as installing, operating, maintaining, cost. We can install biogas plant easily in the building basement or on the ground floor, or backyard of the building. And top of the building roof is used for solar PV system for installing solar panels. The initializing cost of these systems is little bit high but due to renewable sources the payback in short interval of time.

1

References

1. Pakistan Economic survey 2011-2012 chapter 12 population, labor Force & Employment, page 167-168, 170-172
2. Pakistan Economic survey, page 201,207-208, 218-219.
3. The myth of renewable energy I Bulletin of the atomic scientist. Thebulletion.org 2011-11-22 retrieved 2013-1003.
4. Islam M.R & Rasjod, T.S(2012). Prospects and potential analysis of solar Biomass, Energy at pabna District, Bangladesh: A realistic way to Miligate District energy demand international journal of engineering.2
5. <http://www.ica.org/pulications/freepublications/publication/cooking.pdf>
6. Biswas, M.M, Das, K.K., Baqee I.A., Sadi, M.A., & Forhad, H.M.S (2011). Prospects of renewable Energy and energy storage system in Bangladesh and developing economics. Global journal of researches in engineering (GJRE). II (5), 23-31
7. Driesen J., & Katireai, F (2008). Design for distributed energy resources. Power and energy magazine, IEEE, 6(3), 30-40
8. Rahman, S., Saha, S.K., Khan, M.R.H Habiba, U., & Hosse, S.M. (2013) Present situation of renewable energy in Bangladesh. Renewable energy resources existing in Bangladesh. Global journal of researches in engineering, B(5).
9. Saha.S.KHabiba.U (2015). The analysis of solar energy system to eliminate the existing load-shedding problem in Bangladesh. American academic & Scholarly research journal (AASRJ). 5(5)
10. TahsinFaraz, "Benefits of concentrating solar power over solar photovoltaic for power generation in bangladesh.2nd international conference on the developments in renewable energy technology, (ICD RET' 12), January 5-7, 2012, Dhaka Bangladesh, PP(183-187)
11. Ahammed, F., & Taufiq, D.A. (2008). Applications of solar Pv on rural developments in bangladesh. Journal of rural community development, 3(1), 93-103.
12. [online: October:2011] Technical study of biogas plants installed in Bangladesh.
13. www.nrel.gov/learning/re-photovoltaics.html
14. Prospects and Challenges of Renewable Energy in Pakistan 2010 IEEE International Energy Conference
Mohammad Faisal Aziz, Nidhal Abdulaziz

15. Pakistan Economic Survey 2011-2012, Chapter14: Energy, Page 201-202, 207-208, 218-219
16. Assessment of Biomass Energy Resources Potential in Pakistan for Power Generation 4th International Conference on Power Engineering, Energy and Electrical Drives Istanbul, Turkey, 13-17 May 2013
M.J.S.Zuberi, S.Z.Hasany, M.A.Tariq , M.Fahriolu
17. Designing Human and Kitchen Waste Based Biogas & Solar Plant for Pabna University of Science & Technology (PUST) Campus and Cost Benefit Analysis after Renewable Energy Interconnection on PUST Campus's Grid Network
18. Source: Pakistan Energy Sector Overview, SARI/Energy, USAID
19. S. Ahmad, K. Mahmood and M. Anas, "Designing and Strategic Cost Estimation of Biogas Plant: An Alternative for Current Energy Crisis in Pakistan", International Journal Of Renewable Energy & Environmental Engineering, vol. 3, no. 3, pp. 209-212, 2015.

Paper

ORIGINALITY REPORT

27%

SIMILARITY INDEX

25%

INTERNET SOURCES

10%

PUBLICATIONS

23%

STUDENT PAPERS

PRIMARY SOURCES

1

eesd.muet.edu.pk

Internet Source

23%

Submitted to Higher Education Commission **2**
Pakistan

Student Paper

2%

3

"Proceedings of ISES World Congress 2007

(Vol. I – Vol. V)", Springer Nature, 2009

Publication

1%

4

article.sapub.org

Internet Source

<1%

5

www.wrdenergy.com

Internet Source

<1%

6

ajer.org

Internet Source

<1%

Md.Moniruzzaman Tanim, Nawshad Ahmed

7

Chowdhury, Mirza Mahbubur Rahman,

<1%

Jannatul Ferdous. "Design of a photovoltaicbiogas hybrid power generation system for bangladeshi remote area using HOMER software", 2014 3rd International Conference on the Developments in Renewable Energy Technology (ICDRET), 2014

Publication

Exclude quotes Off

Exclude matches Off

Exclude bibliography Off