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Case Study: Energy Optimization at Amity University Madhya Pradesh Using Renewable Sources of Energy

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Abstract: With the increasing environmental concern and growing new technology on renewable energy it's always advisable to have a technology which is pollution free and green. So a combination of emerging technologies is perfect solution to cope up with energy crisis and environmental concern. As our university is in the developing stage, so we can install a mechanism which captures renewable energy to meet the rapidly increasing energy demand. After doing the case study of our campus we discovered some areas stated below to find optimum number of the methods to limit the power taken from grid.

Keywords: Solar Energy, Wind Energy, Bio-Gas Energy**,** Hydro Power**,** Waste management.

I. INTRODUCTION

The abstract outlines the socio-economic potential of campus to install range of renewable energy technologies and help to meet the increasing energy demand. Emphasis will be on techniques of capturing sufficient renewable energy in direct which are highly recognized. Use of energy from fossil fuels in comparative economic analyses of energy supply systems, together with the rate at which the costs of renewable energy technologies can be reduced as a result of mass production of energy conversion devices and greater project experience, will determine how significant the contribution of renewable energy to the global energy supply mix will become over time. We are working on idea of green campus which is nowadays a highly emerging option. Many universities like

- AMERICA UNIVERSITY,
- STANFORD UNIVERSITY
- UNIVERSITY OF CALIFORNIA AT SAINT BARBARA
- UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL.

Are working in this direction and get very good results.
Our ultimate goal is in order to provide sufficient affordable energy in AUMP to meet all the basic demands of a growing demand of energy, comfort, mobility and recreational lifestyles.

II. CASE STUDY OF AUMP

Average University power consumption/month=1, 63, 863 KWh

- The peak power required was about 2, 58, 920 KWh in August.
- The minimum power required was 67,800 KWh during holidays.
- Time when there is no ample sunlight is between 15th December-31st January.
- Average temperature of Gwalior=28.7^{0}C
- Average wind speed=15 Km/hr
- Total area on which UNIVERSITY BUILDING is located=25,776.0934m^2
- Total rooftop area where solar panel and windmills can be installed=19,834m^2
- University is located at the terrain of 250m above sea level which is advantage to get good amount of energy from sun and wind. .
- Total waste generated by kitchen is 130kg-150kg (organic waste)/1000 persons and 1.5 liters (kitchen oil).

III. SOLAR ENERGY

- Area of rooftops where solar panel is to be installed=15,000m^2
- No. of solar panel can be installed =2000nos

As Gwalior is considered a city where during summer the temperature (in Celsius) varies between 35^{0}C-48^{0}C, so solar panel on the rooftop is very good option and it is highly efficient.

Nowadays wide range of solar technologies exists like solar films on windows which is new and improved designs are being continually developed with the aim of providing lower capital costs, improved reliability and increased conversion efficiencies so we can focus on it.

We can use solar films on windows where the direct sunlight comes in contact as windows on BLOCK -A & B are orientated at an angle of 15^0.

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Fig 1.Set-up of solar panel

We can install small windmills on roof area where the solar light is not that powerful which can give sufficient energy. As we have advantage that our university is located at height of 250m from sea level this is perfect terrain to generate wind energy. As average wind speed is 15km/h so it is also very good option. As two blocks in AUMP comes into direct exposure of wind so we install network of windmills on their rooftops.

Fig.2. Orientation of windows

III. WIND ENERGY

Fig.3. Set-up of windmills

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IV. BIO-GAS ENERGY PLANT

Fig.4. Set-up of bio-gas plant

We can plan to set-up a Mini Bio-gas plant at some distance from mess in campus where organic waste from canteen and mess etc. can be used without wasting. We can also use it as manure for plantation of plants in campus. Gas can be used for cooking and other purposes.
Nowadays Biomass projects continue to increase, mainly using decomposition of food residues (organic waste) for cogeneration of energy and power, but biomass gasification developers are hoping to increase the opportunities for using this resource.

The future role for transport vehicle where biofuels and biodiesel can be used as fuel is increasing.

We can collect kitchen oil to convert into electricity with vegga-watt generator system.

V. HYDRO ENERGY

SLOPE GRADIENT = 41.35^0
We can generate hydro energy with the use of slope between buildings for running the turbine by flow of running water (rain water or waste water). We calculated the slope gradient which is 41.35^o between building and waste water treatment plant which is sufficient to run turbines, can create good amount of energy. To these project we need a network of pipes of around diameter = 1meter and length = 25meter.

Fig.5. Set-up of pipes for running turbines

VI. WASTE MANAGEMENT

- PLASTIC - We can partnership with companies to recycle back plastic and provide useful products crockeries such as dustbin, duster, sign board, display board, and many other uses.
- E-waste can be used to make useful electronic system for students.
- Recycling paper and cardboard give stars to institution like ASET.ASCO, ALS which will increase competitive behavior and make them about aware about their duties which is now in practice in many institutions.
- Organic waste will be used in production of bio-energy.

Example: - A few days back (18th August 2015), COCHIN INTERNATIONAL AIRPORT became the world's no.1 airport to completely operate on solar power. Its solar plant is producing 50,000-60,000 units per day to be consumed for all its functions, technically make the airport absolutely power neutral.

VII. BACK-UP PLAN

(When There Is No Sufficient Sunlight)
The time when there is no sun like between 15thDecember to 31stJanuary (winter) and during monsoon we can use energy from wind mills as the breeze comes with average speed of 35km/h.

Other option when the solar power is more than the demand power, we can store it and load is fed when required. Whenever solar power is less, we can supply power if its charge is greater than depth of discharge; else power will be taken from grid.

VIII. CONCLUSION

Scenarios by the World Energy Council, the future socio-economic potential of renewable energy sources could supply 20% of global energy by 2030 and 50% by 2050. Theoretically our practise is to show through the poster is that entire energy demand of AUMP could be met entirely from renewable energy sources when used in a sustainable manner.

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